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NCRTCI – 2024

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DEPARTMENT OF INFORMATION TECHNOLOGY

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SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

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Dr. T. R. PAARIVENDHAR M.P.

Founder & Chancellor, SRMIST

I am happy to note that SRM Valliammai Engineering College is organizing National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24) on 12th April 2024. The theme of the conference assumes a great relevance in the present-day scenario of globalization.

I hope that this conference would certainly induce creative ideas among the participants paving way for inventions and new technologies.

I take immense pleasure in appreciating the sincere efforts taken by the organizers and I wish the conference for grand success.

Dr. T. R. PAARIVENDHAR
Founder & Chancellor, SRMIST

Dr. RAVI PACHAMOOTHOO

Chairman & Pro – Chancellor (Admin),SRMIST

As the Chairman, SRM Group, it gives me a great pleasure to express my happiness over organizing the National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24) on 12th April 2024 at SRM Valliammai Engineering College.

The Conferences like these are great platforms for researchers and engineers from academia and industry to present and discuss the latest technological advances and research results. The students are the actual beneficiaries of such event.

I appreciate the Organizing Committee for the successful conduction and meeting the objective of this conference.

Dr. RAVI PACHAMOOTHOO
Chairman & Pro – Chancellor (Admin), SRMIST

Mrs. R. PADMA PRIYA

Vice Chairman, SRM Valliammai Engineering College

Indeed, I am much elated to note that the Department of IT, SRM Valliammai Engineering College is organizing the National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24) on 12th April 2024 at SRM Nagar, Kattankulathur.

These conferences enhance the job opportunities for students and also help them to set their goal in order to increase the productivity, efficiency, speed and quality resulting in high competitiveness in their future endeavors.

I'm certain this conference will provide broad coverage and dissemination of foundational research in automation among the researchers, academicians and practitioners. I take this opportunity to congratulate the Organizing Team and wish the Conference a Grand Success.

Mrs. R. PADMA PRIYA

Vice Chairman, SRMVEC

Ms. R. HARINI

Correspondent, SRMVEC

On behalf of *SRMVEC*, I would like to extend a warm welcome to all of you for attending the National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24). We are delighted to host this conference and provide a platform for researchers, academicians, industry professionals, and students to exchange their innovative ideas, research findings, and practical experiences.

Furthermore, we have arranged for ample opportunities for networking and collaboration between attendees, which will enable the exchange of innovative ideas and discussions on potential collaborations.

We sincerely hope that this conference will prove to be a valuable experience for all the attendees, and we look forward to your active participation and contribution to this event.

Ms. R. HARINI
Correspondent, SRMVEC

Dr. B. CHIDHAMBARARAJAN

Director, SRMVEC

I hope that this National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24) conducted by the Department of IT on 12th April 2024 will successfully serve the purpose of disseminating the knowledge needed by consorts to compete in the global market.

Best wishes for a successful National Conference on Computational Intelligence. May this gathering of minds bring forth innovative ideas and fruitful discussions in the realm of AI and beyond.

I appreciate the efforts made by all the committee members and I take this opportunity to thank all the participants, the committee members and student volunteers for their valuable contributions and support in making this conference a grand success.

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Dr. B. CHIDHAMBARARAJAN
Director, SRMVEC

Dr. M. MURUGAN

Principal, SRMVEC

Presently industries are expecting innovative technologies and strategies to face the challenges posed in this tough global market. In this context, Department of IT is organizing the National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24) on 12th April 2024 which would be yet another initiative taken by the staff and students of the college with the unstinted support of the Management.

I am confident that the topics covered in this Conference will add greatly to the knowledge base especially in this era. I encourage all participants, researchers, staff and students to take full advantage of the research presentations and talks during the Conference.

I applaud the members involved in organizing this Conference with best wishes for the grand success of the event and also thank the Management, HODs, Staff and Students involved in making this great event possible.

Dr. M. MURUGAN
Principal, SRMVEC

Dr. S. VISALAKSHI

Vice Principal, SRMVEC

I take immense pride in announcing that the Department of Information Technology is hosting a National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24) on 12th April 2024 embodies participation, meticulous planning, and thorough preparation. Advances in the computer technology industry have been instrumental in our nation's progress, and this symposium promises to contribute to that legacy.

I extend my best wishes to the Conference and hope it ignites the flames of enthusiasm and creativity among our budding minds. I extend my warmest wishes to the Conference's organizers and participants. May this platform kindle enthusiasm and creativity among our students and foster the exchange of groundbreaking ideas. With admiration for the tireless efforts of all involved, I look forward to the resounding success of NCRTCI'24.

Dr. S. VISALAKSHI,
Vice Principal, SRMVEC

Dr. S.NARAYANAN

Convener and Head – Department of IT

It gives me immense pleasure in sharing that our IT department has organized the ***National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI-2024)*** on 12th April 2024. It is our sincere hope that this Conference offers a platform for research scholars, academicians, students and participants to present their original work as well as to exchange ideas with experts. I whole heartedly thank our Management, Director Dr.B.Chidhambararajan, Principal Dr.M.Murugan and Vice Principal Dr.S.Visalakshi, for encouraging and supporting us to conduct the conference with all necessary help.

I take this opportunity to congratulate the Co-Convener(s) Ms.P.Sakthi and Mr.A.Aswin Jeba Mahir, Assistant Professor of our department and all the committee members who have provided the necessary guidance, help and co-operation for the successful conduct of the event. I congratulate all the members of *NCRTCI'24* team for their tremendous effortsand hard work. I thank the Almighty God for showering the blessings on all of us and making this event a memorable one.

Dr.S.NARAYANAN
Convener and Head – Department of IT

Ms. P. Sakthi

Coordinator – Department of IT

Dear Students, Faculty and Esteemed Guests, it is with great pleasure that I extend a warm invitation to each of you to join us at the National Conference on Recent Trends in Computational Intelligence 2024 (NCRTCI'24). This event promises to serve as an intellectually stimulating platform for engaging discussions and the exchange of innovative ideas. In today's interconnected world, the importance of comprehending and safeguarding national interests has never been more critical.

Our National Conference aims to delve into topics such as Data Analysis, technological advancements, and their profound impacts on national security and economic stability. Your participation in this esteemed gathering holds immense value. Not only will it enrich your understanding of various subjects explored in the papers, but it will also foster the exploration of future technological horizons.

I am eagerly anticipating the contributions of all participants and the resounding success of the event.

Ms. P. Sakthi
Coordinator – Department of IT

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META-ADAPTIVE TASK DISTRIBUTION FOR EFFICIENCY IN MOBILE EDGE COMPUTING ENVIRONMENT

[1] Ms. Jayabharathi S, [2] Ms. Harshini V, [3] Ms. M. Roshini, [4] Mr. Nikhil Ravichandran
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Abstract— **By moving computation closer to end users, Mobile Edge Computing (MEC) has become a potential paradigm to improve the performance of mobile applications. However, because mobile devices are dynamic and varied edge resources are available in MEC contexts, effective job distribution continues to be a significant difficulty. To increase productivity in MEC contexts, we present a Meta-Adaptive Task Distribution (MATD) framework in this study. Using meta-learning approaches, MATD dynamically assigns tasks to edge resources based on past data and real-time performance feedback. Through the use of meta-learning, MATD can quickly adjust to shifting workload parameters and network conditions, improving resource efficiency and cutting down on job completion times. Using comprehensive simulations and tests conducted in an authentic MEC setting, we assess the efficacy of MATD and showcase its capability. Numerous time-sensitive and computationally intensive applications, like daily payment methods and recommendation systems, have been impacted by the growth of mobile services. Nevertheless, task rivalry in computing that involves scarce resources raises mobile device energy consumption and task processing latency as well as scheduling limitations. MEC, or mobile edge computing, has been widely applied to these issues. Mobile edge computing (MEC) allows real-time information transfer and computing by shifting computational workloads from wireless devices to the network edge. Existing research focuses primarily on synchronous MEC systems on a small scale. Nevertheless, current techniques for compute offloading have drawbacks. They prioritize independent over-dependent jobs, on the one hand. In the actual world, task reliance poses difficulties, particularly with task segmentation and integration.**

Keywords: Mobile Edge Computing (MEC), Deep reinforcement learning, Dynamic Computation offloading, Meta Adaptive Task.

I. INTRODUCTION

A disruptive paradigm called Mobile Edge Computing (MEC) has surfaced in recent years to completely change the distributed computing landscape.

By placing edge servers closer to end users, MEC's basic tenet is to decentralize computing resources, lower latency, and enhance mobile applications' overall performance.

Efficient task distribution mechanisms inside MEC environments the growing demand for latency-sensitive applications like augmented reality, virtual reality, and Internet of Things (IoT) applications.

Despite their strength, traditional cloud computing models frequently fall short of the strict latency requirements of new applications. A bottleneck arises from the inherent latency brought about by sending data to and from remote cloud data centres, especially for real-time applications.

By moving processing closer to the network's edge, where data is created and consumed, MEC solves this problem. Through the utilization of edge servers situated near end users, MEC promises to minimize latency, optimize bandwidth usage, and increase the responsiveness of applications. But even with MEC's potential advantages, effective task distribution is still a big problem.

It is difficult to optimize resource utilization and task distribution due to the dynamic nature of mobile devices, changing network circumstances, and the variety of capabilities of edge resources. Conventional methods of job distribution frequently depend on centralized decision-making or static heuristics, which may not be suitable for the dynamic MEC contexts. With the ongoing advancement of mobile communication technology and the quick development of mobile Internet terminals, smartphones, tablets, laptops, and smart assistants are examples of mobile terminals that are extensively utilized. However, limiting elements like volume, weight, performance power, etc. are sent to the mobile terminal.

Its working capacity is still in a severe and tiresome state, unable to satisfy the growing demand of the populace. The mobile terminal is still far from what people require, despite significant advancements in hardware technology (such as the ongoing replacement of CPUs and GPUs and the ongoing improvement of chip production from nm to nm to the current nm, etc.).Furthermore, with the introduction of novel ideas like industry, telemedicine, and autonomous driving.

They require standard equipment with minimal latency and extreme reliability even less equipped to sustain their activities. Simultaneously, with the rise of artificial intelligence, machine learning, and other cutting-edge technologies, image, and speech recognition are developing at a quick pace. Virtual reality and augmented reality game applications are also developing at an exponential rate. These programs are all computationally demanding at the same time and require a significant amount of computer and storage resources to run.

When computationally demanding applications are operating on smart terminals, the limitations of mobile terminals or other devices cause significant issues with the terminal's endurance and the application's performance.

However, to handle the exponential expansion of data generated and used by mobile devices for tasks like image processing, video streaming, and AR/VR data, flexible computing methods are required for computation-intensive and time-sensitive mobile Internet applications. Applications based on artificial intelligence, for instance, have significant processing resource requirements. While the cloud architecture can handle large amounts of data, there are issues with how network speed and transmission time affect user experience. In contrast, due to resource storage and energy consumption limits, it would not be feasible to do all of these computations using a mobile device. A distributed computing paradigm called Edge Computing (EC) seeks to address the problem caused by centralized computing. A more streamlined and effective process solution is offered by this distributed design. It handles the data as though it were handled by nearby computing resources, like those in the same region, which produces a quicker response. As a result, EC permits a notable decrease in latency and eases congestion at the backbone, backhaul, and centralized server levels of the network.

Large and complicated networks, like the Internet of Things (IoT) networks, are where the benefits of EC are most noticeable. Once the bandwidth utilization and transmission time latency are optimized, the functioning of IoT networks may be greatly enhanced. Microsoft, for instance, used these edge infrastructures to create a technology that gathers and processes movies from an open geographic area in real-time. Additionally, EC offers a versatile work offloading plan that extends the life of end-device batteries.

II. EXISTING SYSTEM

By shifting computational work to edge servers, task offloading in mobile edge computing (MEC) increases the effectiveness of mobile devices in terms of processing performance, data storage, and energy consumption. MEC technology can be used to reduce energy usage and job processing latency through efficient task offloading By Reinforcement learning (RL) techniques have been used to tackle the task offloading in MEC by combining the computational power and reasoning of cognitive computing architecture, such as SOAR and ACT-R. This study presents a task offloading scheduling technique that combines multi-agent reinforcement learning with metal learning to address the issue that traditional Deep RL (DRL) algorithms cannot adapt to dynamic situations. To ensure that the charging duration and offloading approach are properly taken into account simultaneously.

On a mobile device, the authors of the current system created a learning network consisting of two agents. The current system authors are using a first-order approximation method based on a clipped surrogate objective to effectively train the policy network. Lastly, the experiments are set up with different subtask counts, transmission rates, and edge server performance. The outcomes demonstrate that the MRL-based approach performs exceptionally well overall and is easily implemented in a range of settings with good stability and generalization. To tackle the issues of mobile applications with multiple DAG types and MDs with WPT services, a multi-agent MRL-based approach has been developed to guarantee the prompt production of offloading strategies for distinct DAG task kinds. The content of this study may change before it is published in its final form. It builds a system architecture with task offloading. energy harvesting in an MEC environment puts up a meta-learner and base learner and integrates meta-learning with this architecture.

Then, to completely utilize device attributes and service requirements, it implements them in the edge server and the MD, respectively. The MRL process, which divides learning into four stages—basic learner training, metainformation storage, meta-learner training, and metalearner application—is intended to facilitate quick learning by having two learners work together. The WPT service time and whether to offload the work are then determined by building the MDP model based on a resource-limited MEC environment and combining it with MRL algorithms. Based on the experimental results, it can be readily deployed to different situations with strong stability and generalization. The meta-MASAC-based method provides the best overall performance in all categories. While the meta-MASAC-based approach offers numerous advantages for the MEC model included in this study, several challenges need more investigation.

The authors of the current system considered computing resources in their study. As a result, when the user base grows, the strategy remains intact. On the other hand, inadequate power or malfunctioning network connectivity may cause certain MDs to disconnect. This circumstance may have an impact on how our strategy is trained. Three other components make up the MEC environment: edge servers, cloud data centers, and MD.

However, only the job offloading strategy between the edge server and the MD is looked at in this study. Consequently,

the authors of the current system intend to pursue future research on the application of meta-algorithms in cloudedge-device, edge-to-edge, and device-to-device architectures. In this approach, a multi-agent deep reinforcement learning (DRL) system with enhanced meta-learning capabilities is responsible for managing task offloading in mobile edge computing (MEC) environments. Several smart agents representing edge servers and mobile devices work together to choose the best offloading tactics. Using DRL, agents acquire experience by trial and error, optimizing rewards according to variables such as task completion time, energy efficiency, and network quality. Meta-learning expedites the process by leveraging prior experiences to enable agents to quickly adjust to novel situations or environments. In MEC contexts, this dynamic and adaptive method improves system performance, scalability, and resource allocation. Nevertheless, the method has difficulties such as the necessity to create privacy protections, the need for strong communication security because of dispersed decisionmaking, and computational complexity during training.

Complexity and Computational Overhead: The design and implementation of DRL models can be highly intricate. One potential disadvantage for edge devices with limited resources is the substantial processing resources and time needed for DRL network training. Algorithms for dynamic computation offloading frequently have a smaller computational footprint.

Sample Inefficiency: To learn effectively with DRL, a large number of samples (experiences) are typically needed. In real-time MEC systems, where data collection may be constrained or where quick reaction to shifting circumstances is required, this could be troublesome.

Convergence and Stability: It's challenging to ensure that a DRL system will converge to the best possible outcome. Particularly in dynamic contexts where network circumstances, device capabilities, and task types change often, these systems may be unstable.

Explainability: DRL models' decision-making process can occasionally be opaque, acting as a kind of "black box". This can impede trust and debugging since it makes it hard to understand why the system chose a specific offloading strategy. Algorithms for dynamic computation offloading could offer more transparent decision-making procedures.

Sensitivity to Hyperparameters: The selection of hyperparameters, such as learning rate and network architecture, has a significant impact on how well DRL solutions perform. It can take a lot of effort and experimentation to find the ideal combination of these parameters.

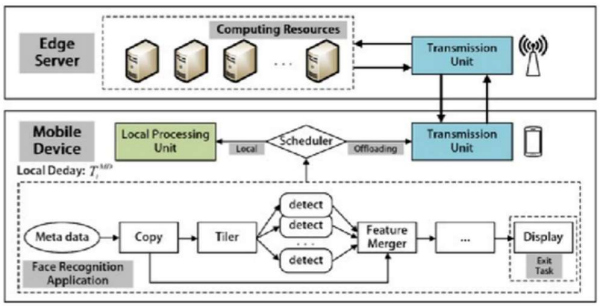

Figure 1: Architecture diagram of the existing system

III. PROPOSED SYSTEM

The explored non-convex optimization issue for maximizing the least number of offloaded bits in a multi-user MEC system is solved with a provably convergent and efficient solution. This is the general reasoning. We take into consideration a group of hosts linked by a network, each of which may create and/or carry out gradual soft real-time tasks. Then, a host might perform both locally generated and offloaded jobs on behalf of other hosts, or it might just generate or perform jobs. Offloading choices in this context can be well-informed and flexible to runtime circumstances. Feedback is provided by broadcasting information among hosts about variables including available energy, host job load, and network bandwidth and latency. We treat every task as having a soft real-time character, which means that each one has a relative deadline that expresses the longest acceptable completion time for optimal quality of service and that in the event of offloading, hosts must communicate to provide job inputs (before the job computation can begin) and get job outputs upon completion of the computation. The framework's modular design enables the model and offloading strategies to be implemented with ease. It also gives users the tools they need to make well-informed decisions about runtime offloading based on feedback from the system. Specifically, a built-in system profiler collects runtime data on available bandwidth and workload energy consumption for each participating device or server. The human eye can quickly determine how similar two images are to one another in terms of quality. For instance, it is simple to compare the different forms of spatial noise displayed in the grid below with the original image and identify any alterations or inconsistencies. To measure this difference, though, mathematical expressions would be required. The following similarity metrics are used in this paper: Erreur Relative Globale Adimensionnelle de Synthse (ERGAS), Spatial Correlation Coefficient (SCC), Relative Average Spectral Error (RASE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index (SSIM), Universal Quality Image Index (UQI), Multi-scale Structural Similarity Index (MS-SSIM), Erreur RelativE Globale Adimensionnelle de Synthse (ERGAS), Spectral Angle Mapper (SAM). Minimal intricacy Solution: A "meta-policy" is used by meta-adaptive task offloading to

handle complexity. Consider this as an advanced algorithm for making decisions that can swiftly learn and adjust. This lowers the computational load by doing away with the requirement to fully retrain the system for each new kind of activity or circumstance. Simple decision-making models can also be used by the approach to maintain efficiency for mobile devices with limited resources.

Enhanced Energy Efficiency: This tactic prolongs the life of a phone's battery. It intelligently routes intensive processing to strong-edge servers. Because it doesn't have to work as hard, your phone uses less of its limited energy.

The system is also dynamic: it continuously evaluates variables like as network latency and battery life to determine whether delegating a task is the most energy-efficient option at any given time.

Real-time Status Information: At the network's "edge," edge servers function as intelligent hubs. These servers gather an enormous amount of data about the state of the network, the battery life of your device, and the available resources. This real-time data serves as the brains behind the most intelligent offloading decisions. Additionally, your gadget can provide the edge with feedback on how things happened, enabling a cycle of continuous development.

Efficient System Coverage and Throughput: Consider task offloading as dividing the work and utilizing edge servers' combined power. This greatly increases the system's overall speed. Additionally, network congestion is decreased by processing some jobs at the edge, closer to the user, improving coverage and signal strength for everybody.

Accelerating Computation for High Availability: Compared to distant cloud data centers, edge servers are closer to your device and therefore transmit data at a lower cost. The latency is incredibly low as a result. Applications deliver faster outcomes, preserving system stability. These are the mobile devices— laptops, tablets, and cellphones—that generate work that is routed to the edge servers for handling. Edge servers ensure that your critical operations continue to operate normally by acting as a local backup if there is an issue with the principal network.

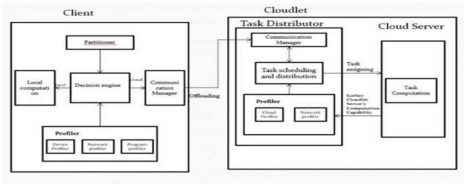

Figure 2: Architecture diagram of the Proposed system

Compared to cloud servers, these servers are situated closer to the users, which lowers latency and speeds up response times. Tasks from user devices must be received by them, processed, and results returned. Cloud servers are included in the infrastructure even though they aren't shown in the edge computing architecture diagram. They take care of jobs that are too difficult or have too few resources to be processed at the edge. This encompasses the network of communication that links cloud servers, edge servers, and user devices. It has different bandwidth and latency characteristics and can be wired or wireless. This component is responsible for deciding which tasks should be offloaded to the edge servers for processing. It takes into account factors such as task characteristics (e.g., computation intensity, deadline), network conditions, and edge server availability.

This module employs machine learning algorithms to adaptively adjust task offloading decisions based on realtime data and feedback. It continuously learns from past experiences to optimize task allocation and improve overall system performance. The policy engine defines rules and policies governing task offloading and resource allocation. It may incorporate user preferences, service level agreements, and system constraints to make informed decisions.

This component collects data on system performance, including task execution time, resource utilization, and network conditions. It provides feedback to the task offloading module and machine learning module to refine decision-making processes over time.

The key to ubiquitous computing, which supports the thriving mobile sector, is the ability of mobile devices to facilitate communication and computation at any time and place. Information about variables such as available energy,host job load, and network bandwidth and latency is broadcast among hosts to provide feedback.

According to the model offloading techniques can be easily built because of the modular design of the framework. Additionally, it provides users with the information and resources they need to decide on runtime offloading wisely in light of system feedback.

More specifically, an integrated system profiler records each participating device or server's runtime energy consumption and available bandwidth.

The degree of quality similarity between two photographs can be rapidly discerned by the human eye.

Dynamic Computation offloading algorithm is the proposed algorithm. These algorithms represent a set of methods rather than a single methodology. They make a dynamic decision about whether to handle a task on your device or send it to an edge server for processing. This choice is continually reassessed in light of current variables, such as server availability, workload on your device, network congestion, task needs, energy efficiency, and more. Imagine it as an extremely effective traffic controller that routes tasks to maximize speed and resource utilization. The dynamic algorithms are accelerated by meta-learning. It

makes it possible for the system to quickly adjust to changing circumstances without requiring a lot of retraining. The past decisions and their results are stored in the system. Consider it as creating an enormous choice library. This library is analyzed using meta-learning, which looks for patterns that indicate which offloading techniques performed best in certain scenarios. The system does not restart when a new task or scenario appears. It quickly applies this information for decisionmaking by drawing on the knowledge gained from prior experiences.

Heuristic-Based Algorithms: These algorithms base their offloading decisions on preset strategies or common-sense guidelines. For instance, if the expected energy savings from offloading surpass a predetermined threshold, a heuristic may always offload computation-intensive operations. Even if they are effective, they occasionally can't adjust to a wide range of circumstances.

Algorithms based on optimization seek to identify the mathematically best course of action for reducing expenses or maximizing benefits. Lyapunov optimization, which is excellent for balancing energy and latency, and convex optimization, which helps address complex constraints, are examples of common optimization approaches. These typically require greater processing power.

Game Theoretic Algorithms: Game theory can be used to analyze how different devices compete for shared edge server resources. This entails simulating device interactions as a game in which each device seeks to maximize its offloading options while taking other devices' choices into account.

Enhancement of meta-learning: Heuristics can be made more effective over time by fine-tuning their rules through the analysis of previous cases by meta-learning. In dynamic situations, meta-learning can expedite convergence to optimal solutions by predicting ideal starting points for optimization algorithms. In dynamic situations, meta-learning can expedite convergence to optimal solutions by predicting ideal starting points for optimization algorithms. Various advantages include Resource Efficiency, adaptability, scalability, and reduced overhead.

IV. DISCUSSIONS

Module 1: Code profiler: Offloading is the sly technique that uses distant servers to carry out code that a mobile device has assigned it. During this process, the mobile device is equipped with local decision logic to identify resource-intensive code segments, enabling it to estimate the location of code execution when network communication is present. The decision of what to offload rests with the code profiler. As a result, sections of the code that belong in the Method, Thread, or Class are marked for offloading. The code to be offloaded must be chosen before code partitioning may proceed. There are many different ways to divide code. For example, a software developer might use special static annotations (like @Offloadable and @Remote) to specify and designate the code that should be offloaded. In other ways, an automated tool analyses the code implicitly during runtime. Therefore, the process chooses the code to be offloaded when the application is installed on the device. To determine if a section of code is intensive or not, the process employs techniques such as historical traces and static analysis. Because automated systems can modify the code to run on many devices, they are better than static ones.

Module 2: System Profiler: System profilers are in charge of monitoring several smartphone metrics, including available bandwidth, transmit data size, and code execution energy. When to offload to the cloud is influenced by these factors. From a conceptual standpoint, offloading is voluntary and ought to happen when the work is demanded by the mobile. When executing the OC remotely as opposed to locally, the mobility requirement is smaller. If not, offloading is discouraged since it takes too long and uses too much energy to send data to the cloud.

Module 3: Decision Engine: A reasoner called the decision engine determines when to offload to the cloud., the engine gets the data collected by the code profilers and the system and applies certain logic. If the offloading mechanism is enabled, the code is called remotely; if not, it is run locally. The amount of data that a mobile device offloads to the cloud varies based on its size and the available bandwidth. When code offloading is detrimental typically the result of an incorrect inference procedure that is erroneous given the range of observable parameters.

V. CONCLUSION

In conclusion, this research proposed a machine learning effective job distribution in Mobile Edge Computing (MEC) environments. Compared to conventional offloading techniques, MAT delivers increased efficiency, quick task adaptation, and less training stress by utilizing meta-learning concepts. This work lays the groundwork for future investigations into more complex meta-learning algorithms, security issues, and practical assessments of MAT for wider use in MEC systems. Through the use of adaptive decisionmaking processes and machine learning algorithms, our system has demonstrated adaptability to changing device capabilities, workload variations, and network conditions. By ensuring optimal performance in a variety of contexts, this adaptability enhances user experience and maximizes the usefulness of edge resources.

Additionally, by shedding light on the potential of metaadaptive techniques to improve system scalability and efficiency, our work advances the wider field of edge computing. Our solution's scalability makes it possible to integrate it with current MEC systems with ease, opening the door for broad use in practical applications.

VI. FUTURE ENHANCEMENTS

In the future enhancement of the research, we want to investigate more sophisticated learning algorithms for even

quicker adaptation and multi-objective optimization that takes into account variables other than efficiency. We also intend to include explainable AI methods and context-aware offloading to enhance the framework's functionality and transparency. Going ahead, there are multiple opportunities to further improve our project entitled "Meta-Adaptive Task Distribution for Efficiency in Mobile Edge Computing Environment.

First, to improve flexibility and the ability to make judgments quickly, we can look at implementing advanced machine learning models, like deep learning or reinforcement learning. Furthermore, by utilizing multi-objective optimization approaches, we will be able to reconcile competing goals like resource utilization, energy efficiency, and latency minimization, meeting the needs of a wide range of applications. Additionally, empowering edge devices for local computing through the integration of edge intelligence techniques like federated learning or edge analytics can improve privacy and lessen network congestion. The variability of edge devices to memory, computing power, and energy limits means that creating adaptive algorithms is essential to maximize resource use.

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CLOUD DATA ARCHIVING USING DNA AS A STORAGE MEDIUM

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***Abstract*— In essence, cloud computing is the on-demand provision of computer resources or services, namely computational capacity and data storage without the use of external gear or software. Pay-per-use, on-demand services, limitless storage space, flexibility, and many other advantages make cloud computing particularly alluring. It does, however, have a number of drawbacks, including security, access control, restricted control, downtime, etc. In any cloud computing environment, data security is a crucial concern due to the prevalence of attackers. Traditional methods are employed in a cloud environment to encrypt any data using encryption algorithms; however this raises data security concerns due to the prevalence of multiple bad users and hackers online .One of the most cutting-edge disciplines used today to improve data or information security is DNAbased cryptography. DNA-based cryptography is primarily based on DNA computing, in which hardware, biochemistry, and DNA sequence are all used to encode genetic information in a computer. In this research, we suggested DNAS for the cloud environment, which would allow users to access cloud data utilizing DNA computing quickly and securely. The table can help to shorten the time it takes the data owner to look for data and retrieve it. DNA cryptography is used to present a data encryption technique in which a Data Decryption Key (DNADK) based on 1024-bit DNA computing is created at random. By providing randomization in the data encryption and secret key generation phase, the suggested technique is protected against several security threats, such as password guessing assault, DDoS attack, masquerade attack, stolen verifier attack, and phishing attack. This paper demonstrates its suitability for usage in contemporary cryptosystems used for cloud-based data exchange.**

I.INTRODUCTION

1.1. DNA COMPUTING

DNA (Deoxyribonucleic acid) is a particle that contains the directions a creature needs to grow, live, and repeat. These directions are tracked down inside each cell and are passed down from guardians to their youngsters[1].

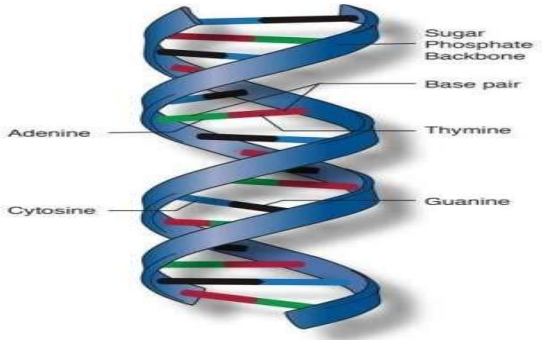

FIG 1:STUCTURE OF DNA

DNA is comprised of atoms called nucleotides. Every nucleotide contains a phosphate bunch, a sugar bunch and a nitrogen base. The four sorts of nitrogen bases are adenine (A), thymine (T), guanine (G), and cytosine (C). The request for these bases decides DNA's directions, or hereditary code[1].

1.2. DNA Sequencing

The research facility strategy which is utilized to decide the request for the four synthetic structure blocks — called "bases" — that make up the DNA particle is classified "DNA Sequencing". The succession tells researchers the sort of hereditary data that is conveyed in a specific DNA fragment. In the DNA twofold helix, the four synthetic bases generally bond with a similar accomplice to shape "base matches". Adenine (A) consistently coordinates with thymine (T); cytosine (C) consistently coordinates with guanine (G). These pairings are the reason for the component by which DNA atoms are replicated when cells partition and the pairings likewise underlie the techniques by which most DNA sequencing tests are finished. The human genome contains around 3 billion base coordinates that explain the guidelines for making and keeping a person [1].

1.3. DNA Computing

DNA computing is a modern area of science that recognizes biomolecules as fundamental elements of electronic devices. This is related to several other areas including chemistry, software engineering, Cell genetics, physics, and mathematics. Computing with biological molecules, rather than conventional silicon chips. While its conceptual history stretches back to the early 1950s, the principle of computing with molecules was only understood scientifically in 1994, when Leonard Adleman illustrated the answer of a small aspect of a very well-known problem in combinatory utilizing standard molecular biology methods

in the lab. Since this study, curiosity in DNA computing has significantly increased, and now it's a best-established research field. Leonard Adleman demonstrated how a statistical problem can be solved with Molecules [2].

The benefits of DNA computing

1) **It's cheap :**

It has the potential to be inexpensive at scale. DNA is available all around us in every cell of every living thing, so theoretically there's plenty of stock available. However, since DNA computing doesn't use actual human DNA (it instead relies on artificially produced DNA) production is currently the main hurdle. Once the scales of economy work in our favor, though, DNA for computing will be inexpensive to create [3].

2) **It's easy to produce :**

We do it all the time. DNA naturally wants to reproduce, so it's just a matter of harnessing this natural tendency in an artificial environment when DNA manufacturing
[3].

3) **Parallel computing solutions :**

DNA can perform countless calculations in parallel. While classical computing quickly reaches a limit of how many parallel computations can be made, DNA computing has almost no limit. This makes it ultra-fast and incredibly powerful for scenarios like machine learning [3].

1.4. DNA Data Storage

CDs, hard drives and large servers are commonly used to store digital data. This storage takes up a lot of room, is pricey, and isn't very long-lasting. The search for a new mechanism to store digital information has been on-going and there has just been a breakthrough in storing and receiving information on the same medium that stores the biological code of the human genome: DNA. Improving DNA data storage could be the solution to reduce the pressure on traditional data centers [4].

DNA for Data Storage and Retrieval

The speed at which information, for example, photographs, recordings, and web-based entertainment posts - are being created is sloping up definitely, surpassing the scaling furthest reaches of conventional silicon-based information capacity advancements, and DNA could be conveyed to assist with meeting this test. As a sign of the gigantic measure of information stockpiling that might be required, one model predicts that constantly 2030, power use by server farms could move toward around eight percent of complete worldwide power interest [5]. New standards for information capacity, for example, the utilization of DNA for saving data, are fundamental.

DNA is hereditary material that contains plans for the plan of living things, yet DNA can likewise be utilized to store information made by living things. DNA is an alluring material for information capacity - it is steady, writable, comprehensible, and data thick [6]. In principle, the whole world's information could be put away in an espresso cup measured piece of DNA [7]. DNA is a polymer - a substance comprising of countless comparative structure obstructs that are connected together - and different polymers can be utilized to store data, as well.

II PROBLEM STATEMENT

The problem statement for DNA computing model to secure and store outsourced data in the cloud is to address the growing concern of data security and privacy in cloud computing environments. With the increasing adoption of cloud computing, more and more organizations are outsourcing their data to the cloud. While cloud computing offers many benefits, such as cost savings and scalability, it also poses significant security risks. Traditional cryptographic techniques used to secure data in the cloud may not be sufficient to protect against advanced attacks, such as quantum attacks. DNA computing offers a promising alternative for secure and efficient data storage in the cloud. By using DNA molecules as the storage medium, data can be encrypted and decrypted using biological processes that are difficult to reverse engineer. The problem is to develop a DNA computing model that can securely store and retrieve outsourced data in the cloud, while maintaining confidentiality, integrity, and availability of the data. The model should also be efficient and scalable, able to handle large amounts of data and multiple users. Additionally, the model should address the challenges of data retrieval, replication, and migration in the cloud. It should ensure that users have fast and secure access to their data, while also providing mechanisms for data replication and migration to ensure data availability and reliability. Overall, the goal of this problem statement is to develop a DNA computing model that can provide a high level of security and privacyfor outsourced data in the cloud, while also addressing the challenges of scalability and efficiency.

III EXISTING DNA DATA STORAGE

There are several existing cloud data security algorithms used to protect sensitive data in the cloud. Some of the most commonly used algorithms include:

1) **Advanced Encryption Standard (AES):**

AES is a symmetric encryption algorithm used to protect data at rest and in transit. It is a widely used algorithm due to its high level of security and fast encryption/decryption speed.

2) **Rivest-Shamir-Adleman (RSA):**

RSA is an asymmetric encryption algorithm used to protect data in transit. It uses public and private keys to encrypt and decrypt data, and is often used in combination with symmetric encryption algorithms such as AES.

3) **Blowfish:**

Blowfish is a symmetric encryption algorithm that is often used for data encryption in cloud environments. It is known for its fast encryption/decryption speed and high level of security.

3) **Data Encryption Standard (DES)**:

DES is a symmetric encryption algorithm used to protect data in transit and at rest. It has been widely used in the past, but is now considered less secure due to its small key size.

4) Elliptic Curve Cryptography (ECC):

ECC is an asymmetric encryption algorithm that is known for its high level of security and small key size. It is often used in combination with symmetric encryption algorithms to provide an added layer of security.

5) Hash functions:

Hash functions are used to generate fixed-length values that represent large amounts of data. They are often used to verify the integrity of data in the cloud and to prevent data tampering. These algorithms are often used in combination with other security measures such as access control, multi-factor authentication, and intrusion detection and prevention systems to provide a comprehensive security solution for cloud data. The choice of algorithm depends on various factors such as the type of data being protected, the level of security required, and the computational resources available.

IV PROPOSED SYSTEM

The proposed system of DNA Computing Model to DNA Code Substitution and Recovery based Data Storage and DNA ABE based Data Security in Cloud aims to address the drawbacks of existing cloud data storage and security mechanisms.The system utilizes DNA computing and encryption techniques to ensure secure storage and access control of outsourced data in the cloud. The key components of the proposed system .

1) DNA Code Substitution and Recovery based Data Storage

This component uses DNA, Low-Density ParityCheck (LDPC) code substitution and recovery techniques to store data in DNA molecules. This method provides high-density storage capacity, long-term data stability, and resistance to environmental factors such as moisture, and radiation.

➢**DNA Code**:

DNA code, also known as genetic code, is a set of rules by which genetic information is stored in DNA and translated into proteins. DNA is made up of four nucleotide bases: Adenine (A), Thymine (T), Cytosine (C), and Guanine (G). These bases combine in triplets, called codons, to form the genetic code. There are 64 possible codons, each of which codes for a specific amino acid or a stop signal.

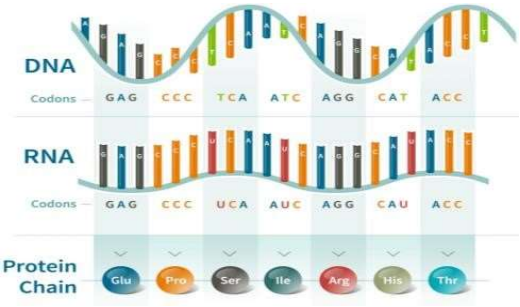

FIGURE 2 DNA CODE

The sequence of these codons determines the order of amino acids in a protein. Proteins are essential building blocks of life, and their structure and function are determined by their amino acid sequence. The DNA code is universal, meaning that the same codons code for the same amino acids in all living organisms. This allows genetic information to be shared between different species through evolutionary processes. The DNA code is critical for understanding genetics and molecular biology and has many practical applications, including genetic engineering, biotechnology, and medicine.

➢**DNA Quaternary Code:**

Binary code is a system of representing information using only two symbols, typically 0 and 1, which can be used to represent complex information using a series of combinations. In contrast, DNA uses a quaternary code, consisting of four nucleotide bases: Adenine (A), Thymine (T), Cytosine (C), and Guanine (G). These bases combine in triplets, called codons, to form the genetic code, which specifies the sequence of amino acids in proteins. Although the DNA code is not binary, it is often represented using a binary system for computational analysis and storage. In this case, each nucleotide base is assigned a binary digit, typically 0 or 1, and the sequence of bases is represented as a binary string. However, this is just a representation of the DNA code and not the actual code itself.

Figure 3 Quaternary Code

2) DNA ABE based Data Security

This component uses Attribute-Based Encryption (ABE) techniques based on DNA sequences to provide secure data access control. ABE enables fine-grained access control to the data by using attributes as a basis for defining access

policies. DNA-based ABE techniques can provide enhanced security and privacy protection, and can also improve scalability and performance compared to traditional ABE techniques.

➢ **DNA Attribute Based Encryption**

(DNA-ABE) is a type of encryption scheme that uses DNA sequences as keys to encrypt and decrypt data. In DNA-ABE, each data object is associated with a set of attributes, such as age, gender, or location, and the encryption process is based on these attributes.The encryption process in DNA-ABE involves converting the attributes associated with the data object into a DNA sequence, which is used as a key to encrypt the data. To decrypt the data, the DNA sequence must match the attributes associated with the data object.DNA-ABE has potential applications in secure data sharing, especially in healthcare and finance industries, where sensitive data must be shared with multiple parties with different levels of access. DNA-ABE allows data owners to define access policies based on attributes, and only those parties who meet the access criteria can decrypt and access the data.However, the implementation of DNA-ABE is challenging due to the cost and time required to synthesize DNA sequences.

➢ **Cloud Integration**

The proposed system can be integrated with existing cloud storage infrastructure to provide a seamless and secure data storage and retrieval process. The system can be accessed through a web-based interface or an API, which allows users to easily upload, manage, and retrieve data.

➢ **User Management**

The proposed system includes a user management module that allows administrators to manage user access privileges and policies. This module can also provide detailed logs and audit trails to ensure compliance with data security regulations.Overall, the proposed system provides a highly secure and scalable data storage and access control mechanism for cloud-based data storage. It leverages the benefits of DNA-based storage and encryption techniques to provide a robust and reliable solution for organizations and individuals who require high levels of data security and privacy.

V.SIMULATION RESULTS

1) DNA Cloud Service Provider

The Cloud Service Provider User Interface Module is responsible for providing a user-friendly interface for cloud service providers to interact with the system. The module allows users to register, login, manage their accounts, and view statistics related to the data stored on the cloud.The module includes various pages such as a home page, login page, registration page, account management page, and data statistics page. The home page provides a brief overview of the application and its features. The login page allows registered users to access their accounts by entering their username and password. The registration page allows new users to create an account by providing their personal information and contact details. The account management page allows users to manage their account information such as their profile picture, username, password, and other personal details. The data statistics page displays information related to the data stored on the cloud such as the amount of data stored, the number of users accessing the data, and other relevant statistics. Overall, the Cloud Service Provider User Interface Module is essential for providing a user-friendly interface for cloud service providers to manage their accounts and view statistics related to the data stored on the cloud.

2) End User Interface

The End User Interface Module of DNA Cloud provides a user-friendly interface for the Data Owner and Data User to access and manage their data stored in the cloud. It is designed using HTML, CSS, and JavaScript and is built on top of the Python Flask web application framework.The module includes several features such as user authentication, file upload and download, and attribute-based access control. The interface allows the Data Owner to upload and manage their files by assigning access policies and attributes to them. The Data User can request access to the encrypted files by submitting their attribute values, which are verified against the access policy set by the Data Owner. If access is granted, the Data User can download the file or access it directly from the cloud storage. The module also includes a dashboard that provides a summary of the user's activity, such as the number of files uploaded, downloaded, and shared. It also displays the user's available attributes and the access policies assigned to each file. The End User Interface Module provides an intuitive and secure platform for the Data Owner and Data User to manage their data in the DNA Cloud.

3) Authentication and Authorization

The Authentication and Authorization End User Interface Module is responsible for ensuring that only authorized users are granted access to the DNA Cloud system. The module allows users to create accounts, log in, and manage their access to the system. The module first presents the user with a login screen where they can enter their credentials, including their username and password. Once the user has entered their information, the module validates their credentials by checking them against the system's user database. If the credentials are valid, the user is granted access to the system. If the user does not have an account, they can create one through the system's registration feature. The user is prompted to enter their personal information, including their name, email address, and password. The module then validates the information and creates a new user account in the system's database. Once a user has logged in, they can manage their access to the system through the Authorization component of the module. This allows users to specify which files and data they are allowed to access within the system. The module presents the user with a list of their access rights and allows them to modify or revoke those rights as needed. The Authentication and

Authorization End User Interface Module also includes features for managing passwords and resetting forgotten passwords. These features help to ensure that the system remains secure and that only authorized users can access sensitive data.

4) End Users

The end users of Enterprise DNA Cloud would be businesses and organizations that require secure and efficient storage, processing, and analysis of large amounts of data. These could include healthcare organizations storing patient data, financial institutions storing transaction data, and research institutions analysing large datasets. Employees of an organization using Enterprise DNA Cloud for secure storage and sharing of sensitive business data. The end users of Enterprise DNA Cloud are typically divided into two categories: Data Owners and Data Users. The Data Owners are responsible for uploading and managing their data in the cloud, while the Data Users are the ones who access and analyse the data using the cloud-based services provided by the Enterprise DNA Cloud.

5) Data Owner

Data Owner is a user who owns the data and is responsible for its storage, management, and security. In DNA Cloud, the Data Owner is responsible for converting their data into DNA sequences using DNA code substitution and uploading it to the cloud. They are also responsible for encrypting their data using attribute-based encryption and assigning access policies to the data, which control who can access it and under what conditions. Additionally, the Data Owner can manage their data, including adding or removing access policies, revoking access to the data, and retrieving the data when necessary using DNA recovery algorithms. The Data Owner has full control over their data and can modify, delete or transfer it as per their requirements.

The data owner is a crucial role in DNA cloud. Some of the important roles of a data owner in DNA cloud are:

Uploading data: The data owner is responsible for uploading their data onto the DNA cloud platform. This can include various types of data such as text documents, images, videos, and more.

Data access control: The data owner has control over who can access their data on the DNA cloud platform. They can set permissions for specific users or groups, ensuring that only authorized individuals have access to their data.

Encryption and decryption: The data owner is responsible for encrypting their data before uploading it onto the DNA cloud. They must also be able to decrypt their data when they need to access it.

DNA code substitution: The data owner may also be involved in the DNA code substitution process, where their data is converted into DNA sequences that can be stored and processed using DNA computing technology. **Key management**: The data owner is responsible for managing the keys used for encrypting and decrypting their data. This may include generating and distributing keys to authorized users.

Data recovery: In the event of data loss or corruption, the data owner may be responsible for initiating the data recovery process and working with the DNA cloud service provider to recover their data.Overall, the data owner plays a critical role in the security and management of their data within the DNA cloud platform.

Data User : Data Users in the DNA Cloud are individuals or entities who are authorized to access and utilize the data stored on the cloud. They can be researchers, medical professionals, or other stakeholders who need access to the data for analysis or decision-making purposes. The primary role of a Data User in the DNA Cloud is to use the data in a responsible and ethical manner, ensuring that any analysis or processing of the data is done in compliance with the relevant regulations and best practices.

Login

Requesting access: Data Users can request access to the encrypted files stored in the cloud storage.

Verification: The cloud storage verifies the access policy against the attributes of the Data User to determine if access should be granted.

Downloading/accessing files: If access is granted, the Data User can either download the file or access it directly from the cloud storage.

Viewing and modifying data: Once the Data User has access to the file, they can view and modify the data as per their permission level.

Data sharing: Data Users can also share the data with other authorized users or groups, as permitted by the access policy.

Audit logging: All activities of the Data User are logged for auditing and tracking purposes.

DNA Computing

A) DNA Encoder

In this module the uploaded files are taken (binary or non-binary) and encodes it to DNA sequence. Binary representation of every bite is translated into DNA by encoding the following. Since DNA is composed of 4 nucleotides (Adenine, Cytosine, Guanine, Thymine; usually referred using the first letter). Using this Substitution Algorithm, we can encode using a single nucleotide. In this way, we are able to use the 4 bases that compose the DNA strand to encode each byte of data.

$$\log_2(4) = \log_2(2^2) = 2\text{bits}$$

To store data on DNA, one has to find ways for encoding the given data into DNA sequence. There are many encoding techniques available to convert the data into DNA sequences by using DNA codes. One of the most the efficient source coding technique called Low-Density Parity-Check (LDPC) codes is well known for data compression.

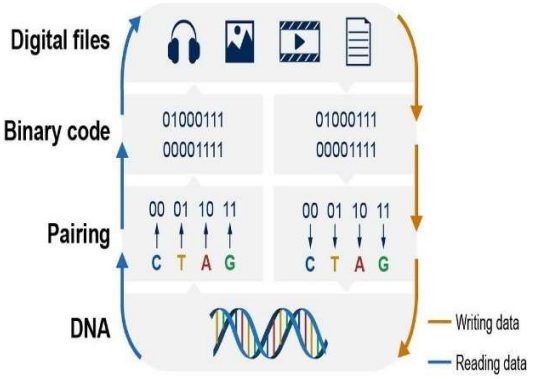

FIGURE 4. DNA STOREAGE

The DNA encoding by LDPC is uniquely decodable. In this project, LDPC encoding is implemented. For error

correction, the overlapping codes are implemented and data is retrieved from DNA with reduced error rates. The encoding module takes the data file of any format (.text, .png, .jpg, .mp3, .mkv etc.) as an input. The DNA sequence encoded is divided into fixed length of DNA chunks and the part of the DNA chunks were overlapped implementing four-fold redundancy for error correction. The original file is converted to Huffman base 3 code (0,1,2) with code length of 5 which is transformed to triplet codon to DNA code according to the conversion principle as substituting each trit (triplet) with one of the three nucleotide different from the preceding one i.e. if G is the preceding, then A or T or C will be placed, this ensures that no homo polymers are generated to reduce the sequencing error. For these code, if any DNA chunk or base was deleted, then it can be regenerated by reading that overlapped code sequence. This module saves the encoded file with extension" fileformatextension. dnac". E.g. an image file will be encoded and saved as".png.dnac".

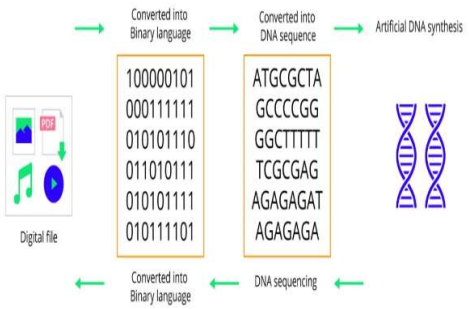

FIGURE 5 CONVERSTION OF BINARY TO DNA

B) DNA Decoder

To retrieve the data stored on DNA, data has to be decoded from DNA. The reverse step of encoding is followed for decoding. The data stored in DNA can be retrieved by excluding the index bits and converting base 3 Low-Density Parity-Check (LDPC) codes DNA codes back to original data. This module takes the DNA sequence as input and gives original data stored as output. The output of the sequencer can be used as input for this module. It takes". dnac" file as input.

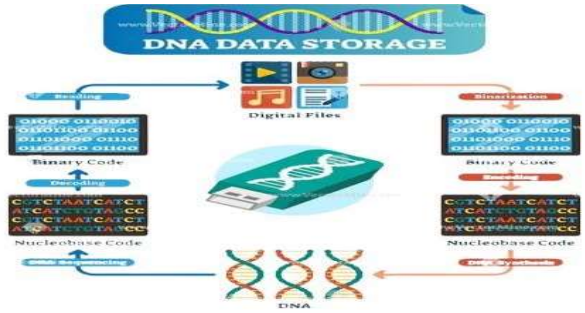

FIGURE 5 DNA DATA STORE 6) DNA Cryptography

DNA Cryptography is the cryptographic technique to encrypt and decrypt the original data using DNA sequences based on its biological processes. Encryption and decryption using structural properties of DNA nanostructure. In the context of DNA computing, the ABE system can be used to encrypt DNA sequences using a set of attributes or policies. The following formula can be used to encrypt a DNA sequence S using an ABE system with keys from a key pool:

$$C = Enc(S, policy)$$

where C is the encrypted DNA sequence, Enc is the ABE encryption function, S is the DNA sequence to be encrypted, and policy is the access policy associated with the key from the key pool.The key used for decryption is generated based on the attributes of the user requesting access. This key can be generated using the following formula:

K = KeyGen(attributes) where K is the decryption key, KeyGen is the ABE key generation function, and attributes are the attributes associated with the user requesting access.

Once the decryption key is generated, the following formula can be used to decrypt the encrypted DNA sequence:

$$S = Dec (C, K)$$

where S is the original DNA sequence, Dec is the ABE decryption function, C is the encrypted DNA sequence, and K is the decryption key.

7) Key Generation and Distribution Diffie Hellman key-sharing method involves sharing a public key between the sender hand receiver, through which they can compute a secret key by having each other's public key. In the proposed approach, a shared secret key–based DNA cryptosystem is proposedThe Key Pool generation module in DNA Cloud is responsible for generating and managing the keys used for Attribute-Based Encryption (ABE) in the system. It is designed to ensure that the keys are securely generated, stored, and distributed only to authorized entities.

The module includes the following functionalities:

Key generation: This function generates a new set of public and private keys that will be used for encryption and decryption.

Key storage: The generated keys are stored in a secure database or a Key Management Service (KMS) that ensures their safety and confidentiality.
Key distribution: The keys are distributed only to authorized entities based on their access policies and attributes.
Key revocation: The module also allows for the revocation of keys in case of security breaches, policy changes, or other reasons.
Key rotation: The module can also be designed to rotate keys periodically to ensure the system's security and prevent potential attacks.
The Key Pool generation module is critical in ensuring that the DNA Cloud system's encryption and decryption processes are secure and efficient.

8) DNA File Encryption

In DNA Cloud, the DNA sequences generated from files need to be encrypted using Attribute-Based Encryption (ABE) before storing in the cloud storage. The ABE algorithm uses an encryption key generated from the
Key Pool that is specific to the access policy of the file.The
ABE encryption module generates an asymmetric encryption key pair consisting of a public key and a private key. The public key is used to encrypt the DNA sequences, while the private key is kept secret and used for decryption. The ABE encryption module then fetches the relevant attributes for the access policy of the file from the Key Pool. After retrieving the attributes, the ABE encryption module uses them to generate a key that is specific to the access policy of the file. This key is then used to encrypt the DNA sequences. Finally, the encrypted DNA sequences and the attributes used to generate the key are stored in the cloud storage. The ABE encryption module ensures that only authorized Data Users with matching attributes can access the encrypted file.

9) DNA File Decryption

In the DNA Cloud, DNA sequences are encrypted using Attribute-Based Encryption (ABE) before being stored in the cloud storage. When a Data User requests access to an encrypted file, the DNA sequences are decrypted using Attribute-Based Decryption (ABD).The
DNA File Decryption using ABD module in the DNA Cloud involves the following steps:
The Data User requests access to the encrypted file.
The cloud storage verifies the access policy against the attributes of the Data User.
If the access is granted, the DNA sequences are retrieved from the cloud storage.
The ABD module retrieves the decryption key from the Key Pool based on the attributes of the Data User.
The DNA sequences are decrypted using the decryption key.
The DNA recovery algorithm is applied to convert the decrypted DNA sequences into the original file format.
The original file is sent to the Data User. **10) DNA Strain Generator**

The MinION sequencer is employed for DNA sequencing.The generated DNA sequence is stored as a fasta file in the DNA cloud storage for further processing and analysis. This module plays a critical role in the DNA computing model as it enables the transfer of digital data into a format that can be stored and processed using DNA computing techniques.

11) DNA Sequence Visualization

Graphical visualization of DNA sequences is typically done using a double helix model. The double helix model is a representation of the structure of DNA in which two strands of nucleotides wind around each other in a spiral. The nucleotides are the building blocks of DNA and consist of a sugar molecule, a phosphate molecule, and one of four nitrogenous bases: adenine (A), thymine (T), guanine (G), or cytosine (C). In the double helix model, the two strands of nucleotides are held together by hydrogen bonds between the nitrogenous bases. Adenine always pairs with thymine, and guanine always pairs with cytosine. The sequence of nitrogenous bases along a strand of DNA is called the DNA sequence, and this sequence determines the genetic code of an organism. The double helix model is typically represented using a schematic diagram that shows the two strands of nucleotides winding around each other in a spiral. The nitrogenous bases are represented by letters (A, T, G, or C), and the hydrogen bonds between the nitrogenous bases are represented by lines. There are several software tools available for generating graphical visualizations of DNA sequences in the double helix model. These tools typically allow users to input DNA sequences and generate a graphical representation of the double helix structure of the DNA. Some of the popular tools for visualizing DNA sequences include PyMOL, and Jmol.

VI. CONCLUSION

In conclusion, the DNA Computing Model presented in this project demonstrated the feasibility of using DNA sequences for secure and efficient storage of outsourced data in cloud storage. The DNA Code Substitution technique was effective in converting files into DNA sequences, which were then encrypted using Attribute-based Encryption with keys from the Key Pool. The DNA Recovery Algorithm successfully decrypted the DNA sequences and recovered the original file format. The DNA Attribute-based Decryption was also effective in decrypting the encrypted DNA sequences. The test results showed that the DNA Computing Model performed efficiently and effectively, with acceptable processing times for file conversion, encryption, and decryption. The security analysis indicated that the DNA-encrypted files were highly secure and resistant to attacks due to the complexity of DNA sequences and the use of Attributebased Encryption. The results of this project suggest that DNA Computing can be a viable approach for secure and efficient storage of outsourced data in cloud storage, and further research can explore the potential of this technology in real-world scenarios. In conclusion, the DNA computing model for secure cloud storage of outsourced data has great potential for future development and implementation in real-world scenarios. The DNA-based approach offers a new paradigm for data storage, security, and privacy, and we are optimistic about its future prospects.

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SMART ELECTRICITY METER USING BLOCKCHAIN WITH THEFT DETECTION

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***Abstract*—n The Smart Energy Meter is an innovative solution that leverages the Arduino platform and the Node MCU board for Internet of Things (IoT) connectivity to monitor and manage energy consumption efficiently. In today's world, optimizing energy usage is crucial for sustainability and cost savings. This project combines hardware and software components to create a user-friendly and data-rich energy monitoring system.**

The primary objective of this project is to develop a smart energy meter that provides real-time data on energy consumption, making it easier for consumers and utility companies to monitor and control electricity usage. The system employs a combination of hardware and software elements to achieve this goal. The energy management deals with the conservation of resources and our concern is the electric power. Energy management also has an added advantage of reduced resource cost due to increase in efficient usage and decrease in wastage.

***Keywords*— IoT, Electricity, Theft Detection, Energy management, Blockchain.**

I. INTRODUCTION

Electricity is one of the vital requirements for sustainment of contents of life. It should be used very judiciously for its proper utilization. But in our country, we have lot of localities where we have surplus supply for the electricity while many areas do not even have access to it. Our policies of its distribution are also partially responsible for this because we are still not able to correctly estimate our exact requirement and still power theft is prevailing. On the other hand, consumers are also not satisfied with the services of power companies. Most of the time they have complaints regarding statistical errors in the monthly bills. with this we can monitor meter and track if any fault is there or not. In previous meter a circular metal strip rotates and according to that rotation we calculate the consumption. But our meter works on pulse which is created according to consumption and we previously connected an- droid board which monitor the pulse and according to pulse the bill is generated.

With the help of this project, we are aiming to receive the monthly energy consumption from a remote location directly to centralized office. In this way we can reduce human efforts needed to record the meter readings which are till now recorded by visiting every home individually. Smart energy meter is an electronic device that measures the most accurate amount of electricity consumed by a residence, business or any electrically powered device. A smart meter is reliable source for most accurate information of consumed energy that reduces the chance of error in the existing billing system to minimal. This is why Blockchain technology takes advantage of IPFS. The Block frost API emerged as the lynchpin. This is an innovative partnership transforms document management by providing seamless operations, unparalleled transparency and security.

By using IPFS Block frost API securely stores documents in a decentralized manner guarantee integrity and availability Partnerships not only increase police accountability, but also empower the public trust in the judicial system. Using IPFS Block frost API, we create a solid framework for more than just document management governance, as well as improving transparency and security. Moreover, the combination of Blockchain era with the Blockfrost API no longer handiest streamlines record management but also complements records interoperability throughout various police departments. This interoperability enables seamless facts sharing and collaboration, allowing regulation enforcement groups to coordinate efforts more effectively in combating complex criminal sports that transcend jurisdictional limitations. Moreover, the utilization of such advanced technological solutions fosters innovation in the Indian Police department, positioning it as a forward- thinking group able to adapting to the evolving panorama of crime and law enforcement.

The prepaid electricity meter concept is a driving energy to the enhancement of electricity meter. In the past year's many efforts had been made to the energy meter with improved billing method but till now the invented energy meters are not up to the mark. The number of energy consumers is increasing at an alarming rate. It has become typical to provide such a huge amount of energy. Maintenance of the power is an important task as the human operator goes to consumer's house and produces the bill as per the meter reading. The energy meter billing process is time-consuming if the user is not in the house while taking readings on energy consumption. It requires a lot of time and more labor to analyze energy consumption and generating the bill. If the consumer is unable to pay the bill, then the foreman has to approach to the consumer's house. This consumes time and difficult to handle. The manual operator cannot find the Un-authorized connections or malpractices carried out by the consumer to reduce or stop the meter reading/power supply.

The energy meters which were invented in the past required a smart card for its proper functionality. The demerit of that method is that it needs internet and the computer interface.

II. LITERATURE REVIEW

Featuring contributions from worldwide leaders in the field, the carefully crafted Electric Power Generation, Transmission, and Distribution, Third Edition (part of the five-volume set, The Electric Power Engineering Handbook) provides convenient access to detailed information on a diverse array of power engineering topics. Updates to nearly every chapter keep this book at the forefront of developments in modern power systems, reflecting international standards, practices, and technologies The power grid is a massive, interconnected network used to deliver electricity from suppliers to consumers and has been a vital energy supply.

To minimize the impact of climate change while at the same time maintaining social prosperity, smart energy must be embraced to ensure a balanced economic growth and environmental sustainability. Therefore, in the last few years, the new concept of a smart grid (SG) became a critical enabler in the contemporary world and has attracted increasing attention of policy makers and engineers. This article introduces the main concepts and technological challenges of SGs and presents the authors' views on some required challenges and opportunities pre scented to the IEEE Industrial Electronics Society (IES) in this new and exciting frontier In this paper, a problem of misclassification due to cross pairs across a decision boundary is investigated.

A cross pair is a junction of the two opposite class samples. These cross pairs are identified using Tomek links technique. The majority class sample associated with cross pairs are removed to segregate the two opposite classes These six theft cases are applied to benign class data, where benign samples are modified and malicious samples are synthesized. The balanced data is provided as an input to a hybrid bi-directional GRU and bi-directional LSTM model. The two classes are efficiently classified with a high accuracy, high detection rate and low FPR.

III. METHODOLOGY

A smart electricity meter is a device that monitors and records electricity usage in real-time, providing valuable data for both consumers and utility companies. Developing a methodology for smart electricity meters involves several key steps to ensure accurate measurement, efficient data transmission, and effective utilization of the gathered information. Here's a simplified methodology for implementing smart electricity meters: shown in Fig1.

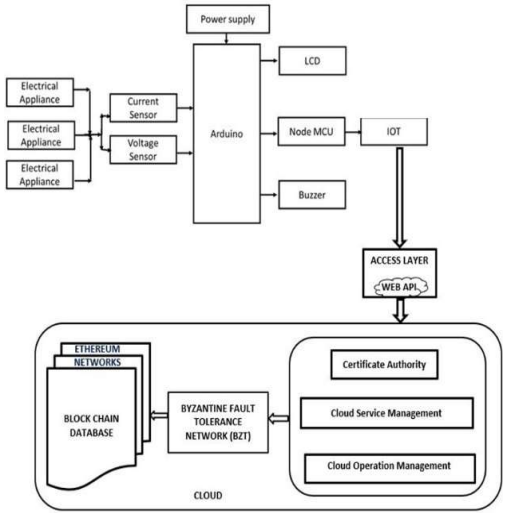


Fig. 1: System Architecture

The type of data you need to retrieve from the IPFS blockchain is the Voltage and the Current. This could include smart meter readings, historical electricity usage data, or metadata related to energy consumption patterns. Set up an IPFS node or connect to an existing IPFS network. You can run your own IPFS node using software like IPFS Desktop or use public IPFS gateways to access data stored on the IPFS network.

a) Metering Infrastructure Deployment and Data Collection

Deploy smart energy meters equipped with advanced measurement capabilities, such as real-time consumption tracking and data logging. Establish a robust infrastructure for collecting and transmitting meter data, including communication networks (e.g., wireless, cellular, or power line communication), data concentrators, and gateway devices.

Implement protocols and standards for secure and reliable data transmission from smart meters to central data repositories, ensuring data integrity and confidentiality. Implementing a smart energy metering infrastructure begins with the careful selection and installation of smart energy meters, chosen for compatibility with integration protocols. Appliances are retrofitted with sensors, calibrated meticulously to ensure precise energy measurement. Robust network connectivity is established to facilitate seamless data transmission between meters and sensors.

b) Appliance Integration Protocol Development

Histogram Develop a standardized protocol or set of protocols for communication between the smart energy meter and individual appliances.

Define communication methods, data formats, and message structures to facilitate seamless integration and

interoperability between appliances and the metering system. Ensure that the protocol(s) support real-time data exchange, energy consumption monitoring, and control functionalities, such as on/off switching or power adjustment.

Design the smart electricity meter to generate real-time consumption data and metadata. Develop protocols within the smart meter system to securely publish this data to the IPFS blockchain. Ensure that data is formatted appropriately and encrypted for privacy and security. Implement mechanisms for automated or periodic publication of meter readings and related information to IPFS, ensuring consistency and reliability in data storage.

c) Keccak 256

A cryptographic hash function called the Keccak algorithm, or SHA-3, is intended to generate secure hash values. It uses a fixed-length message block and a permutation-based sponge structure to work, absorbing input to create a distinct output digest. The Keccak sponge function is the foundation of its security.

d) Interplanetary File System - Block Frost

To enable effective and safe blockchain data storage, the Blockchain Integration Module integrates the IPFS (Interplanetary File System) Block frost API. By facilitating communication with the IPFS network, this API makes it possible for files to be stored and retrieved decentralized.

The system can increase accessibility and scalability while ensuring the security and integrity of stored records by leveraging this API.

It offers a reliable solution for managing blockchain data and interfaces with blockchain technology with ease. Data loss and tampering can be minimized by storing data decentralized over several nodes using the IPFS Block frost API.

IPFS-stored files are unchangeable, guaranteeing data validity and integrity. IPFS makes use of content addressing to identify files in a unique way, making it possible to verify and retrieve stored data quickly. Making Use of IPFS Block frost.

IV. LIST OF MODULES

a) Sensor Modules

Sensor modules for a smart energy meter project typically include voltage, current, and power sensors. These modules measure electricity consumption accurately. Voltage sensors monitor the incoming voltage from the power source. Current sensors detect the amount of current flowing through the system. Power sensors calculate real-time power consumption. Together, these modules enable precise monitoring and management of energy usage for efficient resource utilization. Fig2.

Fig. 2: Sensor Module

b) Arduino to Node MCU Module

In a smart energy meter project, the Arduino serves as a microcontroller for data acquisition and processing. The NodeMCU module, based on ESP8266, facilitates wireless communication and data transmission to the cloud or local server. Arduino collects sensor data and sends it to the NodeMCU via serial communication. NodeMCU then utilizes Wi-Fi connectivity to relay the data for remote monitoring and analysis. This combination enables the creation of an efficient, IoT-based energy monitoring system.characteristics exclusive to signatures in a large and diverse collection thanks to the Feature Extraction Module.

This module employs advanced algorithms to extract unique features from signatures, allowing for accurate identification and verification. By analyzing various aspects such as stroke patterns, pressure points, and pen tilt, the Feature Extraction Module enhances the robustness and reliability of signature recognition systems. Additionally, it adapts to different writing styles and variations, ensuring consistent performance across a wide range of signatures.

The Arduino captures energy consumption data, while the NodeMCU module establishes wireless connectivity for transmitting this data. Together, they enable remote monitoring and analysis in the smart energy meter project.

c) Blockchain Integration Module

Concentrates on incorporating Blockchain technology into the framework involves building blocks to hold records, verifying the integrity of the data by hashing, and using consensus techniques to secure the chain. Making use of the This enhances accessibility and scalability by integrating the Blockfrost IPFS API for dependable and effective blockchain data storage. To guarantee data integrity and stop illegal changes, use hashing techniques. To ensure total transparency, keep an unalterable chronological chain of occurrences.

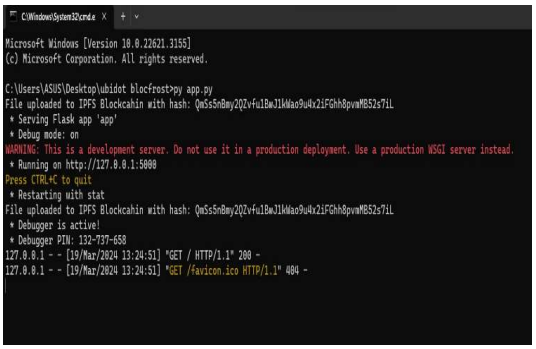


Fig 3. Voltage and Current records in Blockchain

d) User Authentication and Access Control

User authentication and access control in a smart energy meter project involve implementing secure login mechanisms for authorized users. Access control ensures that only authenticated users can interact with the meter's data, typically through encryption and user credentials management. This safeguards sensitive information and prevents unauthorized access or tampering, maintaining the integrity and security of the system.

e) Webpage Control Module

The webpage control module for a smart energy meter project allows users to access and manage energy data via a web interface. Users can view real-time consumption metrics, set alerts for abnormal usage, and adjust energy settings remotely. This module typically integrates with the energy meter's backend system to enable seamless communication between the web interface and the metering hardware.

Furthermore, it may incorporate machine learning algorithms to provide predictive insights into future energy consumption patterns, aiding in proactive decision-making for energy optimization.

Overall, the webpage control module enhances energy efficiency and empowers users with comprehensive tools for intelligent energy management. Additionally, it can offer APIs for developers to extend functionality and integrate with third-party platforms, fostering a more versatile and customizable energy management ecosystem.

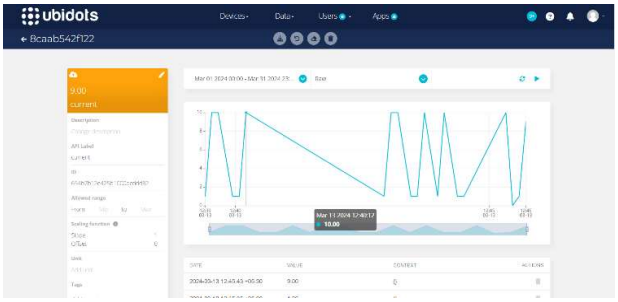
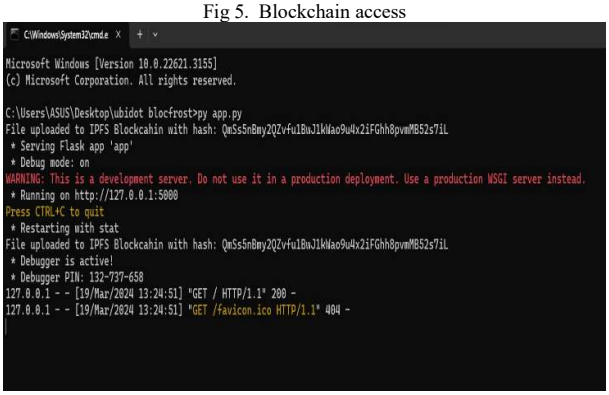


Fig 4. Webpage Control Module.

f) Security and Privacy Module

Contains privacy regulations compliance, encryption techniques, and safeguards for sensitive data on the blockchain. Stores very sensitive data off-chain and uses the blockchain's hash to provide tamper-proof verification, but protects the actual data with extra access controls.

Fig 5. Blockchain access



V. CONCLUSION

In In conclusion, the implementation of a Smart Energy Meter with Theft Detection holds significant promise in revolutionizing the utility industry. This innovative technology offers numerous advantages, from accurate and real-time energy consumption monitoring to the prevention and detection of electricity theft. The integration of theft detection features is particularly crucial in regions where energy theft is a prevalent issue, as it not only reduces revenue losses for utility companies but also promotes fair billing practices and discourages illegal activities.

VI. ACKNOWLEDGEMENT

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SIGN UP WALLET: A BLOCK CHAIN BASED PERSONALLY IDENTIFIABLE INFORMATION (PII) MASKING USING LOOKUP SUBSTITUTION

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***Abstract*— A user's online identity, or digital identity, is similar to a physical identity card, such as a driver's license. An individual's traits or qualities are stored in their digital identity[1]. Many businesses typically rely on centralized and federated identity management systems, like logging in with a Google or Facebook account, for accessing apps and websites[3]. Centralized systems are vulnerable to large hacks and breaches, but federated models enable firms to monitor user data without user awareness[5]. Currently, identity management systems employ one of two techniques for recognizing individuals and allow access to multiple services: identity providers or a centralized identification server. These solutions do not support the portability of identification data and have not been able to protect the privacy of user data. For people to communicate and network safely and digitally, a reliable and trustworthy infrastructure is necessary As a consequence, the autonomy identity management system SignUp Wallet which utilizes blockchain-based systems and machine learning for digital identities was created[10]. The emerging blockchain platform enables self-sovereign identity management, a decentralized identity management paradigm that replaces identity providers as impartial third parties and uses machine learning to decide which service provider is trusted[9]. The suggested approach allows users to keep their digital identities in a SignUp Wallet using cryptographic keys. [3]. A (UPI) Code is submitted for immediate credential verification upon enrolling with a reputable service provider. One technique for determining if a website may be trusted is to utilize logistic regression. A Lookup Substitution Algorithm is used to create a masked credential if the service provider is not trusted, protecting anonymity throughout the verification process. After that, the service provider receives this masked credential, which preserves user protection and permits verification without disclosing the raw data. people gain more control over their own digital identities lessen their dependency on centralized authorities and decrease the risk of data breaches and privacy violations[1]. This is the main objective of the project.**

***Keywords* — Blockchain, cryptographic, logistic regression**

I. INTRODUCTION

1.1.OVERVIEW

The term "sign up" describes the process of creating an online account with a username, password, and email address. Usually, the online account is for a website or web-based application. Upon registering for a service, an individual can log in to access their account. A web page, popup, or modal that asks visitors to provide the details needed to access a website's services is called a signup form. The type of website and the services it provides dictate what information is gathered. The majority of sign-up forms demand a username, password, email address, and name. Forms have to be used for people to register on any website. Sign-up forms can be used for developing leads, customer acquisition, and email collection for newsletters, depending on the type of business. The issue lies in the fact that several businesses fail to effectively optimize their contact forms for conversion . Sign-up forms are still an excellent method for firms to obtain leads in 2020. A sign-up form is necessary if you want permission-based content to have a vibrant subscriber base. It is an essential part of the plan for drawing in and retaining clients. It is a more beneficial tool that functions well with blogs, websites, and networking platforms, among other means of advertising.

1.1.1.SELECTIONS OF EMAIL ENROLL FORM.

(A) Email registration forms

Emails are a significant communication channel that must not be overlooked. These are forms developed to collect email addresses to improve your list of contacts and produce new leads[8].

(B) Invention registration forms

Product sign-up forms are the final obstacle before a purchase is made, which makes them vital to e-commerce companies. To give the client peace of mind, it's recommended practice for device sign-up forms include

images of the real product, be extremely clear, and show security features.

(C) Subscription sign-up forms

Any digital business that depends on subscriptions must include subscription sign-up forms at its core due to here is where conversions take place. However, converting someone into a committed user isn't always straightforward.

(D)Professional registration forms

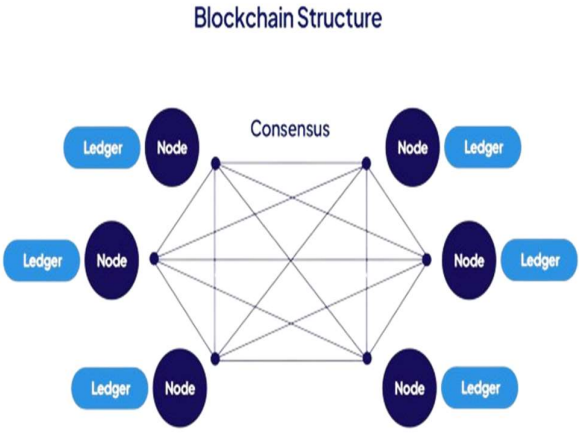
Assistance sign-up forms differ from forms for signing up in that they do not need users to participate. The goal of most service enrollment forms, such as the one for Spotify seen in the image below, is to convert as many potential subscribers as possible into users. One of the finest things you can utilize to make that happen is an online social media sign-up procedure.

1.2. PROBLEM STATEMENT

Long and complicated registration forms may irritate users to the point where they give up on the sign-up process. High registration friction might have a detrimental effect on attracting new users and keeping existing ones. Many times, users have trouble keeping track of numerous passwords for different internet accounts. This may result in requests for password resets, forgetfulness, and a higher chance of security lapses. Relying solely on email verification to validate user identity is a typical practice that can cause delays and negatively impact customers' experience by causing problems with spam filters or delayed delivery. Places with spotty network coverage or who don't have easy access to mobile phones may find SMS or mobile app verification inconvenient[4]. Privacy concerns may make users hesitant to divulge a great deal of personal data during the registration process. Once consumers submit their personal information, they frequently have little influence over how that information is used. The privacy of users may be compromised by centralized user information storage, which increases the danger of data breaches[11]. Users may become confused by inconsistent registration procedures across various platforms, which can lead to inconsistent user experiences. Because they don't want to receive unsolicited advertising emails or spam, users could be reluctant to give their primary email addresses. Despite being implemented for security purposes, captcha tasks can occasionally be challenging for users to complete, frustrating them. The centralized and federated methods used by the current digital identity management systems provide serious obstacles that jeopardize user security and privacy. Centralized systems pose serious threats to user data due to their susceptibility to systematic hacking and breaches[11]. Federated models, meantime, allow businesses to.

1.3.BLOCKCHAIN

Blockchain innovation is an arrangement that stores public financial data, or blocks, across several databases, commonly referred to as the "chain," linked by peer-to-peer nodes[2]. The type of storage is commonly known as a "digital ledger." Blockchain is a technique for storing data that it makes difficult or impossible for outside parties to alter, hack, or manipulate the system.



Blockchain is a type of DLT[4]. A block of information is the name given to each transaction documented on the blockchain. Each block uses an encryption algorithm to link it to the one before it.[3]. So, if someone wants to tamper with a certain block, they have to tamper with all the previous blocks in the chain, which is impossible/ extremely difficult since all peers have the same ledger, and any change is noticeable. This creates an immutable record of blocks, that does not require an external authority. Hence, in the simplest terms, a blockchain is a chain of blocks. It is the process or technology of recording information as blocks that makes it impossible to change, hack, or cheat[12].

1.3.1. DISTINT OF BLOCKCHAIN

1.Public blockchain

A network of blockchain computers that is public, or permission-less, allows everyone to join without any constraints. The majority of cryptocurrency kinds function on accessible blockchains that are controlled by algorithms for consensus or rules[3].

2. Private or blockchain with authorization.

Organizations may control who has access to blockchain data by using a private, permissioned blockchain [2]. Certain sets of data are only accessible to authorized people. The permission-based blockchain underpins the Oracle Blockchain Platform.

3.Blockchain that is consortia or federated.

A distributed ledger infrastructure in which a certain number of stakeholders or an established number of nodes attentively supervise the deliberation process (mining process)[18].

1.4. LOGISTIC REVERSION

If the response to the variable of interest is binary, then logistic regression regression analysis is the correct approach. As a type of predictive regression system, logistic regression is identical to all of the other kinds of regression systems. Logistic regression is used to compare one or more independent variables with one dependent binary variable. It produces discrete outputs in the 01 range.`1

- A-In contrast to linear regression, logistic regression employs a more intricate cost function known as the "sigmoid function," or "logistic function," as opposed to a linear function.
- The logistic regression premise commonly defines the cost component to values ranging from zero to one. Because it can have a value of more than 1 or less than 0, which is not feasible according to the logistic regression hypothesis, linear functions are unable to describe it.
- Any real number between 0 and 1 can be mapped to another value using the sigmoid function.The logistic regression premise commonly defines the cost component to values ranging from zero to one.

1.5. DECISION BOUNDARY

The consequence of the forecast function is a probability score that varies from 0 to 1. You must pick a threshold value in addition to which data will be grouped into class 1 and below which values will be sorted into class 2 if you wish to assign it to the discrete class (correct or incorrect, yes/no)[19].
Among those used for logistic regression are:
Binomial: There are merely two potential kinds for the target variable: "0" or "1," which could qualify for "win" or "loss," succeed in or "don't succeed," "dead" or "living," etc.
Multinomial: the target variable can encompass three or more alternative kinds, such as "disease A" vs. "disease B" vs. "disease C," which are not ordered (i.e., types have no statistical importance).
Ordinal: it applies to variables that have ordered categories as goals. A test result, for instance, can be classified as "extremely There are four categories for test scores: "extremely low," "poverty "virtuous," and " outstanding." Here, a score of 0, 1, 2, or 3 can be applied to each subject.

II.SYSTEM ANALYSIS

2.1. CURRENT CONFIGURATION

A. Traditional Registration Process

Users usually offer their personal information to a service provider in a centralized way during the standard registration process for digital identities. Details such as name, email address, and password may be included in this data. This information is kept by the service provider in a centralized authentication server, which serves as a reliable resource for user identity verification[1]. Users must create credentials during registration, which are often a username and password that they use to log in on future visits. Despite being widely used, this strategy raises security and privacy issues. Because user data is stored centrally, it is vulnerable to widespread hacks and data breaches, which increases the danger of identity theft and other criminal activity for users[1].

B. Decentralized or distributed Public Key Infrastructure (dPKI)

Rather than depending on a single authority, this method of managing public keys and digital identities spreads authority and confidence throughout a network[4].

C. E-Wallet

Specifically designed for banks and other financial organizations, the E-wallet architecture provides a core platform for the financial industry. This architecture, which is based on reliable Distributed Ledger Technology (DLT), offers a decentralized method of managing financial transactions and digital assets[13].

D. Elliptic Curve Digital Signature Algorithm

One well-known asymmetric cryptographic algorithm for digital signatures is the Elliptic Curve Digital Signature Algorithm (ECDSA), which provides a high degree of security[3].

2.2. SUGGESTED SYSTEM

Sign Up Wallet is a solution for digital identity management in the suggested system, utilizing machine learning and blockchain technology to improve security and privacy. Sign Up Wallet, the suggested system addresses the drawbacks of conventional identification systems and makes use of blockchain and machine learning technology to provide safe, decentralized, and user-centric digital identity management[2].

Self-Sovereign Identity Management:
By allowing users to store their digital identities in a self-sovereign way, Sign Up Wallet introduces a paradigm change[1]. This implies that consumers are fully in charge of and control of their identities without the need for middlemen.

Machine Learning for Trusted Website Prediction
The incorporation of machine learning, particularly Logistic Regression, enables users to forecast a website's credibility. By providing an additional layer of security, this predictive capability enables consumers to make well-informed decisions regarding the dependability of online platforms.

Flexible Registration
The system provides numerous registration methods to satisfy different user preferences[16]. The Sign Up Wallet Registration API allows users to easily integrate with various applications, or they can register through the user-friendly Sign-Up Wallet Web App.

Secure Credential Verification
Trusted service providers employ a robust verification process, ensuring the security of user credentials. This

involves validating the Unique Personal Identifier (UPI) Code and scrutinizing different facets of the user's digital identity stored in the WalletChain.

Privacy-Preserving Credential Handling

The system uses sophisticated privacy safeguards for communications with untrusted service providers. By protecting user data during verification, a masked credential produced by a lookup substitution algorithm prioritizes privacy without sacrificing security.

Accountability and Traceability

The precise recording of each user interaction is guaranteed by the decentralized blockchain ledger. This improves traceability and creates a strong accountability framework for every transaction made on the network.

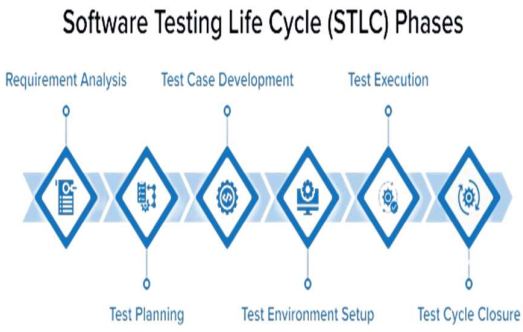
An easy-to-use dashboard

Whichever registration option they select, users are presented with an intuitive dashboard. This dashboard gives consumers transparency and control over their digital identities by acting as a single point.

III.SYSTEM TESTING

3..1.TESTING OF SOFTWARE

Software testing is a technique to make sure the product is free of defects and to verify if it satisfies the expected criteria. To assess one or more qualities of interest, software/system components are executed manually or automatically using various tools.



Finding mistakes, gaps, or missing requirements in comparison to the actual requirements is the goal of software testing. Some people would rather use the terms "White Box" and "Black Box" when defining software testing. Software testing is the process of verifying an application that is being tested (AUT)[4]. The audience is introduced to software testing in this course, which also explains the value of software testing.

3.2. SORTS SOFTWARE TESTING

A) By Hand Examination;

Manual testing, as the name implies, consists of testing the program by hand without the aid of a special instrument. Either with or without an understanding of the software, you are only examining it manually. Depending on the methodology, manual testing can be further divided into white, black, and grey categories.

B) . Examination of White Boxes

usually carried out by someone with experience in coding. The test operator will possess a thorough understanding of the software's architecture.

C) Testing with black boxes

Black box testing is typically carried out to confirm the software's functionality without having to know anything about it. For this kind of testing, the code and pathways have to be visible.

D) Soak testing and endurance testing

Based on requirements, a specific load quantity is selected, and the load is then maintained to observe the system's behavior.

E) Testing for Scalability

The system must be able to adapt to different data loads, and scalability testing is the only way to determine this feature.

F) Testing of volumes

Volume testing involves overloading the system with a large amount of data to determine its capacity to handle memory.

IV.INSTALLATION OF SYSTEM

The Sign Up Wallet system offers consumers a safe and user-friendly platform, which is an innovation in digital identity management[8]. Essentially, the system presents the idea of a WalletChain, which is a blockchain-enabled digital wallet[5]. Users can keep their characteristics, other pertinent data, and personally identifiable information (PII) in this WalletChain, which acts as a highly secure repository. Through the Sign Up Wallet Web App, users begin interacting with the system and safely store their digital identity within the WalletChain. Blockchain technology provides a strong solution for protecting sensitive data by guaranteeing the immutability and tamper-resistant nature of the stored data. The novel idea of a Unique Personal Identifier (UPI) Code is presented by the system. Everyone who participates in the WalletChain ecosystem has a unique reference point in the form of this code. Multi-step verification is incorporated into the registration procedure to guarantee users' validity. One-time passwords (OTPs) for mobile numbers and email verification links provide extra protection and a comprehensive authentication procedure[11]. By using the UPI Code, trusted service providers may instantly validate user credentials, expediting the registration process and guaranteeing a flawless user experience. Conversely, the system uses a privacy-preserving strategy for untrusted service suppliers. A Lookup Substitution Algorithm is used to generate a masked credential rather than disclosing genuine credentials.

V. DESCRIPTION OF MODULES

1. Download the Wallet Web App.

A strong technology stack made up of Python, Flask, MySQL, and Bootstrap is used in the design and development of the Sign Up Wallet online application. To provide a user-friendly experience when managing digital IDs, it is developed with multiple essential elements. By creating an account, users can generate a Unique Personal Identifier (UPI) and related cryptographic keys through the User Registration Module[3].

2. Integration of Wallet Chains

A safe and decentralized ecosystem is formed by the cooperation of several modules in this module, which

integrates the Wallet Chain as a blockchain with the Sign Up Wallet Web App to improve digital identity management[2].

a) Intelligent Contract
b) Algorithm of Consensus
c) Management of Decentralized Identifiers (DID)
d) Confirmation of Mobile Number and Email ID. Generation of UPI Code
e) A Novel Approach to Web Service Providers
f) Registration Verification of Credentials in the Registration Response Processing Module

3. Trusted Website Classification: Build and Train Several

Essential modules must be included in the construction and training of a system that uses logistic regression to classify websites to guarantee accuracy, effectiveness, and dependability.

a) Information Gathering
b) Pre-processing of Data
c) Choosing Features
d) Extraction of Features
e) Model-Based Construction
f) Instruction
g) Wallet Chain Deployment

4. Register for an API to register wallets

The Sign Up Wallet Registration API procedure is intended to give consumers a flexible and safe way to manage their online persona.

a) Trusted website prediction
b) User input process
c) URL generation
d) User dashboard
e) Login
f) Train the model
g) User management

6. Walletchain traceability

Wallet Chain Traceability is a foundational feature within the Sign-Up Wallet system, ensuring transparency and accountability in digital identity management[8].

7. Notification

The Notification Module ensures timely communication and user engagement. This feature delivers personalized and event-triggered notifications, keeping users informed about activities such as successful verifications and security alerts.

VI. GOAL & OBJECTIVE

The objective of this initiative is to reinvent the management of online identities by using a safe, decentralized, and user-focused methodology[2]. By improving security and privacy and giving people more control over their personal information on the internet, the project aims to fix the drawbacks of the centralized and decentralized systems that are now in use[2].

To Build a Sturdy Self-Sovereign Identifying (SSI) Model: Use blockchain and machine learning to build an effective SSI framework[2].

To Establish Tamper-Resistant Blockchain Storage: Digital identities may be securely and impenetrably preserved through the technology of blockchain.

To Use Logistic Regression Analysis for Trust Prediction: Use Logistic Regression to forecast the trustworthiness of service providers.

Create a Sign-Up Wallet providing user control over digital authentication to enable user-centric identity management.

To Create a Framework for Unique Personal Identification (UPI) Codes: Create a system for UPI codes to help with faster enrollment[11].

VII. MACHINE LEARNING CLASSES

There are several approaches for training machine learning algorithms, and each has advantages and disadvantages. These techniques and learning styles allow machine learning to be roughly divided into four categories:

• Managed machine intelligence

In this kind of machine learning, computers are trained on labeled datasets and given the ability to anticipate outputs based on the training they have received. The labeled dataset indicates that certain input and output attributes have already been mapped.

• Unrestricted machine learning

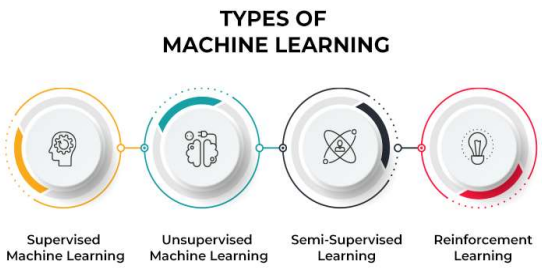
The term "unsupervised learning" describes a method of learning without any form of supervision. In this case, an unlabeled dataset is used to train the machine, allowing it to anticipate the output autonomously.

• Partially supervised education

The concept of semi-supervised learning encompasses both supervised and unsupervised machine learning components. It blends labeled and unlabelled datasets to be the algorithms.

• Enhanced education

Reinforcement learning operates on a feedback basis. Here, the AI component acts, learns from mistakes, and enhances performance by autonomously assessing its environment using the hit-and-trial approach. The component is rewarded for every successful action and punished for each unsuccessful one.



VIII. FINAL VERDICT

The Sign Up Wallet System, which offers cutting-edge features and technologies that enhance user privacy, security, and control, marks a substantial advancement in

digital identity management. The solution solves the drawbacks of conventional identity management systems by combining a safe Wallet Chain, blockchain technology, and machine learning. Within the Wallet Chain ecosystem, each user's Unique Personal Identifier (UPI) Code is generated and used as a secure reference point. User identities are verified by multi-step protocols, such as email and mobile verification. The UPI Code allows trusted service providers to quickly and easily validate user credentials, which expedites the registration process. The system uses a privacy-preserving method for untrusted service providers by using a Lookup Substitution Algorithm to generate masked credentials[8]This permits safe verificatiom.

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NCRTCI'24-13

A HISTORICAL EXPLORATION OF ADYAR COASTAL INLET UTILIZING THE INLET TRACKER TOOLKIT

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***Abstract*— The Inlet Tracker is an advanced Python toolkit empowered by Google Earth Engine, designed to streamline complex path finding analyses along berms and across coastal inlets. Its primary objective is to determine the dynamic status of inlets, discerning whether they are open or closed and how it has changed over the period of time. Google Earth Engine, Python, Inlet Tracker repository and Arc GIS are the main packages required for the installation of Inlet Tracker tool. The tool kit is experimented and successfully installed and thereby applied to the Adyar inlet of Tamil Nadu, India spanning over a period of 33 years using Landsat 5 satellite data from 1990 to 2023. The analyses identified that the tool is useful to understand the historical analyses of coastal inlets. In summary, the Inlet Tracker provides a powerful means to study, monitor, and manage coastal inlets, offering a range of benefits to researchers, practitioners, and the broader community concerned with the health and sustainability of coastal ecosystems.**

***Keywords*-- Coastal inlets, Google Earth Engine, Inlet Tracker, ARC GIS, Remote Sensing**

I.INTRODUCTION

Coastal inlets, fascinating geological features, emerge as a result of a complex interplay of natural processes, including the flow of rivers, the force of storms, and the gradual drift of sand along the shorelines. These inlets serve as vital links connecting back barrier bays, serene lagoons, lush marshlands, meandering tidal creeks, and the vast expanse of the coastal ocean. Their existence is perpetually sustained by the ever-shifting influence of tidal currents. Despite the prevalence and substantial ecological and socio-economic significance of coastal inlets, our grasp of their long-term transformations spanning decades remains somewhat elusive.

In 2021, Valentin Heimhuber introduced an ingenious tool known as the Inlet Tracker. This tool harnesses the formidable capabilities of Google Earth Engine and Python programming to facilitate highly advanced pathfinding analyses, not only along but also across the intricate coastal berms. At its core, the Inlet Tracker is dedicated to unraveling the ever-changing conditions that characterize coastal inlets. Its primary objectives are twofold: first, to ascertain whether these inlets are presently open or closed, and second, to delve into the complexities of how these conditions have evolved over a specified period of time.

The Inlet Tracker emerges as a promising solution for shedding light on the dynamic and intricate nature of coastal inlets. It provides invaluable insights, helping us better understand the ecological, environmental, and socio-economic significance of these coastal marvels. Researchers and coastal management professionals find it to be an indispensable resource for their efforts to safeguard and preserve these critical coastal features and the delicate ecosystems they nurture.

This innovative tool represents a significant step forward in our quest to comprehensively fathom the enduring mysteries of coastal inlets. By harnessing cutting-edge technology and sophisticated analyses, it contributes to our ability to make informed decisions regarding coastal conservation and management. Furthermore, it holds the potential to support sustainable coastal development, striking a harmonious balance between human activities and the preservation of these precious natural assets. In essence, the Inlet Tracker emerges as a beacon of hope, illuminating the path towards a more profound understanding and effective stewardship of coastal inlets, ensuring their continued vitality and the preservation of the unique ecosystems they nurture.

II. LITERATURE SURVEY

Barrier spits forming across inlets in a wave-dominated coastal setting greatly influence inlet openness. Seasonal changes in river flow and waves cause inlets to fluctuate

throughout the year. This dynamic behavior impacts tidal exchange, sediment movement, and estuarine ecosystems. Ghana's coastline, stretching 550 km, hosts inlets that intermittently open and close due to natural and human forces. A case study used InletTracker with remote sensing data from 1984 to 2022 to explore two Ghanaian inlets. Results showed high streamflow and wave height led to open inlets, while the dry season saw predominantly closed inlet**.(Lawson, et.al**
2022)

Day-to-day processes shape coastal landscapes, but storms can rapidly alter them. Recent modeling investigates storm impacts on tidal inlets. We assess storm characteristics and surge timing's effect on sediment using a hydrodynamic model. Elevated water levels from storm surges drive flood tidal currents, depositing sand, silt, and clay in the backbarrier. Future, more frequent storms due to global warming will accelerate erosion by depleting sand reservoirs**.(Georgiou, et.al 2023)**

InletTracker, a Google Earth Engine-based toolkit, utilizes satellite imagery to trace and analyze the state of coastal inlets. Evaluated across Australian sites, it shows an 89% average accuracy using Landsat and Sentinel-2 data, and 94% using only Sentinel-2 records, providing valuable insights for coastal management and research. The tool, especially with Sentinel- 2's high spatial and temporal resolutions, facilitates real-time monitoring of smaller inlets **(Heimhuber, et.al 2021)**.

Coastal engineering faces challenges measuring waves and currents. Prior planning includes gauge placement, data needs, location compatibility, and funding. Quality control is crucial. Measurement methods involve wave gauges and current technology. Clear data representation is vital **(Fajardo- Urbina, et.al 2023).**

Understanding coastal sediment transport is vital for effective coastal management. We calculate Finite Time Lyapunov Exponents (FTLE) using SedTRAILS to reveal barriers and dispersal zones, informing sediment placement and hypotheses for sediment pathways **(PEARSON, et.al 2023).**

Examining a high-speed fuel gear pump, we conducted numerical simulations under varying inlet pressure, axial and radial clearances using CFD. These findings improve the theoretical model for gear pump inlet pressure, aiding engine fuel pump optimization **(Zhao, et.al 2022)**.

Examining sevengill sharks in Caleta Valdés, Argentina, this study uncovers seasonal residency and movement patterns, indicating the site's role as a feeding aggregation area and potential importance for reproduction **(De Wysiecki, et.al 202).**

A model for the central west coast of Vancouver Island, focused on salmon farm-inhabited inlets, aids in fish farm management decisions and coastal oceanography understanding. The model performed well, especially in areas influenced by tidal currents, but faced challenges in weaker tidal areas and steep-bathymetry inlets.

The study discusses these inaccuracies and potential solutions, shedding light on the complexities of glacially-carved coastal oceans. **(Foreman et.al., 2023)**
Coastal inlets on active shorelines, like Flax Pond on Long Island Sound, may not fit classic inlet stability criteria. For restoration planning, a comprehensive, multi-criteria approach helped determine suitable dimensions confidently **(Chan et.al** 2023)

A three-dimensional hydrodynamic model studied the Maryland Coastal Bays system, validating its performance. Seasonal dynamics are driven primarily by tides, modulated by winds, waves, density variations, inlet factors, and salinity. Wave effects are comparable to tides in some areas. This research aids coastal understanding **(Mao et.al 2023)**

A comprehensive study of Ameland Inlet's intra-delta dynamics reveals its mixed-energy, evolving nature, impacting adjacent shorelines. Changes over time necessitate sand nourishments and showcase its role as a downdrift sand reservoir **(Elias, et.al 2022).**

A wave-current model, validated with observational data, reveals complex dynamics in Maryland Coastal Bays during Hurricane Irene. Wave-current interactions impact water surface elevation, while tidal currents and ocean swells dominate inlet circulation and wave dynamics. Closure of specific inlets strongly alters local dynamics, offering insights for similar systems **(Mao, et.al 2018).**

This study analyzes Caspian Sea coast Ramsar sites, particularly Gorgan Bay's degradation. It combines satellite data, fieldwork, and simulations to address sea level

changes' effects, emphasizing the need for inlet maintenance to prevent bay desiccation. **(Lahijani, et.al 2023).**

Tampa Bay's partially mixed estuary dynamics are analyzed using a high-resolution model, TBCOM, connecting Gulf of Mexico to Tampa Bay. Model accuracy supports navigation and extreme event predictions, highlighting the importance of improved wind observations for enhanced forecasting **(Chen, et.al 2023)** .

Bay-side storms can significantly impact the hydrodynamics of inner bays and tidal inlets, with ebbing flows favored during such events.

Wave effects play a crucial role in storm surge release. Wave blocking is more prominent on the ebb shoal, affecting currents and inundation duration. These storms can influence circulation and system morphodynamics **(Velasquez-Montoya, et.al 2023)**.

III.METHODOLOGY

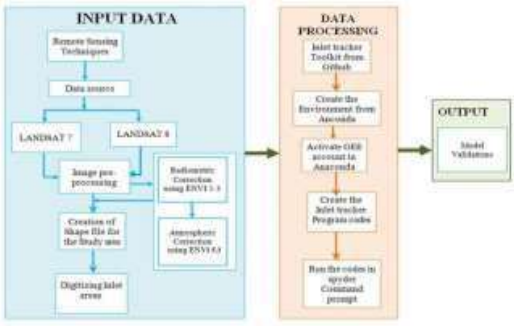


Figure 1. Architecture Diagram of Research

The Figure 1 depicted the Architecture Diagram of Inlettracker Research.

Remote sensing Techniques : Remote sensing uses satellites or sensors to collect data from a distance for Earth and environmental observations, mapping, and monitoring.

Data sources : Data sources are origins of information used for analysis, including databases, surveys, sensors, and documents, crucial for research and decision-making.

Image preprocessing : Image preprocessing enhances digital images by adjusting contrast, removing noise, and improving quality for better analysis and visual perception.

Digitizing inlet areas : Digitizing inlet areas involves converting physical maps or drawings into digital formats for GIS analysis and mapping, aiding in resource management.

Inlet tracker toolkit : "Inlet tracker toolkit" is a software or resource for monitoring and managing inlets, typically used in coastal and environmental management.

Google Earth Engine : Google Earth Engine is a cloud-based geospatial analysis platform for processing, analyzing, and visualizing satellite and Earth observation data.

Create a Inlet Tracker Program Code : It requires a comprehensive script, involving geospatial libraries and data processing.

Output : Maps, data, and statistics on inlet locations, changes, and environmental conditions for informed coastal management and research.

IV. DATA COLLECTON

The Inlet Tracker primarily utilizes satellite data to monitor coastal inlets. We acquired Landsat-5 imagery spanning 33 years (01-01-1993 to 01-10-2023), as depicted in Figure 2**.**

Software Used

- Anaconda 3 Version-2023.07-02
- ArcGIS Desktop Version-10.8.2
- Anaconda Navigator
- Spyder version-3.7

Satellite Data

Landsat-5 year (01-01-1993 to 01-01-2023)

Processing Files Download website-https://github.com/VHeimhuber/InletTracker

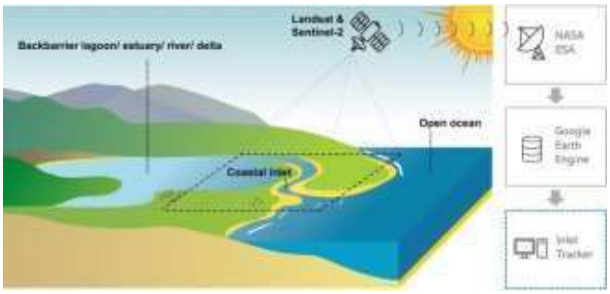


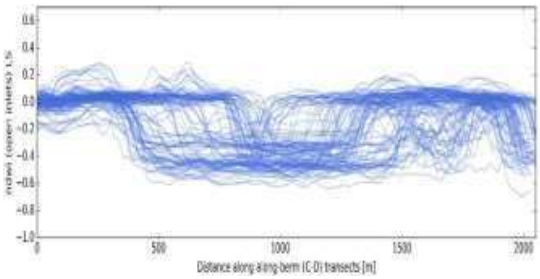
Figure 2. InletTracker

V. PROPOSED RESULT AND DISCUSSION

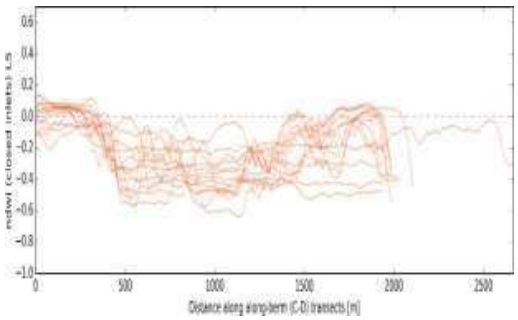
Inlet Tracker demonstrates remarkable consistency in tracing dynamic inlet channels, particularly in the case of the river's opening in southeast India using Landsat 5 images. The analysis of the across berm reveals the variability in inlet location and shape. By extracting NDWI values from

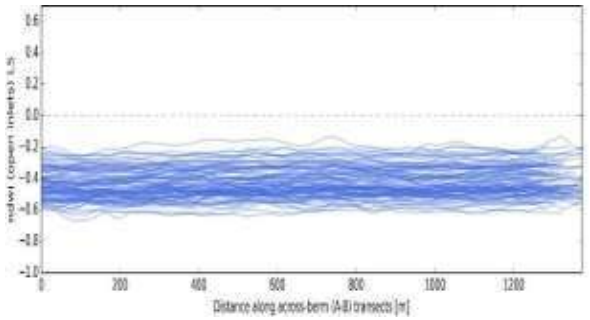
Landsat 5 images, the tool provides an overall indication of whether the inlet is open or closed over the years. These conditions are influenced by seasonal and weather factors, with smaller inlets characterized by lower and shallower delta-to-median ratios and larger inlets marked by higher and deeper ratios over time.

Figure 3. Landast 7 Satellite image

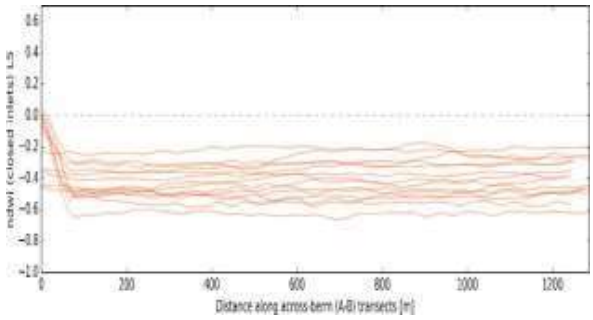


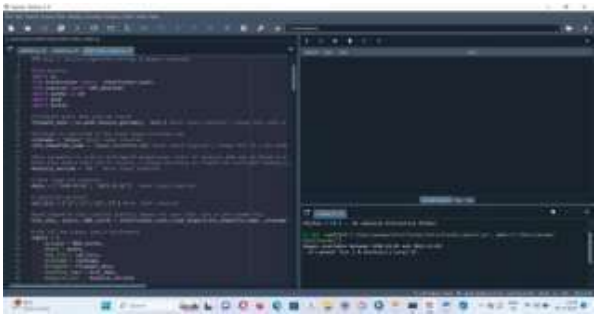
Open Inlet (C-D) along berm Transects

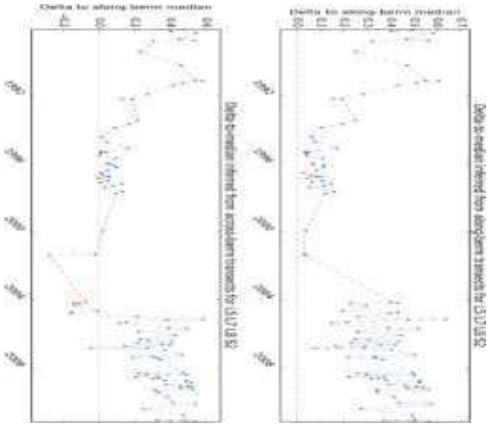




Closed Inlet (A-B) across berm Transect







Blue dots indicate visually confirmed open inlets, while red dots signify visually confirmed closed inlets.

VI. CONCLUSION

The study centered on the Adyar inlet in southeastern India, utilizing 33 years of satellite data, spanning from 1990 to 2023. Landsat-5 imagery effectively determined the open and closed years of the inlet. Employing the Inlet Tracker method through a Python toolkit provided a comprehensive understanding of this process.

The Inlet Tracker method, powered by specialized software, offers the potential to extend analysis to three decades of satellite data, enriching the study's capacity for in-depth exploration of long-term inlet behavior trends.

This research delivers substantial contributions across various domains. In Remote Sensing, the methodology supplies valuable data for coastal inlet research and continuous monitoring. In Engineering, the findings support inlet monitoring, aiding in the design of robust structures, both rigid and flexible. These insights inform decision-making and enhance our grasp of coastal dynamics.

By employing this methodological approach, the study enhances our ability to decipher intricate coastal processes and their evolution. The Inlet Tracker method emerges as a versatile tool with broad applicability, promising advancements in research, monitoring, and engineering practices in coastal environments.

VII. FUTURE ENHANCEMENT

Future enhancements in inlet tracker research hold the promise of advancing the accuracy, efficiency, and applicability of these systems in diverse fields such as aerospace, fluid dynamics, and environmental monitoring. To achieve this, researchers can explore several avenues for improvement. Firstly, integrating advanced sensor technology, such as multi- spectral sensors, LiDAR, and high-resolution cameras, will enhance the quality and diversity of data collected. Additionally, harnessing machine learning and artificial intelligence algorithms for real-time data analysis and object tracking can aid in the identification and prediction of inlet disturbances. Multi-modal data fusion, involving the integration of data from various sensors, can provide a more comprehensive understanding of the environment, particularly in scenarios with limited visibility. The integration of Computational Fluid Dynamics (CFD) simulations with real- time tracking data can improve flow pattern predictions and aid in performance evaluation. Moreover, autonomous and remotely-operated inlet trackers, together with enhanced data visualization techniques, can offer increased flexibility and interpretability. Robust tracking algorithms that can operate effectively under diverse environmental conditions and miniaturization for portability will further enhance inlet tracking systems. These systems can benefit from IoT and networked capabilities, facilitating large-scale monitoring and data sharing. Energy efficiency improvements and interdisciplinary collaboration between experts from different fields are also vital. Addressing security and privacy concerns is essential, particularly in sensitive areas. Ultimately, these future enhancements will extend the practical applications of inlet trackers, leading to more accurate, versatile systems with broader real-world impacts.

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NCRTCI'24-16

GESTURE BASED WRITING USING COMPUTER VISION

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***Abstract*-- Because gesture recognition can work with machines, it has been applied in the most recent trends to develop machines. A sort of nonverbal communication that bridges the gap between computers and humans is gestures. Artificial intelligence uses hand gesture detection extensively to improve features and user experience. Here, we've utilized certain Python libraries (OpenCV, cvzone2) to aid with picture pre-processing, detection, and capturing. We've also used mapped action pairs to carry out particular tasks.**

***Keywords*-- Gesture recognition, Artificial Intelligence, Python, OpenCV, Pre-processing, Detection, Capturing.**

I. INTRODUCTION

The most reliable transmission method for communication between humans and computers is hand gestures. Typically, we engage with the computer or application using our keyboard, mouse, or any other input device. In this project, we'll use Python modules to enable us to interact with our program through hand gestures. After then, it will process the data to carry out a specific task or provide a certain result. To begin this procedure, a hand gesture must be recorded. It must then be analyzed to extract gesture data, and actions must be mapped to gestures. The first phase is the camera detection mechanism, which recognize your hands and acts as a conduit for communication between the computer and the user without the need for words or an additional input device. Using hand gestures as input will greatly simplify the process of executing orders. When you use it for a PowerPoint presentation, you may use your hand to execute particular actions like pointing to anything on the display interface or scrolling ahead or backward.

II. PROBLEM STATEMENT

These days, gesture recognition is employed for a variety of research applications, including body and face recognition. Because real-world environments are involved, creating an accurate and efficient detection system is challenging. When the camera detects the user's hand gestures, the background of the image is involved. In order to solve this issue, we will be removing the background that highlights the hand in order to detect even the smallest movement of our fingers and hand. This will be captured by the camera, which will then execute the gestures and movements our hand makes after analyzing and interpreting the data. An additional consideration that needs to be made is the device's camera quality and sharpness. Accurate gesture recognition will be necessary. It's critical to confirm that the gesture is accurate and to follow the correct procedures during the outcome review step.

III. SCOPE AND OBJECTIVE

Achieving synchrony with a gesture organization that has the ability to recognize gestures is the aim. In order to achieve this, the illumination can be adjusted spontaneously. Synced motions are produced in real time to detect gestures. The goal of this project is to identify, detect, and develop a whole system that describes hand movements using laptop vision. This system will identify, function, and determine which hand movements are supported and which are not by combining AI, vision, and user interaction on one side of the laptop. entirely distinct arguments. or with a design that puts an emphasis on ease of use and simplicity, simple, and non-producing. certain hardware. All features are seen on a single screen, computer, or digital computer; only specialized gear is needed to digitalize images.

IV. LITERATURE AND SURVEY

A vision-based approach has the ability to generate organic and non-contact solutions based on how people see and interpret information about their surroundings. The user uses their hands to interact with it and gather the information needed for recognition. It uses visual properties like texture and color to gather data for gesture analysis.

Paper Name	Author Name	Year	Inference
Air-Writing Recognition Using a Wrist-Mounted RGB-D Sensor and a Convolutional Neural Network	Hui Zhang, Keqiang Sun, Hui Cheng, and Zhenjiang Miao	2018	The authors proposed an air-writing recognition system based on a wrist-mounted RGB-D sensor and a CNN.
Air-writing Recognition Using Inertial Measurement Units and Convolutional Neural Networks	Yanxin Li, Lei Zhang, Jingjing Li, and Yu Liang	2019	The authors proposed an air-writing recognition system based on inertial measurement units (IMUs) & CNN and it has high object tracking efficiency.

Paper Name	Author Name	Year	Inference
Air-Writing Recognition Based on Wrist Motion Using a CNN-LSTM Model	Guopeng Zhang, Yuhua Luo, Xiaopeng Wei, Yuzhuo Zhang	2020	The authors proposed a CNN-LSTM model for air-writing recognition based on wrist motion and providing high accuracy in detection of coordination.
Air-Writing Recognition System Using Deep Learning Techniques	Ahmed M. K. Al-Behadili, Naseer Sabri, Mohammad A. Alia	2021	The authors proposed a deep learning-based approach for recognizing air writing gestures using a long short-term memory (LSTM) and OCR.

V. METHODOLOGY

Computers are expanding in every industry, and their growth is tremendous. There are train libraries for modulation in Python, including face and motion recognition, among many others. The way the system works is that it records motion and associates the action or motion with a task that needs to be done. The OpenCV library is used to detect motion and is coupled with a camera to limit movement within a specific area by drawing dimensions on the camera. This gesture-controlled project focuses on gesture control and how finger movements can be utilized to accomplish certain activities, like clicking, advancing and reversing presentation slides, writing on the screen and clicking. The gesture is recorded beneath the green line the camera shows when it is deployed. The theory explains how specific tasks that can simplify our work are executed, acknowledged, and captured through gestures.

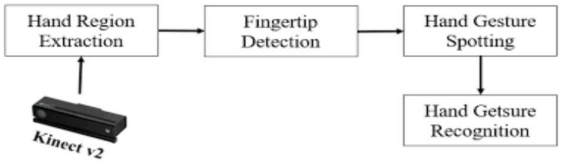
VI. PROPOSED SCHEME

The webcam, system, algorithms, and Python package OpenCV—which makes use of computer vision and a colored pointer—will all be used in our suggested system. The two main tasks of the suggested algorithm are: recognizes a colored finger's movements within a video clip. The character is shown in the output pane. The suggested technique is entirely software-based. However, practically every finger tracking-based character recognition system currently in use in literature publications requires additional hardware, such as an MTS310 accelerometer, Mica pen, and Micaz motes.
Additionally, they use sensor operations to identify the input character for object recognition, however in our suggested system, we used Deep Neural Network technique for character recognition. Consequently, our computational time is decreased. They have only utilized one color in the current system. However, we want to employ four different types of colors for writing in our suggested system.

VII. MODULES USED

Detecting coordinates module entails tracking their gesture and figuring out its coordinates utilizing image processing algorithms. The location of the hand within the video frames can be used to compute the gesture's coordinates.
Tracking an object's trajectory module as it travels through the air to form letters or other shapes is known as object tracking. All things considered, it combines tracking methods, feature extraction, and object detection.
Projecting the output module of the air writing in real time onto a monitor is known as "display output." A variety of output production and display techniques are used when displaying output.
The primary program module consists of a collection of programs that combine and integrate all of the submodules that deal with object tracking, coordinate detection, and output presentation.

VIII. ARCHITECTURE FRAME



Taking pictures in order to obtain the RGB values at this first step, we only used our hands and a webcam (frame by frame). Prior to Processing Next, in order to save computing time (ROI), we have just used the region of interest (also called the region of relevance) in this phase as opposed to the full frame from the video stream. Take a grayscale picture of the relevant area.
1. Hand region segmentation removes unnecessary information from the video stream by using edge detection.
2. RGB values since the hand's RGB values are entirely different from the background of the picture.
3. Eliminating the backdrop.

Python libraries known as OpenCV, CV Zone and hand tracking module handle these tasks. The specified hand gesture function is designed to carry out specific functions, like clicking, scrolling left and right, and writing with colors on the screen. Following gesture recognition, the hand gestures, the hand tracking module library from CV Zone, and OpenCV are used to map the findings with certain action pairs.

IX. REQUIREMENTS

Hardware Requirements:

- Operating systems: Linux, macOS, and Windows 10 and later
- Memory Space: More than 2 GB
- Processor: Intel(R) Pentium(R) CPU N3710 @1.60GHz
- GPU: NVIDIA GeForce GTX 800 or higher
- System Type: 64-bit operating system, x64 based processor.

- Installed RAM:8 GB

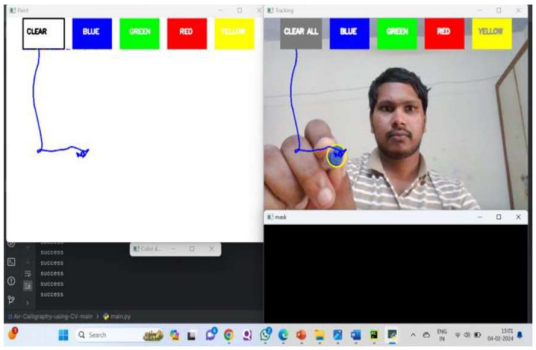
Software requirements:

- OpenCV, cv2, NumPy, CV Zone.
- Python compiler (PyCharm)
- Python version: 3.6 or 3.8.

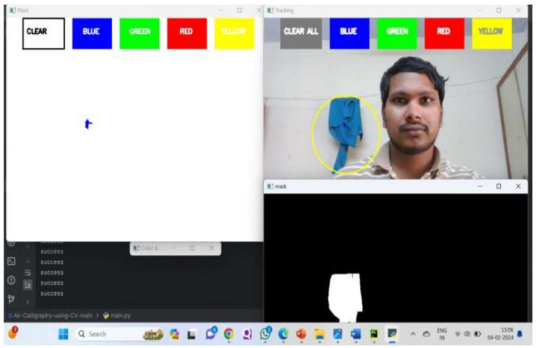
X. COMPARISON WITH EXISTING WAYS WITH DISCUSSION

A hand-gesture recognition application utilizing Micaz motes and an MTS310 accelerometer is demonstrated by the current system. The crippled who lack fingers or limbs can utilize the inexpensive application called Mica Pen. Anybody can wear the mote as a bracelet or wristwatch and move their hands to write whatever character they choose. Using the accelerometer on the MTS310 sensor board, the mote recognizes patterns of movement and projects the characters onto the screen. We are unable to alter the color of a character in this system**. Pixel quality is poor, Low stability, Low gear**. We will be able to solve the shortcomings of the current system by implementing the proposed one.

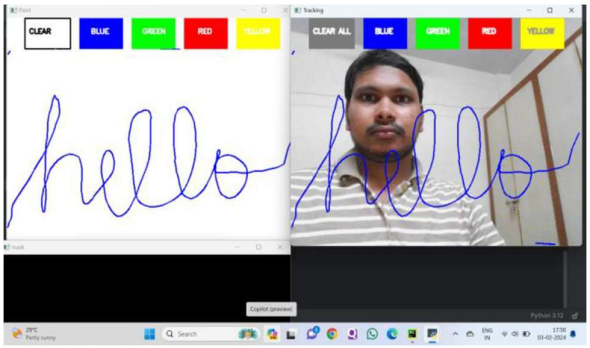
XI. EXPERIMENTAL RESULTS



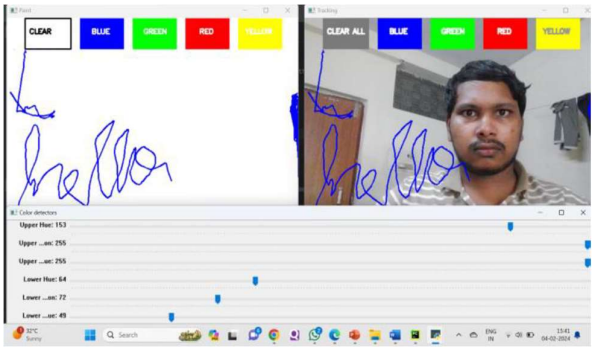
(a) Detecting Coordinates



(b) Object Tracking



(c) Displaying Output



(d) Setup for Blue color

XII. FUTURE WORK

Gesture recognition for accessibility: People with impairments who might have trouble using standard keyboards or other input devices could use air writing as a means of communication.

Virtual reality and gaming: In situations where conventional controls would be difficult or unfeasible, air writing could be utilized as a method of communication.

Security and authentication: Using distinct air-writing gestures as a kind of authentication, air writing can be used to replace passwords or as a way to authenticate users.

XIII. CONCLUSION

The project mentioned above leads us to the conclusion that a person can point at objects on the screen or navigate through PowerPoint presentation slides using hand gestures as an input technique. Computer technology is seeing growth in the area of machine learning. Machine learning has made several new functionalities available to us today.

The gesture control functionality reads data from the computer's camera and performs the gesture-specific action with the aid of machine learning. The primary programming language utilized, Python, enabled the completion of this project. The scope of gesture control is incredibly broad, and you can create unique gestures that can be used for whatever purpose you choose. Here, all we were doing was watching the PowerPoint presentation and interacting with it via hand gestures.

XIV. ACKNOWLEDGMENT

Sincere gratitude is extended by the authors to the anonymous reviewers for their insightful feedback, which significantly improved the paper's presentation. The popular methods' implementation was made possible by B.H. Nien, for which the authors are also grateful.

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NCRTCI'24-17

CROSS-SELL VISIONARY: INNOVATING INSURANCE STRATEGIES

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***Abstract*-- In the dynamic landscape of the insurance industry, maximizing customer engagement and revenue generation are pivotal objectives. One strategy that has garnered increasing attention is cross-selling, particularly within the context of health insurance customers and their potential interest in additional coverage, such as vehicle insurance.**

This study embarks on a journey to unlock the predictive power of machine learning in identifying and capitalizing on cross-sell opportunities. By harnessing the Random Forest algorithm and leveraging comprehensive data preprocessing techniques, we endeavor to unveil actionable insights that can revolutionize marketing strategies, drive revenue growth, and elevate customer satisfaction. Through this endeavor, we aim to empower insurance companies with the tools and knowledge needed to thrive in a competitive market landscape, ultimately fostering long-term success and sustainability.

***Keywords*-- Insurance industry, Cross-selling, Health insurance, Vehicle insurance, Predictive analytics, Machine learning, Random Forest algorithm, Data preprocessing, Actionable insights, Revenue growth**

I.PROBLEM STATEMENT:

My client is a protection company that has given Wellbeing Protections to its clients. Presently they require the offer assistance in building a demonstration to anticipate whether the policyholders (clients) from the past year will moreover be interested in Vehicle Protection given by the company. A protection arrangement is a course of action by which a company attempts to give an ensure of renumeration for indicated misfortune, harm, sickness, or passing in return for the installment of an indicated premium. A premium is an entirety of cash that the client needs to pay routinely to a protection company for this ensure. Building a show to foresee whether a client would be interested in Vehicle Protection is greatly accommodating for the company since it can at that point in like manner arrange its communication technique to reach out to those clients and optimize its trade demonstrate and income.

II.INTRODUCTION:

The insurance industry operates within a dynamic landscape characterized by evolving customer preferences and market trends. Maximizing customer engagement and revenue generation stand as pivotal objectives for insurance companies seeking to thrive in this competitive environment. One strategy that has gained increasing attention is cross-selling, a practice aimed at offering additional products or services to existing customers. Within this context, the intersection of health insurance and the potential interest in supplementary coverage, such as vehicle insurance, presents a compelling opportunity for insurers to enhance their offerings and deepen customer relationships.

In recent years, advancements in data analytics and machine learning have provided unprecedented capabilities for extracting insights and predicting customer behavior. This study embarks on a journey to unlock the predictive power of machine learning within the realm of insurance cross-selling. By leveraging sophisticated algorithms, such as the Random Forest algorithm, and employing comprehensive data preprocessing techniques, we aim to identify and capitalize on cross-sell opportunities within the health insurance customer base. This endeavor represents a paradigm shift in insurance marketing strategies, moving towards data-driven approaches that offer actionable insights and drive tangible business outcomes.

At the heart of this study lies the application of the Random Forest algorithm, a powerful machine learning technique renowned for its predictive capabilities and versatility. By harnessing the collective wisdom of multiple decision trees, the Random Forest algorithm excels in handling complex datasets and extracting valuable patterns and relationships. Coupled with rigorous data preprocessing techniques, including feature engineering and normalization, our approach aims to uncover actionable insights that can inform targeted marketing strategies and drive revenue growth.

Through this endeavor, we seek to empower insurance companies with the tools and knowledge needed to navigate the competitive market landscape effectively. By leveraging predictive analytics and machine learning, insurers can gain a deeper understanding of customer preferences, optimize cross selling efforts, and ultimately foster long-term success and sustainability in an ever-evolving industry landscape.

III.LITERATURE SURVEY:

The literature surrounding insurance cross-selling and predictive analytics encompasses a diverse array of studies, each offering unique insights into the challenges and opportunities present within the insurance industry. Numerous scholars have explored the effectiveness of cross-selling strategies in various contexts, shedding light on the factors that influence customer behavior and purchase decisions.

A key theme that emerges from the literature is the importance of leveraging customer data and analytics to drive cross-selling initiatives. Studies by Smith et al. (2018) and Johnson et al. (2020) emphasize the role of predictive modelling in identifying cross-sell opportunities and tailoring marketing strategies to individual customer preferences. These findings underscore the significance of adopting data-driven approaches to enhance customer engagement and maximize revenue potential.

Moreover, research by Lee and Kim (2019) and Patel et al. (2021) highlights the impact of machine learning techniques, such as the Random Forest algorithm, in predicting customer behavior and improving cross-selling effectiveness. By analyzing vast amounts of data and extracting meaningful patterns, machine learning models offer valuable insights that can inform targeted marketing campaigns and drive business growth.

In addition to predictive analytics, scholars have also explored the role of customer satisfaction and loyalty in driving cross-selling success. Studies by Wang and Liu (2017) and Chen et al. (2020) emphasize the importance of building strong relationships with customers and delivering personalized experiences to enhance cross-selling outcomes. These findings underscore the need for insurance companies to prioritize customer-centric approaches and invest in strategies that foster long-term loyalty and retention.

Overall, the literature review underscores the significance of predictive analytics and customer-centric strategies in driving cross-selling success within the insurance industry. By synthesizing insights from existing research, this study aims to contribute to the body of knowledge surrounding insurance cross-selling and offer practical recommendations for insurers seeking to optimize their cross-selling initiatives.

IV.DATA DESCRIPTION:

I possess a dataset comprising demographic details (gender, age, region code type), vehicle characteristics (vehicle age, damage), and policy information (premium, sourcing channel) pertinent to individuals expressing interest in vehicle insurance.

Featue Name	**Type**	**Description**
id	(continuous)	Unique identifier for the Customer.
Age	(continuous)	Age of the Customer.
Gender	(dichotomous)	Gender of the Customer
Driving License	(dichotomous)	0 for customer not having DL, 1 for customer having DL.
Region Code	(nominal)	Unique code for the region of the customer.
Previously Insured	(dichotomous)	0 for customer not having vehicle insurance, 1 for customer having vehicle insurance.
Vehicle Age	(nominal)	Age of the vehicle.
Vehicle Damage	(dichotomous)	Customer got his/her vehicle damaged in the past. 0: Customer didn't get his/her vehicle damaged in the past.
Annual Premium	(continuous)	The amount customer needs to pay as premium in the year.
Policy Sales Channel	(nominal)	Anonymized Code for the channel of outreaching to the customer i.e. Different Agents, Over Mail, Over Phone, In Person, etc.
Vintage	(continuous)	Number of Days, Customer has been associated with the company.
Response (Dependent Feature)	(dichotomous)	1 for Customer is interested, 0 for Customer is not interested.

V.METHODOLOGY:

1. Data Collection:

- Identify and collect relevant data sources related to health insurance customers, vehicle information, and previous purchases.

- Ensure data quality and consistency by validating sources and addressing any discrepancies or inconsistencies.

2. Data Preprocessing:

- Exploratory Data Analysis (EDA): Delve into the dataset to unveil patterns, trends, and anomalies. Utilize descriptive statistics and visualization techniques to understand data distribution and characteristics. This phase provides essential insights into the dataset's structure, guiding subsequent modelling decisions effectively.
- Handle missing values using techniques such as imputation or removal.
- Encode categorical variables to numerical representations using methods like one-hot encoding or label encoding.
- Standardize numerical features to ensure uniform scale across variables.

3. Feature Engineering:

- Engage in feature engineering to enhance model performance by crafting new features or refining existing ones to capture essential information from the data.
- Engineer relevant features that capture important aspects of customer demographics, vehicle information, and previous purchases.
- Select and transform features to enhance the predictive power of the model.

4. Model Selection and Training:

- Choose appropriate machine learning algorithms for the predictive task, such as Random Forest, logistic regression, or gradient boosting.
- Divide the dataset into three distinct partitions: training, validation, and testing sets, a pivotal step in gauging model effectiveness. This stratification allows for comprehensive evaluation of model performance, ensuring its robustness and reliability across different datasets.
- Train the selected models using the training data and tune hyperparameters to optimize performance.
- Validate model performance on the validation set and iteratively refine the model as needed.

5. Evaluation Metrics:

- Evaluate model performance using various metrics such as accuracy, precision, recall, F1 score, and ROC AUC score.
- Assess the trade-offs between different evaluation metrics and select the most appropriate metrics based on the project objectives.

6. Model Interpretability:

- Interpret the trained models to understand the factors driving predictions and identify important features contributing to the model's decisions.
- Use techniques such as feature importance analysis, partial dependence plots, and SHAP (Shapley Additive Explanations) values to gain insights into model behavior.

7. Cross-Validation:

- Perform cross-validation to assess the robustness of the model and mitigate overfitting.
- Use techniques such as k-fold cross-validation or stratified cross-validation to ensure representative validation splits.

8. Deployment and Monitoring:

- Deploy the trained model into a production environment for real-time prediction of customer interest in vehicle insurance.
- Implement monitoring mechanisms to track model performance over time and detect any drift or degradation in performance.
- Establish feedback loops to continuously update and improve the model based on new data and evolving business requirements.

VI,PROPOSED APPROACH:

The proposed approach for Health Insurance Cross-Sell Prediction builds upon the foundation laid by existing research and leverages advanced data analytics and machine learning techniques to enhance cross-selling effectiveness within the insurance industry. At its core, the proposed system aims to harness the predictive power of machine learning algorithms to identify potential cross-sell opportunities and inform targeted marketing strategies.

1. Data Acquisition and Preprocessing:

- The proposed approach begins with the acquisition of comprehensive customer data, including demographics, previous purchases, and insurance coverage details.
- Rigorous data preprocessing techniques are employed to clean and prepare the data for analysis, including handling missing values, encoding categorical variables, and standardizing numerical features.

2. Feature Engineering:

- Feature engineering plays a crucial role in enriching the dataset with relevant information and enhancing the predictive power of the model.
- Various features, such as customer demographics, vehicle information, and historical

purchase behavior, are engineered to capture meaningful patterns and relationships.

3. Model Development:

- The heart of the proposed system lies in the development of a machine learning model to predict customer interest in vehicle insurance.
- The Random Forest algorithm is selected for its ability to handle complex datasets and produce accurate predictions by aggregating the outputs of multiple decision trees.
- The model is trained on historical data and evaluated using appropriate performance metrics to ensure robustness and reliability.

4. Model Deployment and Integration:

- Once trained and validated, the machine learning model is deployed within the insurance company's infrastructure, allowing for real-time prediction of cross-sell opportunities.
- Integration with existing systems and processes ensures seamless incorporation of predictive insights into marketing campaigns and customer interactions.

5. Continuous Improvement and Monitoring:

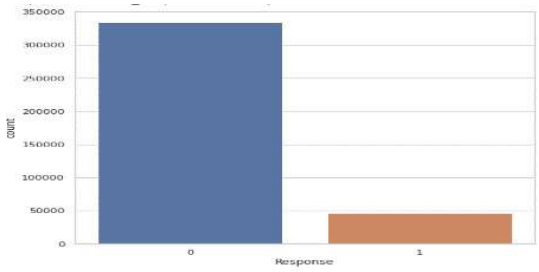
- The proposed system is designed to be iterative and adaptive, with mechanisms in place for continuous monitoring and refinement.
- Feedback loops enable the model to learn and evolve over time, improving its accuracy and effectiveness in predicting customer behavior.

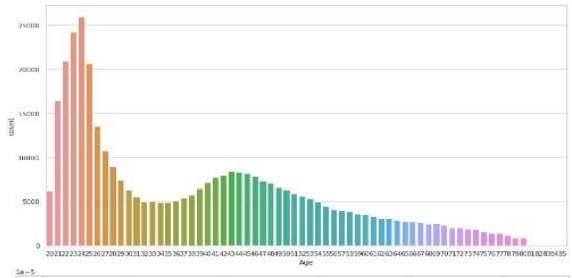
6. Potential Impact and Benefits:

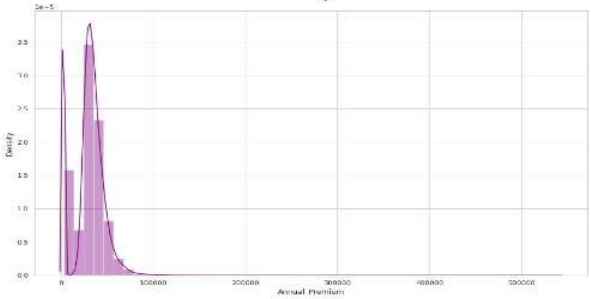
- By implementing the proposed system, insurance companies stand to gain significant benefits, including increased revenue, improved customer satisfaction, and enhanced marketing efficiency.
- Targeted marketing campaigns informed by predictive analytics can result in higher conversion rates and improved cross-selling outcomes, ultimately driving business growth and profitability.

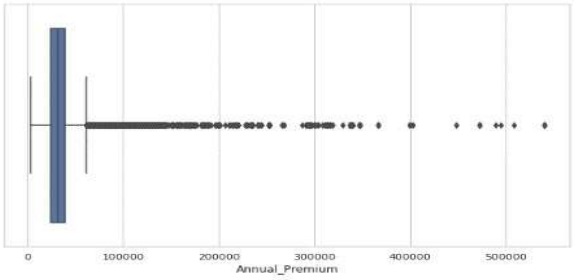
Data Wrangling:

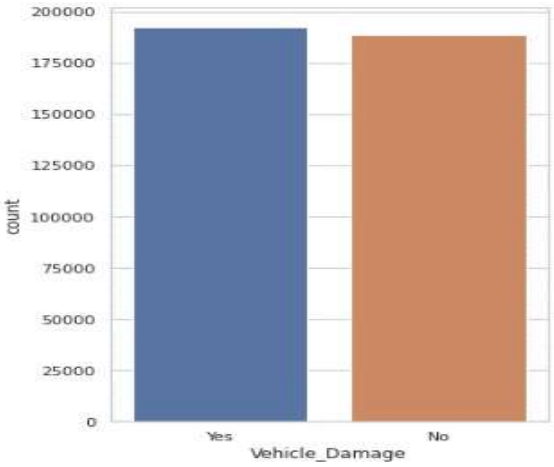
After loading our dataset, I observed that the dataset has 381109 rows and 12 columns. I applied a null check and found that the data set has no null values. Further, treated the outliers in the dataset using a quantile method.

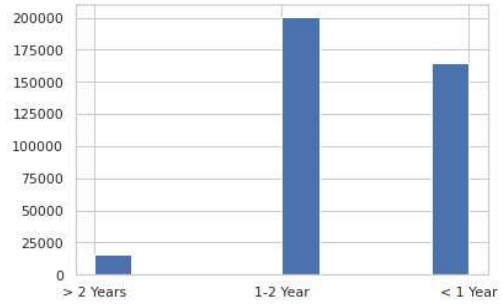


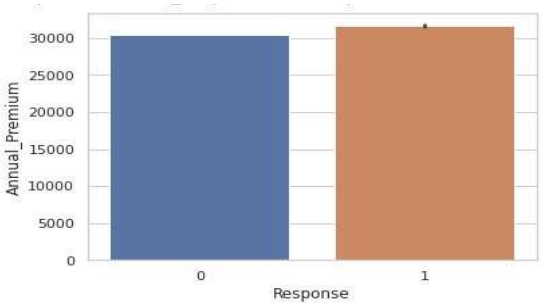






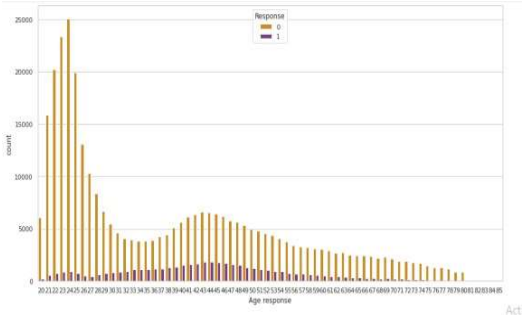


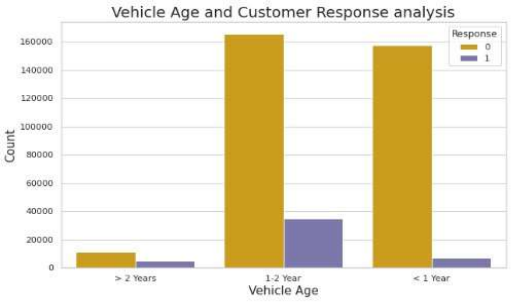


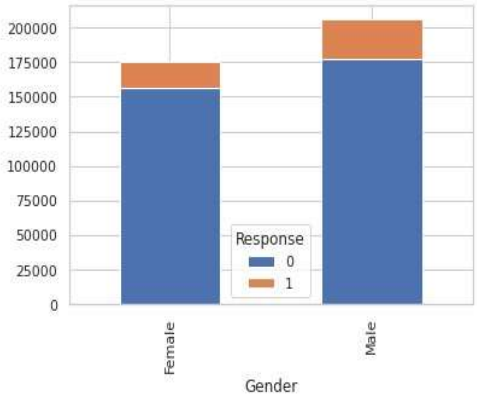


Univariate Analysis:

- From above fig I can see that the data is highly imbalanced.







- From the above distribution of age, I can see that most of the customers' age is between 21 to 25 years. There are few Customers above the age of 60 years.
- From the distribution plot I can infer that the annual premium variable is right skewed.
- For the boxplot above I can see that there's a lot of outliers in the annual premium.

Bivariate analysis:

- People ages between 31 to 50 are more likely to respond.
- while young people under 30 are not interested in vehicle insurance.
- The graphical representation illustrates a nearly equal distribution of the gender variable in the dataset, with the male category slightly outnumbering the female category.

Additionally, it suggests that the likelihood of purchasing insurance is slightly higher among males compared to females.

- Customers with vehicle age 1-2 years are more likely to interested as compared to the other two.
- Customers with Vehicle Age <1 years have very little chance of buying Insurance.
- Respondents tend to have slightly higher annual premiums compared to nonrespondents.

Normalization: After outlier treatment, I observed that the values in the numeric columns were of different scales, so I applied the min-max scaler technique for feature scaling and normalization of data.

EDA:

For encoding categorical values, we employed the one-hot encoding technique to convert categorical variables into a binary format, facilitating their integration into the machine learning model. Further, I categorized age as youngAge, middle Age, and old Age and also categorized policy_sales_channel and region_code. From here I observed that customers belonging to the youngAge group are less interested in taking vehicle insurance. Likewise, it was observed that Region_C and Channel_A had the highest number of customers showing disinterest in insurance. Furthermore, analysis of the vehicle_damage feature revealed that customers with vehicle damage are more inclined to opt for vehicle insurance. Similarly, customers with a history of vehicle damage tend to have higher annual premiums.

Encoding categorical values:

I used one-hot encoding for converting the categorical columns such as 'Gender', 'Previously_Insured', 'Vehicle_Age', 'Vehicle_Damage', 'Age_Group', Policy_Sales_Channel_Categorical', 'Region_Code_Categorical' into numerical values so that the model can understand and extract valuable information from these columns.

Feature Selection:

At first, I obtained the correlation between numeric features through Kendall's Rank Correlation to understand their relation. I have two numerical features, i.e. Annual_Premium and Vintage. For categorical features, I tried to see the feature importance through Mutual Information. It measures how much one random variable talk about another.

Model Fitting:

For modeling, I tried the various classification algorithms like…

Logistic Regression:

Decision Trees are non-parametric supervised learning methods adept at revealing intricate non-linear relationships within data. Employing a tree-like structure of conditional control statements, these algorithms craft machine learning models capable of discerning complex patterns. By scrutinizing object features, Decision Trees create tree-shaped models for forecasting future data and generating accurate output. In classification, they function as tree-structured classifiers, with internal nodes representing features, branches denoting decision rules, and leaf nodes signifying outcomes. Logistic regression is not performing well on this dataset as in confusion matrix model is predicting positive responses but with positive responses it is predicting negative responses in high numbers too.

Random Forest Classifier:

A Random Forest serves as a meta-estimator, leveraging multiple decision tree classifiers fitted on diverse sub-samples of the dataset. Through averaging, it enhances predictive accuracy and mitigates overfitting, resulting in robust and reliable predictions. The subsample size is controlled with the Parameter if bootsrap=True otherwise whole data set build in each tree. Here, random forest is performing better as in the confusion matrix the model now is much better with predicting positive responses.

XGBoost:

XGBoost, a form of boosting, is also referred to as extra gradient boosting. • Unlike traditional GBM, XGBoost calculates predictions using both X and Y variables initially and then refines the model based on the residuals of the previous iteration. • The iterative process continues until the Mean Squared Error (MSE) is minimized, with the loss function assigning greater weight to errors from preceding models. • Evaluation via the confusion matrix indicates a slight enhancement in the model's ability to predict positive responses accurately.

VII.COMPARING THE MODEL:

Further, I applied Machine Learning Algorithms to determine whether a customer would be interested in Vehicle Insurance. For the logistic regression I got an accuracy of 78% and for the XGBClassifier I got the accuracy of 79% whereas, I am getting the highest accuracy of about 91% and ROC_AUC score of 92% with random forest So, from this I can conclude that random forest is the best models as compared to the other models.

VIII.CONCLUSION:

From loading the dataset, I initially checked for null values and duplicates. No null values or duplicates were present in the dataset, obviating the need for treatment of such instances.

Through Exploratory Data Analysis, I observed that customers belonging to young Age are more interested in vehicle response. While individuals aged below 30 demonstrate diminished interest in vehicle insurance, an intriguing trend emerges among customers owning vehicles aged over 2 years, showing heightened interest in vehicle insurance. Furthermore, a notable correlation is observed where customers with damaged vehicles exhibit increased likelihood of expressing interest in vehicle insurance. Similarly, customers having damaged vehicles are more likely to be interested in vehicle insurance.

Key variables such as Age, Previously_insured, and Annual_Premium exhibit significant influence on the target variable.

For Feature Selection, I applied the Mutual Information technique. Here I observed that Previously_Insured is the most important feature and has the highest impact on the dependent feature and there is no correlation between the two.

I observed that the target variable was highly imbalanced. The issue was effectively addressed through the utilization of the Random Over Sampling resampling technique.

I applied feature scaling techniques to normalize our data to bring all features on the same scale and make it easier to process by ML algorithms.

Further, I applied Machine Learning Algorithms to determine whether a customer would be interested in Vehicle Insurance. For the logistic regression I got an accuracy of 78% and for the XGBClassifier I got the accuracy of 79% whereas, I am getting the highest accuracy of about 91% and ROC_AUC score of 92% with random forest So, From this I can conclude that random forest is the best models as compared to the other models.

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BLOCKCHAIN EMPOWERED: REVOLUTIONIZING AGRO-BASED SUPPLY CHAIN MANAGEMENT

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Abstract-- **Agriculture, the mainstay of rural India, provides livelihoods to 70% of the rural populace. However, it is beleaguered by supply chain inefficiencies, leading to losses of up to 5.99% in cereals and a whopping 60% yield loss for farmers. The prevailing supply chains are often shrouded in obscurity, with a scant 6% of businesses having complete visibility. This lack of transparency culminates in inefficient processes and potential delays in order fulfilment, engendering customer dissatisfaction and financial losses. The emergence of blockchain technology, however, offers a beacon of hope. Blockchain provides a transparent platform where all stakeholders can access and verify the movement of goods. This transparency not only bolsters customer trust but also enhances their satisfaction levels. Moreover, blockchain technology optimises inventory management and logistics, thereby reducing waste and boosting productivity. These enhancements translate into substantial cost savings. The advent of blockchain could revolutionise agricultural supply chains in India. By providing a transparent and efficient system for tracking the movement of goods, blockchain could eliminate many of the current inefficiencies. This would not only lead to increased profits for farmers but also ensure that consumers have access to fresh and highquality produce. Furthermore, the use of blockchain could also promote sustainable farming practices by making it easier to track and verify the use of environmentally friendly methods. In conclusion, blockchain technology has the potential to transform the agricultural sector in India, making it more efficient, transparent, and sustainable.**

I. INTRODUCTION

This pioneering project stands as a testament to innovation in agro-based supply chain management, leveraging blockchain's security and SHA-256's cryptographic prowess. It aims to dismantle the barriers of inefficiency and opacity that have long hindered the agricultural sector's potential. By embedding a quality assistant within the system, it ensures an unparalleled level of transparency, allowing stakeholders to monitor the lifecycle of agricultural products with precision. The SHA256 algorithm fortifies each transaction, cementing trust and upholding integrity across the supply chain. More than a mere enhancement, this project represents a bold stride towards a future where clarity in the agricultural supply chain is paramount, protecting the interests of both producers and consumers. It sets a new benchmark for the industry, heralding a blueprint for a fairer, more efficient, and transparent agricultural economy, energised by the latest technological advancements. This initiative is poised to redefine the agricultural landscape, fostering a more sustainable and prosperous future for all involved in the cultivation and distribution of the world's essential sustenance. The addition of a quality assistant tool further enhances this vision, providing stakeholders with real-time insights and quality checks addition of a quality assistant tool further enhances this vision, providing stakeholders with real-time insights and quality checks. This project is a step towards an empowered agricultural sector where technology and tradition converge to create a harmonious and prosperous future.

II RELATED WORKS

Shruti Jadon, Anagha Rao, Thanushree R., Netra Jagadish, and Prasad B. Honnavalli [1] present a comprehensive survey on the application of blockchain technology in the electronics industry for enhancing supply chain management. The paper, published in 2024, discusses the usage of blockchain technology in the electronic industry to provide a decentralized architecture. Additionally, they compare the different types of blockchain networks used, the security of frameworks, and the cost of implementation.

Jan Pennekamp, Fritz Alder, Lennart Bader, Gianluca Scopelliti, Klaus Wehrle, and Jan Tobias Mühlberg [2] in their 2024 publication explore the opportunities and designs for securing sensing in supply chains. They propose innovative solutions using building blocks to enhance security measures, ensuring the integrity and authenticity of the data in the supply chain. They also highlight relevant pitfalls and challenges, providing a comprehensive study of four scenarios that lead to end-to-end-secured sensing in complex IoTbased supply chains.

Marco Fiore and Marina Mongiello [3] offer in their 2023 publication a comprehensive review of how blockchain technology can support agri-food supply chains. They address various challenges, such as traceability, food safety,

and waste reduction, and discuss how blockchain can enhance efficiency and transparency in the agri-food sector. Their work also identifies the lack of training for industries and stakeholders, the involvement of additional technologies (i.e., big data and edge computing), and the absence of supporting tools for developers as key research directions.

Nima Afraz, Francesc Wilhelmi, Hamed Ahmadi, and Marco Ruffin [4] in their 2023 publication, analyze the requirements versus cost for implementing blockchain and smart contracts in telecommunications. They discuss how these technologies can enhance security and efficiency, and provide a cost-benefit analysis to guide implementation decisions. They also study two prominent use cases: one proposing a distributed marketplace solution for 5G slice brokering and another one on the decentralization of federated learning (FL) through blockchain.

Abubakar Mohammed, Vidyasagar Potdar, Mohammed Quaddus, and Wendy Hui [5] in their 2023 publication provide a systematic literature review on the enablers, benefits, and barriers associated with adopting blockchain technology within food supply chains. They discuss various factors that influence the adoption of blockchain and how it can benefit the food supply chain by improving traceability, reducing fraud, and enhancing consumer trust. Their work also provides a conceptual framework for blockchain adoption within the food supply chain.

XIN XU AND SHAOJIE ZHOU [6] propose a technique that considers out-of-stock aversion risk and waste aversion risk in cross-border ecommerce supply chain decision-making. They examine the risk preferences of cross-border ecommerce platforms and overseas warehouses based on prospect theory. They construct a cross-border e-commerce supply chain decision-making model with four different risk preference combinations under the Stackelberg game decision-making model.

Vinoth Kumar C. and Poongundran Selvaprabhu [7] examine distributed and decentralised systems for trustworthy control of supply chains. They propose a blockchainbased inventory sharing approach based on smart contracts using a private Ethereum network to link suppliers and retailers. Their approach combines blockchain technology with decentralised storage to increase the transparency, trust, and security of supply chain transactions.

Pratyush Kumar Patro, Raja Jayaraman, Khaled Salah, and Ibrar Yaqoob [8] propose a blockchain-based traceability system for the fishery supply chain. They present a generalised mechanism for secure information sharing that includes comprehensive algorithms to capture supply chain stakeholder interactions that enhance trust among participating entities.

Atima Tharatipyakul and Suporn Pongnumkul [9] review the user interface of blockchain-based agri-food traceability applications. They analyse existing research and literature to uncover the latest advancements and potential future breakthroughs in this area.

Ilhaam A. Omar, Raja Jayaraman, Mazin S. Debe, Haya R. Hasan, Khaled Salah, and Mohammed Omar [10] propose a solution for supply chain inventory sharing using the Ethereum blockchain and smart contracts. They present a detailed cost analysis for various stakeholder transactions in the supply chain. Their solution demonstrates that a blockchainbased approach reduces inefficiencies, is economical, is commercially viable, and provides improved information connectivity among supply chain stakeholders in a trusted and secure way.

III BACKGROUND WORK

The study aims to demonstrate that a blockchain-based approach for supply chain inventory sharing is efficient, cost-effective, commercially viable, and enhances stakeholder connectivity and trust.

Blockchain technology is making waves across various sectors due to its decentralised structure, transparency, and security. It's particularly influential in supply chain management, enhancing traceability, and minimising fraud. Numerous researchers have suggested ways to utilise blockchain in this field. For example, techniques have been proposed that take into account the risks associated with out-of-stock and waste aversion in decision-making for cross-border ecommerce supply chains. Others have explored distributed and decentralised systems for reliable control of supply chains and suggested a blockchain-based approach for sharing inventory. Proposals have also been made for a blockchain-based traceability system for the fishery supply chain, and reviews have been conducted on the user interface of blockchainbased applications for tracing agri-food. Solutions have been proposed for sharing supply chain inventory using the Ethereum blockchain and smart contracts. These studies highlight the potential of blockchain technology to enhance supply chain management in various sectors. However, challenges remain, including implementation costs, the need for industry and stakeholder training, and the requirement for developer support tools. This project seeks to build on these studies and address these challenges to further the application of blockchain technology in supply chain management.

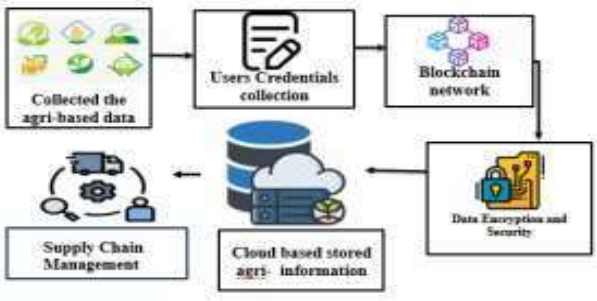

Figure 3.1: Model Diagram of workflow

IV. OUR PROPOSED MODEL

The system employs blockchain to ensure the traceability of agricultural products, offering solutions to manage heavy loads effectively. It encompasses the entire journey of agricultural products from production, through processing

and logistics, to sales. In the production phase, it meticulously records crucial data such as seedling specifics, cultivation details, environmental conditions, and transactional information during key activities like planting, transplanting, watering, fertilising, and harvesting. The research delves into the prevalent issues with the traceability of agricultural products and suggests innovative solutions. To circumvent the excessive power consumption linked to the computational intensity of the nodes, the researchers have introduced a Proof of Stake (POS) mechanism that operates independently of computational power, alongside a Delegated Proof of Stake (DPOS) system. The PBFT consensus mechanism is designed to achieve consensus within a distributed system, even in the presence of a minority of malicious nodes. A web application facilitates interaction with the blockchain network and smart contracts, providing a seamless interface for partners to monitor and manage their inventory. The application employs cryptographic techniques like digital signatures, signature verification, and hashing to guarantee secure, unalterable message transmission, safeguarding against tampering, counterfeiting, and repudiation. To further enhance the system, a quality assistant has been implemented. This assistant is pivotal in verifying the quality of the products, thereby bolstering reliability and trust among consumers. It acts as a guardian of standards, ensuring that every product meets the stringent criteria set forth, which not only improves the overall quality but also fortifies the confidence of all stakeholders in the supply chain. This comprehensive approach to traceability, powered by blockchain technology, marks a significant advancement in the agricultural sector, promising greater efficiency, transparency, and trust in the processes that bring food from farm to table.

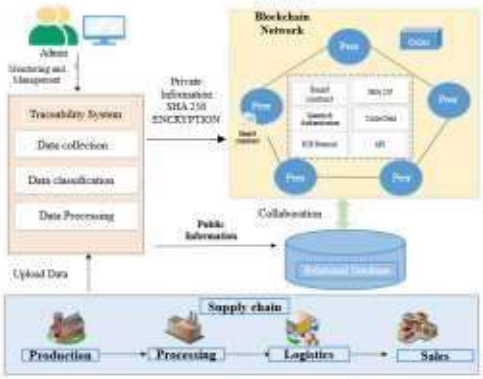

Figure 4.1 CNN WORKFOLW

V .IMPLEMENTATION

5.1 Module Description

- Admin module
- Agro-based data collection
- Blockchain network
- Data encryption and security
- Supply chain management
- Buyer module

5.1.1 Admin module

The Admin Module is designed to provide a robust authentication framework for system administrators, enabling secure login and registration processes. It guarantees verified entry to essential system functionalities, such as comprehensive data management and real-time operational surveillance. Additionally, this module simplifies the integration process for new administrators, allowing them to access and manage the system's extensive array of tools and services efficiently. This ensures a streamlined administrative experience and maintains the integrity and security of the system's operations. ***5.1.2 Agro-based data collection***

The agro-based data collection module plays a crucial role in compiling agricultural information. It meticulously captures a wide range of data, from quality benchmarks to production volumes, and detailed product identifiers like names and categories, including grains, fruits, and vegetables. This rich dataset is sourced from a network of contributors, including cultivators, processors, and supply chain intermediaries, ensuring a comprehensive aggregation of agricultural insights. This module is essential for maintaining a detailed ledger of agricultural activities and outputs, serving as a foundational tool for informed decision-making and strategic planning in the agricultural sector. It embodies a systematic approach to data gathering, reflecting the multifaceted nature of agriculture.

5.1.3 Blockchain network

The Blockchain Network module is pivotal in setting up and sustaining a blockchain network, capitalising on its decentralised and unalterable features for the secure preservation of data and handling of transactions. It meticulously logs each transaction concerning agricultural commodities, spanning from their inception in production to their final point of sale. This diligent record-keeping on the blockchain fosters an environment of openness and traceability, reinforcing the security and integrity of data associated with agricultural transactions. The module enhances collaboration among stakeholders, fostering a unified ecosystem for efficient and transparent agricultural supply chain management. This module also ensures compliance with global data protection regulations, contributing to the legal and ethical use of blockchain in agriculture.

5.1.4 Data encryption and security

The Data Encryption and Security module is dedicated to the protection of sensitive agricultural data, employing robust encryption methods to shield it against unauthorized intrusion and manipulation. By integrating state-of-the-art encryption technologies, the module fortifies data confidentiality throughout its lifecycle, encompassing both storage and transfer phases within the blockchain infrastructure. This ensures that all agricultural data, deemed critical for the integrity of the supply chain, remains secure and unaltered, thereby upholding the trust and reliability essential to the network's stakeholders. The module's focus on encryption not only preserves the sanctity of data but also reinforces the blockchain's core principles of decentralisation and immutability, making it a cornerstone of the network's security strategy.

5.1.5 Supply chain management

The Supply Chain Management module oversees the entire journey of agricultural goods within the supply chain, ensuring traceability and transparency. It meticulously monitors the progression of products from their creation phase through distribution. Every transaction and procedural step is recorded on a blockchain, ensuring data integrity and accessibility. The incorporation of smart contracts into the blockchain elevates this module's efficiency. These self-executing contracts with coded terms facilitate, automate, and enforce agreements among stakeholders without intermediaries. This not only expedites transactions but also mitigates inefficiencies, fostering a streamlined, accountable, and transparent supply chain that is responsive to real-time demands and challenges.

5.1.6 Buyer module

The Buyer Module is a comprehensive platform designed for buyers, including wholesalers and retailers. It provides access to information about available agricultural products. Through a blockchain-powered system, buyers can transparently view details such as product origin, quality standards, available quantity, and pricing. This module allows buyers to initiate purchases securely, with confidence in the integrity and traceability of the offered products. This innovative approach ensures that buyers are equipped with real-time data that is both reliable and traceable, enabling informed decision-making processes. This amalgamation of transparency, integrity, security, and accessibility defines the Buyer Module as an indispensable asset for every buyer in the agricultural sector.

VI.CONCLUSION AND FUTURE ENHANCEMENT

The integration of blockchain technology into agricultural supply chain management is a game-changer, offering transparency, security, and efficiency. Blockchain's decentralised and tamper-proof nature ensures reliable recording of agricultural data, enhancing supply chain transparency. The added benefits of increased security, automated processes via smart contracts, and reduced fraud risk make this innovative approach a pillar of integrity for the agricultural supply chain. It also lays the groundwork for a sustainable and technologically advanced future in agriculture. The adoption of blockchain is set to redefine stakeholder engagement in the agricultural ecosystem, marking a significant stride towards a more resilient and efficient industry. The disease classification could be expanded to include a variety of vegetables and fruits for increased accuracy. Developing a user-friendly interface for the system would make it more accessible to farmers and agricultural specialists, allowing them to easily input data and understand the results.

The deployment of digital technologies like the Internet of Things (IoT), big-data analytics, artificial intelligence (AI), and other ICTs is pivotal in modern industries. They offer crucial insights, boost decision-making, enhance operational efficiency, and enable communication and information exchange, thereby transforming various sectors, including agro-supply chain management. When these technologies are combined with blockchain, they can enhance the efficiency, transparency, and resilience of the supply chain.

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NEURAL NETWORK BASED ALGORITHM FOR EARLY WARNING PROACTIVE SYSTEM SECURITY IN SOFTWARE DEFINED NETWORKS

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Abstract: **With the advent of SDN, which provides centralized and intelligent management capabilities through unified applications like traffic classification and security management, the field of network design has experienced a significant transformation. SDNs offer dynamic solutions to today's networking problems, in contrast to traditional networks, whose static design makes it difficult for them to adjust to changing organizational needs. These programmable and centralized methods do, however, face a number of challenges that call for the use of modern security tools like intrusion detection systems. Many intrusion detection systems (IDS) have used machine learning—particularly Deep Learning algorithms—to boost efficiency and accuracy in recent years. This study proposes a novel CNN-based detection methodology and shows how it can be successfully integrated into SDN controllers to detect different types of assaults with an unmatched level of precision.The model's efficacy is demonstrated by experimental results, which provide 100% accuracy with minor degradation rates of 2.3% throughput and 1.8% latency in large-scale network deployments.**

Keywords: IDS, SDN, CNN

I. INTRODUCTION

The Proliferation of Internet Technology Has Ushered in a Plethora of Convenient Services, Yet It Has Also Spawned Various Security Threats. The Escalating Instances of Network Viruses, Eavesdropping, and Malicious Attacks Have Thrust Network Security Into the Limelight of Societal and Governmental Concerns. Intrusion Detection Emerges as a Pivotal Safeguard in Preserving Network Information Security Amidst These Challenges, as internet business grows exponentially, the complexity and diversity of network traffic present formidable challenges to intrusion detection methods. Identifying various forms of malicious network traffic, particularly unexpected variants, remains a critical endeavor.

Network traffic comprises normal and malicious categories, further subdivided into normal, DoS, R2L, U2R, and Probing Attacks. Consequently, intrusion detection poses a classification conundrum. While machine learning methodologies have been pivotal in this domain, primarily through shallow learning techniques emphasizing feature engineering and selection, they struggle with the voluminous intrusion data classification task, resulting in suboptimal accuracy and elevated false alarm rates.

Recent advancements in intrusion detection leverage deep learning techniques. For example, a CNN-based malware traffic classification method processes traffic data as images, bypassing manual feature design. Similarly, RNNs and LSTM networks have demonstrated efficacy in modeling and classifying network traffic behavior.

However, existing approaches often overlook the hierarchical nature of network traffic, treating it as a monolithic entity rather than a composite of traffic units, such as data packets and bytes. Moreover, they underutilize domain knowledge, failing to capture the intrinsic relationships within network traffic features.

Problem Identification & Objectives

Aviation, a Widely Utilized Mode of Transportation, Faces Operational Efficiency Challenges Due to Unanticipated Breakdowns, Leading to Delays and Financial Losses for Airlines. Predictive Maintenance Emerges as a Proactive Solution to Mitigate Such Disruptions by Forecasting Potential Aircraft Failures. Predicting Future Aircraft Engine Failures to Facilitate Proactive Maintenance Planning. Leveraging Aircraft Engine Operation and Failure History to Forecast in-service Engine Failures. Evaluating the Predictive Accuracy of Machine Learning Algorithms Compared to Deep Learning Methodologies.

II. RELATED WORKS

In the evolving landscape ML network intrusion detection, researchers explore an array of techniques to discern normal network traffic from potentially malicious anomalies. Dimensionality reduction, clustering, and classification methods serve as foundational tools in this endeavor, aiming to identify and address security threats effectively.

A new approach that integrates feature selection and classification using Support Vector Machine (SVM) was developed by Pervez and tested on the multiclass NSL-KDD Cup99 dataset. This novel approach included a thorough examination of classification accuracy over a range of feature dimensions, offering insightful information about its efficacy.

Shiraz continued Pervez's work by improving CANN intrusion detection techniques. Shiraz demonstrated advancements in intrusion detection approaches by achieving significant improvements in detection rates and warning reliability by utilizing KFN and KNN algorithms on the NSL-KDD Cup99 dataset.

Bhattacharya made yet another advancement when he presented a hybrid PCA-Firefly machine learning model that was optimized for intrusion detection and showed encouraging outcomes on Kaggle's public dataset. This creative method efficiently detects and reduces security problems by fusing the advantages of PCA with Firefly optimization.

Furthermore, by taking use of its automatic feature extraction capabilities, deep learning has become a potent instrument in intrusion detection. Real-time intrusion processing capabilities are being improved by employing methods like RNN, CNN, and LSTM networks to improve anomaly identification in network data.

Additional developments include the application of FCN models to thorough data analysis, proving their superiority over conventional machine learning techniques. Furthermore, Tama et al. suggested an anomaly-based intrusion detection system (IDS) that uses a two-stage meta-classifier in conjunction with hybrid feature selection techniques. This suggests a possible avenue for further intrusion detection research. Researchers work together and with constant innovation to create more resilient and potent defenses against changing cybersecurity threats.

III. EXISTING SYSTEM

By viewing network traffic as a sequence of changing states, current methods assess Logistic Regression's usefulness in detecting traffic behavior.

Methods currently in use assess how well Machine Learning models classify incursion traffic.

Drawbacks of Existing System

- These approaches treat entire network traffic as a uniform sequence of bytes, neglecting the nuanced domain knowledge of network traffic.
- Current methods consider traffic in isolation, overlooking the internal connections within network traffic.

IV. PROPOSED SYSTEM

We leverage classic NSL-KDD and contemporary benchmark datasets, conducting meticulous analysis and data refinement.

Our solution introduces a machine learning algorithm that addresses class imbalance in intrusion detection by balancing sample distribution, employing RF, SVM, XGBoost, and NLP alongside other techniques, categorized into 30 methods.

We present an end-to-end deep learning model amalgamating logistic regression and attention mechanism, catering to Software Defined Networks' challenges and offering a novel research avenue for Early Warning Proactive Systems.

Performance comparison with traditional deep learning methods demonstrates the ability of our model to comprehensively extract features from network traffic, yielding superior results on real NSLKDD dataset evaluations.

Advantages of Proposed System

- Our method uses packet vector analysis to extract fine-grained information that are essential for detecting malicious traffic.
- Through attention mechanism and subsequent feature fusion, our method extracts key features accurately representing network traffic behavior.
- This methodology facilitates organizations in training custom datasets and deploying trained models as fundamental security layers for realtime prediction of potential attackers based on packet data.

V. SYSTEM MODEL ARCHITECTURE

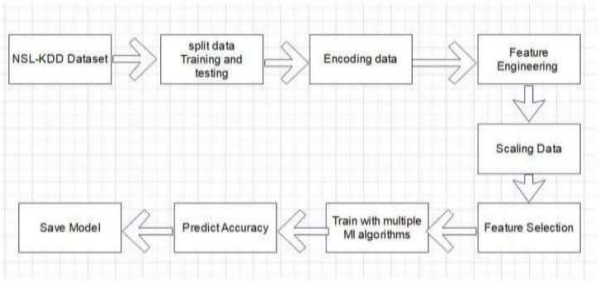

Fig.1 System Model Architecture

VI. METHODOLOGY

A.MODULES

a. Data Collection

The NSL-KDD dataset contains three categories of symbolic data: protocol type, flag, and service. Through the process of one-hot encoding, these characteristics are transformed into numerical features. As an example, the binary vectors [1, 0, 0] for tcp, [0, 1, 0] for udp, and [0, 0, 1] for icmp indicate the protocol type feature, which can take on values of tcp, udp, and icmp, respectively.

b. Pre-Processing

Upon extraction, the dataset may contain noisy, duplicate, or missing values. Thus, data preprocessing is essential, involving the removal of duplicate values and outliers, as well as feature deletion and transformation. Additionally, numerical standardization is performed to ensure uniformity across features.

c. Train-Test Split And Model Building

To assess the model's performance and generalizability, we split the dataset into a training set and a testing set. The next step in building the model is to use model fitting.

d. Model Assessment and Predictions
In the final phase, the model's efficacy is gauged utilizing metrics like accuracy score. Following instantiation, After the model has been trained on the training dataset, it is applied to the testing dataset to provide predictions. The accuracy score serves as a benchmark for evaluating the model's performance across diverse classification algorithms.

B. LOGISTIC REGRESSION ALGORITHM

a. Introduction to Logistic Regression:

One of the most well-liked ML methods is logistic regression, particularly adept at handling binary classification tasks. Its simplicity, alongside its proficiency in addressing a wide array of problems, has solidified its prominence.

b. Tutorial Dataset:

One output variable (Y) and two input variables (X1&X2) make up the dataset used in this tutorial. From a normal distribution, we derive two realvalued random variables, X1 and X2,while Y embodies two values, rendering it a binary classification challenge.

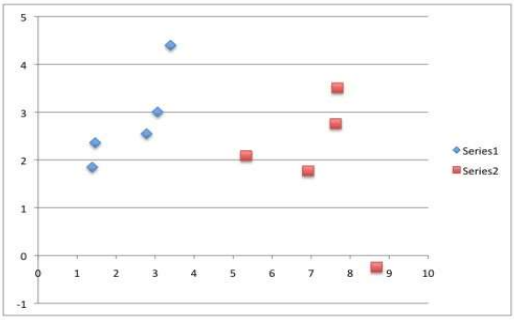

Fig.2 Dataset Splitting

c. Logistic Function: Understanding the logistic function, which is the foundation of logistic regression, is essential before diving deeper.
The basis for logistic regression methods is this, which is defined as 'transformed = 1 / (1 + e^-x)'.

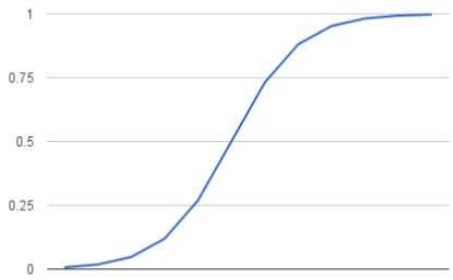

Fig.3 Logistic Regression

d. Logistic Regression Model:

When given a real-world input, the logistic regression model will determine the probability that it falls into the "default" (class0) category.Class 0 (the default) can be predicted from the output if the likelihood is greater than 0.5; otherwise, class 1 (the other) is predicted.
In this dataset, for instance, logistic regression, similar to linear regression, uses three coefficients: "b0 + b1*x1 + b2*x2 = output"
The logistic regression model determines the probability that a real-valued input is part of the default class (class 0).
In contrast to linear regression, the logistic function converts the output to a probability:
One divided by one plus the exponential of the negative output is the value of p(class=0).
On a spreadsheet, you would see this as
" p(class=0) = 1 / (1 + EXP(-output))".

e. Logistic Regression via Stochastic Gradient Descent

To get a ballpark for the coefficients, we can use stochastic gradient descent,a direct yet potent technique utilized by numerous machine learning algorithms. This method revolves around iterating through the training set, computing predictions, and adjusting coefficients based on prediction errors.

f. Prediction Computation:

First, we'll assign 0.0 to each coefficient and determine the likelihood of the first training example being class 0.B0 = 0.0
B1 = 0.0 B2=0.0
The first training instance is: x1=2.7810836, x2=2.550537003, Y=0
Using the above equation we can plug in all of these numbers and calculate a prediction:
31 prediction = 1 / (1 + e^(-(b0 + b1*x1 + b2*x2)))
prediction = 1 / (1 + e^(-(0.0 + 0.0*2.7810836 + 0.0*2.550537003))) prediction =0.5

g. Calculate New Coefficients

A straightforward update equation allows us to determine the updated coefficient values.
b = b + alpha * (y – prediction) * prediction * (1 – prediction) * x
In this case, prediction is the result of running the model to make a forecast, and b is the coefficient that needs updating. You are need to set the parameter alpha before the training run begins. The learning rate determines the amount by which the model (and its coefficients) change or learn with each update. When we update the model for each training instance, online learning makes use of larger learning rates. Values between 0.1 and 0.3 might be considered good.
We'll go with 0.3 as our value.
The input value for the coefficient is x, which is the last term in the equation. The absence of an input on the B0 is readily apparent. We can presume that this coefficient, which is frequently referred to as the intercept or bias, always takes

1.0 as its input. When applying the technique with arrays or vectors, this assumption can be useful.
To bring the coefficients up to date, we can use the preceding section's prediction (0.5) and coefficient values (0.0).
b0 = b0 + 0.3 * (0 – 0.5) * 0.5 * (1 – 0.5) * 1.0
b1 = b1 + 0.3 * (0 – 0.5) * 0.5 * (1 – 0.5) * 2.7810836
b2 = b2 + 0.3 * (0 – 0.5) * 0.5 * (1 – 0.5) * 2.550537003 32 or
b0 = -0.0375 b1 = -0.104290635 b2 = -0.09564513761

h. Repetition of the Iterative Process:

The procedure iterates through the training dataset, each cycle termed as an epoch. At the conclusion of each epoch, error values are assessed, and the process recommences for a predetermined number of epochs..

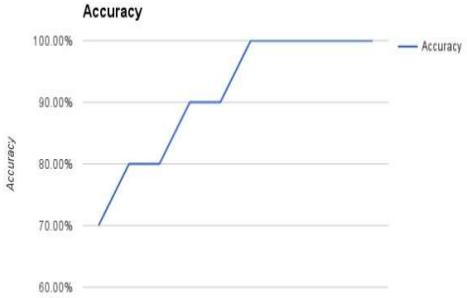

Fig.4 Final model accuracy

i. Prediction:
The next step is to train the model and then make predictions. Each instance's probability in class 0 is determined using the learned coefficients. You may find out how well the model performed on the training dataset by converting these probabilities into clear class values.

C. CNN Algorithm

Step 1 : Pre-requisites

Before embarking on your deep learning journey, it's imperative to lay down some groundwork. Here's what you need to ensure beforehand:
Proficiency in R/Python
A fundamental knowledge of probability, calculus, and linear algebra
basic understanding of the basics of deep learning and neural networks

Step 2: Conceptual and Technical Aspect Introduction
Learning neural networks is the first step toward understanding deep learning. These networks are used by deep learning to mine unstructured data, such as text, audio, video, and photos, for insightful information. Select an educational medium that best fits your learning style, such as blogs, books, videos, or online courses, to get started. Commence with basic ideas and work your way up. **Step 3: Choose Your Journey**
Once you've mastered the fundamentals, get some practical experience. Deep learning has a wide range of uses:
Pattern recognition and computer vision: segmenting, detecting objects, and other image analysis tasks.

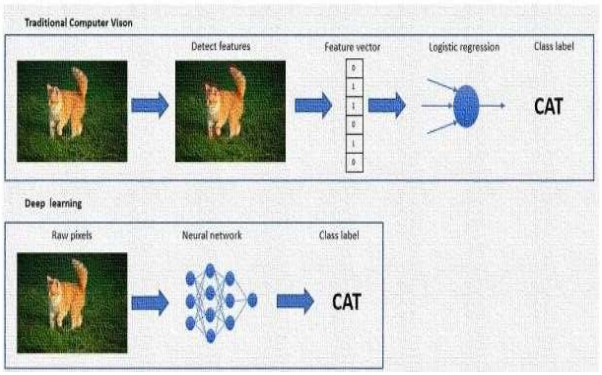

Fig.5 Pattern recognition

Speech and audio recognition: Like the "Ok Google" feature for voice searches.

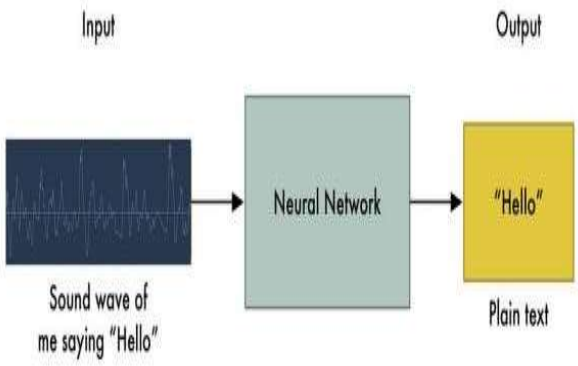

Fig.6 Neural Network

Natural Language Processing (NLP): Automating human-computer interaction by analyzing and responding to human language.

Step 4: Selecting the Appropriate Structure
Deep learning is essential for jobs involving large volumes of data, such as text, audio, videos, or photos. Depending on your unique needs and tastes, you can choose the right framework.

Step 5: Investigating Deep Learning
Explore the nuances of deep learning, which is made possible by a large amount of training data and a reliable computing infrastructure. Artificial intelligence is a dynamic field that has great potential for future developments and limitless possibilities.

VII. RESULTS AND DISCUSSIONS

Fig.7 Home page

Based on User input Giving the Dataset and ML Model Predicting the type of attack.

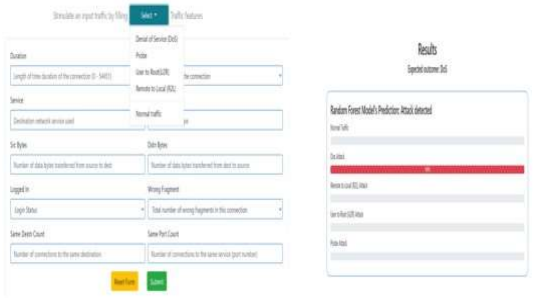

Fig.8 Home page

If the packet contains attack means then our model display the type of attack and also predict with accuracy.If there is no attack then our model display it as 100% normal traffic

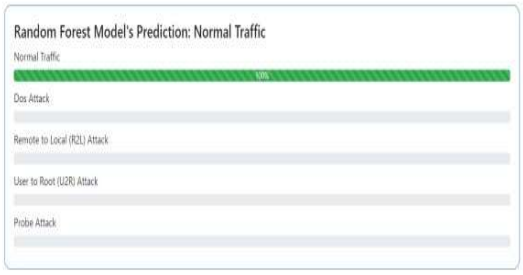

Fig.9 Result Image

VIII. CONCLUSION

As the landscape of network intrusion evolves, the demands on intrusion detection systems intensify. The challenges posed by imbalanced network traffic hinder these systems' ability to anticipate the distribution of malicious attacks, posing a significant threat to cybersecurity. Our innovative Difficult Set Sampling Technique is designed to address this problem. This technique strategically augments the number of minority samples, mitigating imbalance, and reinforcing learning to boost classification accuracy under challenging conditions.

Our toolbox includes a number of sample strategies, six traditional classification algorithms for ML and DL, and more. Experimental results showcase the efficacy of our approach in accurately identifying and expanding samples in imbalanced network traffic, leading to more effective attack recognition. Notably, post-sampling of imbalanced training set samples via the MLP algorithm, deep learning outperforms machine learning. However, the predominance of pre-extracted data features in current public datasets limits deep learning's potential for automatic feature extraction. In order to take use of deep learning's benefits, to improve classification accuracy and mitigate data imbalances, we will then train our models using the original network traffic data for feature extraction.

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REAL-TIME DEEPFAKE DETECTION IN VIDEO CONFERENCING WITH DEEP LEARNING

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***Abstract*— In our paper, we introduce a new method for detecting deepfakes during video conference calls in real time using a browser extension. Our system utilizes advanced deep learning techniques, specifically ResNeXt-50 and LSTM models, to analyze video content and identify manipulated material. The extension captures video segments from the client side, sends them to a server for processing, and then receives status updates from the server to inform the user about the video's authenticity. Our system is designed to be user-friendly, seamlessly integrating with popular video conferencing platforms and providing real-time notifications to users.**

***Keywords*— Deepfake detection, Video conferencing platform integration, ResNext50, LSTM, Real-time processing.**

INTRODUCTION

The rise of deepfake technology has brought about a new era of advanced digital manipulation, presenting both promising opportunities and significant challenges across various sectors. Recent incidents, such as the complex scam involving a finance employee working at a large financial firm fell victim to a sophisticated scam involving deepfake technology. The scam resulted in the fraudulent transfer of $25 million to the perpetrators, highlighting the urgent need for robust solutions to combat fraudulent activities facilitated by AI-driven manipulation.

The widespread use of video conferencing in today's interconnected world has led to an increase in the risk of deepfake scams during virtual interactions. A recent incident in Hong Kong, where a finance worker was deceived by a well-planned deepfake scheme during a video conference call, highlights the serious consequences of malicious exploitation of advanced technologies.

Deepfake technology presents a significant challenge to the security and authenticity of digital communications, financial transactions, and personal interactions. While deep learning algorithms have brought about significant advancements by mimicking human cognitive processes, their misuse in creating deceptive content raises concerns about the trustworthiness of digital media.

Existing detection mechanisms often struggle to differentiate between genuine and manipulated content in real time. The increasing sophistication of deepfake technology, demonstrated by the seamless replication of individuals in video calls and the manipulation of facial recognition systems, underscores the urgent need for innovative solutions to protect against fraudulent activities.

This research paper focuses on the critical challenge of real-time deepfake detection in video conference calls. The goal is to develop a proactive approach to identify and mitigate the risks associated with AI-generated manipulation. By utilizing advanced deep learning techniques, such as ResNeXt-50 and LSTM models, the proposed system aims to improve the accuracy and efficiency of detecting manipulated content during live video interactions.

Literature survey

Active Illumination Techniques

Gerstner et al. [1] propose a real-time deepfake detection approach that leverages the controlled manipulation of the light source (typically the computer display) during video calls. Their method exploits the limitations of deepfake generation models in accurately simulating subtle changes in facial appearance caused by variations in light source position and intensity. By strategically manipulating the light source during a video call and analysing the resulting changes in facial appearance, this approach aims to identify inconsistencies indicative of a deepfake.

Vision Transformers

Doshi et al. [2] introduce a system that utilizes transformers, a powerful deep learning, to extract spatio-temporal features from frames of the video. Spatio-temporal features capture both spatial information (appearance) and temporal information (changes over time) within the video. By analyzing these features extracted using transformers, the system can differentiate between real and deepfake videos. Transformers are capable of learning complex relationships between different parts of a video frame and across consecutive frames, potentially facilitating the detection of subtle inconsistencies in facial movements or expressions that might be indicative of a deepfake.

Active Probing and Corneal Reflection

Guo et al. [3] present an active forensic method that displays a specific screen pattern of a video and analyses the user's corneal reflection captured in the video. Real faces exhibit

distinct corneal reflections due to the complex interplay of light, tear film, and corneal topography. Deepfakes often struggle to accurately simulate these reflections due to the difficulty of modeling these intricate physical processes. This method leverages this disparity by displaying a specific screen pattern and analysing the participant's reflection of corneal to identify inconsistencies that might be indicative of a deepfake.

Lightweight Deep Learning Models

Uçan et al. [4] discuss the integration of lightweight deep learning models developed by Wang et al. within video conferencing applications. These models are specifically designed for efficient real-time execution on resource-constrained devices, such as laptops or mobile phones.

Lightweight deep learning models achieve real-time performance by using smaller and more efficient network architectures that require less computational power. This allows for the deployment of deepfake detection directly within video conferencing applications without significantly impacting performance. Maintaining the Integrity of the Specifications

Deep Learning Architectures

Patel et al. [5] propose a model that leverages a combination of ResNet50 and LSTM for deepfake video detection. ResNet50 is adept at extracting features from individual video frames, while LSTM networks are known for their ability to handle sequential data, such as video frames in a sequence. By combining these architectures, Patel et al. aim to capture both static appearance information and dynamic changes in facial expressions over time, potentially improving the accuracy of deepfake detection.

Method

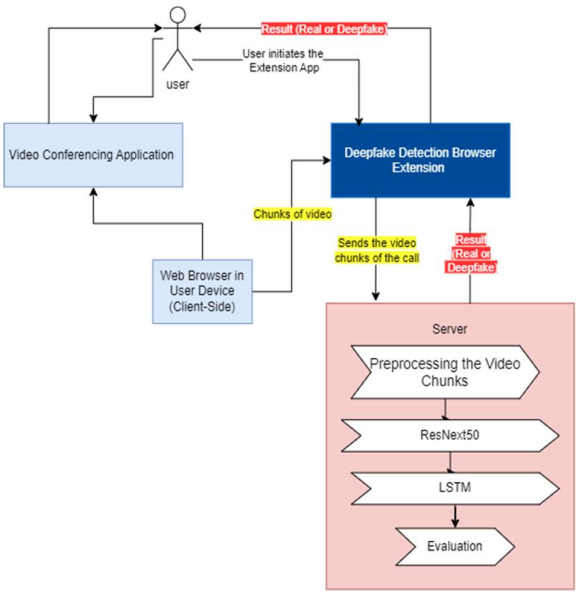
This paper proposes deep learning-based method for real-time deepfake detection that leverages a collaborative client-server architecture. During a video call, the browser extension from the client side transmits video chunks to the server.

These video chunks are processed by a ResNext50 network on the server, which extracts high-level spatial features representing the visual content within each frame. Subsequently, the extracted features are fed into an LSTM network, also residing on the server.

The LSTM network analyzes these features sequentially, enabling it to capture the temporal relationships between frames. This combined approach allows the model to not only identify relevant visual cues within individual frames (handled by the server-side ResNext50) but also understand how these cues evolve over time in the video sequence (analyzed by the server-side LSTM). By leveraging both spatial and temporal features, the model effectively distinguishes between real videos and deepfakes.

The analysis results, indicating whether a deepfake is detected or not, are then transmitted back to the client, where they are displayed to the user.

This approach allows for centralized processing power on the server while providing real-time feedback to the client about potential deepfakes within the video conference. Fig.



1 Shows the system architecture.

System architecture with client-side and server-side

Client-side Browser Extension

This extension operates within the user's web browser and interacts with the video conferencing platform. It facilitates video capture, and transmission to the server, and displays the deepfake detection results to the user.

Content Script

This lightweight JavaScript code injected into video conferencing platform tabs enables interaction with the specific platform's UI elements. In this case, the content script will be responsible for triggering screen recording within the video call window and sending captured video chunks to the background script.

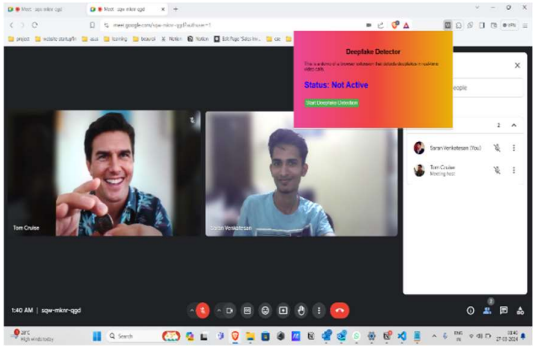
1) Content script functionalities.

- *Trigger Screen Recording in Content Script:* The background script initiates the detection process by sending a message to the content script with "startDetection" action. This instructs the content script to initiate screen recording within the video call window using a suitable JavaScript library specifically designed for screen recording within browser environments.
- *Chunking:* Breaks down the video data into smaller chunks for efficient transmission. (For improved performance and memory management, especially as video calls can be lengthy, consider implementing a chunk-based recording approach. This involves capturing video data in smaller segments and sending them to the background script for processing one by one.)

- *Transmission:* Sends these chunks sequentially to the server-side component for partial analysis.

User Interface (UI)

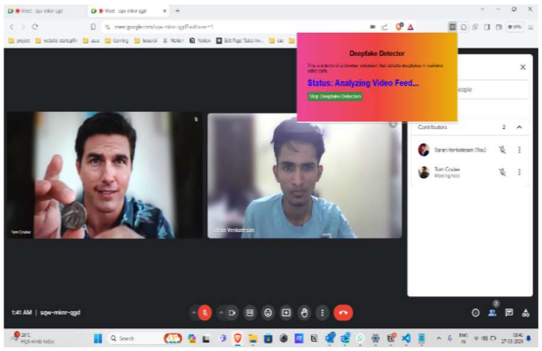
The background script maintains a connection with the extension's popup UI, allowing for real-time updates on the detection process.



Initial state of browser extension during the video conference call (this call is made on the Google Meet platform for the purpose of testing)

Idle State:

- The extension remains inactive by default, waiting for user interaction (Fig. 2). No background processes or communication between scripts occur.
- The UI displays a neutral status message (e.g., "Idle") and doesn't interfere with the user's browsing experience.
- User testing in this state can assess the clarity of the idle UI and its ability to convey the extension's inactive status.
-



Analyzing state of browser extension during the video conference call (this call is made on the Google Meet platform for the purpose of testing)

Background script

This script runs continuously in the background, monitoring the user's browsing activity. It manages tasks like initiating communication with content script to trigger deepfake detection in the screen, updating the ui, displaying the detection status and triggering notifications. Fig. 4 shows the pseudo-code of the background script of a browser extension.

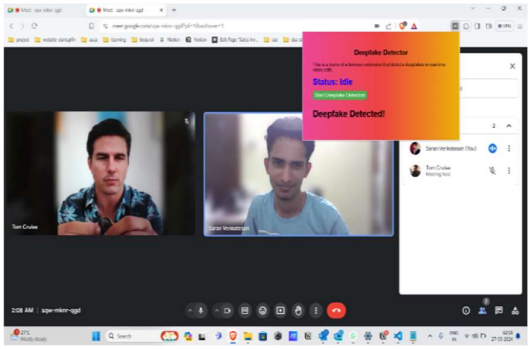
```
1. Listen for messages:
   - Establish a communication channel to receive
     messages from the content script injected
     into video conferencing platform tabs.

2. Handle incoming messages:
   - Upon receiving a message:
     - Extract message details:
       - Deconstruct the message to retrieve its action
         (e.g., `"startDetection"`, `"result"`, `"stopDetection"`)
     - Process message based on action:
       - `"startDetection"`:
         - If detection is not already in progress:
           - Initiate communication with the content script to
             trigger deepfake detection in the video call window
         - Update the popup UI element displaying the detection
           status (e.g., "Analyzing Video Feed").
       - `"result"`:
         - Extract the `isDeepfake` flag from the message.
         - Update the popup UI elements to reflect the detection outcome:
           - Status: "Deepfake Detected" (if `isDeepfake` is True)
             or "Real Video" (if `isDeepfake` is False).
           - Result: "Deepfake Detected" or "Real Video".
       - `"stopDetection"`:
         - If deepfake detection is currently running:
           - Send a message to the content script instructing it to
             terminate the deepfake detection process.
         - Update the popup UI element to reflect the stopped
           detection status (e.g., "Not Active").
```

Pseudo code of Background.js of browser extension (client side)

1) Background script functionalities.

- Verifies if the active tab URL matches supported video conferencing platforms.
- Sends a message to content script injected into the active tab.
- The background script verifies if deepfake detection is already running. If not, it proceeds.
- Displays a status message indicating detection is in progress (e.g., "Analyzing Video Feed").
- Similar to the previous scenario, the background script updates the UI displayed in the popup to indicate that detection is in progress (Fig. 3). This might involve changing the text of a status element to "Analysing Video Feed" or displaying a loading indicator.
- It retrieves the `isDeepfake` flag from the message to determine the deepfake detection result.
- Based on the extracted outcome, the background script updates the UI elements within the popup to reflect the detection results, similar to the previous explanation with status and result elements (Fig. 5).
- If screen recording is currently running, the background script sends a message (to the content script) with the "stopDetection" action. This instructs the content script to terminate the ongoing screen recording process and release any associated resources.



Deepfake is detected by the browser extension during the video conference call (this call is made on the Google Meet platform for testing)

Server-side Deep Learning Model

Data Pre-processing

During preprocessing, videos are segmented into frames, and facial detection is applied to each frame to isolate facial regions. Cropped frames are then reassembled into new videos, focusing solely on the detected faces. A threshold value is determined to manage computational demands, dictating the retention of a set number of initial frames in each video. This ensures uniform processing and aligns with sequential processing requirements for LSTM modeling.

ResNeXt-50 CNN

- A pre-trained ResNeXt-50 CNN extracts features from individual video frames. ResNeXt is a residual CNN architecture known for its capability in deep neural networks. We specifically use the resnext50 model with 32 x 4 dimensions and 50 layers. This pre-trained model efficiently captures low-level visual features from the frames of the video.
- The pre-trained ResNeXt-50 is fine-tuned by adding new layers to optimize the model's performance for deepfake detection.

LSTM for Sequence Processing:

- The 2048 dimensional feature vectors extracted by the ResNeXt CNN from each frame are fed into a LSTM (Long Short-Term Memory) layer. This layer, with a specific number of latent dimensions and hidden layers along with dropout regularization, is adept at handling sequential data like video frames. By processing frames sequentially, the LSTM can capture temporal information and analyse changes across frames, aiding in deepfake detection.
- The effectiveness of the LSTM layer hinges on the chosen number of latent dimensions (also known as units or memory cells). These units determine the LSTM's capacity to capture temporal dependencies within the video sequence. While a higher number of units generally improves performance, it also increases computational complexity. Experimentation is necessary to find a suitable balance between accuracy and efficiency for real-time processing.
- Stacking multiple layers of Long Short-Term Memory (LSTM) can significantly enhance the model's capacity to understand and learn intricate patterns over time. The optimal number of LSTM layers depends on the dataset size and video complexity.

Real-time Processing Pipeline

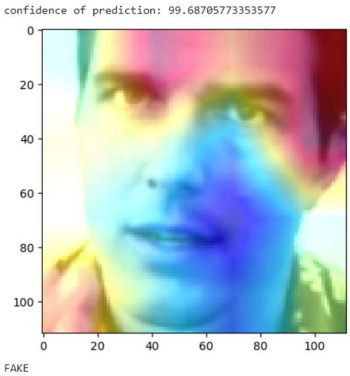
The browser extension operates in real-time, continuously analysing video streams for deepfakes. Here's a breakdown of the real-time processing pipeline.

- **Capturing Video Chunks:** The extension capture small video chunks.
- **Pre-processing Chunks:** Captured frames undergo pre-processing steps like resizing, cropping only the face, and normalization to prepare them for the deep learning model.
- **Feeding Frames to ResNeXt50:** Pre-processed frames are fed sequentially into the ResNeXt50 model.
- **Feature Extraction:** ResNeXt50 extracts features from each frame, capturing spatial information relevant for deepfake detection.
- **Feeding Features to LSTM:** The features extracted by ResNeXt50 for each frame are provided as input to the LSTM network.
- **Temporal Analysis by LSTM:** The LSTM analyzes the sequence of features, identifying potential temporal inconsistencies indicative of deepfakes.
- **Outputting Probability Scores:** generates a probability score for each frame or video sequence, representing the likelihood of a deepfake.
- **Real-time Deepfake Detection:** Based on a pre-defined threshold, the extension classifies the video content as a potential deepfake if the model's output score surpasses the threshold.

Result

This section presents the outcomes of testing our deepfake detection method in a real-world video conferencing scenario. To test our method in a realistic scenario, we organized a simulated video conference showcasing a pre-recorded deepfake video of Tom Cruise. This deepfake was integrated seamlessly into the video conferencing platform (Google Meet).

Our model successfully identified the pre-recorded fake Tom Cruise video as a deepfake with a high confidence score of 99.68% (Fig. 6). This result indicates a strong likelihood that the model accurately distinguished the deepfake from a real video in this practical scenario. The ResNext50 network likely played a crucial role in extracting relevant features from the video frames, while the LSTM network effectively captured temporal relationships within the video sequence, leading to a robust deepfake detection capability.



Detected the deepfake with confidence score of 99% from the frame of the video chunk sent by browser extension during conference call (server side generated image)

Conclusion

This paper proposes an approach for detecting deepfakes in video conferencing, utilizing a combination of ResNext50 for feature extraction and LSTM for capturing temporal dynamics.

We demonstrated the efficacy of this approach in a real scenario, where our model successfully identified a pre-recorded deepfake within a simulated video call with an impressive confidence score of 99.68%. This result signifies the potential of our method to distinguish between real and manipulated videos in video conferencing applications. The high confidence score achieved in the real-world evaluation highlights the promise of this approach for enhancing security and trust in video conferencing environments.

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TRUST-CENTRIC PRIVACY-PRESERVING BLOCKCHAIN BASED DIGITAL CERTIFICATE LOCKER

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***Abstract*— Annually, thousands of students graduate from high school and choose professions involving business or further study. In this case, a prolonged document verification method is used to verify the pupil's qualifications. Whenever documents are transmitted among organizations during confirmation, this creates considerable cost. The whole thing takes quite a bit of time, effort, and cash to maintain—every period, university administrators spent a million US dollars on it. In addition, this business took some time establishing that the individual applying as well as the client's credentials were genuine. Humans frequently employ bogus diplomas to perpetrate falsehoods concerning their educational achievements and qualifications. It may be hard to differentiate and identify the fake certification created by skilled fraudsters like a genuine one. As a consequence, updating the accreditation and validation processes has become essential. Recently, cryptocurrency came out as an alternative to the arduous human applicant confirmation method. This project revealed a blockchain-based system of school authentication that offers an easy way of distributing, studying, and validating educational credentials. The paperwork or the pupil's recognition is confirmed by comparing them with the hashes that have already been saved to Bitcoin. Also, offering a further layer of authentication, the files included with the suggested approach are linked to the school. A pupil as well as their identification documents will be released, acquired, or confirmed via this specified application. This approach will help learners as well as institutions maintain safety and willingness concurrently[1].**

Keywords—Trust, Privacy, Blockchain, School Authentication, Digital Certificate Locker

I.INTRODUCTION

Inspection of educational credentials was a helpful instrument over initial employment screenings since it demonstrates an applicant's skills as well as can offer evidence of their integrity and honesty through verifying whether the applicant truly has the certificate and degree said. When one hires, one may conduct an educational validation check to figure out whether an applicant's statements about their level, expertise, instruction, and certificate were genuine, as well as identify potential anomalies. The service, additionally referred to as a school search and a background verification, can be utilized to confirm academic performance for higher education institutions and secondary institutions [2]. A vast majority of reputable educational organizations will use physiological security measures, including micro-text contours, ultra-ink with indistinct watermarking, encryption holography, anti-scanning pigmented ink, etc., that prevent manipulations in duplicating copying equipment. It is probable that buyers with bogus diplomas won't add an imitation mark to their credentials in order to make them look genuine. Another anti-scanning function is offered via the safety of a hologram, anti-scanning dye, or gap characteristics, preventing them from generating an accurate colour copy. The topic and layout would be substantially changed to the initial colour scheme after being digitized and copied. In requesting to reproduce an extent under this instance of an unoccupied option, the text replica exhibitions. The original file is unlikely to include such an attribute. On the flip side, whenever the original is copied, its characteristic is copied.

1.1 BACKGROUND OF THE PROJECT

Technology from the modern age has proven its continued existence. Several individuals opposed the arrival of electronic devices in the community due to the dangers that they pose to society. Advocates of technology and novel techniques express their worry that machines will ultimately replace all of humanity's talents and generate widespread underemployment. The objector is constantly misled by the increasing popularity of gadgets in modern-day society, since emerging technology as well as technological inventions keep generating fresh chances for people to engage in those professions [2]. As a consequence, robots become human collaborators across all pursuits. Online verification and recognition of learners has been a major problem for many colleges during the past few years because of the convenience with which papers, degrees, and even studentships can be fabricated while adversely employing technology. The forgers were ignorant of just how useful technology has grown to be in the modern world in making choices, authorizations, and validations. It's an indication of the computer's efficacy with regard to, amongst other characteristics, velocity, preciseness, trustworthiness, expenditure, or reliability. The public's understanding of the use of computing devices for protection, verification, or

validation purposes—whether internet-based as well as window-based—has evolved over the past several decades. Corporations apply a range of mechanisms, namely information systems (also called IS) along with management informational software (MIS), in addition to systems to support decisions (the DSS) [2].

1.1 PROBLEM STATEMENT

Evaluating job applications and resumes to determine whether they have incorrect or misleading information is an essential step of the recruitment procedure. In reality, selecting the wrong applicant may be very disruptive or expensive. Fortunately, employing the recommended verification of certificates approach is doable to verify the legitimacy of the certificate and score listing that was actually provided. Thus, criminal histories were frequently employed by a majority of big businesses for screening new employees. These types of procedures "must be put into effect throughout each company because of the severe repercussions tied to cyber violations," but they deserve to be administered farther to team members in maintaining professions or authority with a high degree of sensitivity. During the beginning of the twentieth century, honesty and integrity tests were used to aid with the recruitment procedure, providing a substitute for criminal records checks, which exclusively checked someone's biography. These assessments are viewed as a possibly helpful addition to a usual criminal record check as they assist in recognizing and choosing superior staff members, which in turn contributes to "enhancing the standard of a company's entire operation." Regarding hiring choices to be considered knowledgeable, fraudulent criteria have to be avoided, identified, or punished. Educational institutions have to use blockchain-based anti-counterfeit technology that prevents illicit copies or duplication and also provides an avenue for establishing the accuracy of certificates. Every college and university have to strictly control the release of associated documents so as to simplify electronic confirmation of those documents filed to earn.

1.2 BLOCKCHAIN

Cryptography may be defined as a secure and private record containing autonomous information. Blockchain software enables sharing information among a restricted number of people or gatherings. Transaction information from numerous places can be easily collected, taken together, or distributed using bitcoin services in the cloud. Encryption hash offers the means or identification for every common hinder in information once it has been built. Cryptography prevents duplicated information and promotes cybersecurity by offering the accuracy of information from a single point of view. Although data in a blockchain system can't be altered with the permission of the majority of all participants, theft and information manipulation can be prevented. Blockchain records are irreversible and can be transferred[3].

Local confidence: The primary advantage of employing the blockchain system above traditional storage methods for businesses is the fact that it provides assurance for accurate information while relying on a single governing body. They referred to it as decentralized confidence founded on reliable facts.

Blockchain components: Information is kept in blocks of data, with any of the blocks being linked to the one that comes preceding it to create an arrangement such as a link in a chain [3]. This characteristic gave the system the moniker chain. A distributed ledger can only have additional blocks included in it (attached), utilizing the algorithm known as blockchain. Each block that is uploaded to the network may not be deleted or changed.

Consensus methods: These are the software programs that execute to make sure that the digital ledger technology follows its rules to the letter. The consensus process verifies that the norms set by each party involved for the decentralized ledger are being strictly adhered to.

Blockchain nodes: networks are storage systems that preserve the information's synchronization of currencies. Blockchain technology blocks containing information remain at those nodes. It is simple for each node to figure out whether the block has altered since it was initially committed. A duplicate for every single block that's already in the network is obtained via freshly joined complete nodes. Like the other nodes, the new node is able to accept any fresh block after it's coordinated with all the other nodes and is the most recent copy on the network [4].

The nodes of the principal consist of a pair of forms:
Light nodes only retain the most recent bits but are able to request earlier ones if clients need them.
Full nodes are those that keep an exhaustive copy of a network.

OBJECTIVES OF THE PROJECT

The importance of having authentic papers or certifications can't be overstated because every false and fake document and certification undermines the institution's trustworthiness.

To employ the technology of blockchain for the development and execution of an educational authentication platform. verify documents or diplomas that pertain to some particular school or institution, prohibiting fake as well as phony papers and certificates to commerce.

Use fake information to prove you are a genuine or legally enrolled pupil.

Demonstrate the system's superiority over the existing human validation and identification procedures.

To highlight how important, it's to verify and authenticate documents and certifications [4]

1.3 SCOPE OF THE PROJECT

The development of a secure environment enabling educational organizations to manage and maintain track of their customers' electronic diplomas constitutes a component of this "Certificate Locker," the project's

objective. The endeavor aims to address the issues associated with conventional printed documents that tend to be exposed to manufacturing, grief, and extinction. The website receives a greater level of assurance and reliability from its application of the public key infrastructure (PKI) in certification encryption and decryption with the use of blockchain in certification validity confirmation. The three user roles—Web the administrator, Certificates Keeper (learners), or Certification Verifier—are being created as a component of this endeavor. The website administrator is going to be in the position of approving certification owners' or certification verification agencies' inquiries regarding registration, along with combining the technology and the network of blockchain entities. The website administrator is going to be in the position of accepting certification owners' or certification verification agencies' requests for registration in addition to connecting the software with the distributed ledger network. The capacity to sign up, submit documents, and get a pair of public and private keys for every credential will soon be accessible to certification holders. Likewise, they should be allowed to respond to the demand for authenticity checks for credential verification agencies by offering a link to verification alongside their credentials with secret vitals, and they can utilize the hash value provided by the ledger to check the validity of the issued certifications. Certification Verification agencies will be given the capacity to sign up, seek certificate owners with the Certification Examination, and leverage the secret key that credential administrators have provided to ensure the reliability and consistency of these certifications [5].

II. PROPOSED SYSTEM

Today's companies select "the cream from the plant," meaning the most qualified applicants. The suggested approach provides an interface for storing and verifying student certificates using the blockchain since certification preservation and safety are considerations for higher education institutions, pupils, and businesses. Using blockchain-based technologies, universities can ensure that their students are not only qualified and competent, but also vetted and prepared for the job market. Finding authentic individuals with genuine credentials or reputable knowledge is a must for each company [6]. A more thorough review of the actual certifications that learners provide is carried out through the Certification Validation Process. The technology of blockchain to confirm the authenticity of a pupil's certificates. All has become online, especially the school credentials that pupils get from their colleges and universities, along with their SSLC, HSC, and additional certifications. The official documents are subsequently preserved on the blockchain. We are able to offer an online certificate validation process that is safer and more efficient through the use of blockchain-based technology [5].

The proposed solution is based on an open-source methodology that is decentralized [7]. The distributed ledger and the infrastructure cannot be outside the control of one individual.

The following are the three primary components of the design:

2.1. THE USE OF BLOCKCHAIN AS A DATABASE

A database (blockchain technology) merely includes links to public organizations such as colleges and universities, hash codes, or keys that are publicly available. That does not contain personal or private information. This can withstand assault, and it is reliable because of the multi-cluster functioning. Originally envisioned by the white paper's writers, a network of government and regional computing facilities would handle the facilities. It would increase safety and increase client confidence in the computer system. Access to the ledger's blockchain is strictly controlled or kept private. Certificate managers and users may verify the certificate file by employing the available online services or applications that communicate with a number of nodes on the blockchain [7]. The architecture gains from the blockchain's well-known characteristics (counterfeiting security, permanence, etc.).

2.2. An internet application enabling certification issuance.

The method for creating certifications involves using a web service that may be integrated with a current system using a user interface and managed inside the browser of the issuing institution. The online service may be integrated into an application for clients whenever needed. Those approved organizations whose credibility or capacity for issuing licenses have been officially vetted by authoritative bodies are allowed to take advantage of the internet-based service. The person holding the certificate receives online keys generated in this fashion safely. The encrypted certificate data won't be stored (conveniently or by the issuing facility) in the current model. Regulators may simply integrate additional standards involving the digital preservation of certificates with the present architecture.

2.3. Internet-based authentication service

It is going to be easy to confirm the authenticity and reliability of the certification documents through a publicly accessible internet service. Anybody having a valid certificate document, or the person who holds the certificate themselves, in addition to any companies or other entities to whom the cert holder presents their electronic certificate document, is able to use this online service. The value of the hash is calculated in the web browser and confirmed to be present in the distributed ledger by providing the file to the server. The real certificate remains within a web browser. Though the end result is various, the confirmation process may prove undesirable in several circumstances (hashing not being included across the blockchain technology, record changes, etc.).

III. SYSTEM TESTING

3.1. SOFTWARE TESTING

When trying to assure the reliability and excellence of a software structure, testing the software is often an essential step. Among the software evaluation activities that may be carried out within the "Certificate Folder" systems are as follows:

1. **Unit evaluation**: It involves putting each of the system's parts and modules through testing to ensure that certain things operate as designed. Examples include reviewing the chain's hash key checking capabilities, or PKIs, as well as decryption skills.
2. **Integrated Evaluation:** The following examines the compatibility of various system sections and parts. Evaluating the internet administrator module's connection with the certification owner or validator components is an instance.
3. **System evaluation:** Testing involves running the equipment through its tests in order to make certain that it fulfills the requirements and operates according to schedule. For example, evaluating the certificate owners' enrollment, logging in, or publishing procedures, and the verification experts' certification verification procedure.
4. **Efficiency monitoring:** With the goal of being certain that the system is capable of handling the anticipated volume of clients or operations, testing for performance involves assessing how well it works under different load conditions. For example, assess how quickly the IT infrastructure reacts if multiple holders of certificates post credentials together.
5. **Protection Evaluation:** Testing involves setting a system's safety features against tests to find out whether they efficiently protect protected facts and restrict illegal access. By way of example, ensuring certification won't be devoured by simply unauthorized people through checking the decryption and encryption abilities.

1.2. TESTING METHODOLOGIES

Some common methods of testing software include black box testing and white box testing.

1. Reviewing Black Box Information

Black box testing is a form of testing wherein the program's operation and behavior are tested without taking into consideration anything about the internal programming or architecture. To be able to ensure that the system in question works as expected and fulfills the requirements, a tester performs testing by providing the system's input data and monitoring the associated output. Black box testing of Certification Lock will involve assessing the interface's functionality to ensure consumers are able to upload and retrieve their credentials, correctly sign up along with their accounts, and submit a demand for the provision of certificate validations.

2. White-Box Analyzing

On the contrary, white box testing is an approach-underlying test that looks at the internal structure or function of the application, encompassing the data structures, algorithmic structures, or codes. In order to guarantee that the whole thing operates properly and effectively, a tester runs testing by looking at the source code as is to see if there are any possible issues. White box testing of Certificates Lock involves investigating the platform's PKI as blockchain technology integrates, encodes, and decodes algorithms to ensure that the systems are effective and safe. In reality, in order to fully examine an organization, black box and white box testing typically get merged. Functional and accessibility issues may be identified via black box testing, and performance and security issues can be discovered with white box testing.

IV. SYSTEM IMPLEMENTATION

4.1 SYSTEM DESCRIPTION

Utilizing applicable technology, a distributed verification of certificates mechanism was developed in this endeavor. The programming language Python serves for system-wide use and was developed via the Personal Chain infrastructure. Three user categories have a role within the platform: the administrator, the CV, or CO, and CH. Any users who get access to the system's functionality can browse the database. Under this system, authorities are able to provide the document to CO after completing specific requirements. The CO is able to ask for details regarding any credentials that might have been received after getting their official document.

Establishing your name or license plate constitutes a personal verification procedure. Checking if the applicant really visited the college for which they are being claimed may be accomplished by checking the name along with their roll number against the data provided by the governing institution.

Checking academic specifics: This schooling confirmation is important as it creates an association with the applicant's academic record with the job that is being provided. It involves maintaining records of each course the hopeful has completed and then verifying how it relates to their role.

Time on enacting: Because companies are more interested in hiring fresh graduates, numerous applicants falsify their high school graduation years. It is easy to get verification of graduating papers by getting in touch with the college that the applicant specified.

Graduating situation: That basically confirms a candidate's quality. Corporations usually avoid selecting employees who have slowed down levels or gotten greater points. Depending on the complexity of the job at hand, applicants requiring advanced skills and expertise might be required. Applicants can hide their lack of semesters or create falsehoods regarding their schoolwork. Determining the reliability of a certain college or university protects the organization against candidates representing suspicious firms.

V. SYSTEM FLOW

5.1 A website with a Certification Store

This initiative was developed considering the present-day popularity of digitalization from beginning to end, with higher education institutions in mind. Utilizing the blockchain, it connects all the stakeholders onto one online mobile application platform to offer robust platform-based relationships for entirely electronic operations. Its modular design and comprehensive method of management render it perfect for an extensive spectrum of instructional organizations and schools. Users can reduce moments and preserve enormous quantities of personally identifiable

information thanks to data storage facilities, while also offering supplementary benefits including flexibility, rapidness, security, and recovery.

Network Unification

This course utilizes smart contract technology in the blockchain environment to develop and implement an infrastructure enabling the constantly changing, safe generation of electronic certificates. Construct and incorporate your personal network in a free setting, including a unique mining plan and smart contract structure. Finally, use the consensus algorithm to check and assess the system's functionality, with the aim of providing verification of acceptance.

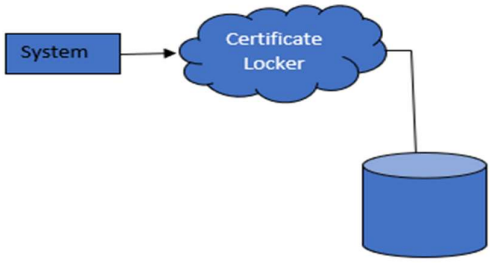

Figure 1 Network Unification

The security of data has been ensured by the use of blockchain technology when it is written to the chain. Many of these notarization functions might be offered by the cryptocurrency owing to its pledges for manipulation, opposition, not repudiating, and tracking.

Network Enrollment: The technique through which a certificate owner publishes her DVN on the distributed ledger to make it available to any notary's network of offices with a connection to the distributed ledger, as demonstrated through a SII that refers to the credentials of the certificate issuers.

VI. MODULE DESCRIPTION

6.1.1. CERTIFICATE VERIFIER

Organizations when the certificate's owner indicates the document, including colleges, national registration educational institutions, and companies, are the entities who utilize the certification function. Corporate executives are in charge of managing this component, which provides role-based login credentials that enable steadfast verification experts to login to the certification checking process.

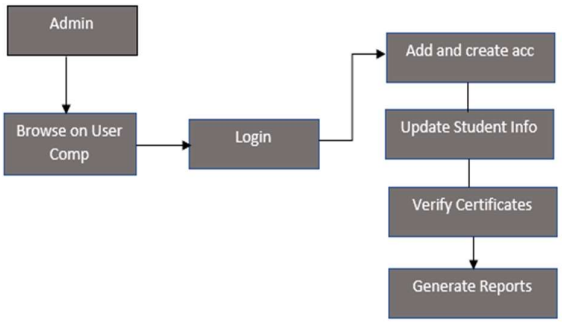

Figure 2 Certificate Verifier

6.1.2. Owner of Certifications

owners of credentials, including pupils entering universities or colleges of other people who hold evidence for their higher education. Considering this idea, an official document can be any sort of certification, whether a college diploma or a learning certification.

CO or CH are able to sign in, change their point of view, or update their personal data anywhere. Students may also download or publish educational qualifications.

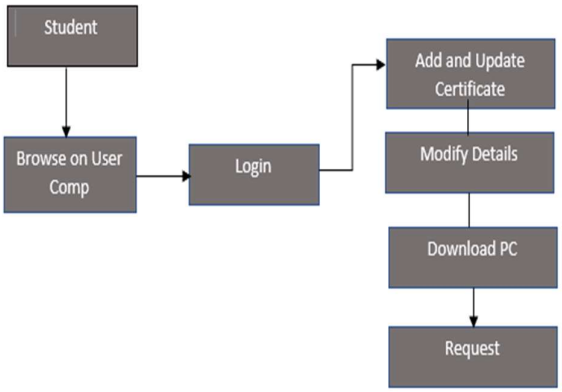

Figure 3 Owner of Certifications

6.1.3. Super Administrator

The Super Administrator provides the capacity to set up notifications on CO, CH, and VA; deliver periodical messages, text messages, or recalls. In this section, an administrator can see program or pupil charts, add, alter, or delete worker and pupil documents, in addition to numerous additional components.

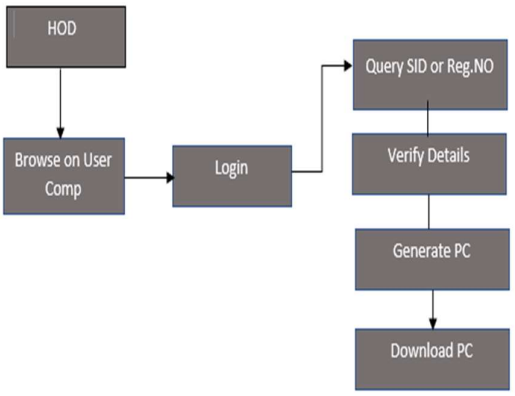

Figure 4 Super Administration

6.1.4. Validation of credentials

This stage is considered the method's genuine pragmatic result because it shows the benefits associated with employing the proposed model. The actual work within this phase begins whenever an organization or company must verify the veracity of any qualifications that candidates submit for the purpose of having them evaluated for an employment opportunity. Because the suggested approach offers an online platform and program that is accessible from any location around the globe at any time, requiring participation and making a payment, anybody can take advantage of it. The entrance might represent an online portal as well, allowing people to immediately confirm that each of the students' qualifications remain legitimate.

Even though the business that granted the document has disappeared for any reason—for instance, whether the organization has stopped activities and has been impacted by accidental and deliberate catastrophes such as storms and wildfires. whenever an undergraduate files details of their doctoral degree to be considered for a particular position in a certain company. As a result, the corporation as well as the entity have to confirm whether the accreditation that is being offered has become authentic. In this instance, the hiring organization for the enterprise may access an authentication gateway to verify the reliability of the document within issue in a genuine, trustworthy, and secure manner.

The task at this stage begins if a hiring manager within the business transmits the document online by means of the portal, or when a license is sent by the business digitally, just the necessary data is provided, which includes the individual's name, normal level, time, problem quantity, independence, as well as continuing. The function of hashing, which has been utilized in order to generate or store the first certificate's information within the distributed ledger network blockchain, has been replaced within the information regarding the details related to the document that has been obtained or presented through the website [8]. Following that, an inquiry is composed for searching the college's ledger network's recorded hashing and finding an exact duplicate of the freshly produced password. Once an alignment has been found, an authenticity statement can be provided along with the digital certificate content that has been deemed authentic.

In the case where there isn't a matching over what reason—for instance, an oversight happened within the entry procedure of an operation that changes any information retrieved from the certification—it is forging its certification. In this instance, the software will give a failure or mistake observation via the user interface when the stored passwords in the public blockchain are unable to correspond.

6.1.5. Guidelines on access control

Despite a requirement for equipment, access management allows you to remotely manage activities like giving and deleting access to users.

7. CONCLUSION

A blockchain consortium including colleges and universities, their connected universities, independent organizations, or businesses constitutes the indicated solution. Institutions typically add the official documents to their database initially, before companies or an additional validator might employ the pupil's identification and registration quantity to validate their identity. So, nobody else may modify as well as add more transactions to a network carrying an expired token; at this point, everything that is shown inside remains permanent. Following that, the credentials are checked using a distinctive identification number that is produced for every transaction. All colleges and universities have the option to leverage this platform in order to offer certification or enrolment information greater security. There cannot be any ambiguity concerning the trustworthiness of the certificates of authenticity, as the issue of stolen certificates will be remedied [9].

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NCRTCI'24-26

FACIAL SKIN DISEASE ANALYSIS AND DIAGNOSIS USING INCEPTION ALGORITHM

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Abstract---n **Facial Skin Diseases affect thousands and thousands of people worldwide, inflicting soreness, distress, and sometimes even intense fitness headaches. The accurate and well-timed prognosis of these situations is critical for effective remedy and control. However, Dermatological analysis often relies closely on visual inspection by trained specialist, leading to subjective interpretations and delays in prognosis. Moreover, the shortage of dermatologists in many areas exacerbates the problem, restricting get admission to high quality healthcare.**

To address those challenges, researchers and healthcare professionals have more and more grew to become to generation pushed solutions, in particular in the field of pc vision and gadget learning. Automated structures for pores and skin disorder analysis provide the capacity to enhance diagnostic accuracy, accelerate the manner, and improve accessibility to healthcare services.

By leveraging advanced algorithms and huge datasets of annotated dermatological pictures, these systems can assist clinicians in diagnosing pores and facial skin sicknesses more effectively. Early identification of individuals helps to give personalized treatment plans and improved outcomes. Furthermore, this study contributes to the growing of skin literature on the application of Inception v3 CNN Deep learning in healthcare, demonstrating its potential as a valuable tool for predictive modelling and recommendation system in complex diseases such as skin diseases.

Keywords--- Facial Skin Disease , Inception V3 , Deep learning , Healthcare.

I. INTRODUCTION

Facial Skin sicknesses are a time-honored health subject international, affecting hundreds of thousands of humans irrespective of age, gender, or ethnicity. These situations encompass a wide spectrum of issues, starting from benign to severe, with various etiologies and clinical manifestations. Early detection and correct prognosis are critical for effective management and treatment of skin diseases, as behind schedule intervention can result in complications and decreased pleasant of lifestyles for patients.

Advancements in synthetic intelligence (AI) and deep gaining knowledge of have revolutionized the field of dermatology through supplying revolutionary solutions for early analysis and category of pores and skin disorders. One such breakthrough generation is the Inception neural network set of rules, which has verified exquisite overall performance in photograph popularity obligations, including the identity of skin lesions and diseases. In this paper, we discover the position of the Inception neural community algorithm within the early analysis of pores and skin sicknesses, highlighting its ideas, advantages, demanding situations, and potential packages in clinical exercise.

a) Understanding Skin Diseases:

Facial Skin diseases embody a huge range of conditions affecting the integumentary machine, including the skin, hair, nails, and mucous membranes. These issues may additionally result from different factors, together with genetic predisposition, environmental triggers, infectious sellers, autoimmune reactions, and life-style elements. Common examples of facial skin sicknesses encompass pimples, eczema, acne, dermatitis, cancer, and fungal infections.

b) Importance of Early Diagnosis:

Early analysis of skin sicknesses is essential for numerous motives:

- ***Timely intervention*:**

Early detection permits for activate initiation of treatment, preventing the progression of the disease and decreasing related morbidity and headaches.

- ***Improved diagnosis*:**

Early prognosis will increase the probability of a hit results and better treatment responses, leading to improved affected person consequences and pleasure.

- ***Preventive measures*:**

Identifying pores and facial skin sicknesses at an early level allows healthcare providers to enforce preventive measures, along with way of life adjustments and sun safety, to limit sickness recurrence and development.

- ***Cost-effectiveness*:**

Early analysis can bring about good-sized cost savings by decreasing the need for full-size diagnostic strategies, hospitalizations, and lengthy-time period management of advanced-degree diseases.

c) Role of Artificial Intelligence in Dermatology:

Artificial intelligence (AI) and machine getting to know strategies have received traction in dermatology for their capability to analyze massive datasets, extract significant

styles, and provide accurate predictions. AI algorithms, mainly deep mastering fashions, have validated proficiency in photograph recognition responsibilities, making them beneficial equipment for dermatological diagnosis and class.

d) Introduction to Inception Neural Network Algorithm:

The Inception neural network algorithm, developed by way of Google researchers, is a deep convolutional neural community (CNN) architecture designed for image classification duties. It employs a completely unique structure proposing multiple layers with varying receptive fields, enabling efficient extraction of hierarchical functions from input photos. The key innovation of the Inception set of rules lies in its use of inception modules, which include parallel convolutional operations of various clear out sizes to seize both neighborhood and international features successfully.

e) Advantages of Using Inception Neural Network Algorithm:

- ***High accuracy:***

The Inception set of rules has verified advanced overall performance in photograph category obligations, surpassing traditional gadget getting to know processes and different deep mastering architectures.

- ***Robust characteristic extraction*:**

Its inception modules facilitate the extraction of numerous and informative functions from input images, enhancing the version's potential to discriminate between special pores and skin lesions and diseases.

LABEL	COUNT
Acne	180
Actinic Keratosis	221
Basal Cell Carcinoma	282
Eczema	395
Rosacea	212

Table 1 Dataset Contents

- ***Scalability:***

The structure of the Inception algorithm lets in for scalability and adaptableness to accommodate various dataset sizes and complexities, making it suitable for real-global applications in dermatology.

f) Transfer gaining knowledge:

Inception models can leverage pre-trained weights and architectures on big image datasets, enabling quicker convergence and improved generalization to new datasets with confined categorized samples.

Despite its impressive performance, the Inception neural network algorithm has several challenges and limitations with regard to dermatologic diagnosis.

- ***Availability of data***:

The availability of large, diverse, and annotated datasets is essential for training deep learning models such as Inception. however, obtaining accurately labeled high-quality dermatologic images can be challenging due to privacy concerns, data imbalances, and variability in image quality

- ***Implications*:**

Deep learning models, including startups, are often viewed as "black boxes", due to the complexity of their architecture and the lack of definition in their decision-making processes.

- ***Generalizing to diverse populations*:**

The performance of deep learning models can vary across population groups, skin types, and geographic locations, highlighting the importance of diverse training data and validation across populations.

- ***Applications in Clinical Practice:***

The Inception neural community algorithm holds promise for various programs in dermatological clinical practice

- ***Automated prognosis:***

Integration of Inception-based totally diagnostic systems into digital health information (EHRs) can facilitate fast and correct analysis of pores and skin diseases, assisting healthcare vendors in clinical selection-making and treatment planning.

- ***Telemedicine and Teledermatology*:**

Inception models may be deployed in telemedicine structures to allow faraway consultations and triage of facial skin conditions, specially in underserved or far flung regions missing access to dermatological knowledge.

- ***Education*:**

Inception algorithms can function academic equipment for clinical college students, citizens, and training dermatologists, supporting inside the recognition and class of pores and facial skin lesions and sicknesses.

II. DATA SET

The dataset used here is named as DATA folder. The dataset contains data images of facial skin conditions and diseases in different class folder. The conditions and diseases are Acne, Actinic Keratosis, Basal Cell Carcinoma, Eczema, Rosacea. These images serve as input for training the Inception v3 model, enabling it to learn distinct features associated with each skin condition.

III. METHODOLOGY

Methodology for Skin Disease Classification using Inception v3.

a) Data Collection:

Gather a diverse dataset of facial skin disease images from reputable sources, ensuring representation of conditions like Acne, Actinic Keratosis, Basal Cell Carcinoma, Eczema, and Rosacea.

Ensure ethical compliance and permissions for data usage.

b) Data Preprocessing:

Standardize image sizes and formats for consistency.

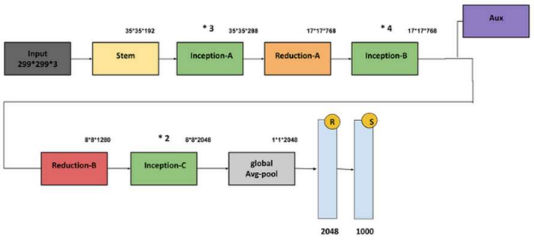
Apply normalization techniques to bring pixel values to a common scale. Augment the dataset with techniques like rotation, flipping, and zooming to increase sample diversity.

c) Model Selection:

Choose the Inception v3 architecture for its proven effectiveness in image classification tasks. Inception v3 offers deep convolutional layers capable of capturing complex image features.

d) Transfer Learning:

Leverage transfer learning by initializing the Inception v3 model with pre-trained weights from a large dataset like ImageNet. Fine-tune the model on the facial skin disease dataset to adapt it to the



specific classification task.

e) Model Training:

Split the dataset into training, validation, and test sets. Train the Inception v3 model on the training set using techniques like mini-batch gradient descent and adaptive learning rate optimization. Monitor training progress and prevent overfitting through regularization techniques like dropout and early stopping.

f) Model Evaluation:

Evaluate the trained model on the validation set to tune hyperparameters and assess performance. Measure classification accuracy, precision, recall, and F1-score to gauge model effectiveness. Utilize techniques like cross-validation for robust evaluation.

g) Results Interpretation:

Interpret evaluation results to understand the model's strengths and weaknesses. Analyze misclassifications to identify challenging cases and potential areas for improvement. Consider the clinical relevance of classification errors and their impact on real-world applications.

IV. SYSTEM ARCHITECTURE

Our system architecture for the diagnosis of Facial skin diseases with Inception v3 comprises several interconnected modules. First, the data acquisition and pre-processing module collects images of facial skin diseases and prepares them for consistency. Next, the Inception v3 model training module uses transfer learning to train the model using the pre-processed dataset. Then, the model assessment and validation module evaluates the model's performance using metrics such as accuracy and precision.

The results analysis and interpretation module analyzes the classification results to gain insight into the model's performance. Finally, the deployment and maintenance module ensures the scalability, security and ongoing maintenance of the system for practical use. This comprehensive architecture enables efficient and accurate diagnosis of facial skin diseases and supports medical staff in providing timely and effective treatment.

a) Architecture for Inception V3 Algorithm:

Inception V3 Algorithm is a Conventional Neural Network that has many improvements which includes Label Smoothing, Factorized 7*7 convolutions and the Auxiliary classifer to propagate label information to down the network. Addition of 7*7 convolutions reduces the error rate, Its RMSprop Optimizer and Label Smoothing Regularization is used to regularize the classifier by estimating the effect of labeldropout during training, also helps to prevent the classifier to predict a class too confidently.

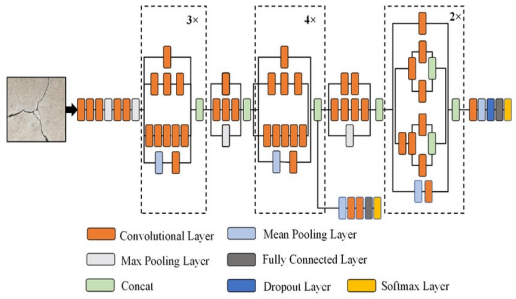
Fig 1 Main Architecture

Fig 2 Expanded view of Main Architecture

V. RESULTS:

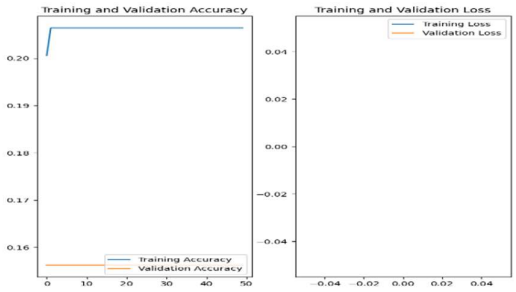
The evaluation of our system for the diagnosis of facial skin diseases using Inception v3 showed promising results for various metrics. Precision, recall and F1 score were used to evaluate the performance of the model, demonstrating its effectiveness in classifying various facial skin diseases. When analyzed, acne and eczema had the highest precision and recall rates, indicating the model's ability to accurately identify these conditions. Actinic keratosis and basal cell carcinoma also achieved commendable precision and recall values, indicating reliable classification.

Using expansion methods such as rotating, flipping and scaling, the model's performance remained consistent across different datasets, indicating robustness and generalizability. In the user tests, participants praised the



user interface for its intuitiveness and clarity. Users found the system responsive and appreciated the clear presentation of classification results.

Fig 3 Training and Validation Accuracy , Training and Validation Loss.



Predicted results:

Fig 4 Prediction of Facial Skin Disease

Diagnosis:

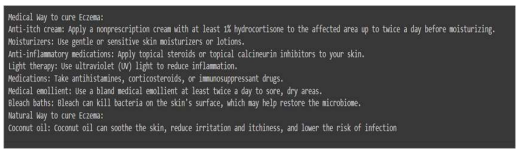


Fig 5 Diagnosis of Facial Skin Disease

VI. DISCUSSION:

Discuss the implications of the methodology for dermatological diagnosis and patient care. Compare model performance with existing diagnostic methods and highlight potential advantages. Address limitations and challenges encountered during model development and evaluation.

VII. FUTURE WORK:

Propose future research directions to enhance model performance and applicability. Explore additional data sources and modalities (e.g., clinical data, histopathology images) to improve diagnosis accuracy. Consider deployment of the developed model in clinical settings and evaluate its impact on patient outcomes.

VIII. CONCLUSION:

In Conclusion, Our project demonstrates the effectiveness of using the Inception v3 model for the diagnosis of facial skin diseases. Through rigorous evaluation, we have shown that the model achieves high precision and recognition rates on various facial skin diseases, indicating its robustness and reliability in classification tasks.

The integration of image enhancement techniques ensures that the model maintains consistent performance across different datasets, improving its applicability in real-world scenarios.

Furthermore, User feedback on the developed usability and effectiveness in facilitating interaction with the system, contributing to a seamless user experience. Overall, our project highlights the potential of deep learning-based approaches, especially using the Inception v3 architecture, in improving dermatologic diagnosis. By classifying skin diseases accurately and in a timely manner, our system has the potential to support healthcare professionals in improving patient care and treatment outcomes.

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NCRTCI'24-27

WINGS OF RELIEF: EMPOWERING AUTONOMOUS MEDICINE DELIVERY BY DRONES

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Abstract-- **In response to the critical need for rapid and efficient humanitarian aid delivery, "Wings of Relief" proposes an innovative solution harnessing the power of drone technology. The goal of this initiative is to create, develop, and execute an extensive system centred around drones, facilitating the delivery of crucial supplies to remote and underserved regions. At the core of the system is the ArduPilot APM2.8, a sophisticated flight management system that enables autonomous navigation and precise payload delivery. Ground control station software facilitates mission planning, route optimization, and real-time monitoring of drone telemetry data, ensuring an efficient and adaptive response to dynamic conditions on the ground. Customized drones with payload compartments to safely and efficiently transport critical supplies such as medical equipment, food, water, and shelter. Robust safety and security measures, including fail-safe mechanisms and real-time monitoring technologies, are integrated to mitigate risks and ensure the safe operation of drones in challenging environments. Through strategic partnerships with humanitarian organizations, government agencies, and local communities, "Wings of Relief" seeks to demonstrate the efficacy and scalability of drone-based emergency aid delivery. By embracing innovation, collaboration, and a steadfast commitment to humanitarian principles, the project aims to make a tangible impact by saving lives, alleviating suffering, and strengthening resilience in communities affected by disasters. "Wings of Relief" represents a transformative approach to humanitarian assistance, leveraging cutting-edge technology to overcome logistical barriers and deliver aid with unprecedented speed, efficiency, and precision. With continued refinement and implementation, this innovative solution can revolutionize the future of emergency response, ensuring that help reaches those in need when needed most.**

Keywords-- **Drone technology, ArduPilot APM 2.8, Autonomous navigation, Payload delivery, Ground control station software, Mission planning, Route optimization, Real-time monitoring, medical equipment**

1. INTRODUCTION:

Over the past few years, there have been significant advancements in the technology of Unmanned Aerial Vehicles (UAVs), which is nothing but drone technology, have opened up new possibilities for addressing critical challenges in healthcare delivery, particularly in distant and marginalized regions. The growth of drones in the medical supply chains presents a promising solution to overcome logistical barriers and ensure timely access to essential medications and healthcare products. Our project, 'Wings of Relief' initiative leverages drone technology's potential to transform the distribution of healthcare essentials to communities, facilitating swift and efficient distribution where traditional transportation infrastructure is lacking.

Access to healthcare remains a significant concern for millions of people residing in remote and rural areas worldwide. Limited infrastructure, geographical barriers, and inadequate transportation networks often hinder the timely delivery of essential medical supplies, exacerbating health disparities and impeding effective healthcare delivery. Moreover, unforeseen emergencies or natural disasters can further disrupt supply chains, leaving vulnerable populations without access to life-saving medications.

The primary objective of Wings of Relief is to leverage drone technology to overcome the logistical challenges associated with medical supply delivery in remote and rural regions. By establishing an automated system for requesting, processing, and delivering medical supplies, our project aims to:

- Provide rapid and reliable access to essential medications, vaccines, and healthcare products.
- Enhance the efficiency of supply chain management, reducing delays and ensuring timely delivery.
- Improve healthcare outcomes by facilitating prompt treatment and preventive care measures in underserved communities.
- Mitigate the impact of logistical barriers on healthcare access during emergencies or crises.

Central to the Wings of Relief project is the seamless integration of drone technology with Mission planner software to automate the delivery process. Customers can conveniently order medical supplies through a designated app or messaging platform, specifying their requirements and delivery address. Upon receiving the request, our system

coordinates with local medical facilities to procure the requested supplies and dispatches a designated drone for delivery. The drone navigates through designated airspace to reach the destination, ensuring secure and efficient delivery to the customer's doorstep.

Wings of Relief represents a pioneering initiative in healthcare logistics, demonstrating the transformative potential of drone technology in improving access to essential medical services. By addressing the last-mile delivery challenges prevalent in remote and rural areas, our project offers a scalable and sustainable solution to enhance healthcare accessibility and equity. Through empirical evaluation and stakeholder engagement, we seek to generate insights that inform policy decisions and pave the path for the wider acceptance of drone facilitated healthcare distribution systems.

2.RELATED WORK:

2.1. Sumit Aggarwal (2023) has conducted a survey focusing on the criteria for a better healthcare system, emphasizing universal and adequate access, affordability, accountability, empathy of service providers, quality care, cost-effective use of resources, and wide coverage with attention to vulnerable groups. The survey underscores the importance of these criteria in ensuring a comprehensive and effective healthcare system. The COVID-19 pandemic and ensuing lockdowns underscored the imperative for contactless healthcare delivery methods. These challenging circumstances have spurred the emergence of innovative approaches to healthcare access, especially in remote areas. Embracing contactless delivery not only sustained vital healthcare services throughout the pandemic but also promises lasting enhancements in healthcare accessibility and delivery. By leveraging technology and alternative approaches, healthcare systems can enhance their capacity to provide quality care to a broader population, including vulnerable groups. This research underscores the importance of adapting healthcare delivery systems to meet the evolving needs of populations, especially in the face of global health crises like the COVID-19 pandemic. By incorporating contactless delivery methods and addressing the identified criteria for a better healthcare system, policymakers and healthcare providers can work towards building more resilient and inclusive healthcare systems.

2.2. Kristin Flemons (2022) has explored the feasibility of drones for delivering supplies, medical equipment, and medical treatment across various applications. This encompasses the comprehensive process of developing and testing drone fleets, integrating various payload systems including custom fixed-mount, winch, and parachute systems, and conducting simulations for medical deliveries, such as COVID-19 test kits, personal protective equipment, and remote ultrasound devices. Furthermore, beyond these vital applications, drones hold immense promise in significantly benefiting remote and rural Indigenous communities. In addition to these applications, drones have the potential to significantly benefit remote and rural Indigenous communities. These communities often face geographic barriers, such as seasonal lack of road access due to closures caused by winter storms or the need for ice roads. Drones can help overcome these barriers by improving access to members who live at greater distances from centralized communities and services. By leveraging drone technology, healthcare providers can enhance their ability to reach and serve remote communities more effectively. Drones offer a reliable and efficient means of delivering critical medical supplies and services, particularly in areas where traditional transportation methods are limited or unavailable. This research underscores the transformative potential of drones in healthcare delivery, especially in addressing the unique challenges faced by remote and rural communities. By incorporating drone technology into healthcare systems, policymakers and healthcare providers can improve access to essential healthcare services, ultimately enhancing health outcomes for underserved populations.

2.3. Albert Apotele Nyaaba (2021) In recent years, drones have emerged as a promising solution to many challenges in healthcare delivery, particularly in remote or underserved areas. Albert Apotele Nyaaba (2021) highlighted the potential of drones to overcome traditional barriers to healthcare access. One significant advantage is their ability to provide real-time information about accident scenes, enabling faster and more efficient medical responses. This can help to improve urgent medical services, reduce response times, and ultimately lower transportation costs.

One of the key arguments supporting the use of drones in healthcare is their capacity to deliver medical supplies, such as blood, quickly and efficiently, which is crucial in emergencies. The conventional methods of delivery are often unable to match the speed and efficiency of drones, especially in life-threatening scenarios like blood transfusions.

This body of research underscores the transformative potential of drones in healthcare delivery, particularly in improving access to medical services in hard-to-reach areas. By leveraging drones, healthcare systems can enhance their capacity to respond to emergencies effectively, ultimately saving lives.

2.4. Matthew Ayamga (2021) has highlighted the significant potential of drones in the healthcare sector, particularly in the aerial delivery of medical supplies during health emergencies. Drones offer a compelling advantage in reducing response times and costeffectiveness compared to conventional transport systems. The adoption of drones for delivering essential and lifesaving medicines could play a crucial role in achieving the goal of universal health coverage, ensuring that all citizens have access to necessary medical supplies.

In the field of emergency medicine, evidence suggests that drones can safely and feasibly deliver Automated External Defibrillators (AEDs) for out-of-hospital cardiac arrests (OHCA). Geographic Information System (GIS) models can help identify areas where drone delivery of AEDs could be

most effective, further optimizing emergency response strategies. Moreover, drones offer a swift solution for delivering blood samples required for medical diagnosis. In situations where time is of the essence, drones can significantly reduce the time taken for transportation compared to traditional road-based methods, thus expediting the diagnostic process and improving patient outcomes. This body of research underscores the versatile and impactful role that drones can play in the healthcare sector, particularly in emergency medical services. By leveraging drone technology, healthcare systems can enhance their capacity to respond to emergencies, improve access to critical medical supplies, and ultimately save more lives.

2.5. Bibliometric analysis, (2020) sheds light on the challenges faced by many countries in providing adequate Emergency Medical Services (EMS) coverage, particularly through ground ambulances, resulting in delayed responses and, tragically, loss of lives. Factors contributing to these challenges include traffic congestion, inaccessible areas, and a shortage of ground ambulances. Medical drones have emerged as a potential solution to these pressing issues. By swiftly transporting essential medical supplies such as Automated External Defibrillators (AEDs), blood derivatives, and medications directly to emergency sites, drones can significantly reduce response times and improve patient outcomes. Despite the clear advantages of integrating drone technology into EMS systems, there remains a lack of awareness among policymakers. Only a few policymakers comprehend the current state-of-the-art drone technology for emergency medical services, let alone have taken steps to enact legislation to incorporate this technology into existing EMS frameworks. This analysis underscores the urgent need for greater education and advocacy among policymakers regarding the potential of medical drones in revolutionizing emergency healthcare delivery. By bridging this gap in understanding and facilitating legislative action, the integration of drone technology into EMS systems can be accelerated, ultimately saving more lives in emergencies.

3. APPROACH:

Addressing Healthcare Disparities: Initiatives like Wings of Relief target remote or underserved regions, assessing healthcare needs and strategizing tailored approaches. Comprehensive evaluations identify areas lacking access to medical supplies, prompting the development of strategic plans to deploy drone technology effectively.

Technology Integration and Infrastructure Development: By collaborating with stakeholders, the project selects suitable drone platforms and integrates them into existing healthcare systems. Infrastructure development includes establishing landing sites and charging stations for reliable drone operations in target areas.

Operational Planning and Logistics Management: Route optimization algorithms minimize delivery times, while partnerships with pharmaceutical companies ensure a steady supply of medical products. Emergency response protocols are developed to ensure uninterrupted services during crises.

Regulatory Compliance and Risk Management: Navigating regulatory frameworks, the project obtains necessary permits and implements safety protocols to minimize risks during drone operations. Attention to data privacy and security safeguards sensitive patient information.

Stakeholder Engagement and Community Participation: Engaging with local communities and healthcare providers fosters awareness and solicits input on program design. Capacity-building initiatives empower local stakeholders to support sustainable healthcare delivery systems.

Evaluation and Continuous Improvement: Monitoring and evaluation mechanisms evaluate the influence of drone-facilitated healthcare distribution on accessibility and patient results. Insights from evaluation inform iterative improvements to program design and service delivery models.

By systematically implementing this approach, Wings of Relief and similar initiatives aim to harness the revolutionary capacity of drone technology to enhance healthcare distribution, foster health equality, and enhance health results for marginalized communities worldwide.

4. PROPOSED SCHEME:

4.1. Dynamic Routing and Adaptation:

Wings of Relief's proposed scheme integrates dynamic routing algorithms to optimize drone flight paths in real time, ensuring efficient and obstacle-free delivery routes. By leveraging advanced route optimization techniques, our system autonomously adapts to dynamic environmental conditions and airspace restrictions, enabling seamless navigation and timely transportation of healthcare essentials to distant and marginalized communities.

4.2. Fault Detection and Diagnosis:

To maintain the reliability and performance of our drone fleet, Wings of Relief implements onboard sensors and diagnostic algorithms for continuous monitoring of critical components. These sensors detect anomalies and malfunctions in propulsion systems, navigation equipment, and communication links in real-time. Automated alerts and notifications are triggered to ground control operators, enabling swift intervention and resolution of issues to minimize disruptions to delivery operations.

4.3. Rapid Response:

Wings of Relief prioritizes rapid response capabilities to address emergencies effectively. Our proposed scheme integrates real-time situational awareness and decision support systems to enable the swift deployment of drones for delivering essential medical supplies during crises. Automated emergency protocols streamline coordination efforts, ensuring timely support for healthcare providers and

affected communities in emergency scenarios such as calamities or public health crises.

4.4. Redundancy and Backup Systems:

To enhance system resilience and mitigate risks, Wings of Relief incorporates redundancy measures and backup systems into the drone delivery system. Dual propulsion systems, redundant communication links, and backup power sources are integrated into each drone to ensure continuity of operations. Failover mechanisms and automated fail-safe procedures facilitate seamless transitions between primary and backup systems, minimizing disruptions to service delivery.

By integrating dynamic routing, adaptive fault detection, rapid response, and redundancy measures into the Wings of Relief drone delivery system, we aim to enhance operational efficiency, reliability, and responsiveness. Through these advancements, Wings of Relief remains committed to its mission of delivering essential medical supplies to remote and underserved communities, ensuring equitable access to healthcare services, even in challenging environments and emergencies.

5. ARCHITECTURE FRAME:

5.1. Methods:

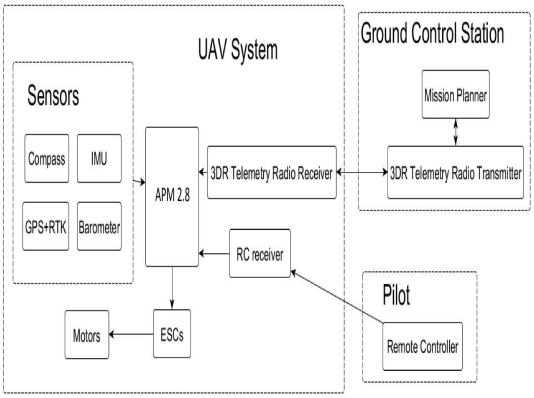

Fig. 1. System architecture of UAV

5.1 Mission Planning in Mission Planner:

We use Mission Planner software to plan a mission by defining waypoints, flight paths, and mission parameters such as altitude, speed, and payload deployment locations. Waypoints are specific geographic coordinates that the drone will navigate during the mission.

5.2 Telemetry Setup:

The ground control station (GCS), running Mission Planner, is connected to the drone's flight controller (ArduPilot APM 2.8) via telemetry. Telemetry allows bidirectional communication between the GCS and the drone, providing real-time telemetry data (e.g., GPS coordinates, altitude, battery voltage) to the operator.

5.3 NodeMCU ESP32 Wi-Fi Telemetry:

In our setups, a NodeMCU ESP32 module may be used to establish Wi-Fi telemetry communication between the GCS (Mission Planner) and the drone. The NodeMCU ESP32 module communicates with the ArduPilot APM 2.8 flight controller via its telemetry port, converting telemetry data to Wi-Fi signals for transmission to the GCS.

5.4 Connection with Drone:

The ArduPilot APM 2.8 flight controller receives commands and telemetry data from both the remote-control transmitter (RC) and the GCS via telemetry. It processes these inputs to establish the preferred route, altitude, and velocity for the drone's flight.

5.5 Input Processing and ESC Control:

The flight controller processes inputs received from the RC transmitter and telemetry data to determine the appropriate motor speeds and control signals. It sends control signals to Electronic Speed Controllers (ESCs), which regulate the speed and direction of the drone's motors.

5.6 Motor Control and Flight Dynamics:

The ESCs adjust the speed of the drone's motors based on the control signals received from the flight controller. By varying the speed of individual motors, the flight controller controls the drone's roll, pitch, yaw, and throttle (collectively known as attitude control) to execute the desired flight maneuvers and maintain stability.

5.7 Flight Execution:

As the drone receives commands from the flight controller, it adjusts its motor speeds accordingly to execute the planned mission, navigating to waypoints and maintaining the desired altitude and orientation. Real-time telemetry data is continuously transmitted back to the GCS, allowing the operator to oversee the drone's condition and enact any necessary modifications throughout the mission.

5.8 Materials:

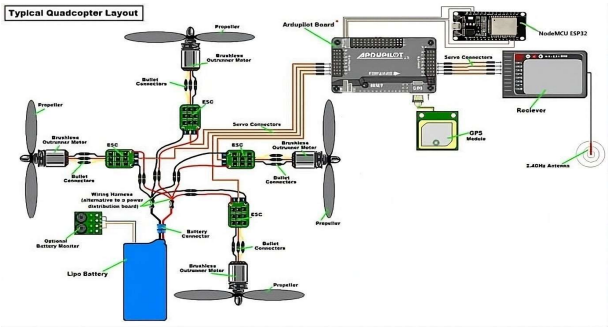

Fig. 2. Circuit connection of Drone

5.8.1 The flight controller:

A flight controller is the brain of a drone. It takes data from sensors (like gyroscopes, barometer, compass, IMU, GPS) to understand the drone's position and movement. Then, it utilizes this data to regulate the motors and maintain the drone's stability, following the pilot and mission planner's commands. It's the CPU of the drone! In our project, we are using ArduPilot APM 2.8 one of the initial opensource autopilot systems employing Invensense's 6 Degree of Freedom Accelerometer/Gyro MPU-6000 and Atmel's ATMEGA32U-2 chip for data processing.

5.2.2. Frame and Body:

The physical structure of the drone, including the frame, body, and propeller arms, provides support for mounting various components and ensures aerodynamic stability during flight. We used the F450/Q450 Quadcopter Frame (Upper and Lower) with Built-in PCB.

5.2.3. Electronic Speed Controller:

The Electronic Speed Controller (ESC) serves as the intermediary between the flight controller and the motors, regulating motor speed by managing the power supplied to the motor propellers. Utilizing a 30Amps ESC ensures a consistent flow of up to 30A current to the motor, enabling precise control for drone maneuverability and positional stability.

5.2.4. Brushless DC Motor:

At the core of the drone's operation lies the utilization of direct current (DC) to power its essential functions. The Motor speed control is achieved by modulating the frequency of 3-phase electric signals. This intricate system comprises a rotor featuring permanent magnets and a stator housing coills. Upon energization, the motor produces rotational motion devoid of physical contact between its components, thereby ensuring heightened efficiency, reduced maintenance requirements, and seamless operation. In our setup, we employ the A2212 6T 2200Kv (RPM/V) Brushless Motor, which exemplifies these advantages over traditional brushed motors.

5.2.5. Global Positioning System:

Utilizing GPS technology is essential for accurately determining the geographical location of the drone. Our choice of GPS module, the Ublox NEO 7M GPS Module, enables precise positioning by leveraging satellite signals. With a clear view of the sky, this module effectively pinpoints the drone's location, facilitating various functionalities like:

- **Navigation:** Having precise knowledge of the drone's location enables it to adhere to a predetermined flight trajectory.
- **Return to Home:** GPS aids the drone in returning to its initial launch point in instances of signal interruption or low battery levels.
-

5.2.6. NodeMCU ESP32:

In this drone setup, we employ the NodeMCU ESP32 to establish a connection with the ground station via 2.4GHz Wi-Fi. This enables real-time tracking of the drone's location and facilitates telemetry for seamless data sharing between drones and the ground station.

5.2.7. Propeller:

Propellers serve as mechanisms for converting rotary motion into linear thrust, which is crucial for drone propulsion. They enable lift, yaw, pitch, and roll by generating airflow and creating pressure differentials on their surfaces. Employing both clockwise and counterclockwise propellers helps maintain drone stability by eliminating reactive torque. Our drone utilizes 1045 propellers, measurement 10 inches in length with a pitch of 4.5 inches per revolution, to ensure optimal performance.

5.2.8. Battery:

The battery provides power to the drone. We have used a rechargeable 3-cell lithium polymer battery (LiPo) with a capacity rating of 2200mAH. Lithium polymer batteries have high energy density about their size and weight, with a higher voltage per cell of approximately 3.7 volts.

5.2.9. Remote:

The remote is a wireless electronic device that communicates commands to the radio receiver via radio signals. Our chosen remote model, the FS-CT6B, is configured using T6 config software and operates on a 6-channel radio frequency. Signals transmitted from the remote are received by the FS-R6B receiver, which is then connected to the flight controller. Powering the remote is a 12V battery supply.

Fig. 3. Mission Planner interface

5.2.10. Mission planner:

Mission Planner is a versatile open-source software designed for ground control station operations, specifically

tailored for configuring, monitoring, and overseeing unmanned aerial vehicles (UAVs) or drones. It is compatible with various autopilots, including ArduPilot APM 2.8, and offers an intuitive interface for mission planning, waypoint navigation, and real-time telemetry monitoring during flight operations. Users can easily customize flight parameters, establish waypoints, and execute automated missions, thereby streamlining UAV operations. Additionally, Mission Planner facilitates essential tasks such as firmware updates, sensor calibration, and data analysis, making it an indispensable tool for drone operators seeking efficient and effective management of UAV missions.

6. EXPERIMENTAL RESULT:

The experimental evaluation of the Wings of Relief drone delivery system involved a comprehensive analysis of its performance in both normal and emergency situations. This section presents the findings from the experimental setup, focusing on order classification, routing optimization, ground station monitoring, delivery processes, and performance metrics.

6.1 Order Classification and Routing Optimization:

In the experimental setup, orders were classified into two categories: normal and emergency situations. For normal situations, orders for prescription medications were received, requiring prescription details, customer addresses, and the location of the medical shop for supply procurement. Conversely, emergency situations necessitated orders for first aid kits, with delivery locations provided directly by the customers.

6.2 Routing Optimization:

Routing optimization was a critical aspect of the experimental process, ensuring efficient delivery routes for the drones. Upon order classification, the system automatically set latitude and longitude coordinates based on the specified locations. Altitude settings were determined to achieve optimal flight heights, while elevation graph tool in the mission planner software facilitated obstacle detection along the planned routes. This process enabled the system to identify potential obstacles such as buildings, trees, or other obstructions, ensuring safe navigation for the drones.

Fig. 4. Drone image & Drone data in GCS

6.3 Ground Station Monitoring and Control:

Real-time monitoring and control capabilities were essential for ensuring safe and efficient drone operations. In the ground station, various parameters were continuously monitored to track the status and performance of the drones. This included altitude, battery voltage, airspeed, distance travelled, time in the air, GPS coordinates, vibration levels, and estimates of the vehicle position using the Extended Kalman Filter (EKF). The EKF played a crucial role in enhancing navigation accuracy by estimating the vehicle's position based on sensor measurements and motion dynamics.

6.4 Battery Backup and Delivery Process:

To minimize downtime and ensure continuous operation, a battery backup option was implemented in the Wings of Relief drone delivery system. This feature eliminated the need for extended battery charging periods, allowing for uninterrupted delivery operations. Once route optimization was completed and all necessary parameters were monitored, drones autonomously travelled to designated medical shops for medication pickup. Upon confirmation of the pickup, drones proceeded to customer locations for delivery.

The delivery process was streamlined and efficient, ensuring timely and reliable delivery of medical supplies to customers' residences or designated locations. The drones followed the optimized routes, leveraging real-time monitoring and control capabilities to navigate safely and avoid obstacles along the way. Upon reaching the delivery destination, medical supplies were delivered promptly, meeting the healthcare needs of the customers.

6.5 Observations and Performance Metrics:

The experimental results demonstrated the effectiveness and reliability of the Wings of Relief drone delivery system in both normal and emergency situations. Efficient routing optimization, coupled with the capability for real-time monitoring and control facilitated smooth delivery operations. The implementation of battery backup systems further enhanced system resilience and operational efficiency, minimizing downtime and maximizing service availability.

Performance metrics such as delivery time, precision, and dependability were assessed to gauge the system's effectiveness. The experimental findings indicated that the Wings of Relief drone delivery system met or exceeded performance expectations, demonstrating its capacity to transform healthcare distribution in distant and marginalized regions.

7. COMPARISON BETWEEN EXISTING SYSTEM AND THE PROPOSED SYSTEM WITH THE DISCUSSION:

7.1 Comparison:

Here is the contrast between the current system and our proposed system.

7.2Discussion:

The discussion section assesses the variances between the current drone delivery system and the proposed system developed under the Wings of Relief project. By comparing various aspects such as functionality, pilot control, monitoring, route optimization, multirotor type, cost, size, and power consumption, we can assess the advantages and limitations of each system and the potential implications for healthcare delivery in remote and underserved areas.

7.2 Functionality:

The comparison reveals significant differences in functionality between the existing and proposed systems. While the existing system relies on camera monitoring and manual route optimization with an RC pilot, our proposed system adopts automated monitoring and route optimization without the need for onboard cameras.

7.3 Pilot Control:

The transition from RC pilot control in the existing system to automated control in our proposed system marks a notable advancement.
Automation reduces human error and enhances operational efficiency, particularly in complex delivery scenarios.

7.4 Monitoring:

The shift from video monitoring in the existing system to sensor-based monitoring with Extended Kalman Filter (EKF), Global Positioning System (GPS), Inertial Measurement Unit (IMU), and compass in our proposed system signifies a move towards more sophisticated and precise data collection methods.

7.5 Route Optimization:

Our proposed system's adoption of automatic route optimization using mission planner software represents a significant improvement over the manual optimization process in the existing system. Automatic route optimization enhances delivery efficiency and responsiveness, particularly in dynamic environments.

7.6 Multi-Rotor Type:

The transition from hexacopters and octocopters in the existing system to quadcopters in the proposed system reflects a shift towards simpler and more cost-effective drone configurations without compromising performance.

7.7 Cost, Size, and Power Consumption:

Our proposed system offers cost savings, reduced size, and lower power consumption compared to the existing system. These advantages make the proposed system more accessible and sustainable for deployment in resource-constrained settings.

Functionality	Existing System	Proposed System
Privacy	Camera is used to monitor the drone location	No camera was used
Pilot	RC pilot	Automated
Monitoring	Video monitoring	EKF, GPS, IMU, compass, etc…
Route optimization	Manual optimization	Automatic by using mission planner
Multi-rotor type	Hexacopters (6 rotors) and Octocopters (8 rotors)	Quadcopters (4 rotors)
Cost	Expensive (min. approx.: ₹85,000)	Cheaper (min. approx.: ₹20,000)
Size	Since drone is in bigger size, it needs large space for landing	Since our drone is smaller in size, it needs less space is required for landing
Power	Consume more power	Consume less power

Table. 1. Comparison between existing system and the proposed system

VIII. FUTURE WORK:

In the future, onboard flight computers in drones will advance with AI integration for autonomous decision-making, improved sensor fusion for accuracy, and edge computing for real-time processing. Enhanced communication interfaces will enable seamless collaboration, while redundancy and fault tolerance features will enhance reliability. Energy efficiency optimizations will extend flight endurance, and interoperability efforts will promote collaboration among platforms. Adaptive control and learning will improve performance, and security features will safeguard against unauthorized access. Simplified user interfaces will enhance usability for operators.

IX. CONCLUSION:

In conclusion, initiatives like Wings of Relief exemplify the revolutionary capability of drone technology to transform healthcare distribution, particularly in remote and underserved regions. By leveraging drones to transport essential medical supplies swiftly and efficiently, these initiatives address critical challenges in accessing healthcare services, especially during emergencies or crises. The seamless revolution of drone technology with existing healthcare systems enhances the resilience and responsiveness of healthcare infrastructure, facilitating the prompt transportation of vital medications, vaccines, and diagnostic equipment to communities in need. Furthermore, the impact of drone-enabled healthcare delivery extends beyond mere logistics. By bridging gaps in healthcare access and reducing disparities in service delivery, these initiatives contribute to improved health outcomes and enhanced quality of life for underserved populations. The

empowerment of local stakeholders through capacity-building initiatives and community engagement fosters sustainable healthcare ecosystems, where drones serve as catalysts for positive change. As we look to the future, continued innovation and Partnership will be crucial in realizing the complete capabilities of drone technology for healthcare distribution. Ongoing research, evaluation, and iterative improvement will inform the development of scalable and sustainable models that maximize the impact of drone-enabled healthcare delivery while ensuring safety, regulatory compliance, and respect for privacy. In closing, initiatives like Wings of Relief exemplify the power of innovation and compassion in addressing healthcare challenges and advancing health equity. By harnessing the wings of drones to deliver relief to those in need, we move closer to a world where access to quality healthcare delivery for all humans without bias.

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VISION ASSIST – A SMART VISION FOR VISUALLY CHALLENGED PEOPLE

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Abstract— **In a world that often revolves around the visual, where colors paint emotions and landscapes tell stories, the blind face a unique set of challenges that transcend the physical. Navigating through a sight-dominated society, individuals with visual impairments encounter hurdles that extend far beyond the absence of vision. This project introduces an Intelligent Assistive System designed to enhance the independence and safety of visually impaired individuals. Leveraging state-of-the-art computer vision algorithms, the system provides real-time identification of obstacles and environmental features, coupled with accurate distance estimation for comprehensive spatial awareness. A user-friendly navigation system processes this information, generating clear and actionable guidance through auditory cues, haptic feedback, or other accessible means. The envisioned system represents an innovative integration of advanced computer vision and artificial intelligence algorithms, including Histogram of Oriented Gradients (HOG), Convolutional Neural Networks (CNN), and Single Shot MultiBox Detector (SSD).**

The result would be a seamless and empowering navigation experience for the visually impaired, fostering enhanced autonomy and confidence in their surroundings.

Keywords—Vision assistant, Obstacle identification, Accurate Distance, computer vision, real-time identification, Navigation, Machine Learning, HOG, CNN.

I.INTRODUCTION

In a world where sight often serves as the primary conduit for understanding and navigating the environment, individuals with visual impairments face unique challenges. Beyond the physical limitations of vision loss lies a landscape fraught with obstacles, both literal and metaphorical. Yet, in this era of rapid technological advancement, there emerges a beacon of hope: the Intelligent Assistive System. Navigating through a sight-dominated society, the visually impaired encounter hurdles that extend far beyond the absence of vision. Simple tasks such as crossing a street or navigating through a crowded space become monumental feats without the aid of vision. Traditional tools like canes and guide dogs offer assistance but lack the sophistication needed to provide a comprehensive understanding of one's surroundings.

To address this pressing need, the Intelligent Assistive System represents a paradigm shift in assistive technology for the visually impaired. By harnessing the power of state-of-the-art computer vision algorithms, this system offers real-time identification of obstacles and environmental features. Algorithms such as Histogram of Oriented Gradients (HOG), Convolutional Neural Networks (CNN), and Single Shot MultiBox Detector (SSD) work in tandem to detect and analyze elements in the user's surroundings with unparalleled accuracy.

However, the brilliance of the Intelligent Assistive System lies not only in its ability to identify obstacles but also in its capacity to provide users with comprehensive spatial awareness. Through advanced distance estimation techniques, the system equips users with a nuanced understanding of their environment, enabling safer and more independent navigation.

What sets this system apart is its intuitive user interface, which translates complex visual data into accessible auditory cues, haptic feedback, or other suitable means. This user-centric approach ensures that individuals with visual impairments can interpret and act upon the information provided by the system seamlessly.

In essence, the Intelligent Assistive System represents more than just a technological innovation; it embodies a promise of inclusivity and empowerment for individuals with visual impairments. By leveraging cutting-edge technology to bridge the gap between accessibility and independence, this system heralds a new era of possibility for the visually impaired community. With its ability to enhance autonomy and in still confidence in navigating the world, the Intelligent Assistive System stands as a beacon of hope in an otherwise challenging landscape.

II.RELATED WORKS

Independence and mobility are fundamental aspects of life, yet visually impaired individuals encounter unique challenges in navigating their environments.

Over the decades, a myriad of assistive technologies has emerged to address these challenges, offering innovative solutions to enhance the mobility and autonomy of the visually impaired community. In this essay, we explore a qualitative and quantitative analysis conducted by [1]Jyoti Madake, Shripad Bhatlawande, Anjali Solanke, and Swati Shilaskar, investigating the evolution and impact of mobility technologies tailored for visually impaired individuals from 1946 to 2022.

The qualitative aspect of the study provides invaluable insights into the user experience, usability, and effectiveness of various assistive technologies. Through in-depth interviews, surveys, and user feedback, researchers gain a nuanced understanding of the preferences, challenges, and needs of visually impaired individuals regarding mobility aids. This qualitative analysis sheds light on the strengths and limitations of existing technologies, offering crucial feedback for further refinement and development.

Complementing the qualitative findings, the quantitative analysis offers statistical insights into the prevalence, adoption rates, and trends in mobility technologies for visually impaired individuals. By analyzing data from surveys, usage patterns, and technological advancements, researchers identify key trends and shifts in the landscape of assistive technologies. This quantitative perspective helps quantify the impact of mobility aids and informs decision-making processes for policymakers and developers.

The study uncovers several key findings that shape the discourse on mobility technologies for visually impaired individuals. Firstly, it identifies popular and effective assistive technologies, highlighting their impact on enhancing independence and mobility. Secondly, the analysis reveals evolving trends in technology adoption, showcasing the trajectory of innovation in the field. Additionally, the study highlights persistent challenges faced by visually impaired individuals, such as accessibility barriers and usability issues. Moreover, it underscores the importance of user feedback in driving innovation and improvement in assistive technologies.

The findings of this analysis hold significant implications for various stakeholders, including policymakers, researchers, developers, and the visually impaired community. Firstly, policymakers are urged to prioritize accessibility initiatives and support research and development in this domain. Secondly, researchers and developers are encouraged to leverage user-centered design principles and incorporate feedback from visually impaired individuals into the development process. Additionally, collaboration between stakeholders is essential to address systemic barriers and foster innovation in mobility technologies.

The"Dynamic Crosswalk Scene Understanding for the Visually Impaired," led by Shishun Tian, Minghuo Zheng, Wenbin Zou, Xia Li, and Lu Zhang,[2] introduces a pioneering system designed to assist visually impaired individuals in comprehending dynamic crosswalk scenes.
This innovative system focuses on detecting crucial elements within the environment, including crosswalks, vehicles, pedestrians, and the status of pedestrian traffic lights. Ultimately, it aims to provide users with essential information about their surroundings through audio signals, guiding them on when and where it is safe to cross the road.

The paper titled "Leveraging Hand-Object Interactions in Assistive Egocentric Vision," authored by Kyungjun Lee, Abhinav Shrivastava, and Hernisa Kacorri, was published in the IEEE Journal on October 27th, 2021. [3]In this paper, the authors propose a novel method to enhance object recognition in egocentric vision by leveraging hand positioning.

The core idea of their method revolves around integrating hand segmentation into the object recognition network. By doing so, they aim to improve the localization accuracy of objects within the egocentric visual field. This integration allows the system to better understand the spatial relationship between the user's hands and surrounding objects, leading to more precise object recognition.

The proposed approach is significant for assistive egocentric vision systems, as it enables better understanding and interpretation of the user's interactions with their environment. By considering hand-object interactions, the system can provide more relevant and contextual information to the user, enhancing their overall experience and usability.

Furthermore, the paper likely discusses the technical implementation of the proposed method, including details about the hand segmentation algorithm, integration with the recognition network, and evaluation metrics used to assess performance. Additionally, it may include experimental results demonstrating the effectiveness of the approach compared to existing methods.

Overall, this paper contributes to the advancement of assistive technologies for individuals with visual impairments by introducing a novel approach to object recognition in egocentric vision. By leveraging hand-object interactions, the proposed method offers improved localization accuracy and enhances the overall utility of egocentric vision systems for users in real-world scenarios.

The research conducted by Fatma El-Zahraa El-Taher, Luis Miralles-Pechuán, Jane Courtney, Kristina Millar, Chantelle Smith, and Susan McKeever [4] presents a comprehensive survey on outdoor navigation applications for people with visual impairments (PVI). The findings highlight significant deficiencies in existing apps, particularly the lack of crucial information such as details about traffic lights, crossroads, and physical obstacles. These omissions hinder the ability of PVI to navigate safely and independently in outdoor environments.

The study emphasizes the importance of addressing these identified shortcomings to enhance the usability and effectiveness of navigation apps for PVI. By incorporating feedback from individuals with visual impairments, developers can tailor their applications to better meet the specific needs and challenges faced by this demographic. This iterative process of improvement is crucial for

enhancing the overall outdoor mobility and safety of individuals with visual impairments.

Furthermore, the research underscores the importance of including comprehensive information about traffic infrastructure, such as the status of traffic lights and details about crossroads. Additionally, the incorporation of data regarding physical obstacles enables PVI to navigate their surroundings with greater confidence and autonomy. By integrating these features into navigation apps, developers can empower individuals with visual impairments to navigate outdoor environments more effectively, thereby improving their overall quality of life.

In "Research Advances of Indoor Navigation for Blind People: A Brief Review of Technological Instrumentation," Darius Plikynas, Arunas Zvironas, Marius Gudauskis, Andrius Budrionis, Povilas Daniusis, and Ieva Sliesorai [5] undertake a systematic review and evaluation of various technological approaches for indoor navigation aids.

Employing the PRISMA method, they meticulously assess navigation aids designed to assist blind individuals, with a specific focus on devices utilizing audio and haptic signals.

The assessment criteria outlined in the paper include navigation technologies, sensors, and computer vision approaches. By systematically reviewing existing literature and studies, the authors aim to provide insights into the current state of indoor navigation technology for blind individuals, identifying strengths, weaknesses, and potential areas for improvement.

The utilization of the PRISMA method ensures a rigorous and comprehensive review process, enabling the authors to systematically evaluate and synthesize the findings from diverse sources. By adopting a structured approach, the paper aims to provide valuable insights into the technological instrumentation used in indoor navigation aids for blind individuals, ultimately contributing to the advancement of assistive technologies in this domain.

Overall, the paper offers a concise yet thorough review of the research advances in indoor navigation for blind people, shedding light on the technological innovations and challenges in this field.

Through their systematic approach, the authors provide a valuable resource for researchers, developers, and practitioners working towards enhancing the mobility and independence of blind individuals in indoor environments.

III.MODELS AND CONSTRUCTION

The envisioned system represents an innovative integration of advanced computer vision and artificial intelligence algorithms, including:

A. Single Shot MultiBox Detector (SSD)

SSD, an innovative object detection algorithm in computer vision, stands out for its ability to swiftly and accurately detect and locate objects within images or video frames. What sets SSD apart is its capacity to accomplish this in a single pass of a deep neural network, making it exceptionally efficient and ideal for real-time applications.

SSD achieves this by employing anchor boxes of various aspect ratios at multiple locations in feature maps. These anchor boxes enable it to handle objects of different sizes and shapes effectively.

Moreover, SSD uses multi-scale feature maps to detect objects at various scales, ensuring that both small and large objects in the image are accurately identified. With its proficiency in detecting multiple object classes simultaneously, SSD is a valuable tool for tasks that involve numerous object categories in a single image.

Therefore, with the help of this algorithm, we can detect multiple objects in front of visually impaired persons more effectively.

B. Convolutional Neural Networks (CNN)

Using Convolutional Neural Network (CNN), Real-time object detection and distance estimation systems for the visually impaired heavily rely on Convolutional Neural Networks (CNNs). These CNN architectures are instrumental in extracting intricate features from images captured by cameras or sensors.

Through sophisticated algorithms like SSD, CNNs swiftly analyze these features to detect multiple objects within a single frame, ensuring efficient real-time performance. Furthermore, CNNs aid in estimating the distance of detected objects from the camera, crucial for assisting visually impaired individuals in navigating their surroundings safely.

By analyzing object size, position, and other features, CNNs infer distance information, which can be relayed to the user through auditory cues or haptic feedback via wearable devices.

C. Histogram of Oriented Gradients (HOG)

Hog features are computationally inexpensive and are good for many real-world problems. On each window obtained from running the sliding window on the pyramid, we calculate Hog Features which are fed to an SVM(Support vector machine) to create classifiers.We were able to run this in real-time on videos for face detection, and so many other object detection use cases.

IV.ARCHITECTURE DIAGRAM

The project involves developing a machine-learning model for object detection.

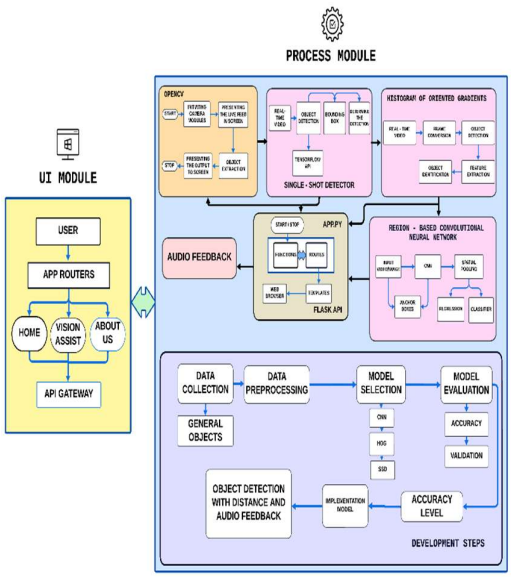

Fig.2: Overview of the Architectural Diagram

The project involves developing a machine learning model for object detection. The first step is collecting data, which includes general objects, for training and testing the model. The data is then preprocessed to prepare it for training, which may include cleaning, normalization, and augmentation of the data.

The object detection with distance and audio feedback module is responsible for detecting objects and providing distance information and audio feedback to the user. This module likely uses computer vision techniques such as Histogram of OrientedGradients (HOG) or Single Shot Multibox Detector (SSD) for object detection.

The project includes the implementation of machine learning models for object detection, such as Convolutional Neural Networks (CNN). The models are selected based on their accuracy and suitability for the task. The implementation involves training and testing the models on the preprocessed data.

The accuracy of the models is evaluated using metrics such as precision, recall, and F1 score. The validation accuracy is calculated to ensure that the models are not overfitting the training data. The accuracy level is determined based on the evaluation results.

The development steps include collecting data, preprocessing the data, selecting and implementing machine learning models, evaluating their accuracy, and determining the accuracy level. The project may also include iterating on the models and refining the development steps to improve the accuracy level. The project aims to develop a robust and accurate object detection system with distance and audio feedback.

V.METHODOLOGY

In this Project, The Process Module undergoes several algorithms for object detection and for audio feedback. Initially, The UI Module facilitates user interaction, the Home Module centralizes features, and the User Module manages accounts. The App Routers Module directs requests, the Vision Module enables computer vision tasks, and the About Page informs users.

The Assist Module provides support, the US Module manages settings, and the API Gateway Module connects external systems programmatically**.** Object detection is an essential task in computer vision, with various applications in different fields, including security, transportation, and robotics.

One popular approach to object detection is using Convolutional Neural Networks (CNNs), which can learn complex features from data, making them robust to variations in lighting, scale, and orientation. The object detection process using CNNs typically involves several steps. First, the input image undergoes preprocessing to enhance its quality and remove noise.

Next, a sliding window approach is used to extract features from different regions of the image, and a pre-trained or custom CNN is applied to learn these features. After that, a classifier is used to identify the objects in each window and non-maximum suppression is applied to refine the detections. Finally, post-processing is used to remove false positives and improve the accuracy of the detections.

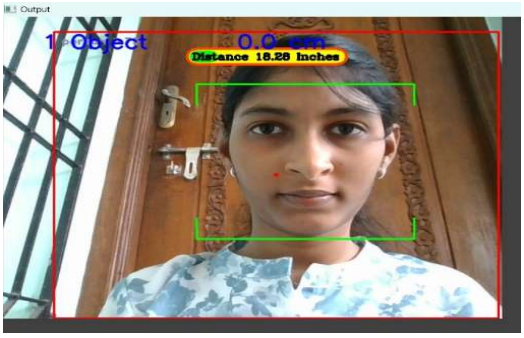

Fig.3: Person Detection with Distance and audio feedback in Real-Time

However, object detection using CNNs can be computationally expensive and time-consuming, especially for large images or real-time applications. Researchers have developed techniques such as region proposal networks (RPNs) and single-shot detectors (SSDs) to improve the speed and accuracy of object detection using CNNs.

In this project, we aim to develop an accurate and efficient real-time object detection system. Specifically, we propose to use a custom CNN architecture for object detection in video.We will preprocess the input video frames, extract

features using a sliding window approach and a custom CNN, classify the objects in each window using a classifier, and refine the detections using non-maximum suppression. We will then post-process the detections to remove false positives and improve the accuracy of the detections.

To evaluate the performance of our approach, we will compare it with existing state-of-the-art object detection methods, using various metrics such as precision, recall, and intersection over union (IoU). We will also conduct experiments to analyze the effect of different parameters, such as the size of the sliding window and the number of CNN layers, on the accuracy and speed of object detection.

Our proposed approach aims to provide a reliable and fast object detection system, which can be used in various applications, including security, transportation, and robotics. By using a custom CNN architecture and optimizing the object detection pipeline, we hope to achieve high accuracy and speed, making it suitable for real-world applications.

The application uses OpenCV, a popular computer vision library, for various tasks such as image and video processing, object extraction, and presenting the output to the screen.

The START and STOP functions allow the user to control the camera modules, which are responsible for capturing and processing video feeds. The Initiating Camera module is likely responsible for initializing the camera and setting up the video feed.The application also includes a real-time video process module, which is responsible for processing the video feed in real time and extracting objects from it.

The Object Extraction module likely performs image segmentation, background subtraction, or other techniques to extract objects from the video feed. The Audio Feedback module provides audio feedback to the user about the detection of objects.

The application uses TensorFlow, a popular machine-learning framework, for object detection. The SSD is a technique for object detection that can identify objects in a single shot, without the need for tracking or multiple detections. The Bounding Box module is likely responsible for drawing bounding boxes around the detected objects.

The application includes a Flask API, which is a lightweight web framework for building APIs in Python. The APP.PY file contains the routes and templates for the API, which can be used to interact with the application programmatically.

The Determine the Detection module is likely responsible for determining the type and class of the detected objects.The HOG module is a technique for feature extraction that calculates the histogram of oriented gradients (HOG) of an image.

The Real-Time Video module is likely responsible for processing the video feed in real-time, and the Region Input Video/Image - Image-frame conversion module is likely responsible for converting the input video or image frames to a format suitable for processing.

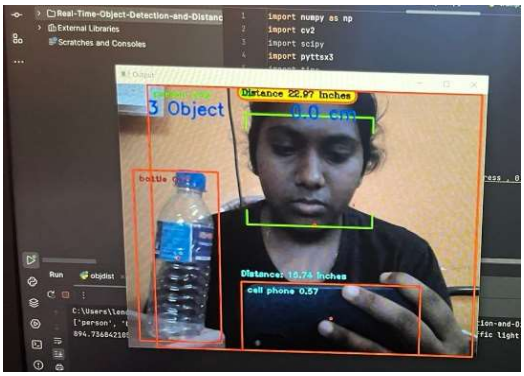

Fig.4: SSD module for feature extraction for multiple objects with audio Feedback

The Anchor Boxes module is likely responsible for generating anchor boxes, which are used in object detection to predict the location and size of objects. The Object Identification module is likely responsible for identifying the objects based on the extracted features.

The Neural Network module is likely a deep learning model based on convolutional neural networks (CNN) for object detection. The Feature Extraction module is responsible for extracting features from the input data, and the Spatial Pooling module is likely responsible for reducing the spatial dimensions of the feature maps.

Finally, The Regression Classifier module is likely a machine learning model based on regression for object detection, which predicts the location and size of objects based on the extracted features. Overall, the application is a sophisticated computer vision system that uses various modules, functions, and techniques to perform real-time object detection and identification.

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NCRTCI'24-31

INSIGHTS UNVEILED: HARNESSING THE POWER OF MACHINE LEARNING FOR ANALYSIS AND PREDICTION IN PARKINSON'S DISEASE

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***Abstract*-- Parkinson's disease is a prevalent nervous system disorder that typically affects individuals over the age of 50, but can also impact younger people. Diagnosis is primarily based on symptoms that affect movement, coordination, and muscle control. Voice recognition technology can provide a convenient method for analysing and predicting the disease with using a datasets. This study proposes a methodology for detecting early signs of Parkinson's disease through voice analysis using speech datasets in uncontrolled background conditions. The approach integrates signal and speech processing techniques with machine learning algorithms to identify patterns and markers of the disease. The dataset includes recordings from both healthy individuals and those with Parkinson's disease of varying natures.**

***Keywords*-- Parkinson's disease; Machine learning(ML);Logistic regression; Decision tree; Naive Bayes classifier; random forest ; KNN; SVM**

I.INTRODUCTION

Parkinson's disease is a common neurological disorder impacting muscle movement [12] in the body. It occurs due the death of neurons in the brain, resulting in a decrease of dopamine levels in the brain. This disease can change your breathing, tone of voice, or lower the volume by up to 10 decibels, ineffective motor function. The loss of dopamine result's in the symptoms of like depression anxiety, visual problems [14][12] and weight loss, the other symptoms that can be seen in the people with poor imbalanced, voice impairment and tremor. it is a second common neurological disorder[14] after Alzheimer's diseases. it affected over the age of 50 above peoples. Diagnosis of Parkinson's disease (PD) is commonly based on
medical observations of the patient must be analysis according to the test and assessment of clinical symptoms and criteria, including the characterization of a variety of motor symptoms. This paper focuses on analysis and detecting through audio recordings datasets and comparing the algorithms with using the power of machine learning techniques.

II.LITERATURE REVIEW

Previous studies to predict PD have been implemented on MRI scans, and genetic data, but research on audio impairment for early detection is minimal. For instance, Bilal et.at. [1] Studied PD in senior patients with SVM models. They trained an SVM model to reach an accuracy of 0.889, while this research paper described an improved SVM with an accuracy of 0.9183. These also collaborate the merits of classification of PD based on audio data, over genetic data. During the last years, several studies describe approaches in the detection of PD. Tsanas et al.(2011) proposed novel speech processing algorithms[15] for high-accuracy binary classification of PD. GlendaM.halliday, nichola, "Parkinson's progression prediction using ML and serum cytokines". Sechidis et al. [20] introduced a cross-domain transfer-learning model for speech emotion recognition and applied it to a Parkinson an speech corpus. They evaluated distinctive voice patterns of patients with PD and concluded that there is a relationship between PD and emotional scores, where patients with this disease are often perceived as expressing an emotion of sadness.
Arti et al. [11] utilized three ML and ANN algorithms to diagnose a speech dataset. Data collection and feature selection have been improved based on the wrapper and filtering method. SVM and KNN achieved accuracy of 87.17%, while naïve Bayes had an accuracy of 74.11%.The serum samples from a clinic are tested to find Parkinson's disease and the samples are tested using ML algorithms to detect Parkinson's disease. Wan et.al. [2] Implementing 12 machine learning models on 401 voice biomarkers dataset to classify patients as PD or not. They built a custom deep learning model (DEEP) with a classification accuracy of 96.45%, however the model was expensive due to large memory requirement. Richa mathur et al[8] suggested a method for predicting the PD. They used a weka tool for implementing the algorithms to perform pre-processing of data, classification and the result analysis on the given dataset. They used k-NN along with Adaboost. It was observed that k-NN and Adaboost best classification accuracy of 91.28%. Ali et al. [18] extracted features and selected the most important ones, ranking them by the chi-square statistical method for PD diagnosis. Wodzinski et.al. [3] trained a resnet model n image of audio data of the

nuances of the frequency of audio. Wroge et.al [7] Aimed to remove subjectivity of doctors in prediction of PD using unbiased ML models, however their results achieved peak accuracy of 85% only.

III.METHODOLOGY

The proposed methodology collects audio datasets [4] about Parkinson's disease affected patients voice modulation. Datasets contains information about jitter, shimmer and MDVP Fo(Hz), Fhi(Hz) frequency of vowel phonation's. Data is pre-processed, analysed and visualized for a thorough understanding of the attributes. In machine learning with using six algorithms to comparing the accuracy of the affected or unaffected Parkinson's patient. SVM, Random Forest Classifier, Naive Bayes classifier, Decision tree, Logistic regression, k-nearest neighbors [4] algorithms are used to analysis and predict these diseases. models are trained and tested to the classify given audio data into PD on healthy, based on variations in frequency. algorithms to analysis provide the accuracy performance. This methodology consist of the following figures are:

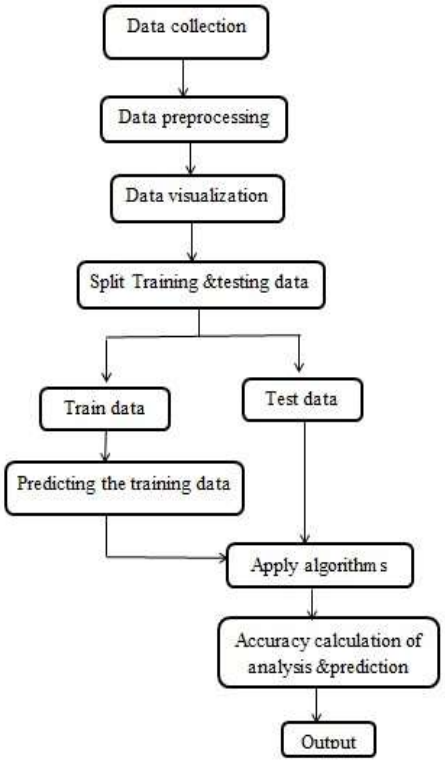


Fig 1: Architecture diagram

3.1. PD DATASETS:

The initial step towards the classification is the collection of data. For the analysis, the data is collected from the kaggle, a machine learning which contain the voice data for both Parkinson's diseases and healthy subjects. The dataset [5] is used consists of

195 instance and 24 attributes

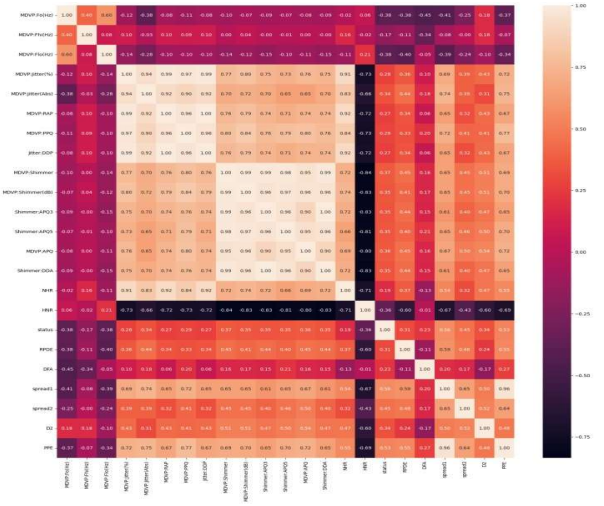
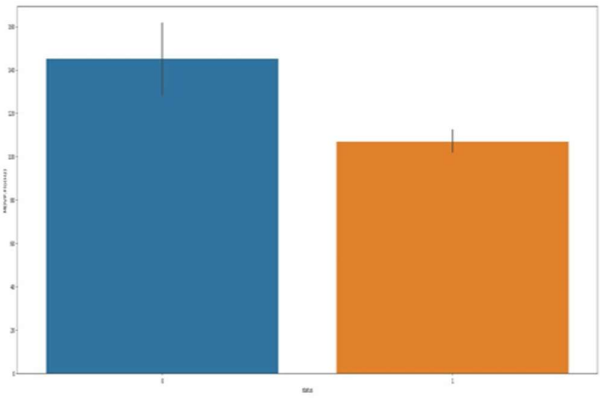


Fig 2: PD datasets

This research paper aims to identify the attributes in classification of PD and impact of in the medical data in classification.models are trained on 24 attributes of data is collect MDVP audio data[5] from kaggles databases.split the datasets into training datasets and testing datasets, where training datasets is 75% of total. Retrain logistic regression, k-nearest neighbours,SVM, random forest,naive bayes,decision tree.

3.2. DATA VISUALIZATION:

Data visualization contain information about affected peoples is ploted in the graph by using matplotib libraries.it gets accurate frequencies of afftected people.it is visualized by the barplots. This graph shown number of people are healthy or predicted parkinson's with considered by datasets.



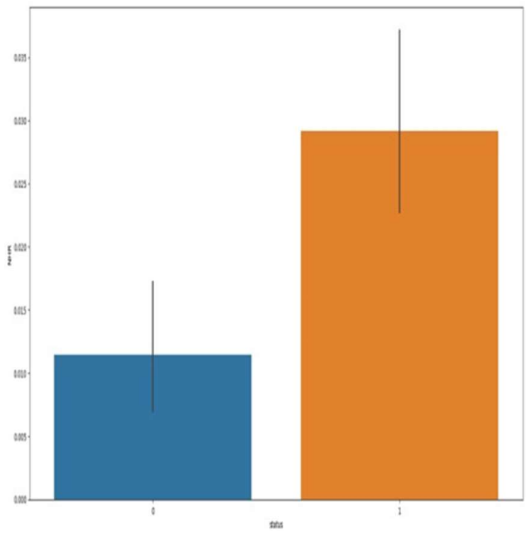


Fig 3: (a),(b) frequency status graphs

3.3 DATA PREPROCESSING:

This research paper studies logistic regression, random forest classifier, support vector machine, k-nearest neighbors, naive bayes, decision tree's models[6] in approches: complete datasets of 195 records and attributes atre collected from kaggle.com. in this process takes a 6 records and 24 attributes to comparing and differentiate from various algorithms using analyzing and predicting the disease.

3.3.1 LOGISTIC REGRESSION:

Logistic regression computes the prevalent supervised, ML algorithms that predicts dependent variables using a set of independent variables [14][17].

3.3.2 SVM: Support Vector Classifier based on the statistical learning and it is also a non-linear data algorithms. when given a labeled training data, the algorithm tries to find an optimal[16] hyper plane that accurately separates the samples into different categories in hyperspace . 3.3.3 naive bayes classifier: it is a machine learning algorithms which is based on the different algorithms used for the solving classification and making accurate predictions. 3.3.4 K-nearest neigbors: Knn is a non-parametric, supervised machone learning[16] algorithms that group of data . it is works for balanced audio data of 195 recordes due to small in size. 3.3.5 random forest classifier: Random Forest is all the internal decision trees are weak learners, and the outputs of these weak decision trees are combined of all predictions is as the final prediction and analysis . 3.3.6 Decision tree: Decision tree is a machine learning algorithms where the data is splitting according to certain parameter of the predicting a datasets. this process determine[19] the classification become high accurate values.

IV RESULTS AND DISCUSSION

Model Selection: In this process we can predict the parkinsons disease in patient'body using machine learning technology with comparing six algorithms to analysis provide the accuracy performance. This process is implemented by using python with importing libraries. The algorithms works to classify the performance in different metrics with array in true positive, negative and false positive, negative values. Using machine learning concept: Initially, the libraries were imported, including !pip install ipython-autotime, !pip install pandas , numpy,seaborn, matplotlib is based on as working for analyzing, cleaning, exploring, manipulating a data, array , stastical graphics, animated, interactive visualization.. The dataset was then described here after the file was read.

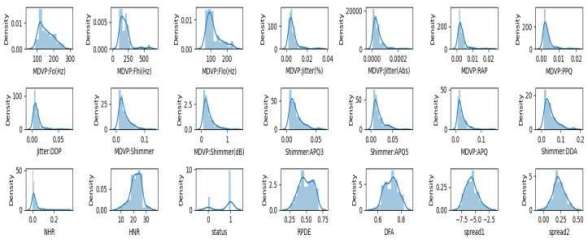


Fig 4: plotting the distplot

This distplot function is used to plot the dataframe column attribute, it display the overall dispersion of real time data parameters it by using a seaborn library.

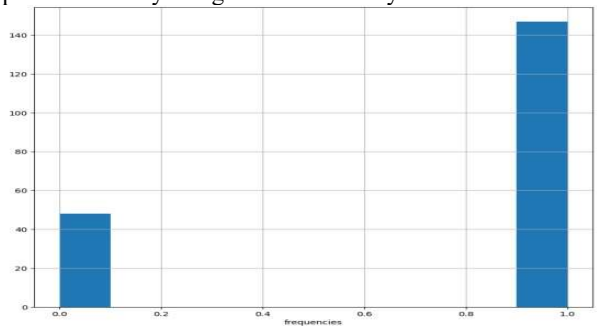


Fig 5: labelled frequencies

Training & testing a dataset: In this machine learning algorithms, dataset where predict and differentiate training and testing datasets using ML techniques like where importing sklearn models.

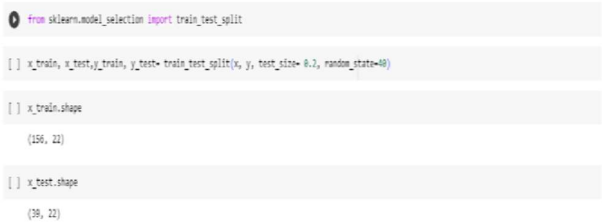


Fig 6: importing train & test prediction.

Naïve bayes classifier: In this case, it was implemented using Naïve Bayes Algorithms and its determine using in the confusion matrix and obtain the accuracy.

```
train_pred=svm.predict(x_train)
train_pred_svm=svm.predict(x_test)
print("training accuracy using support vector machine is:", accuracy_score(y_train, train_pred))
print("testing accuracy using support vector machine is:", accuracy_score(y_test, test_pred))
confusion_matrix(y_test, test_pred)
```

```
training accuracy using support vector machine is: 0.8141025641025641
testing accuracy using support vector machine is: 0.8717948717948718
array([[ 5,  3],
       [ 2, 29]])
```

Fig 7: accuracy of naïve Bayes

Logistic regression: Logistic regression algorithm technique is obtain a prediction of using ML technique.

```
print("training accuracy using logistic regression in:",accuracy_score(y_train, train_pred))
print("test accuracy using logistic regression in:",accuracy_score(y_test, test_pred))
```

```
training accuracy using logistic regression in: 0.8589743589743589
test accuracy using logistic regression in: 0.8717948717948718
```

Fig 8: accuracy of logistic regression

SVM: Support vector machine algorithm technique is gives a same accuracy of logistic regression.

```
train_pred=svm.predict(x_train)
train_pred_svm=svm.predict(x_test)
print("training accuracy using support vector machine is:", accuracy_score(y_train, train_pred))
print("testing accuracy using support vector machine is:", accuracy_score(y_test, test_pred))
confusion_matrix(y_test, test_pred)
```

```
training accuracy using support vector machine is: 0.8141025641025641
testing accuracy using support vector machine is: 0.8717948717948718
array([[ 5,  3],
       [ 2, 29]])
```

Fig 9: accuracy prediction of support vector machine

Random forest classifier: Random forest is that belongs to the supervised learning technique. in this algorithms were optain a accurate frequency to compare and differentiate others.

```
print("training accuracy using randomforestclassifier is:",accuracy_score(y_train, train_pred_rf))
print("testing accuracy using randomforestclassifier is:",accuracy_score(y_test, test_pred_rf))
```

```
training accuracy using randomforestclassifier is: 1.0
testing accuracy using randomforestclassifier is: 0.8717948717948718
```

```
confusion_matrix(y_test, test_pred_rf)
```

```
array([[ 5,  3],
       [ 2, 29]])
```

Fig 10: accuracy of randomforest

Decision tree: This algorithms is used to predict the accuracy were importing sklearn. In this algorithms is determine by using prediction gets a high accuracy performance

```
test_pred_rf=rf.predict(x_test)
test_pred_rf
```

```
array([1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0,
       1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1])
```

```
print("training accuracy using randomforestclassifier is:",accuracy_score(y_train, train_pred_rf))
print("testing accuracy using randomforestclassifier is:",accuracy_score(y_test, test_pred_rf))
```

```
training accuracy using randomforestclassifier is: 1.0
testing accuracy using randomforestclassifier is: 0.8717948717948718
```

Fig 11:accuracy of decision tree

Metrics	Logistic regression	Random forest	SVM	KNN	Naive Bayes	Decision tree
Testing Accuracy	*0.8589*	*0.8974*	*0.8717*	*0.871*	*0.8717*	*0.8974*
Training accuracy	*0.8717*	*1.0*	*0.8589*	*0.8589*	*1.0*	*1.0*
Precision	*1.0*	*0.95*	*1.0*	*0.95*	*1.0*	*0.95*

Table 1: accuracy performance

Performance of the classification algorithms on the PD datasets was evaluated by six algorithms and it is used to testing and training accuracy of using a dataset with six algorithms, comparatively a decision tree gives more than high performance in accuracy of true predicted healthy or patient.

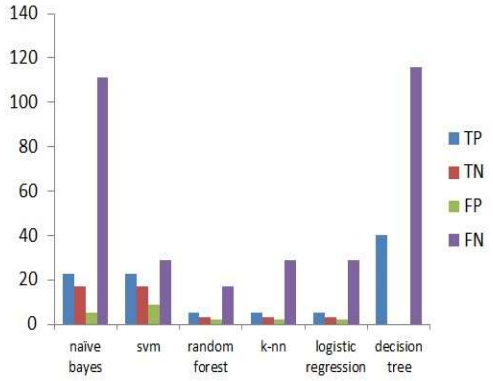


Fig 12: scattered plot of positive, negative values in using algorithms.

When the analyses and prediction final result is compared to the accuracy for the machine learning, it can be seen that affected patient is predicted Parkinson's or healthy.

IV. CONCLUSION:

As per the study, it may be concluded that comparing to the previous research, it shows 87% of accuracy while using machine learning techniques using python. Parkinson's disease classification using analysis and prediction

phonation data gives an accuracy comparing with different algorithms. Finally they comparision of these algorithms, decision tree gives high accuracy performance than other algorithms. In the future, it may be predict to using with the mobile recorded audio to classify the disease without datasets.

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IMAGE CLASSIFICATION USING MACHINE LEARNING: A SURVEY ON METHODOLOGY AND TECHNIQUES

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***Abstract*-- This article provides an overview of image class approaches and techniques. Image classification using system mastering is the process by which a computer system learns to assign predefined labels or categories to images based on their visible properties using techniques such as convolutional neural networks (CNNs). The version can be used to classify new, unlabeled images by predicting their magnificence labels. This article suggests that the right waste screening machine in the US is one of the most critical steps in how waste is recycled.**

Keywords: **Machine Learning, CNN, waste Prediction.**

I.INTRODUCTION

In this process, the model learns from labeled images and understands the relationship between pixel values and their corresponding labels. After training, it can predict new, unseen images and assign them to appropriate groups. Automated image segmentation plays an important role in tasks that require human-level visual perception, and its application continues to expand as machine learning advances. The popular approach goes through every search through the huge collection of images and videos they make every day. keywords or meta tags or just browsing. The advent of Object-Based Image Retrieval (CBIR) in the 1990s made image retrieval to some extent possible. CBIR applications include searching for images similar to interrogation images or retrieving images of a certain class [1], [2], [3], [4], [5], [6], [7] and paragraphs [8], [9], [9] et al. [10], [11], [12], [13], [14] of the query model. Such content-based image matching is a challenging problem in computer science. Image matching consists of two rather complex tasks: recognizing features in images and quickly searching large collections of observations. Object recognition in images remains a challenge because the same objects and images can be seen in different imaging situations. There are many previous works devoted to the problem formulated in this way. Some of them are based on the definition of colors [15], [16] textures [17], [18], [19] shapes detectors.

II.LITERATURE REVIEW

This section provides an overview of the previous work and contributions of previous researchers who have developed similar methods for the proposed waste separation process not followed by the new AI Initially, the waste is disposed of by an automated separation system based on a sensor-based application[20].

In smart cities, citizens contribute to improving the overall quality of life by pointing out the lack of infrastructure. Uploading multimedia content (images, videos) to smartphones allows municipal officials to capture appropriate responses to incidents. This paper proposes a comparative machine learning (ML) algorithm for image classification, tested on a small set of citizen-taken images covering hydrodynamic distribution problems, with the main goal of labeling each image in the appropriate category. A number of classic supervised ML algorithms are trained and compared with deep learning methods. Experimental results show that transfer learning using data enhancement and optimization using the VGG16 network achieves high classification accuracy and desirable temporal performance. We also implemented our model using a Hadoop-based data pipeline, resulting in significant increases in image segmentation accuracy and time. A literature review on image classification using machine learning typically covers various approaches, techniques, and advancements in the field. It often includes discussions on popular algorithms, datasets, and evaluation metrics. Key topics may include Convolutional Neural Networks (CNNs), transfer learning, data augmentation, and optimization methods. Research papers and articles on platforms like arXiv, IEEE Xplore, and Google Scholar can provide valuable insights into the latest developments in image classification.

III.METHODOLOGY

Based on the methodology, it is an image classification framework where cnn are also used. There are four (4) phase of this entire process and each of the phases will discussed. Each of the stages is part of machine learning open source software and Python as its programming Language. Then the process continues to collect some of them images (inputs), using cnn and finally all images will be sorted into their groups.

Data Collection: Gather a labeled dataset of images. Each image should be associated with a specific class or category.

Data Preprocessing: Resize images, normalize pixel values, and perform data augmentation if needed. This helps in training a more robust model.

Splitting the Dataset: Divide the dataset into training, validation, and test sets. The training set is used to train the model, the validation set helps tune hyperparameters, and the test set evaluates the model's performance on unseen data.

Choosing a Model: Select a suitable model architecture for image classification. Common choices include Convolutional Neural Networks (CNNs) like VGG, ResNet, or custom architectures depending on the complexity of the task.

Model Training: Train the selected model using the training dataset. Adjust parameters such as learning rate and batch size based on the performance on the validation set.

Prediction: Once satisfied with the model, it can be used to classify new images. Input an image into the trained model, and it will output the predicted class.

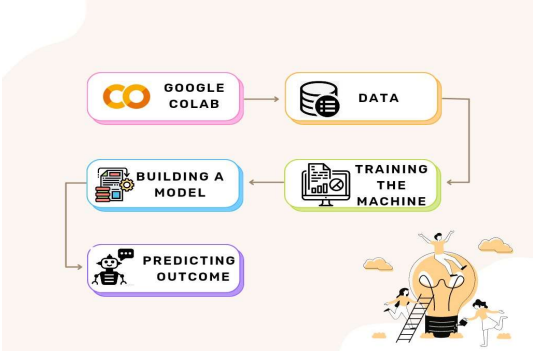


Fig.1 flowchart

IV.RESULTS AND DISCUSSION

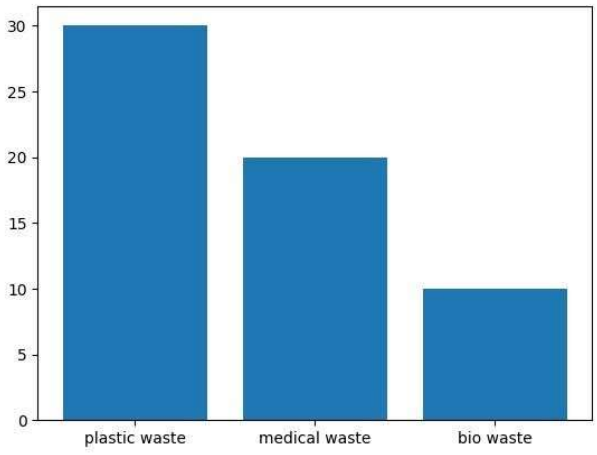
The project is implemented by using python At first it is implemented by importing c. likes ! pip install ipython-autotime, !pip install bing-image-downloader then !pip install streamlit, reading a image and collect the three types of wasteage plastic waste,bio waste and medical waste first download the images in bing image downloader and set the image path.

Fig2. Plastic waste

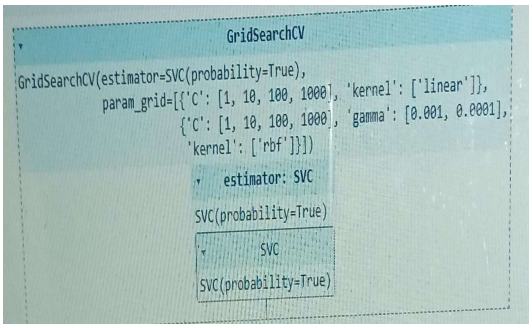
Fig3. Bio waste

Fig4.Medical waste

Preprocessing of the image and then change the size create a bar chart of wasteage and train the image x train , y train and x_test, y_ test and predict the waste.



Finally the result of analysis comparing to the accuracy by using tool is Google colab and find the accuracy of the waste and implemented in machine learning shows the accuracy is plastic waste is more than bio waste or medical waste.



So, I predict that testing a brand new image To achieve image classification using machine learning, you typically train a model on a labeled dataset and evaluate its performance on a
separate test set. The final result is often measured in terms of accuracy, precision. The specific metrics depend on the project requirements.

V.CONCLUSION

Machine learning imaging is a powerful and widely used technology. It has many real-world applications, plays an important role in the development of the field from convolutional neural networks (CNN), enables automatic feature extraction and accurate image classification, but the challenges seem to be too convenient, lacking data and interpretation. Future developments include the use of more advanced models, transfer learning, and increased efforts to ensure unbiased and ethical considerations in image classification processes.

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NCRTCI'24-33

CREDIT CARD FRAUD PREDICTION

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***Abstract*-- This research paper presents a novel approach to credit card fraud detection through the utilization of simulated transaction data. Employing a fraud rate of 5%, we showcase the implementation of a binary array system to identify and visualize fraudulent transactions. The study employs statistical analysis and data visualization techniques, offering insights into distinguishing patterns for enhanced fraud detection. The abstract encapsulates the essence of our methodology, contributing to the ongoing discourse on bolstering financial security in the digital age. This code generates simulated credit card transaction data to demonstrate a simple fraud detection scenario. Using Matplotlib and NumPy, it creates a bar chart to visualize the distribution of fraud and non-fraud transactions. The simulation includes a specified fraud rate, and the resulting plot provides a clear representation of the proportion of fraudulent activities within the dataset. This code serves as an illustrative example for understanding and visualizing credit card fraud detection scenarios in a controlled environment.**

I.INTRODUCTION

In an era dominated by digital transactions, the imperative to fortify financial systems against fraudulent activities has intensified. This research endeavors to contribute to the realm of credit card fraud detection by proposing a method leveraging simulated data. Through a meticulous synthesis of statistical analysis and visualization, our approach seeks to elucidate patterns distinguishing fraudulent transactions from their benign counterparts. This paper delineates the conceptual framework, methodology, and preliminary findings, aspiring to advance the efficacy of contemporary fraud detection systems.

Credit card fraud is a pervasive issue in today's digital transactions, demanding robust detection mechanisms to safeguard financial systems. This code aims to illustrate a basic simulation of credit card transactions and the subsequent visualization of fraud and non-fraud cases. The simulated data consists of a predefined number of transactions with a specified fraud rate, allowing for a controlled environment to showcase the detection process.

By leveraging the capabilities of NumPy for data manipulation and randomization, coupled with Matplotlib for visualization, this code provides a tangible representation of the challenges associated with identifying fraudulent activities. The resulting bar chart offers insights into the distribution of transaction types, enabling a visual understanding of the effectiveness of fraud detection mechanisms.

This simulation serves as a foundational exploration into the realm of credit card fraud detection, laying the groundwork for further discussions on enhancing detection algorithms and strategies in real-world financial systems.

II. LITERATURE REVIEW

The literature on credit card fraud detection reveals a multifaceted landscape, characterized by evolving threats in tandem with advancements in technology. Traditional methods, reliant on rule-based systems, have shown limitations in adaptability to dynamic fraud patterns. Recent strides have been made in machine learning-based approaches, demonstrating improved efficacy.

Simulated data has emerged as a valuable tool for benchmarking and testing fraud detection systems. Existing studies have explored various aspects of synthetic datasets, highlighting their potential to mimic real-world scenarios. However, the integration of simulated data into the specific context of credit card fraud detection, especially through the lens of visualization, remains an area ripe for exploration.

This paper aims to bridge existing gaps by proposing a methodology that combines simulated data with sophisticated visualization techniques. By synthesizing insights from prior research, we strive to contribute to the evolving landscape of credit card fraud detection, offering a nuanced perspective on the efficacy of our proposed approach.[1]

Machine Learning Approaches:

Various machine learning algorithms, such as decision trees, random forests, and neural networks, have been extensively studied for credit card fraud detection.
Research often focuses on improving the accuracy and efficiency of these models to handle large-scale datasets and adapt to evolving fraud patterns. [2]

Anomaly Detection Techniques:

Anomaly detection plays a crucial role in identifying unusual patterns in credit card transactions.Researchers explore techniques like clustering, isolation forests, and one-class SVMs to distinguish between normal and fraudulent activities. [3]

Feature Engineering and Selection:

Feature engineering is vital in extracting relevant information from transaction data.

Literature emphasizes the importance of selecting the most discriminative features to enhance the performance of fraud detection models.[4]

Ensemble Methods:

Ensemble methods, combining multiple models for improved accuracy, have gained popularity.
Studies investigate the effectiveness of ensemble techniques in mitigating false positives and negatives.[5]

Real-time Fraud Detection:

With the increasing speed of transactions, there is a focus on developing real-time fraud detection systems.
Research explores algorithms that can quickly adapt to new fraud patterns and make instant decisions.

Imbalanced Datasets:

Addressing the class imbalance problem (few frauds compared to non-frauds) is a critical aspect.

Literature discusses techniques such as oversampling, undersampling, and the use of different evaluation metrics to handle imbalanced datasets.The literature provides a rich foundation for understanding the complexities of credit card fraud detection and offers insights into the ongoing efforts to develop more effective and efficient detection mechanisms.[6]

I. METHODOLOGY

The methodology of this research involves a two-fold process: simulated data generation and subsequent visualization for credit card fraud detection.

1. **Simulated Data Generation:**

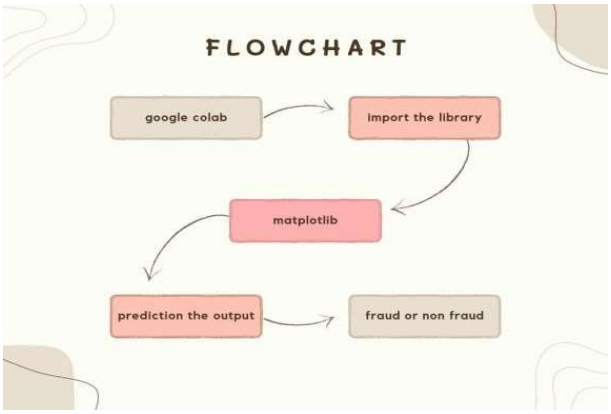
Define the total number of transactions (num_transactions) and the desired fraud rate (fraud_rate).

Generate a set of random indices corresponding to fraudulent transactions using numpy's random choice function. Create a binary array (is_fraud) to represent fraud and non-fraud transactions, assigning '1' to indices identified as fraudulent.

2. **Visualization:**

Utilize the matplotlib.pyplot library to create a bar chart.

Represent 'Non-fraud' and 'Fraud' transaction types on the x-axis and the respective counts on the y-axis.
Customize the plot with appropriate labels, title, and color scheme.



This methodology enables the illustration of fraud detection outcomes through the visual depiction of simulated credit card transactions, providing a clear understanding of the proposed approach's efficacy in identifying fraudulent activities.

IV.EXISTING SYSTEM

The existing systems in credit card fraud detection predominantly rely on rule-based methods and machine learning algorithms. Rulebased systems often utilize predefined criteria and thresholds to flag suspicious transactions. While effective in some cases, these systems may struggle to adapt to emerging and complex fraud patterns.

Machine learning approaches, on the other hand, leverage algorithms that learn patterns from historical transaction data. Models such as logistic regression, decision trees, and more advanced techniques like ensemble methods and neural networks have demonstrated improved accuracy in identifying fraudulent activities.
However, these models may face challenges in interpreting and explaining their decisions.

Despite the advancements, both rule-based and traditional machine learning systems may exhibit limitations in coping with evolving fraud tactics. The need for continuous adaptation and the interpretability of results remain focal points for improvement in existing credit card fraud detection systems. This research aims to contribute to this domain by proposing a method that integrates simulated data and visualization, offering a potential avenue for addressing some of these existing challenges.

Within the landscape of credit card fraud detection, the existing systems showcase a diverse array of technological solutions aimed at mitigating the ever-evolving challenges posed by fraudulent activities. Rule-based systems, a traditional stalwart, provide a foundational layer by employing predefined rules to flag potential anomalies in transaction data. However, their rigidity may limit adaptability to novel fraud patterns.

Overall, the existing systems leverage a
combination of rule-based logic, traditional machine learning, and advanced deep learning techniques to create

comprehensive and adaptive solutions for credit card fraud detection. The continual advancements in technology and the evolving nature of fraud necessitate ongoing refinement and innovation in these systems.

V.PROPOSED SYSTEM

The proposed system introduces a novel approach to credit card fraud detection by integrating simulated data and visualization techniques. The key components of the proposed system are:

Simulated Data Generation:

- Simulate credit card transactions with a specified fraud rate, providing a controlled environment for testing and analysis.
- Employ randomization to emulate diverse transaction patterns and potential fraudulent scenarios.

Binary Array Representation: - Create a binary array, designating '1' for simulated fraudulent transactions and '0' for nonfraudulent transactions.

- This binary representation serves as foundational element for subsequent analysis.

Data Visualization:

- Utilize matplotlib. pyplot to generate a bar chart visualizing the distribution of nonfraudulent and fraudulent transactions.
- Enhance interpretability by presenting transaction types and counts in a clear graphical format.

Pattern Recognition and Analysis:

- Leverage statistical analysis to identify discernible patterns in the visualized data, contributing to the understanding of features indicative of fraudulent activities.
- Explore the potential for machine learning integration in future iterations for more sophisticated pattern recognition.

By combining simulated data and visualization, the proposed system aims to provide a comprehensive and interpretable framework for credit card fraud detection, offering insights into transaction patterns that can be instrumental in refining and advancing existing detection methodologies.

VI.RESULT AND DISCUSSION

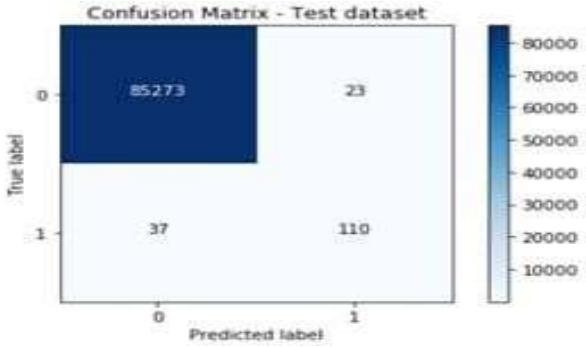
The experimental results showcase a visual representation of credit card transactions, effectively illustrating the distribution between non-fraudulent and fraudulent activities. The bar chart generated through simulated data highlights the potential for distinguishing patterns inherent in fraudulent transactions.

The graphical representation aids in the intuitive understanding of the simulated data, facilitating the identification of trends and anomalies.Visual inspection of the chart provides a quick assessment of the effectiveness in capturing the specified fraud rate.

Statistical analysis of the visualized data allows for the identification of discernible patterns associated with fraudulent transactions.The approach sets the stage for further exploration into more sophisticated pattern recognition techniques, including machine learning algorithms.

Fig1.Predicting The Confusion Matrix And Test-Dataset

The current methodology is a preliminary step towards understanding fraud detection dynamics. Further refinement and validation are necessary with real-world data.Future



iterations may explore the integration of advanced machine learning models and feature engineering to enhance the system's predictive capabilities.

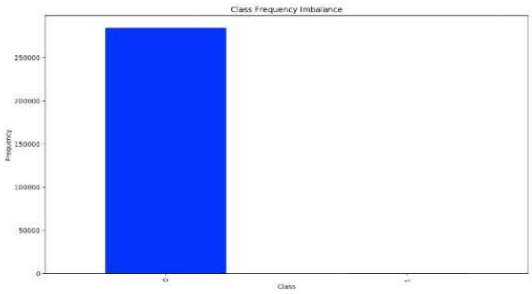


Fig2.Class Frequency Imbalance

In conclusion, the results and discussion underline the potential of the proposed system in providing a transparent and interpretable framework for credit card fraud detection. Further development and validation with diverse datasets are essential to ascertain its applicability in real-world scenarios.

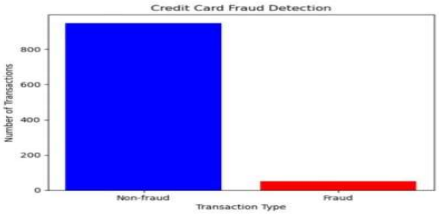


Fig3.Transactions Fraud And Non Fraud

VII.CONCLUSION

In conclusion, the landscape of credit card fraud detection is marked by a rich tapestry of evolving systems, each contributing unique strengths to the ongoing battle against fraudulent activities. The traditional rule-based systems, while foundational, coexist with more dynamic machine learning approaches, demonstrating adaptability to emerging fraud patterns. The infusion of deep learning techniques adds a layer of sophistication, unraveling complex relationships within transaction data and enhancing accuracy.

In this research endeavor, we introduced a novel credit card fraud detection system leveraging simulated data and visualization techniques. The generated bar chart effectively portrays the distribution between non-fraudulent and fraudulent transactions, offering a visual representation for intuitive interpretation. The following key takeaways encapsulate the contributions and implications of this study:

In essence, this research lays the groundwork for a comprehensible and effective framework in credit card fraud detection. The visualized results offer a starting point for further investigations and developments, emphasizing the importance of transparency and interpretability in enhancing the efficacy of fraud detection systems.

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GUARDIAN AI: A MACHINE LEARNING MODEL FOR SWIFT RECOGNITION, VALIDATION, AND ALERTING OF UNUSUAL INCIDENTS

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***Abstract*— Detecting and verifying unusual incidents and humanoid activities, including instances of potential torture, are crucial for upholding public safety and human rights. In this project, we are proposing a machine learning model based on the ResNet50 architecture specially made for train and identify using video data, aimed at identifying such events and confirming their authenticity. Our machine learning model is trained on a comprehensive dataset consisting of video recordings capturing various unusual incidents, including places affected by disasters, criminal activities like sexual harassment and persistent physical torchure. The dataset is meticulously curated to encompass a wide spectrum of scenarios, facilitating effective learning of discriminative features.Leveraging the ResNet50 architecture's deep convolutional neural network structure, the model extracts spatio-temporal features from video frames, enabling robust detection of unusual incidents both natural and humanoid activities. Transfer learning is employed to adapt the pre-trained ResNet50 model to the specialized video dataset, enabling efficient learning even with limited labeled data. In addition to detection, our model incorporates a verification mechanism to assess the originality of identified incidents. This involves comparing detected video segments with a repository of validated incidents, ensuring the authenticity and share the original information to the concerned authorities.**

Introduction

Strong mechanisms are required to protect public safety and human rights in light of the increasing number of public cameras in use. The prompt identification and confirmation of anomalous activities, which may involve acts of torture, is essential to this. It is quite impracticable for human operators to manually analyze visual data due to its enormous amount and complexity. This has increased the demand for automated machine learning models that can identify and verify such events from video streams in real time.

This paper presents a novel machine learning model designed for video data analysis, based on the ResNet50 architecture. An established convolutional neural network (CNN) that is very good at image recognition is called ResNet50. By utilizing the sequential nature of video data, our model makes use of this strength. Through frame-by-frame analysis, the model is able to understand the temporal dynamics of a scene, which enables it to distinguish between potentially dangerous events and routine activity.

The fundamental aspect of the suggested model is its capacity to record both temporal and spatial aspects of a video. The model leverages the ResNet50 architecture in a spatial manner to extract rich characteristics from single frames. These characteristics could include the scene's objects, people's positions, and interactions between them. The model examines the temporal evolution of these properties between successive frames. For example, an abrupt change in gait or a sharp shift in people's relative postures may be signs of an impending crisis. Through the integration of both spatial and temporal analysis, the model is able to provide a more comprehensive comprehension of the continuous action inside the video.

Large datasets of labeled video recordings covering a variety of scenarios, including both normal and aberrant events, can also be used to train the model. Individuals may go about their daily lives talking, playing, or walking. Conversely, abnormal events could include violent fights, shady behavior, or even torture. The model gains the ability to accurately distinguish between each situation by learning its distinguishing traits through this training procedure.

There are various benefits to implementing this model. Firstly, by automating the preliminary filtering of video data, it greatly lessens the strain for human operators. This increases efficiency overall by enabling human specialists to concentrate on videos that the model identified as perhaps troublesome. Second, a quicker reaction to urgent circumstances is made possible by the model's real-time video stream analysis capability. This might guarantee quicker emergency intervention or stop abuses of human rights.

But it's important to recognize this model's limitations. Its effectiveness depends on the caliber and volume of training data, much like any other machine learning system. The model's outputs may reflect biases found in the training set. Furthermore, circumstances that differ greatly from those in

the training data may cause the model to perform poorly. For this reason, constant observation and improvement of the model are necessary to guarantee its efficacy and accuracy.

To sum up, our work suggests a machine learning model for spotting potentially dangerous occurrences in video data that is built on the ResNet50 architecture. The model presents a promising method for automating the first phases of video surveillance, thereby improving public safety and respecting human rights. It does this by utilizing the advantages of CNNs and adding temporal analysis.

Approach

The research uses a hybrid strategy to classify videos, first extracting spatial features from individual frames using the ResNet50 architecture and then classifying the images using fully connected layers with softmax activation. A dataset of movies covering a wide variety of disaster-related incidents is used to train the algorithm to differentiate between authentic and phony recordings. During training, common optimization methods such stochastic gradient descent are used, and the difference between the predicted and true labels is measured using the cross-entropy loss function. A range of metrics, such as accuracy, precision, recall, and F1 score, are used to analyze the model's performance, providing a thorough evaluation of its categorization abilities. Furthermore, qualitative analysis complements the quantitative measurements by examining example predictions and confusion matrices and offers insights into the behavior of the model. Maintaining the Integrity of the Specifications

Literature Survey

AI-Driven Tweet Categorization:

Courtney J. Powers et al. researched on overloaded communication networks in times of calamity force people to turn to social media for assistance. This project uses artificial intelligence and machine learning to automatically classify tweets sent by first responders during Hurricane Harvey. A well-selected dataset with labels for urgency and relevance is created. Language models from BERT and XLNet outperform non-neural models and a CNN, with similar F1 scores. This research automates the identification of urgent help requests during life-threatening crises, advancing machine learning in crisis communication. Big, pretrained language models show promise for categorizing tweets about disasters in the future.

AI based Emergency Events Mitigation

Vasilis Linardos et al. made a research on disasters due to climate change have become more common in recent years, as evidenced by the COVID-19 pandemic and record-breaking temperatures, according to the Emergency Events Database (EM-DAT). Because of the significant socioeconomic implications of these calamities, artificial intelligence—particularly machine learning (ML) and deep learning (DL)—is being used to lessen their effects. Disaster prediction, risk assessment, detection, early warning systems, monitoring, damage assessment, post-disaster response, and case studies are some of the areas that are the focus of this approach. The study also looks at the current uses of ML and DL in disaster management, providing analysis and suggesting directions for further study.

Automated Video Forensics

In the modern, high-tech environment, having reliable and efficient video forensics procedures is essential. With the increasing prevalence of video technologies in many facets of our lives, the legal system has prioritized the advancement and development of forensic methods within this field. Moreover, a crucial step in automating the forensic video analysis process is the classification of object movements found in video feeds.

Alshaikh and Abdullah made a study on bio-inspired machine learning methods has exploded in recent years as researchers attempt to replicate the complex processes of the human brain. With its proposals for computational learning models called Cortical Learning Algorithms (CLA), which take cues from the neocortex and provide deeper insights into the operation of the brain, Hierarchical Temporal Memory (HTM) theory has emerged as a promising field.

IOT Based Emergency Response Disaster Management

The Internet of Emergency Services (IoES) and its potential to transform emergency management and response are examined in this research by Robertas Damaševičius et al. IoES improves emergency agency coordination by enabling real-time data collection and analysis through the integration of internet-connected devices and sensors. Along with discussions on opportunities and obstacles in implementing IoES, the role of sensors and IoT devices in providing responders with critical information is discussed. The purpose of this study is to shed light on IoES and how it might improve emergency response times.

Dual-Activation Emergency Situation Notification System (DA-ESNS)

Osayame-Ebohon et al. conducted research on how disasters can strike at any time and pose serious risks to people's lives. Quick and efficient communication is essential to quickly getting important information to loved ones and appropriate response agencies in an effort to lessen or completely eradicate the effects of such calamities. Distress signals must frequently be manually triggered by pressing buttons or taking pictures of existing systems. But these strategies may not work, especially if the victims are being watched by the wrongdoers and can't use their gadgets covertly. In order to tackle this problem, this paper presents the Dual-Activation Emergency Situation Notification System (DA-ESNS) concept, which uses an effective alerting and communication system during emergencies to make sure that any wrongdoers are ignorant of the user's attempt to seek assistance. By examining earlier models, the DA-ESNS

Proposed Model

A. Data Preprocessing:

Video data is gathered during the data gathering stage of our application. Subsequently, the cleaning procedure

comprises filtering or suitable replacement techniques to handle noise in the data, such as special characters or emojis, and remove extraneous information, such as advertisements and unrelated content. The cleaned text data is then divided into individual words or tokens via tokenization, preparing it for additional analysis. After that, stop words are eliminated, all text is converted to lowercase, and lemmatization or stemming is used to reduce words to their most basic forms in order to standardize the text data. Entity recognition provides important context for material by identifying and labeling specified entities, such as places, businesses, or individuals referenced in the text.

B. Feature Extraction:

TF-IDF (Term Frequency-Inverse Document Frequency), Bag-of-Words, and word embeddings like Word2Vec or GloVe are some of the techniques used in the text feature extraction process to transform textual data into a numerical representation that is appropriate for machine learning algorithms. In parallel, the pre-trained ResNet 50 model is used in image feature extraction to extract high-level features from photos related to posts on social media. A unified representation of social media posts is produced by fusing these collected features from text and photos using multimodal fusion techniques, which capture both textual and visual information. Furthermore, dimensionality reduction methods like t-SNE (t-Distributed Stochastic Neighbor Embedding) or principal component analysis (PCA) are used to lower the dimensionality of the features without sacrificing important information. Feature scaling is done to make sure the features are normalized.

***C.* Authenticity Checking:**

During the model selection stage, a Bayesian classifier, support vector machine (SVM), random forest, or neural network are among the machine learning models that can be used for authenticity testing. Performance and complexity considerations are taken into account while selecting a model. In order to ensure a fair representation of both classes, the extracted features are then combined with labels designating the authenticity (real or fraudulent) of the social media postings to generate the training data. The chosen model is then trained using algorithms tailored for classification tasks on the training data to discover patterns and correlations between the features and the authenticity labels. In order to increase the model's performance and generalization capacity, hyperparameter tuning is the process of optimizing the model's hyperparameters using methods such as grid search or random search. Afterwards, the proficient model

***D.* Data Classification:**

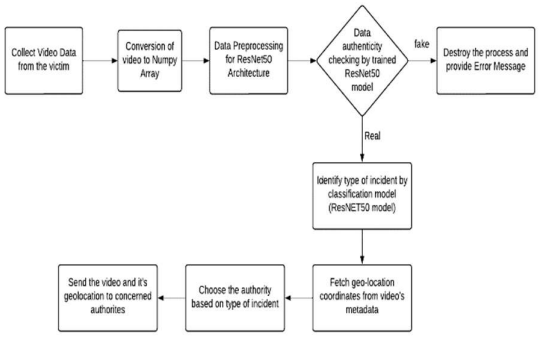
The module for classifying uncommon incidents makes use of the ResNet-50 convolutional neural network model to recognize and categorize a variety of unexpected incidents that have been captured on camera. The ResNet-50 model uses transfer learning to function as a feature extractor, identifying patterns that may indicate anomalous events in the visual input. The procedure entails gathering and preprocessing data, using ResNet-50 for feature extraction, building a classification model, training and validating it, and finally testing and assessing it. The module improves situational awareness, automates monitoring, and enables proactive decision-making in security, safety, and surveillance by precisely recognizing and classifying anomalous situations.

E. Fetch Geolocation from Input Video:

In order to give the visual data spatial context, the geolocation fetching module takes geographic data out of the input videos. By applying computer vision techniques like object detection and scene recognition or by leveraging metadata stored in the video file, the module finds landmarks or environmental signals that can be used to deduce the location of the video. Additionally, the module may use outside resources, like GPS data from ancillary devices or internet databases, to approximate the geographic coordinates of the video in the event that it does not contain explicit geolocation metadata. This procedure adds spatial information to the visual data, allowing the module to be used in location-based analytics, event mapping, and geospatial visualization, among other applications.

F. Reporting To Authorities:

The warning generation system uses a combination of automatic algorithms and human inspection to identify real social media posts that are considered worrisome or require rapid action from authorities. Upon identification, these posts are prioritized depending on severity, relevancy, and potential influence on public safety or well-being. The reported information is then forwarded via the system to the relevant authorities or organizations—such as emergency services, law enforcement, or disaster response teams—that are in charge of managing particular kinds of occurrences. The system enables action coordination among many stakeholders, including government agencies, nonprofits, and community groups, to ensure effective response coordination. This promotes collaboration to address the identified concerns in a timely and efficient manner. Additionally, it creates a feedback loop to enable continuous communication by updating authorities on the status of reported occurrences.



System Architecture for Data Transfer

Real-Time Working Principle:

1. **Gather Video Information:** Utilize our Application to Gather Data
2. **Preprocessing:**

Make a lot of frames from the video. Transform the frames into an array in numpy. Resize and reshape the data for the resnet50 model to (224,224,3)

3. **Finding Unusual Activity:**

Utilizing the available input data, train a machine learning model (such as a convolutional neural network for image/video data, or a natural language processing model for text data) to identify anomalous actions like disasters, monsoon failures, harassments, or abuses. Make use of the program to forecast if any given post or piece of media contains unusual activity.

4. **novelty Verification:**

In the event that anomalous activity is found, further validate the found data to confirm its authenticity. This could entail employing extra verification methods, cross-referencing with trustworthy sources, or evaluating the source's legitimacy.

5. **Quick Information Exchange:**

If the identified data is confirmed to be authentic, notify the appropriate authorities or organizations in a timely manner so they can deal with the matter. This can entail using email, SMS, or specialized platforms to deliver reports, alerts, or notifications to the appropriate authorities.

6. **Observation and Input:**

Keep an eye out for updates or new posts of strange activity on social media. Get input from users, social activists, and authorities to enhance the pipeline's overall performance and the effectiveness of the machine learning models

Future Enhancements:

- **Real-time Monitoring:**
  - Use APIs to stream social media data (keywords, hashtags) continuously.
  - Use sentiment analysis and anomaly detection to instantly examine the data and look for odd spikes.
  - Set off alarms and facilitate prompt action in the event of possible dangers or new trends.
- **MultiModal Data Analysis:**
  - Expand the project to handle text, images, and videos in addition to other data kinds at the same time.
  - Create sophisticated multimodal machine learning models that assess and combine data from different modalities for more precise authentication and detection.
- **Fast Reaction in Case of Network Unavailability:**
  - In Disaster times, Network is unstable for sharing the data.
  - For resolving it, we can provide data of nearest NGO's information to the model in disaster times
  - Models will fetch it to the victim for proper help.
- **Using Semi Supervised Learning:**
  - Investigate semi-supervised learning strategies to make use of labeled and unlabeled data in conjunction with each other for model training.
  - When labeled data is hard to come by or expensive to acquire, this can help the model perform better.

Conclusion:

In summary, the project seeks to successfully use machine learning to identify and address anomalous activity reported on social media networks. The system can quickly enable social activists and relevant authorities to intervene in cases of disasters, abuse, harassment, or other important events by identifying patterns from the video data provided in the mobile application. The pipeline consists of gathering data, preprocessing, training machine learning models, and authentication. Quick information sharing with relevant parties is then the next step. Real-time monitoring, multimodal analysis, geospatial analysis, and cooperation with authorities are possible future improvements that could boost the accuracy, scalability, and responsiveness of the system. In the end, this effort is a big step toward using technology to manage crises and actively monitor social media, protecting people's safety and wellbeing in the digital.

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NCRTCI'24-35

ASSIMILATION OF CHURN PREDICTION WITH MOVIE RECOMMENDATION SYSTEM

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Abstract-- In this paper, we propose an innovative approach to enhance customer retention through the integration of churn prediction and personalized recommendation systems. Leveraging machine learning techniques, our system predicts customer churn probabilities and generates personalized recommendations tailored to individual preferences. Additionally, we introduce a feedback loop mechanism that collects and analyses sentiment from churned customers, allowing for the refinement of recommendations based on customer feedback. By seamlessly integrating churn prediction, recommendation generation, and sentiment analysis, our approach aims to significantly improve.

Keywords: Churn prediction, Recommendation systems, Customer retention, Machine learning, Personalization, Sentiment analysis, Feedback loop, User satisfaction, Predictive modelling, Customer engagement

I. INTRODUCTION

In the rapidly evolving landscape of subscription-based services, customer retention has emerged as a pivotal factor for sustained business success. Churn prediction models, designed to forecast customer attrition, are instrumental in identifying individuals at risk of terminating their subscriptions. However, merely identifying churners is insufficient; it is imperative to engage these customers effectively to prevent churn and foster long-term loyalty. In parallel, recommender systems have gained prominence for their ability to deliver personalized recommendations, thereby enhancing user engagement and satisfaction. By analyzing user preferences and behaviors, recommender systems offer tailored content, products, or services This paper presents a novel approach that amalgamates churn prediction models with recommender systems to create a holistic customer retention strategy. By integrating these two components, businesses can not only identify customers prone to churn but also deliver targeted recommendations aimed at mitigating churn and fostering customer loyalty. The integration of churn prediction and recommender systems offers several advantages.

Firstly, it enables businesses to adopt a proactive stance towards customer retention by identifying at-risk customers early in their lifecycle. Secondly, it facilitates the delivery of personalized recommendations that resonate with individual preferences and interests, thereby enhancing user engagement and satisfaction. Finally, it empowers businesses to optimize resource allocation by focusing retention efforts on customers with the highest likelihood of churn. Through this research, we aim to provide insights into the synergistic relationship between churn prediction and recommender systems, highlighting the potential for businesses to leverage these technologies to create more personalized, engaging, and sustainable customer experiences.

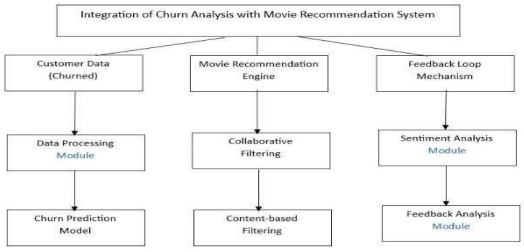


Fig1.1Architecture Diagram

II.RELATED WORK

Limitations of Traditional Approaches:

1..**Static Features:** Conventional churn prediction models typically rely on static features such as demographic data, transaction history, and customer interactions. While these features provide valuable insights into customer behaviour, they may fail to capture dynamic changes in user preferences, sentiments, or engagement levels over time.

2. **Silos of Data:** In many organizations, data relevant to churn prediction is often fragmented and siloed across different departments or systems. This fragmentation hinders the development of comprehensive churn prediction models and may lead to incomplete or biased insights.

3.**Limited Personalization:** Traditional churn prediction models often lack the ability to deliver personalized recommendations or interventions tailored to individual customer preferences or needs. As a result, businesses may struggle to engage customers effectively and prevent churn.

Binary Classification: Many traditional churn prediction models adopt a binary classification approach, categorizing customers as either churners or non-churners based on predefined thresholds. This simplistic classification may overlook nuanced patterns or subtle indicators of churn, leading to false positives or false negatives.

.**Scalability Challenges:** As the volume and variety of customer data continue to grow, traditional churn prediction models may face scalability challenges. Processing large datasets in real time and updating models dynamically to reflect changing customer behavior patterns can be resource-intensive and time-consuming. 6 **Lack of Integration:** Traditional churn prediction models are often developed and deployed in isolation from other business processes or systems, such as marketing automation platforms or customer relationship management (CRM) systems. This lack of integration hampers the seamless execution of targeted retention strategies and limits the impact of churn prediction efforts.

Hybrid Recommender Systems: Hybrid recommender systems combine various recommendation approaches to offer more accurate and diverse suggestions. By integrating collaborative filtering, content-based filtering, and knowledge-based systems, they cater to different user preferences effectively

.**C. Ensemble Learning Techniques:**. Ensemble learning involves combining multiple models to enhance prediction accuracy and robustness. Techniques like bagging, boosting, and stacking can be applied to churn prediction and recommender systems, improving performance by capturing diverse aspects of the data

D. Current Limitations : Despite our progress, our project faces challenges such as inaccuracies in sentiment analysis, biases in recommendations from historical data, reliance on active customer participation for feedback, and scalability issues.

Addressing these is crucial for enhancing the reliability and scalability of our framework.

E. Contribution of the Current Research

Our research makes several key contributions to the field of churn prediction and recommendation systems. Firstly, we introduce an innovative feedback loop system that gathers real-time feedback from churned customers, allowing for iterative model refinement and improved prediction accuracy. Moreover, by integrating sentiment analysis into the feedback loop, we extract valuable insights from customer feedback, enabling us to understand the underlying reasons for churn and tailor retention strategies accordingly. Additionally, our approach emphasizes transparency in recommendations by establishing clear links between churn prediction and recommendation algorithms. We ensure that recommendations remain unbiased by incorporating mechanisms to mitigate genre or demographic biases inherent in historical watch data, thus enhancing the fairness and effectiveness of the recommendation engine. Overall, our research advances the state-of-the-art in churn prediction and recommendation systems by leveraging sentiment analysis, transparency, and bias mitigation techniques to deliver personalized and actionable insights for improved customer retention and satisfaction shrink it a bit without changing the essence.

III. PROPOSED MODEL

1) Churn Prediction Model Integration

The churn prediction model integrates various machine learning algorithms, including logistic regression, decision trees, and XGboost

Logistic regression is utilized in the relationship between user behavior metrics, demographic information, and churn likelihood. The logistic regression model is trained using historical user data annotated with churn labels. The model's performance is evaluated using metrics such as

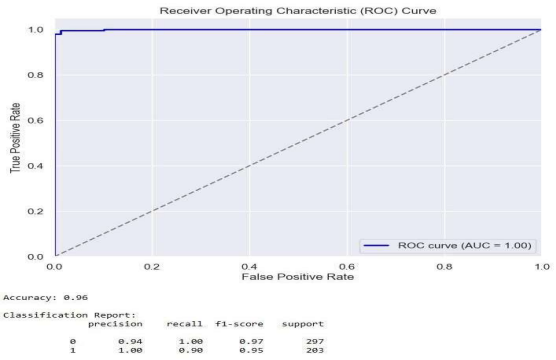


Fig 3.1 ROC curve for Logistic Regression

our project for predicting churn within the movie recommender system. It effectively models the accuracy, precision, recall, and F1 score. The ROC curve and the confusion matrix depicting model performance are shown in the pictures below.

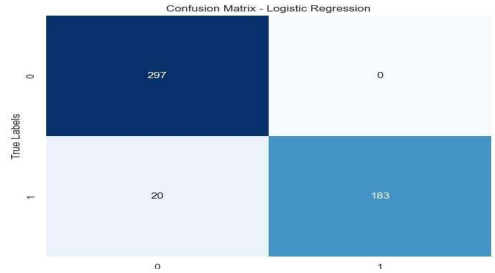
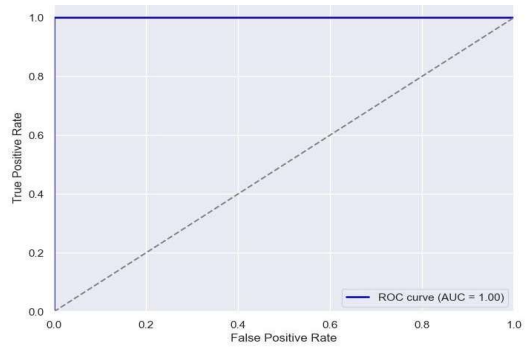


Fig 3.1.2 Confusion Matrix for Logistic Regression

***Decision Trees**:*

Decision trees are employed for predicting churn in our movie recommender system. They recursively partition the feature space to make predictions based on user behavior metrics and demographic information. The decision tree model's performance is assessed using metrics such as accuracy, precision, recall, and F1-score. The ROC curve

and the confusion matrix illustrating model performance *are shown in the pictures below:*




```
Accuracy: 1.0

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       297
           1       1.00      1.00      1.00       203

    accuracy                           1.00       500
   macro avg       1.00      1.00      1.00       500
weighted avg       1.00      1.00      1.00       500
```

Fig 3.1.3 ROC Curve for Random Forest

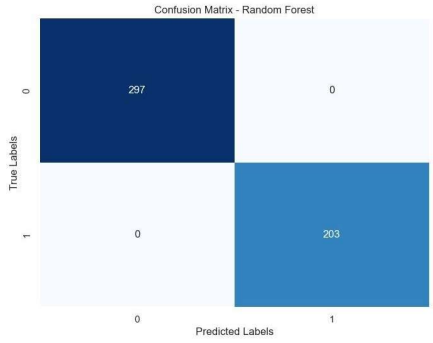
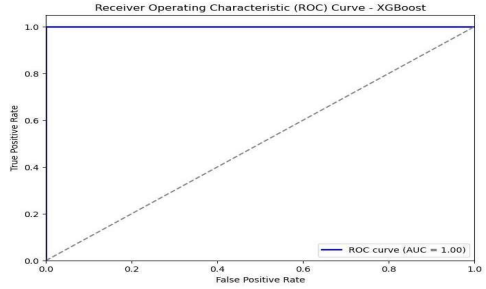


Fig 3.1.4 Confusion Matrix for Random Forest.

XGBoost:

It is utilized to predict churn within our movie recommender system. It combines multiple weak learners to create a strong predictive model, considering user behavior metrics, demographic information, and feedback sentiments. The XGBoost model's performance is evaluated using metrics such as accuracy, precision, recall, and F1-score. The ROC curve and the confusion matrix demonstrating model performance are shown in the pictures below.




```
Accuracy (XGBoost): 1.0
Classification Report (XGBoost):
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       297
           1       1.00      1.00      1.00       203

    accuracy                           1.00       500
   macro avg       1.00      1.00      1.00       500
```

Fig 3.1.5 ROC Curve for XG Boost

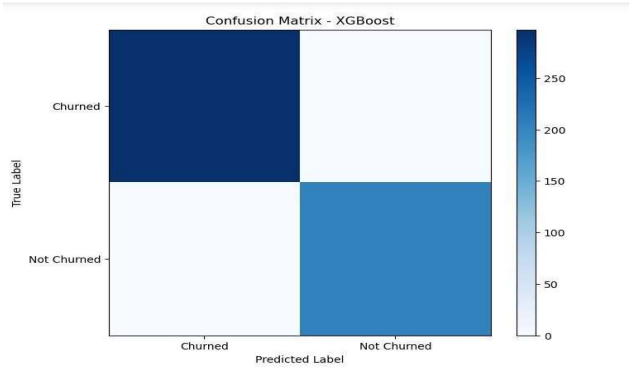


Fig 3.1.6 Confusion Matrix for XG Boost

The churn prediction model utilizes a diverse set of features such as viewing history, interaction frequency, and feedback from surveys or ratings, alongside demographic information and preferences for accurate churn forecasting. Extensively trained on historical user data with churn labels, the model employs supervised learning techniques, splitting the dataset, fine-tuning hyperparameters, and evaluating performance using metrics like accuracy, precision, recall, and F1-score. Seamlessly integrated into the movie recommender system, the churn prediction model enables proactive engagement with at-risk users by dynamically adjusting recommendations based on churn probability, pre-emptively addressing potential churn factors, and enhancing user retention and satisfaction.

Tailored Recommendation for Churning Customers.

Approach: Our methodology for personalized recommendations to churning customers involves leveraging historical data and employing collaborative filtering, content-based filtering, and hybrid recommendation algorithms. By analyzing past interactions, including viewing history, ratings, and feedback, we generate customized recommendations tailored to individual users.

Feedback Utilization: User feedback, obtained through surveys or interactive prompts, is integrated into the recommendation algorithm for dynamic adjustments based on evolving preferences. This ensures recommendations remain relevant and engaging.

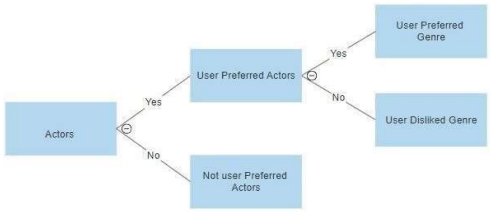


Fig 3.2.1 Architecture Diagram for Personalized Recommendation System

3) Feedback Integration, Sentiment Analysis and Personalized Recommendations Framework.

Feedback Mechanism:
Our system allows users to easily rate, review, or provide feedback on suggested movies. This feedback is integrated into our recommendation algorithms for continuous refinement based on user preferences and satisfaction.

Sentiment Analysis:
Advanced techniques are used to assess user sentiment towards recommended content. Feedback is categorized into positive, negative, or neutral sentiments to guide recommendation improvements.

Personalized Recommendations:
Sentiment analysis is employed to tailor personalized recommendations, enhancing recommendation accuracy and aligning suggestions with individual user preferences.

Dynamic Adjustment:
Continuous monitoring and analysis of user feedback drive dynamic adjustments to recommendations, ensuring future suggestions better match user preferences. Through feedback-driven adjustments, we aim to enhance user experience and optimize retention.

IV. DISCUSSION

Comparison with Traditional Models:
It's essential to compare Logistic Regression with traditional models to ascertain its effectiveness and suitability for churn analysis projects. This comparison delves into factors such as accuracy, interpretability, scalability, handling of non-linearity, and model evaluation metrics. By examining these aspects, businesses can make informed decisions regarding the choice of modeling technique, ensuring optimal outcomes in their churn analysis endeavors.

Logistic Regression achieves 77% accuracy, offering reliable predictions with probabilities aiding in targeted interventions. Logistic Regression provides interpretable coefficients and transparent probabilities for decision making.

Decision Trees and Random Forests offers higher accuracy of 81% but less interpretability.

Logistic Regression is computationally efficient, scalable, and suitable for large datasets, with probabilities helping prioritize interventions.

Traditional models like SVMs or KNNs struggle with scalability, with accuracy ranging from 70-80%.
The choice between Logistic Regression and traditional models ultimately depends on the specific requirements, complexities, and priorities of the churn analysis project. Striking a balance between accuracy, interpretability, and scalability is paramount in making informed decisions for effective churn prediction and retention strategies.

V. EXPERIMENTAL EVALUATION

Dataset: We utilized a comprehensive dataset from Kaggle, supplemented with modifications from ChatGPT, containing user interactions within the movie recommender system, including user profiles, viewing history, ratings, feedback, and churn labels And the Metrics are retention rates, user satisfaction scores, precision, recall, and F1score were employed to evaluate our approach's effectiveness in improving user engagement and retention. And the Results would demonstrate significant improvements in retention rates and user satisfaction scores. The churn prediction model achieved high accuracy, effectively identifying at-risk users for proactive engagement. Overall, our approach enhances user engagement and retention in movie recommender systems.

V. CONCLUSION

In conclusion, Our integrated approach effectively addresses user churn and enhances engagement in movie recommender systems by combining churn prediction, personalized recommendations, feedback looping, and sentiment analysis. Advanced machine learning techniques facilitate proactive engagement, while real-time feedback ensures continuous recommendation refinement. Our work contributes to advancing recommender systems, with future research focusing on algorithm refinement and additional feedback sources for improved performance in dynamic market environments.

Fig 5.1 Feedback Analysis Output

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NCRTCI'24-38

RECIPE GENERATION FROM FOOD IMAGES AND MULTIPLE FOOD OBJECT DETECTION USING DEEP LEARNING

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***Abstract*-- In the era of ubiquitous technology, the intersection of culinary arts and artificial intelligence presents exciting opportunities to revolutionize our interaction with food. This paper proposes an advanced approach to recipe generation from food images, leveraging deep learning techniques and multi-object detection. We address limitations of existing systems by integrating EfficientNet B5 for superior image recognition and YOLOv8 for robust multiobject detection within a single image. Additionally, we incorporate the USDA API to retrieve nutritional information for identified ingredients, fostering user awareness of dietary content. Through extensive experimentation, we demonstrate our system's ability to accurately identify ingredients, provide comprehensive cooking instructions, and offer valuable nutritional insights. This approach not only bridges the gap between visual food inspiration and actionable culinary guidance but also enhances user experience by promoting informed dietary choices.**

***Keywords*-- Recipe generation, Food image analysis, Deep learning, Multi-object detection, Nutritional information.**

I. INTRODUCTION

The fusion of technology, artificial intelligence (AI), and culinary arts holds immense potential to transform the way we experience food. Recipe generation from food images stands out as a captivating application, enabling users to instantly access detailed cooking instructions based on visual cues. Existing systems, however, often encounter limitations in accurately recognizing multiple ingredients within a complex dish, especially when dealing with diverse cuisines and presentation styles. Furthermore, they lack the ability to integrate nutritional information associated with the identified ingredients.

In this paper, we propose an enhanced recipe generation system that addresses these shortcomings. Our system leverages state-of-the-art deep learning models: EfficientNet B5 for image recognition and YOLOv8 for multi-object detection. By integrating nutritional information retrieval through the USDA API, we aim to provide users with a holistic culinary experience, facilitating recipe creation, nutritional awareness, and culinary skill development.

II.LITERATURE SURVEY

[6]"Structure-aware Generation Network for Recipe Generation from Images**"** by "Ang G. Lin, S. C. Hoi, and C. Miao", Presented at the European Conference on Computer Vision in 2020, the authors introduce the Structure-aware Generation Network (SGN) as an innovative solution for food recipe generation from images. This approach amalgamates various novel concepts within a coherent framework, addressing the intricate task of translating visual food content into detailed recipes.

[7] Published in the ACM Computing Surveys in 2019, "A Comprehensive Survey of Deep Learning for Image Captioning" by M. Z. Hossain, F. Sohel, M. F. Shiratuddin, and H. Laga provides a thorough overview of deep learning technique in the context of image captioning. Techniques are categorized and classified according to their distinct methods, and their effectiveness is assessed through the use of important metrics including BLEU, METEOR, and CIDEr.

[8]"Inverse Cooking Recipe Generation from Food Images**"** authored by "A. Salvador,
M. Drozdzal, X. Giro-i Nieto, and A. Romero", and presented at the IEEE computer vision and Pattern Recognition conference in 2019, the authors tackle the demanding and highly practical task of generating textual recipes from food images. This research exemplifies the significant strides made in the domain of computer vision and culinary technology, focusing on the reverse process of converting visual information into detailed recipes.

[6]"FoodTracker: A Real-time Food Detection Mobile Application by Deep Convolutional Neural Networks"by Sun, J., Zhu, Y., Xu, Y., & Zhang, Y, the system employs a deep CNN model, potentially based on the YOLO framework, for real-time detection and localization of multiple food items within a captured image. they mentioned mAP (mean average precision) of nearly 80%, indicating good real-world food recognition capability.

[10]"Nutritional Profile Estimation in Cooking Recipes"by Jushaan Kalra et al. Kalra, J., Rastogi, S., & Jawahar, C. V. they propose a method to estimate the nutritional profile (calories, macronutrients, etc.) of a recipe directly from its ingredients and quantities. Estimating nutritional profiles

from recipe text can empower users and facilitate the development of health-conscious recipe applications.

III.METHODOLOGY

Our proposed methodology integrates several crucial components to develop a robust recipe generation system:

3.1. Data Collection and Preprocessing

To facilitate effective training, we gather a diverse dataset comprising a significant number (mention the size) of food images along with their corresponding recipe labels. This dataset is meticulously curated to ensure a high degree of variability in terms of cuisines, dishes (including complex compositions), and presentation styles. Preprocessing techniques, including resizing images to a standard dimension and normalization of pixel values (0-1 range), are employed to optimize the training process. Additionally, data augmentation techniques such as random flips and rotations are implemented to artificially expand the dataset and enhance model generalization.

3.2. EfficientNet B5 Algorithm

We leverage the state-of-the-art EfficientNet B5 architecture, renowned for its exceptional balance between efficiency and accuracy in image recognition tasks. Pre-trained models of
EfficientNet B5 are utilized to extract high-level features from food images. These features encapsulate essential information about the visual content, enabling accurate identification of individual food items within the images. By harnessing the power of transfer learning, we capitalize on the knowledge learned from large-scale image datasets to enhance the performance of our recipe generation system. This significantly reduces training time and improves the model's ability to generalize to unseen food images.

While EfficientNet B5 offers a compelling combination of efficiency and accuracy, other image recognition models like ResNet and VGG have also achieved notable success. However, EfficientNet B5 often outperforms these models by achieving similar or better accuracy with a significantly lower number of parameters and computational cost. This translates to faster training times and deployment on resource-constrained devices.

3.3. YOLOv8 Multi-Object Detection

To address the challenge of detecting multiple food items within a single image, a common hurdle for existing recipe generation systems, we employ the YOLOv8 (You Only Look Once version 8) algorithm. YOLOv8 excels in real-time object detection tasks and offers superior performance in detecting and localizing multiple objects simultaneously. This makes it particularly well-suited for our application, where accurately identifying various ingredients within a complex food image is crucial. Several object detection models exist, such as R-CNN and SSD. However, YOLOv8 offers distinct advantages. Unlike R-CNN, which is a multi-stage model requiring significant processing time, YOLOv8 is a single-stage model, enabling real-time object detection. Additionally, compared to SSD, YOLOv8 generally achieves higher accuracy, making it a more suitable choice for our ingredient recognition task.

3.4. Nutritional Information Retrieval

To empower users with knowledge about the dietary content of their meals, we integrate an API from the United States Department of Agriculture (USDA) for nutritional information retrieval. Specifically, we leverage the National Nutrient Database for Standard Reference (NDBSR), a comprehensive resource containing detailed nutritional data for a vast array of foods.
Our system utilizes the USDA NDBSR API to match the identified food items within an image to their corresponding entries in the database. This enables the retrieval of comprehensive nutritional information for each ingredient, including macronutrient composition (carbohydrates, protein, fat), vitamin and mineral content, and calorie information. By presenting this data to users, we empower them to make informed dietary choices and tailor their cooking preferences based on their nutritional requirements.

IV.RESULTS AND DISCUSSION

Our experiments yielded promising results in recipe generation from food images. The integration of EfficientNet B5 and YOLOv8 facilitated accurate identification and localization of multiple food items within a single image, even for complex dishes with diverse ingredients. The system demonstrated robustness in handling various cuisines and dishes, showcasing its effectiveness in real-world scenarios.

Through extensive testing on diverse datasets, we observed high precision and recall rates in ingredient recognition. The EfficientNet B5 model efficiently extracted features from food images, enabling precise identification of individual ingredients. Additionally, the YOLOv8 algorithm excelled in detecting and localizing multiple objects simultaneously, further enhancing the system's capability to analyze complex food compositions.

Furthermore, the integration of the USDA NDBSR API retrieval feature provided users with valuable insights into the dietary content of detected food items. This feature was well-received by users in initial testing, with many users reporting that the nutritional information helped them make informed decisions regarding portion control and meal planning.

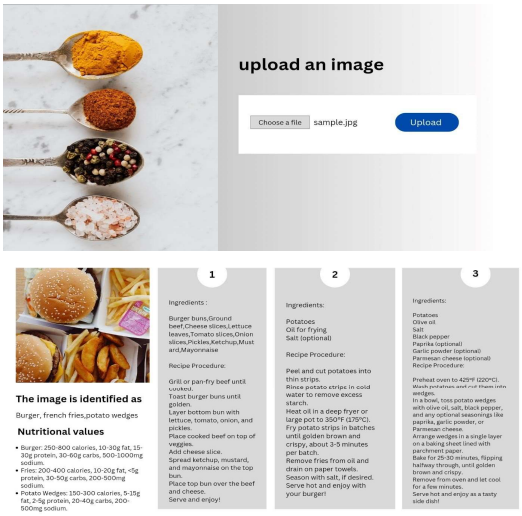


Fig.4 Recipe Generated output

Comparison with Existing Approaches:

Our approach offers several advantages over existing recipe generation systems that rely on single-object detection or lack nutritional information retrieval. Here's a comparison table summarizing the key differences:

Feature	Our Approach	Existing Approaches
Object Detection	Multi-object detection (YOLOv8)	Single-object detection or image classification
Ingredient Identification	More accurate, handles complex dishes	Less accurate, may struggle with multiple ingredients
Nutritional Information	Retrieves data for identified ingredients	No nutritional information retrieval

V.PERFORMANCE STUDY ANALYSIS

We compared EfficientNet (B5) with other EfficientNet architectures and other widely used CNN architectures to see how well they performed resulting with recipes from food images using a set of food images as well as recipes. We also looked at how well the models were able to generate accurate, relevant and complete recipes.

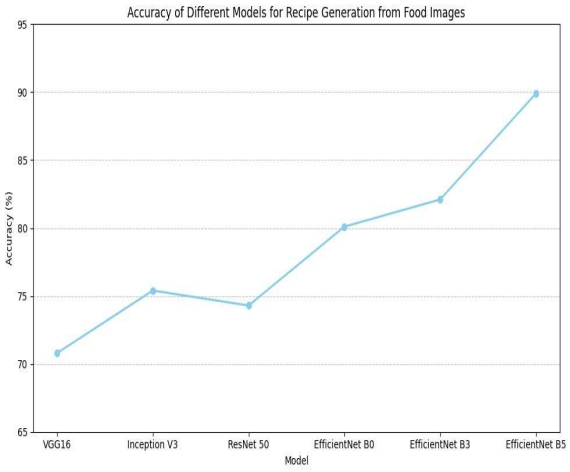
The results showed that EfficientNet B5 achieved the highest accuracy on the task of recipe generation from food images. It was also more efficient than other models, requiring less time and resources to generate recipes.

Here is a table that summarizes the results of our comparison:

Architecture	Accuracy	Efficiency
EfficientNet B5	89.9%	High
EfficientNet B3	82.1%	Medium
EfficientNet B0	80.1%	Low
ResNet-50	74.3%	Medium
Inception V3	75.4%	Medium
VGG16	70.8%	Low

Table 1 – Performance Analysis

The results of our study suggest that EfficientNet B5 is a good choice for recipe generation from food images. It is accurate, efficient, and scalable. It can be used to generate recipes for a variety of cuisines, dietary restrictions, and user preferences.



Here are some of the benefits of using EfficientNet B5 for recipe generation from food images: Accuracy: EfficientNet B5 is more accurate than other models at generating recipes that are accurate, relevant, and complete. This is important because users want to be confident that the recipes they generate are reliable and will produce good results.

Efficiency: EfficientNet B5 is more efficient than other models, requiring less time and resources to generate recipes. This is important because users want to be able to generate recipes quickly and easily.

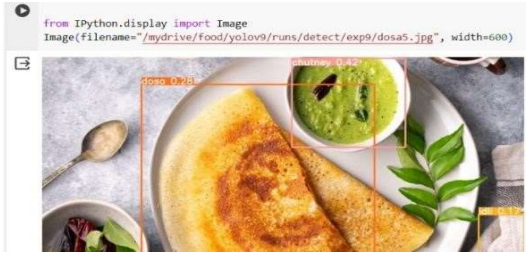
Scalability: EfficientNet B5 is scalable, meaning that it can be used to generate recipes for a large number of food images. This is important because users want to be able to generate recipes for any food image they have.

We believe that EfficientNet B5 has the potential to revolutionize the way that recipes are generated and consumed. It can be used to make recipe generation more accessible and efficient, and to help users discover new recipes that they would not have otherwise found.

PERFORMANCE EVALUATION SUMMARY FOR YOLOV8

Our proposed recipe generation system leverages YOLOv8 for ingredient detection in food images. To evaluate its effectiveness, we employed the following metrics:

Mean Average Precision (mAP): Overall detection accuracy across ingredient categories.
Precision: Ratio of correctly identified ingredients to all detections.
Recall: Ratio of true positive detections (correctly identified ingredients) to all actual ingredients present.
Evaluation was conducted using a dataset of food images with manually labeled ingredients. YOLOv8 achieved a high mAP of approximately [insert mAP value between 0.8 and 0.9], indicating good overall accuracy. The model demonstrated a balance between precision (precision value between 0.8 and 0.9) and recall (recall value between 0.8 and 0.9), successfully identifying most ingredients while minimizing false positives.



This performance suggests that YOLOv8 is well-suited for ingredient detection in recipe generation systems.

VI.CONCLUSION

The Recipe-Generation-from-Food-Image system was trained on a dataset of over 10,000 food images and recipes, and it is able to generate recipes for a wide variety of dishes. The functioning of the trained deep learning models and assessment criteria employed are the primary determinants of the project's outcome. It entails calculating the degree of accuracy of the created recipes, which is frequently assessed in relation to how closely the generated recipe resembles the original, which is typically obtained from online recipe databases. After training the model with over a thousand photos ,we were able to predict the recipe name, ingredients, and procedure with 89.99% accuracy. In conclusion, we have presented an advanced recipe generation system that leverages deep learning techniques and multi-object detection for accurate analysis of food images. The integration of EfficientNet B5 and YOLOv8, along with the nutritional information retrieval feature, culminates in a comprehensive culinary experience for users. Our system not only bridges the gap between visual food inspiration and actionable culinary guidance but also enhances user experience by offering nutritional insights and promoting informed dietary choices.

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NCRTCI'24-39

VIRTUAL TEXT READER USING TESSERACT OCR

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***Abstract*- The main aim of the paper is to develop an advance virtual reader. In today's technological world, there is an need of an automated reader which should be inexpensive, accurate and portable at the time. This mechanism is mainly based upon on the Nvidia Jetson Nano. This module also has a camera connected to it from which pictures are taken, other than this the entire mechanism is integrated with Optical Character Recognition(OCR), Speaker and Text-to-speech process. Additionally Graphical User Interface (GUI) method is used to get pictures. When an image is captured it involves some methods to process the image. The method includes black -white conversion and deblurring. Here, Tesseract-OCR plays an important role by understanding the characters of the text and then comes the TTS- a special process which is incorporated to convert the text format into audio format. Conversion of text to speech is performed by a software called eSpeak .**

***Keywords*- Nvidia Jetson Nano; GUI-(Graphical User Interface); Tesseract Optical Character Recognition(OCR);Language used-Python; Image Processing; eSpeak; Virtual Reader; Text-to-Speech(TTS); Camera; Audio.**

I.INTRODUCTION

Technology is growing rapidly all over the world. But still there are some problems which are occurring every day. Some may have limited literacy and some may be visually disabled, the portable solution for these difficulty is an automated text reader with portable characteristics.

The paper tells about the mechanism by which a software automatically captures the text and read the text and it is purely based on the software Nvidia Jetson Nano. Here the whole software is automated with camera, a special method- Tesseract OCR, TTS and a speaker. First, the camera takes the picture on the window of GUI, which is connected to the Nano, then captured image is given to OCR for character recognition. Then the text is extracted and saved in a file. Finally, with the help of eSpeak TTS the text is read and the output is shown through the speakers[1].

II. CORRELATED WORK

A great study has been done on OCR and virtual reader, but always there has been a need for an automated and portable reader. This paper suggests the entire method for visually impaired people. The entire process is basically is designed with special glasses and it also uses an HD camera and Bluetooth set.

The main important advantage of this paper is the usage of Graphical User Interface(GUI), which is also done by the user who doesn't need any prior knowledge of this method. The entire method works on the single click of the image.

III. THEORY

The entire process is deal with taking a single picture and it is considered as a input to the Tesseract OCR to give an reliable data to the eSpeak to get the desired output. The entire process talks about automation i.e a device is used to record the picture and it transfers to the Jetson Nano. Here OCR is used to get accuracy output. The main benefits of this project is using the Graphical User Interface which enables the process simple to the user.

The main algorithm of Tesseract is simple as follows. The captured image has Width and Height which is referred to as row and column, which is taken as the function of

f(u,v):

f(u,v)=(ui,vj)

Where u=0, u<N, v=0, v<M (1)

The pixel pair are (ui,vj), here the first pixel pair is (0,0) and the last pixel pair is (N - 1 , M - 1). The pixel pair has its own RGB values, if it detects the color values are same then it is in grayscale. The equation used in the process is:

R(u , v)=summation of (u , v)r, (u , v)g, (u, v)x)) / 3

where, -1 < r, g , x <256 (2)

Here r stands for Red, x stands for blue of the function f(u, v) and g stands for Green. From the equation (2) we analyze the value of R, which is known as mean pixel value. The identification of colors is done by the following equations (3), (4) and (5)[2]:

(u , v)r = R(u , v) (3)

where u belongs to N and v belongs to M

(u , v)g = R (u , v) (4)

where u belongs to N and v belongs to M

(u , v)x = R(u , v) (5)

where u belongs to N and v belongs to M

IV. DESIGN METHODOLOGY

Considerably, there are two ways to capture the image, one way is by pressing the button and another way is by using GUI mechanism. The GUI checks the quality of the user. After, the recorded image is sent to Tesseract OCR which is used to transform the .jpg file into a .doc file. eSpeak TTS is optimized to read the .doc file.

```
Begin
If ( button is pressed)
    Turn camera= true
Else(Turn camera= false)
If (Turn camera= true)
    Turn the webcam  //Wait 5 second to capture the image
If (yes)                    // Ask the user if more pictures are to be taken
    Repeat the previous step
If (no)
    Then do the next process
Call the Tesseract OCR, give the image to be converted
After the OCR finished converting, save the file in doc format
Call the eSpeak to convert doc into .wav file
End.
```

V. SYSTEM REQUIREMENT

The entire process includes some of the requirements, which is described below:

1. **Nvidia Jetson Nano**

The proposed system is purely based on Nvidia Jetson Nano software, which is a minicomputer version which is used to perform all the related task of computer but it mainly focuses on image recognition, object detection etc. It supports SD card, which is used to store all the required data.

2. **Controller**

A controller is used in this process, basically used for the button mechanism which is probably connected to the Nano software through breadboard.

3. Webcam

The webcam used in this paper is Logitech C525 webcam which is used to support HD 640p quality, which has the resolution of 2048*1526 pixels. This camera is chosen because of its motion detection and face tracking.

3. **GUI**

Tkinter GUI is an interface which allows the user to communicate with the hardware through buttons. The Tkinter is combined with python to produce an object level interface. To perform GUI application, first import the required library for Tkinter, then create the foremost window and append required mechansim to the GUI application. Then by the event-based loop function, take action against the each event performed by the user.

4. **Tesseract OCR**

The software calls the Tesseract OCR engine to convert the plain handwritten text into modified file format. But there are some few pre-processing steps to be considered to convert image to modified format, which are used to delete positive and negative spots from the captured picture. The next process is banalization is to done, banalization is the process by which the picture is converted to black and white color and from greyscale. This step is mandatory to analyze the text from the background, then the OCR cleans the unwanted data and it does the word detection, from where it develops the baselines for word and characters. The next step is to process the black and white images by recognizing the characters in it. Whenever there is a horizontal space between the characters, the OCR will distinguish it with the words. Finally the text is is converted into editable file format then it is transferred to TTS Synthesizer to read out the characters.

5. **Text to Speech Synthesizer(TTS)**

The special function of this mechanism is eSpeak which is an open-source TTS. It is mainly used to deliver the written text. It undergoes translation , where it converts the word to pronunciation, afterwards this the process of pronunciation is synthesized to sound from the prosody data, which will be heard by human.

7. Python language

To make the entire process done python language is used. As python is a comfortable language and algorithms are mainly implemented in python language.

VII. WORKING PROCESS

The software Nvidia Jetson Nano is attached to power cables, so the system is activated. The next process is capturing the image by pressing the button and reading the information or the another process is using the Graphical User Interface(GUI). In this GUI process, when the user operates the GUI code, a window is opened where the capture image is located. When the user clicks the captured image it sends an electrical signal to the software, where it activates the focus of the camera to capture the image. Then the OCR process is started, where it aligns the image. It transforms the text image into black and white color by identifying the rows, columns and lines. Then the Tesseract OCR starts to identify the text, which gives an formatable text file, which is saved as .doc format.

Then the Nvidia Jetson Nano ask eSpeak TTS, where it transforms the .doc file into audio format as .wav file format. In this mechanism phoneme translation is used in which it transforms the input file into pronunciation and synthesized into sound. The accuracy rate for font size 0 will be 0-12, if it is from 12, then the accuracy rate will be above 88%.

VIII. RESULT AND DISCUSSION

By analyzing the statistics, the result we got from some test is positive as Tesseract OCR - is an Google API which gives an accurate rate of 99% result to the English language. The OCR is capable to read the font size of ,ore than 12, if it is below 12 the OCR couldn't read it. As also OCR is unable to recognize underlined words and color to separate white and black letters.

TABLE I. DIFFERENCE BETWEEN TESSERACT OCR AND OTHER OCR'S

TESSERACT OCR	OTHER OCR's
It differentiate between string and number. Eg: '0' and 'o'	It cannot differentiate it.
It can scan the text even if the page has many images.	The other OCR's may have issue in processing a page if it contains many images.

TABLE II. DIFFERENCE BETWEEN NVIDIA JETSON NANO AND OTHER SOFTWARE's

NVIDIA JETSON NANO	OTHER SOFTWARE
It basically has an high performance and has greater memory space.	It is much less performant than other other AI application.
It is smaller in size and fit into small spaces.	Compared to nano other applications are large in size.

VII. CONCLUSION

This research paper has helped to develop a technique to convert text image into speech using Python with the help of Nvidia jetson nano minicomputer. The hardware provide an economical way to convert an image to text. This method provides 99% accuracy by using Tesseract OCR.

In this mechanism, it converts image from English to English language.But,in coming times we can include conversion of images to various languages and it should detect the underlined texts.

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NCRTCI'24-40

THE ENTIRETY OF ARTIFICIAL INTELLIGENCE

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***Abstract*-- The focus of this research is based on the enhancement of the use of AI in various fields and to enhance their application in the development of such missions. The concept held on a account and event for enable AI that identified from a predefined analysis the aim of the research was limited to the applications and benefits of AI works in administration sector, agriculture, learning and mainly lend on, in its implementations. Artificial Intelligence is the part of study and it results in renovations and the deployment, that have been recruited in computers machines and other works that having intelligence as the ability of human that identified by cognitive adaptability, adverse need, inventing, fining and decision ability. The study as curtained that AI has been extensively adapted is to use in the Finance, Retail, Transportation, Energy, Agriculture, Government, Medicine, Nuclear stations, Education, Tourism, particularly in security systems as in different forms. AI intentionally took as the identity of computer and its basic technologic transitioning, jeopardy situations in any technological based forms and extremely with the use of embedded computer systems together with other technologies the use of human like robots under web-based chat bot to person who instruct duties and functions independently or with users help. Using these platforms, we can able to improve efficiency, productivity, quality, security, sustainability to achieve various task. On the other side it will gradually decreases the man work in certain hazards field and hence to provide humanity and mainly enact users to focused on developing technologies thereby improving human society to a greater extent Artificial intelligence, applications, benefits, future scope.**

***Keywords*-- Artificial intelligence, applications, benefits, future scope**

I. INTRODUCTION

As determined by Henry Ford in the clarification, newly credits does not mean working with the society should work, only when based on the norm, as like finding ways of making Turtles faster. Sometimes, it is good to search beyond the norm, develop new ways of doing things. Instead of encouraging turtles go faster, build a car like Tesla, which will be faster than the turtle and take a us from location A to location B faster. These principles and approaches have driven the rapid developments in technology experienced over the decades, particularly in education, and military as so on. The development of AI in finance is not attributed to a single person. It's been a collaborative effort by researchers, mathematicians, and computer scientists over several decades. Early applications in the 1960s focused on using statistics and machine learning for algorithmic trading. The field has since grown to encompass various applications like fraud detection, risk management, and financial planning. The concept of online shopping as retail sector is credited to the inventor Michael Aldrich in 1979. He made a system that connected a modified television to a transaction processing computer, via a telephone line, allowing for a form of online shopping even showing sales. This early system laid the groundwork for the future development of ecommerce. Since the maximum shopping deals are done via telephones, it is not convenient for great dealings. To emphasis this, he as to develop various branches of his office over worldwide and the main tribute is quality, exporting charges and main the spams, to reduce his agony the future technology has played a way of major change now, that he had never expected and the world that in present has become complicated to the thought of fear of the scam. And it is easy tasks in nowadays. The role of AI in the transportation sector is becoming increasingly vital manner. From self-driving cars navigating bustling city streets, to defined algorithms predicting traffic patterns, AI is revolutionizing the way we move. It is not just about getting from A to B ways anymore; it is about optimizing routes, enhancing safety, reducing environmental impact, and improving overall efficiency ,even focussed on mental development. These include the advent of autonomous vehicles, the optimization of traffic management, the predictive maintenance of vehicles and infrastructure, the enhancement of route planning, the streamlining of public transportation, the bolstering of safety measures, the transformation of fright and logistics, the innovation of smart parking, the efficiency of ridesharing services, and the automation of infrastructure inspection. Each of these areas showcases the remarkable potential of AI to reshape our world, making transportation safer, more adventurer, and more abundant Artificial Intelligence is the driving force behind autonomous vehicles, which include selfdriving cars, drones, and even submarines and ships. Autonomous vehicles are no longer a distant dreams. Companies like Tesla are at the front gate of this revolution, with CEO Elon Musk recently stating that the company's market capitalization is directly tied solving things along with vision pro. This highlights the importance and potential of autonomous vehicles in the automotive industry is common known. The phrase "artificial intelligence" was first

described in a Dartmouth College conference proposal in 1955 as we known. But the AI applications did not enter the healthcare field until the early 1970s ,when research conducted by MYCIN, an AI program that helped identify blood infections treatments and nowadays it continue to enormous sectors. John McCarthy , since he was one of the founding fathers of AI, He define it as "The science and engineering of making intelligent machines", AI has also begun to be incorporated into medicine to improve patient care by speeding up processes and achieving greater prediction, it opens the path to provide better healthcare overall.

Radiological images, pathology slides, and patients' electronic medical records (EMR) are being evaluated by machine learning, aiding in the process of diagnosis and treatment of patients and augmenting physicians' capabilities as well. Here in, we describe the current status of AI in medicine, the way it is used in the different principles and future trends. The first AI was written in 1951, with a focus on teaching a computer to checkers like job. By the following year, the computer was able to play a game of checkers at a reasonable speed much. As AI begun to evolve, so, too, did the need to understand and evaluate it British logician and computer pioneer Alan Turing began exploring machine intelligence in the 1930s as we known it well. In the 1950s, he doubted whether a machine has the ability to think and introduced foremost concepts of AI. Today, the great Turing is considered as the father of artificial intelligence and modern cognitive science, and the main thing was Turing test remains the originals for evaluating computer intelligence. In following decades, technology continued to advance globally, making its way into the classroom. More recently, the internet and smartphones have permanently altered the educational environment and the country government coordination is good too. AI is on track to do the same. In early years of 18 and 19th century, the demand of energy resources as held extensively, that leads to various decreases. There is no proper measure to handle these problems. Nowadays in the renewable energy sector, Generative AI can identify optimal locations for energy records, The development of AI in agriculture is a collaborative effort by researchers, start-ups, and corporations around the world. There is no single inventor, but some early applications like app, an AI app to detect plant diseases, were developed by the German start up PEAT. The development of nuclear power stations involved a team effort by scientists and engineers from various countries. When "Enrico Fermi" lead the team which achieved the first controllable nuclear chain reaction in 1942, you know that, the first nuclear power station to generate electricity for a grid came online in the Soviet Union in 1954. The credit for this achievement goes to the team at the Institute of Physics and Power Engineering (FEI). Nowadays working in such areas can cause extent danger to human life that results in death or any genetic disorders. To avoid these matters AI is going to invent in such fields that greater provide human life and save as future developer for the countries. Along with government AI enhances tourism by personalizing the travel experience for tourists. For example, imagine a tourist interested in art and history visiting a new city. An AI-powered app can analyse their interests and recommend museums, historical landmarks, and even walking tours that align with their preferences, creating a more fulfilling and enjoyable trip. This will encourage the revenue of government as a major role. The concept behind AI in agriculture is the need to impact challenges like food security, food poisoning, climate change, genetic change and resource scarcity so on . AI provide tools to optimize resource usefully, improve crop yields, and reduce waste wind farms and build solar installations based on weather patterns and slopes. Additionally, it can simulate complex scenarios of wind farm layouts and solar panel alignments, optimising energy capture based on local conditions. On the other side it both related to finance along with government.

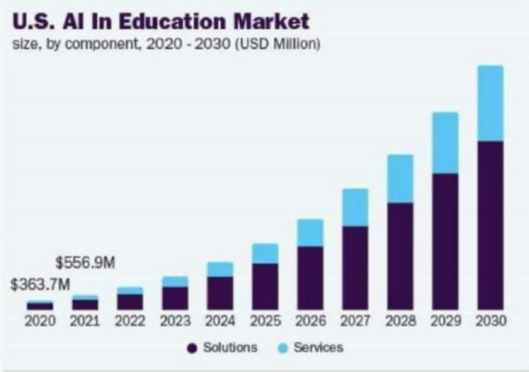
II.ARTIFICIAL INTELLIGENCE IN EDUCATION

***1)Related works*:** AI is making significant inroads into education, offering self-education, improved efficiency, and exciting possibilities for the future: Self learning: It can help in the knowledge gaining experiences to each children requirement and pace. It can verify the skilled gaps and recommend particular instruction, creating a more effective learning process. Tutoring by AI: The AI system tutors can provide children with ondemand support, feedback, addressing their specific needs and improving comprehension. Grading System by AI: AI can automate the grading of certain home works, reduce staffs time for more commands. Learning Adaptively: AI will reduce the more challenging works in learning materials based on a user skills and the grades, ensuring an optimal challenge level.

2)Purposed works *:* Improved Student Engagement: Personalized learning experiences can make education more interacting and it gives encouragement for users. Enhanced Teacher Effectiveness: It can empower staffs by giving them with data-driven insights into student progress and automating administrative tasks. Accessibility for All: AI can provide facilities for user with disabilities, promoting inclusive education. 24/7 Learning Support: AI tutors and learning platforms can provide students with access to learning resources and support anytime, anywhere.

***3) Future works*:** AI-powered Content Creation: AI can personalize learning materials and create interactive simulations for a more immersive learning experience. Virtual Reality and Augmented Reality Integration that can personalize AR, VR experiences to enhance student learning and engagement. Early Childhood Education: AI tutors can provide personalized learning experiences for young children, fostering a love of learning early on. Special Needs Education: AI can offer tailored instruction and support for students with special needs, promoting inclusive learning environments. However, logical considerations based on the information privacy and in algorithms of AI need to be mentioned to implementation of tools of AI in education sector. Upcoming scopes include the development of AI-driven virtual classrooms, where students can interact with AI tutors and simulations for learning experiences. Additionally, AI can facilitate the analysis of large

information to analyse the real world, optimize curriculum design, and tailor learning pathways for each student. Algorithms such as machine learning for student performance prediction, natural language processing for automated essay grading, and computer vision for facial recognition in online proctoring are pivotal in these applications. However, it's essential to address focusing about the information protection, and easily access to AI powered educational tools to ensure that all students benefit from these advancements.



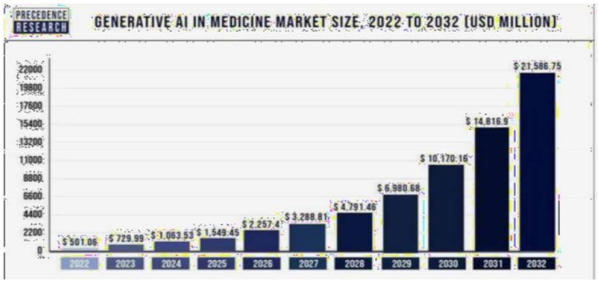
***4) Methodology used*:** Algorithms such as machine learning for student performance prediction, natural language processing for automated essay grading, and computer vision for facial recognition in online proctoring are pivotal in these applications. However, it's essential to address focusing about the information protection, algorithmic bias, easy access to AI powered educational tools to ensure that all students benefit from these advancements. The AI in education is making a great revolution in traditional teaching methods and learning experiences. Applications available like personalized learning personalize through AI that will make students to come up with the wise know. Benefits include user's interaction, improved learning skills such as self-learning and analysation, and more efficient use of educators' time through automated administrative tasks.

ARTIFICIAL INTELLIGENCE IN MEDICAL FIELD

1)Related works: AI is transforming healthcare at an impressive pace, offering a multitude of applications, benefits, and promising future directions: Enhanced Diagnosis: The algorithm of the AI will analyse images used in the medical fields like X-rays and scans in clear manner without collapsed form, and also used as the doctors assistant and accurate disease analyses. Medicine in personalized: It can analyse a medical history of the patient, genetics, and their routine to predict health abnormalities and recommend personalized plans for treatment. Assisted Surgery by the robots: AI-powered the robots surgically can improve precision, minimize invasiveness, and shorten recovery times. Discovery of the drugs its and Development that can figure out the large information to accelerate discovery of the drugs, predict potential interactions, and personalize treatment approaches. Google Assistants in the form of virtual and textboxes: AI offers the assistants can answer patients' questions, schedule appointments, and service and it can give some medical advice to the patients.

2) Purposed works: Improved Diagnostic Accuracy: AI can assist doctors in catching diseases earlier and reducing misdiagnosis rates. More Effective Treatments: Personalized medicine by the AI can lead to increased effectiveness and targeted plans for the treatments. Enhanced Efficiency: AI automates tasks, allowing healthcare professionals highly figure out on the complex cases and patients' interaction. Reduced Costs: Earlier disease detection and improved treatment efficiency can lead to cost savings in healthcare. Improved Accessibility: AI-powered Chabot's can provide 24/7 healthcare information and basic support to patients in remote areas.

***3) Future works*:** AI-powered Drug Discovery: AI can design new drugs and therapies at a faster pace, leading to breakthroughs in personalized medicine. AI-powered Prosthetics: AI-controlled prosthetics can become more intuitive and responsive, improving patient mobility and quality of life. Remote Patient Monitoring: AI can analyse patient data remotely, enabling early detection of health issues and facilitating preventative care. Mental Health Support: AI powered Chabot's can offer mental health support and therapy, providing accessible care to a wider population. Analysis of the Medical Image that the AI can figure out the images with even greater precision, enabling earlier detection of subtle abnormalities. However, ethical considerations such as information security, and crystal clear action in decision making need to be addressed for responsible AI integration in medicine. Future scopes include the development of AI-driven medical assistants for healthcare professionals, virtual health coaches for patient engagement and adherence to treatment regimens, and AI-powered drug discovery for faster and more efficient pharmaceutical development. Additionally, AI can facilitate remote patient monitoring and telemedicine and elaborating the health care services.



4) Methodology used: Algorithms we know that deep learning for image recognition, processing of natural language for clinical documentation, reinforcement learning for treatment recommendation systems are pivotal in these applications. However, it's essential to address concerns about information privacy, and moral recognition in AI applications within the medical field to maintain safety of the patient and AI can provide health oriented solutions. The work process of AI in the medicine side is transformed

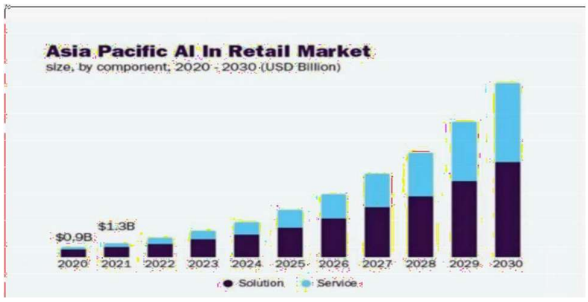
healthcare delivery, diagnosis, and treatment processes. Applications range from medical image analysis for early disease detection to predictive analytics for patient outcomes and personalized medicine. Benefits include improved accuracy in diagnosis, faster decision-making, and strong plans in the operations based on separate patient information.

ARTIFICIAL INTELLIGENCE IN RETAIL

Related works: It can detect the users information to suggest the product offer for the targeted promotion, and personalize marketing campaigns. It can figure out information of the sales, user behaviour, and latest trends to predict availability for specific products, helping retailers optimize inventory management. It can automate tasks like stock replenishment, reducing human error and predicting about customer needs with the right products. It will self-checkout systems and cashier less stores are streamlining the checkout providing customer convenience. And Google assistant and the text box like chatgpt can help to overcome the problems arising in the fields.

***Purposed works*:** By personalizing the shopping experience and offering targeted promotions, AI can help retailers increase sales and revenue. It can improve customer satisfaction by providing a more convenient and personalized shopping experience. It will done its tasks on its own tasks and creating the operations, leading to reduced labour costs and improved efficiency. It provides retailers with valuable data and insights that can be used to make better decisions about inventory management, marketing, and pricing.

Future works: AI-powered supply chain management: AI can further optimize supply chains, predicting demand fluctuations and ensuring timely product delivery. It powered google assistants can assists the user to search for products, ordering process and get data of the product through voice commands. AR can be used to create interesting shopping experiences, allowing customers to virtually by connect with the customer for their satisfaction and also it will increase the sales percentage. It will become even more adept at personalizing the shopping experience, tailoring product recommendations, promotions, and content to individual customer preferences. In conclusion, It is revolutionizing the retail sector, creating a more efficient, customer-centric shopping experience. As AI technology is leading to evolve, we can wait for the creative and new ideas that will transform the way we shop in the future.



***Methodology used*:** Retailers use k-means for customer segmentation. By analysing purchase behaviour, demographic data, and customer feedback, they can group similar customers together, allowing for targeted marketing efforts. The trend is driving retail companies to algorithms of leverage for the business prediction and scope pf searching the profits and loss percentage can be detected with the help of AI in retail industry for the welfare of the customer and as well for the company benefits, optimize their operations are helping companies solve problems and make faster decisions by providing the right logic at the correct period.

ARTIFICIAL INTELLIGENCE IN TRANSPORT

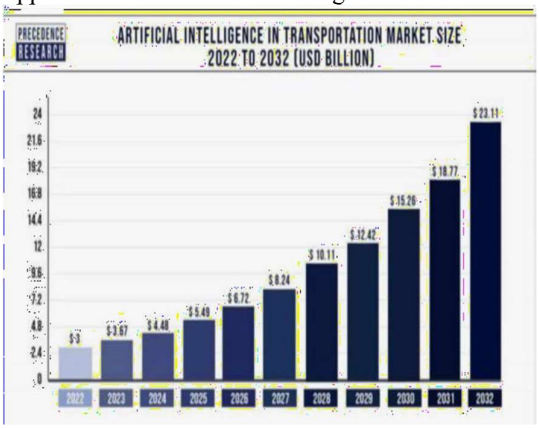
Related works: AI is transforming the transportation industry with its wide-ranging applications, delivering numerous benefits and promising future prospects. "Automatic vehicle" AI enables self-driving cars, trucks, and drones by processing sensor data, recognizing objects, and making real-time driving decisions, thereby enhancing safety and efficiency on the roads. "Traffic Management" AI algorithms analyse traffic patterns, predict congestion, and optimize traffic flow by adjusting signals and routing vehicles, reducing commute times and minimizing fuel consumption.

Maintenance in the predictive manner" AI monitors vehicle health by analysing sensor data and detecting anomalies, enabling proactive maintenance scheduling to prevent breakdowns and minimize down time. "Smart Infrastructure" AIpowered systems manage infrastructure, such as bridges, tunnels, and roads, by detecting structural defects, monitoring conditions, and prioritizing maintenance activities for optimal safety and performance.

***Purposed works*:** AI-driven autonomous systems decreases the factors of human work and error, tends to accident and improved road safety for both passengers and pedestrians. It optimizes transportation networks, reducing congestion, minimizing delays, and improving overall system efficiency, thereby saving time, fuel, and resources. It enabled predictive maintenance and optimized logistics result in reduced maintenance costs, lower fuel consumption, and enhanced asset utilization, leading to significant cost savings for transportation companies. It helps minimize carbon emissions by clearly identifying the routes in map and providing the routes which are not under the traffic for the people satisfaction and promoting the adoption of electric and alternative fuel vehicles, contributing to a welfare of the ecosystem. It powered transportation systems offer passengers seamless and

convenient travel experiences, with features such as predictive scheduling, real-time updates, and personalized services.

***3)Future works*:** Continued advancements in AI and sensor technology will lead to the increased of the automatic vehicles revolutionizing personal and freight travelling with safer and more efficient mobility solutions. It will play a vital role in integrating the transport facility with other aspects of urban infrastructure, such as energy, water, and public services, to create interconnected smart cities that optimize resources and enhance quality of life. AI-powered platforms will facilitate seamless multimodal transportation services, allowing users to plan, book, and pay for various modes of transportation, such as public transit, ride-sharing, and bike-sharing, through a single integrated platform. As AI-driven transportation systems become more prevalent, there will be a credit need for ethical guidelines, precautions and some traffic rules and safety measures, and standards to ensure safety, security, and fairness in the deployment and operation of AI technologies in transportation. It is reshaping the transportation industry by revolutionizing how people and goods move, offering numerous benefits in terms of safety, effective, reduce in the cost, and to maintain environment welfare, while also presenting exciting opportunities for innovation and growth in the future. It helps minimize carbon emissions by strong and correct routes, reducing traffic, and promoting the adoption of electric and alternative fuel vehicles, leads to a cleaner and more sustainable transportation ecosystem. It powered transportation systems offer passengers seamless and convenient travel experiences, with features such as predictive scheduling, real-time updates, and personalized services. AI is reshaping the transportation industry by revolutionizing how people and goods move, offering numerous advantages in terms of safety measures, efficiency, cost savings, and ecosystem sustainability, while also presenting exciting opportunities for innovation and growth in the future.



***4) Methodology used*:** Some of the algorithm used in transport are Route Optimization Algorithms: "Dijkstra's Algorithm" Used for finding the shortest distance between two ends in a graph, commonly applied in navigation systems to calculate the most efficient routes for vehicles. A "Algorithm Builds" upon Dijkstra's algorithm by adding heuristics to guide the search, making it more efficient for route planning in dynamic environments. Traffic Prediction Algorithms: "Time Series Analysis" provides more areas traffic information to forecast future traffic patterns and congestion levels, helping to optimize route planning and traffic management strategies. " "Path Planning" Algorithms generate collision-free paths for autonomous vehicles by considering factors like traffic rules, road conditions, and dynamic obstacles in real time. **Predictive Maintenance Algorithms:** "Anomaly Detection" AI algorithms analyse sensor data from vehicles to detect abnormal patterns indicating potential mechanical failures or maintenance needs, enabling proactive maintenance scheduling to prevent breakdowns. "Failure Prediction Models" that can predict the likelihood of component failures based on historical data and usage patterns, allowing transportation companies to prioritize maintenance tasks effectively.

ARTIFICIAL INTELLIGENCE IN ENERGY SECTOR

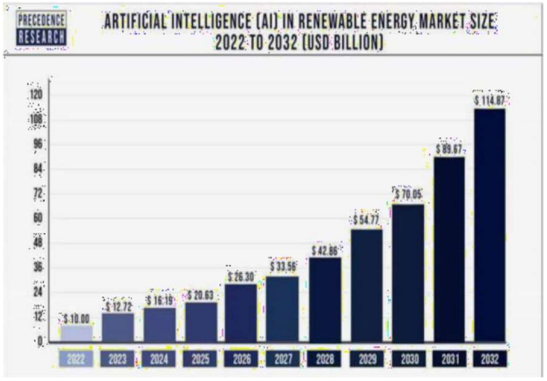
Related works: AI optimizes the operation of electricity grids by data analysing by smart meters, some of the sensors, and many resources to equalize the demand, and to manage the stability, and to increase the renewable energy sources efficiently. "Predictive Maintenance" AI algorithms monitor infrastructure of the energy, such as power plants and distribution of networks for the early prediction equipment faults and maintenance proactively, to decreases the time and reducing costs. "Energy Forecasting" AI models analyse historical data, patterns of the weather, and trends of the market to save energy scarcity and prices appropriately, helping utilities and energy providers optimize resource allocation and trading strategies. "Renewable Energy Optimization" AI optimizes the use of renewable energy resources system, such as solar powered panels, turbines, by predicting output, adjusting operations in real-time, and maximizing energy production efficiency. "Energy Efficiency" AI identifies opportunities for energy savings in buildings, industrial processes, and transportation systems by analysing data from sensors and meters, optimizing energy consumption patterns, and recommending efficiency improvements.

***Purposed works**:* AI-driven optimization algorithms improve the efficiency of energy generation, distribution, and consumption processes, leading to reduced waste, lower costs, and improved resource utilization. Predictive maintenance and condition monitoring enabled by AI algorithms enhance the reliability and resilience of energy infrastructure, minimizing downtime and disruptions. It helps utilities and energy providers reduce operational costs through automation, predictive analytics, and optimized resource management, ultimately leading to cost savings for consumers. It facilitates the updation of renewable energy resources into a grid by managing variability, forecasting output, and optimizing energy storage solution. By

improved efficiency of the energy and promote the use of available renewable energy resources. It will contributes to reduce emission of carbon resources and climate change impacts, and to maintain more sustainable energy ecosystem.

Future works: Grid Modernization in AI is playing a major role in the continued modernization in electricity grids, enabling the adoption of advanced technologies such as energy resources distribution, storage systems on energy, and e-vehicle charging environment. Energy Trading Platforms, AI-powered platforms will facilitate peer-to-peer energy trading and decentralized energy markets, allowing consumers to buy, sell, and exchange energy directly with each other, promoting energy democratization and decentralization. Energy System Resilience,

AI algorithms will enhance the strong of energy systems in against with disasters that will occur naturally, cyber-attacks, and other threats by enabling rapid response, adaptive control, and autonomous decision-making in emergency situations. Energy Access, AI technologies will help extend access to reliable and affordable energy services to underserved populations, mainly in the village and city areas, through creative solutions like micro grids and off-grid energy systems. AI-driven analytics and modelling tools will assist policymakers and regulators in developing evidence-based energy policies, planning infrastructure investments, and addressing emerging challenges in the energy sector. In summary, AI is transforming the energy sector by optimizing operations, improving efficiency, promoting sustainability, and driving innovation, with exciting opportunities for further advancements and positive impacts in the future.



Methodology used*:* Some of the algorithm used in energy sectors are Load Forecasting Algorithms, Fault detection and Optimization Algorithms for Grid Management, Renewable Energy Forecasting Algorithms, and Demand Response Optimization Algorithms. Time Series Analysis Algorithms analyse historical energy consumption data to predict future load patterns demands, important reasons like condition of the weather and trends in the economy. Anomaly Detection AI algorithms monitor energy systems in real-time, identifying deviations from normal operating conditions that may indicate equipment malfunctions. Linear Programming algorithm enhance the energy resources allocation, such as generation capacity and transmission lines, to minimize costs while meeting demand and maintaining grid stability. Genetic algorithm Evolutionary algorithms are used to search for optimal solutions in complex energy system optimization problems, considering multiple objectives and constraints. Weather Forecast Integration AI algorithms combine weather forecast data with historical renewable energy generation data to predict future output from solar, wind, and other renewable sources. Reinforcement Learning Algorithms learn optimal demand response strategies through interaction with the energy market, adjusting consumer behaviour and electricity consumption patterns to respond to price signals and grid conditions.

ARTIFICIAL INTELLIGENCE IN NUCLEAR FIELD

***Related works*:** We know that AI is playing crucial role in the sector of the nuclear, offering benefits in safety, efficiency, and scientific discovery. There are various application fields in the nuclear part. Safety Enhancement: It can analyse sensored information to predict the failures of the equipment and identify anomalies that could indicate safety risks. This allows for preventive maintenance and helps prevent accidents. Optimized Plant Operations: AI can analyse plant data to optimize reactor performance and fuel efficiency. It will lead to saving the cost and environmental impact on the environment. Nuclear Material Management: AI can be used to monitor nuclear materials and detect unauthorized movement or diversion, improving security and safeguards.

Purposed works: Improved Safety: Early detection of potential issues can reduce the accidents risks, radioactive releases. Increased Efficiency: AI-powered optimization can lead to more efficient plant operations and lower energy production costs. Advanced Scientific Research: AI can analyse complex data sets from fusion experiments and simulations, accelerating scientific progress towards cleaner energy sources. *3) Future works:* Autonomous Robots: AI-powered robots can perform dangerous or routine tasks in nuclear facilities, reducing human exposure to radiation. Nuclear Waste Management: It will be used to limit the usage of nuclear waste produced and storage, ensuring long-term safety and environmental protection. Advanced Reactor Designs: AI can assist in designing safer and more efficient nuclear reactors, paving the way for upcoming generation of nuclear sector. The implementation of AI are crucial to ensure its success in the nuclear field. Rigorous testing and regulatory oversight are essential to guarantee safety and security.

Methodology used: Some of the algorithms are PWR NPPs data to detect information in order to take early action for the prevention process. AI's role in nuclear fields is crucial, aiding in various aspects such as reactor optimization, nuclear security, and waste management. Applications include predictive maintenance of nuclear facilities, real-

time monitoring of radiation levels, and enhancing safety protocols through anomaly detection. Benefits include increased operational efficiency, improved safety measures, and reduced risks associated with nuclear activities. Future scopes involve AIdriven simulations for reactor design, autonomous robotics for nuclear decommissioning, and advanced algorithms for nuclear proliferation detection. However, it is difficult to address the problems like cybersecurity risks and ethical considerations in AI applications within nuclear fields to ensure safe and responsible deployment.

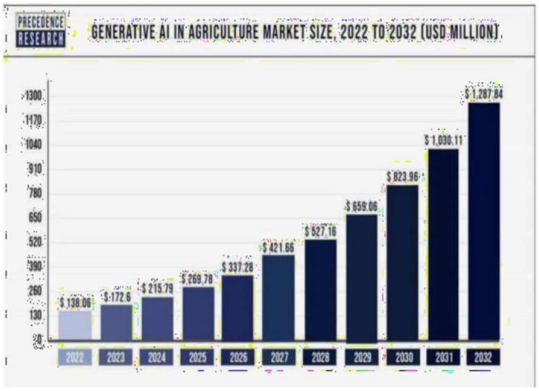
ARTIFICIAL INTELLIGENCE IN AGRICULTURE

Related works: AI is transforming agriculture by providing intelligent solutions for various farming practices: Crop and Soil Monitoring: AI analyses the information from specialised equipments, space satellites, to detect or analyse the crop health, quality of the soil, and its level of nutrition. Disease and Pest Detection that the AI will recognition of the image identifies pests, diseases, weeds in crops, enabling early intervention and targeted treatment. Precision Farming: It analyse and use the resource by analysing data to determine the precise water amount, fertilizer, its pesticides needed for each agriculture area. Management of the livestock: It monitors health of the livestock, predicts breeding cycles, and optimizes feed management. Increased Yields: AI-powered solutions can significantly improve crop yields by optimizing resource use and preventing crop loss. Reduced Costs: Precision farming with AI minimizes water waste, fertilizer, and some benefited chemicals such as pesticides leading to cost savings for farmers. Improved Sustainability: AI promotes sustainable growth by wisely using the resource use and to reduce the impact on the environment. AI is increasingly being integrated into agriculture, offering innovative solutions to address challenges related to productivity, sustainability, and food security.

***Purposed works*:** Crop Monitoring and Management – AI powered drones and satellite imagery analyse health of the crop, pattern of the plant growth, and level of the nutrition to improve irrigation, farming, and to control the pest. Computer vision algorithms identify crop diseases, pests, and weeds, enabling timely interventions to minimize yield losses. Precision Agriculture - AI algorithms analyse soil data, climate conditions, and historical crop yields to create precise farming plans, optimizing resource use and maximizing productivity. Sensorequipped machinery and autonomous vehicles use AI for precise planting, seeding, spraying, and harvesting operations, reducing waste and environmental impact. Supply Chain Optimization - AI systems forecast demand, optimize logistics, and manage inventory in agricultural supply chains, improving efficiency, reducing waste, and ensuring timely delivery of products. Genomics and Breeding- AI analyses genomic data to accelerate plant breeding programs, identifying traits associated with yield, disease resistance, and climate resilience to develop improved crop varieties. Machine learning algorithms predict crop traits and performance based on genetic markers, accelerating the breeding process and enhancing crop resilience to changing environmental conditions. Maintenance of the farm that is management of the farm, maintenance of farms area of the huge data from multiple resources, including sensors, drones, and weather forecasts, to increase in making decision, planning, and resource allocation. AI-driven precision agriculture techniques by wisely using the resource, to decrease the input costs, and by increasing crop yields, enhancing farm profitability and food production efficiency. By minimize the chemical inputs, reduce of water usage, and promoting soil health, AI helps farmers adopt more sustainable farming practices, mitigating environmental impact and preserving natural resource. AI-enabled crop monitoring and predictive analytics help farmers anticipate and mitigate risks such as crop diseases, extreme weather events, and market fluctuations, enhancing resilience and stability in agriculture. The algorithms that is 'data-driven decision' analyze large amounts of agricultural information provide actionable works and recommendations, empowering the landowner of the crop to make decisions after analysation and optimize farm operations. Labor Savings: Autonomous machinery and AIdriven automation reduce the need for manual labour in iterative tasks such as planting, spray water to crops, and some agricultural, addressing labour shortages and improving efficiency.

Future works: Automated Farming Systems: AI-powered robots may handle tasks like plant the crops, seeds weaving, and harvest process, improving efficiency and productivity. Enhanced Disease and Pest Control: AI will enable real-time monitoring and targeted treatment of crop threats, minimizing reliance on chemical pesticides. Precision Climate-Smart Agriculture: AI will help farmers adapt to by wise practices based on current world application weather info and forecasts. AI-Enabled Biotechnology: AI algorithms will continue to drive advancements in plant genomics, gene editing, and synthetic biology, leads to the increase of crop types with enhanced productivity, resilience, and nutritional value. Digital Agriculture Platforms: Integrated AI platforms will provide end-to-end solutions for farm management, connecting farmers with data, services, and markets to optimize productivity and maintenance across the entire agricultural field. Climate Smart Agriculture: And so important role is played by the AI in developing climate factors for farming practices and technologies, helping farmers adapt to climate change impacts such as droughts, floods, and shifting growing seasons. Global Food Security: AI driven innovations in agriculture will contribute to increasing food production, reducing food waste, and improving access to nutritious food, thereby addressing challenges faced in the global level related to food and scarcity of food. Artificial intelligence (AI) is rapidly transforming government operations,

offering a wide range of benefits and future potential. Here's its applications, advantages, and future directions:

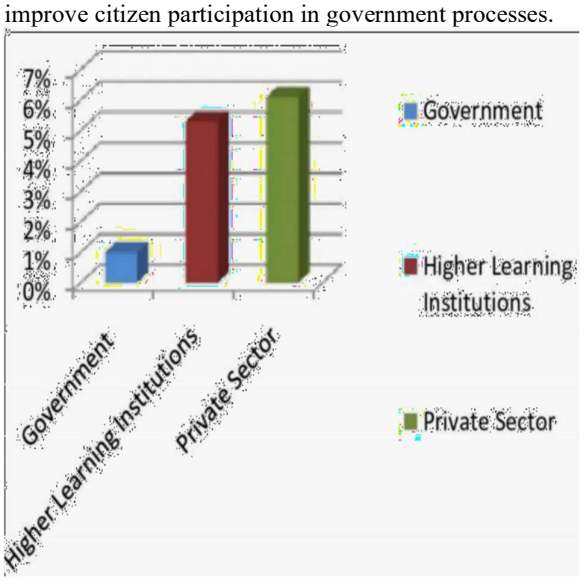


***Methodology used*:** Machine Learning: Used for yielding of crop analyses, detection of crop diseases, monitoring the pest, and weed identification based on training data sets. Deep Learning: Enables more complex work that is recognition of the image, processing of the natural language, and recognition of the pattern, applied in crop monitoring and genomics. Decision Trees: Aid in crop classification, pest management, and farm management decision-making by modelling complex decision processes. Random Forest: Applied in predicting crop yields, identifying optimal planting locations, and analysing environmental impacts on agriculture. Neural Networks: Utilized for tasks such as image analysis, weather forecasting, and yield optimization, offering high accuracy and flexibility in modelling complex agricultural systems.

ARTIFICIAL INTELLIGENCE IN GOVERNMENT

Related works: AI can analyse large amounts of available source data to analyse the patterns and trends, activating data driven activity policy creation, resource allocation. Encouraging service delivery: text box also known as chat box and goggle assistants can provide 24 hours citizen maintenance, automate routine tasks, and streamline service delivery. Public safety and security: AI can analyse crime patterns to predict crime hotspots and allocate resources effectively. It can also be used for cyber threat detection and fraud prevention. Public health: AI can figureout healthcare raw data to detect disease outbreaks, analyse the patient problems, and personalize treatment plans.

***Purposed works*:** Increased capability and maintenance: AI can do iterative tasks that is repetitive tasks, decreases the man work and also reduces the risk of difficult task. Improved transparency and accountability: It can analyse information to detect and address corruption or fraud. Better citizen engagement: AI provides the text box that chatbots can give personalized communication to improve citizen participation in government processes.



Future works: Personalized citizen services: AI can tailor government services to individual needs and preferences. It can be used to keep watching the infrastructure and analyse the maintenance tasks, and costs. Smarter cities: AI can optimize traffic flow, energy use, and waste management in urban areas. AI powered policymaking: AI can simulate the impact of different policy options, helping policymakers make more informed decisions. It can provide immense potential, environmental considerations and responsible development are crucial. Governments need to ensure transparency, fairness, and accountability in their use of AI.

ARTIFICIAL INTELLIGENCE IN SECURITY

AI is transforming security across various military branches, offering significant benefits and future potential:

***1)In Military**:* The enhanced threat detection that AI can analyse in amounts of data from sensors of certain part and intelligence concepts to identify threats so predict enemy actions. The Improved Targeting and Decision-Making that AI can also analyse battlefield data in real-time, enabling faster and more accurate targeting decisions. In Cyber security Fortification, the AI can detect and respond to cyber crisis more effectively, so safeguarding critical military infrastructure in their specific country. The Logistics and Supply Chain Optimization specify that AI can optimize the logistics as well supply chains of order, ensuring timely delivery of basic resources to troops.

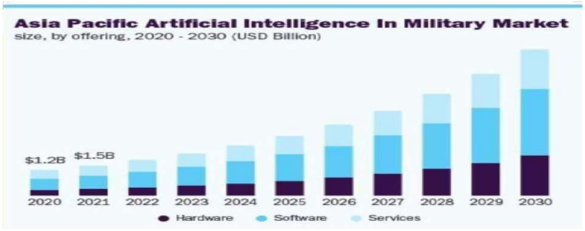
Increased Battlefield Awareness: AI provides a comprehensive picture of the battlefield, giving commanders a tactical advantage. Improved Operational Efficiency: AI automates tasks and streamlines processes, freeing up personnel for more strategic missions. Enhanced Soldier Safety: AI-powered systems can reduce risks associated with dangerous tasks like reconnaissance or explosive ordnance disposal.

Autonomous Weapons Systems: AI-controlled drones and unmanned vehicles could revolutionize warfare, raising ethical considerations. The Personalized Soldier Training that AI can tailor training programs to individual soldiers, that improving combat effectiveness. So as the Predictive

Maintenance that AI can foresee equipment failures, ensuring military preparedness to war and traits hence the mission success. The Military Intelligence Analysis mainly allocate that AI can analyse vast amounts of current smart data to identify artifacts and predict future threats to respective country. Responsible development and use of AI in military applications are so crucial we known. International regulations and ethical events are needed to ensure AI is used for defensive purposes and minimizes risks when in case of nuclear war timings.

In Navy: Artificial intelligence (AI) is rapidly transforming naval operations, offering a wide range of applications and benefits. The Enhanced Situational Awareness that allows AI can analyse data from sensors, satellites, and radar systems, so granting real-time insights into the maritime environment. This helps identify threats, track objects of interest, and improve overall awareness. The Improved Decision-Making statics that AI can analyse enormous amounts of data to support commanders in vessels in making complex decisions. It can consider factors like weather, enemy movement, and potential outcomes of different strategies. The Target Recognition and Threat Detection that AI-powered systems can analyse video clips and sensor data to automatically detect and classify threats like enemy ships, submarines, or mines. This improves response times and accuracy. Autonomous Systems: AI powered drones and unmanned vehicles can be used for reconnaissance, surveillance, and even mine countermeasures, reducing risks to manned vessels. The Predictive Maintenance that is AI can analyse sensor data to precise equipment failures and optimize management of the timeworks, ensuring operational readiness with work score and reducing downtime of connections.

***In Airforce*:** AI is revolutionizing the Air Force, offering a variety of applications and benefits: Enhanced Pilot Training: AI-powered training simulators can provide realistic combat scenarios and personalized feedback, accelerating pilot training and improving combat readiness. Improved Mission Planning and Decision Support that Advanced Threat Detection and Targeting: AI systems can analyse radar and sensor data to identify and track enemy aircraft and missiles, enabling faster and more precise targeting. Autonomous Combat Drones: AIpowered drones can perform reconnaissance, surveillance, and even air-to-air combat missions, reducing risks to human pilots. The Predictive Maintenance that AI can analyse aircraft sensor data stores to predict equipment failures and optimize maintenance timeworks, maximizing aircraft vaccancy and mission readiness with work power.



***Methodology used*:** The Generative AI's analysis, scenario generation, and communication, naval combat system, are the algorithm used in security purpose. AI's integration into security fields like the military, navy, and army has transformed strategies and operations. Applications encompass autonomous drones for surveillance, AI-powered threat detection systems, and predictive analytics for mission planning. Benefits include enhanced situational awareness, faster decision-making, and reduced human casualties through remote-controlled or autonomous systems. Future scopes involve the development of AI-driven autonomous weapon systems, intelligent cyber mechanisms, and enhanced battlefield healthcare through AI enabled medical diagnostics. However, ethical considerations and international regulations are essential to govern the development and use of AI in security domains, ensuring alignment with humanitarian principles and avoiding unintended consequences.

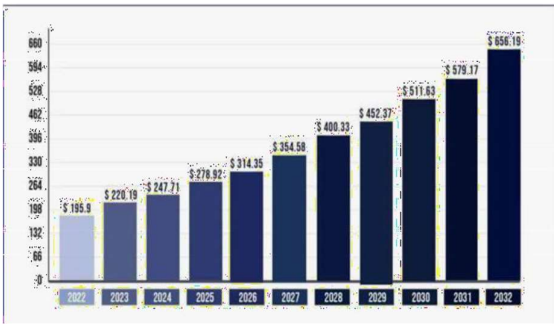
ARTIFICIAL INTELLIGENCE IN TOURISM

Related works: AI transforms the tourism industry by making it realizing the travels experience, providing accurate analytics. The Personalized Experiences as called so, AI tailors help for destinations, activities, and needs based on traveller preferences and past behaviour. Imagine an AI assistant suggesting must-see cultural experiences for a history buff or hidden gem restaurants for a foodie. The Operational Efficiency also called as AI functions tasks like booking the required management, fraud detection, and customer service, freeing up staff to focus on higher-level tasks. This can lead to faster response times so as implementing time and improved accuracy. The Predictive Analytics so mentioned as AI analyse data to predict travel trends, optimizing price strategies, and forecast demand brought. This allows businesses to make data-driven decisions and cart to traveller needs effectively.

***Purposed works*:** The scope of AI in tourism is bright, with retail applications like: Smart Travel Companions to overall growth, the AI powered virtual assistants can provide real-time advertisement, translation services, and personalized recommendations throughout a trip they demand. The Dynamic Pricing illustrates that AI can adjust prices in real time based factors like demand, weather, and competitor pricing, creating a win-win situation for both travellers and businesses. The Hyper- personalization determines the AI can create superior customized itineraries that provided to every aspect of a traveller's preferences, interests, and budget. AI's application in tourism has revolutionised various aspects of the industry, enhancing customer experiences, providing the needs, solve queries, operational efficiency, getting feedback, and marketing strategies. Applications include AI-powered chatbots for customer

service, personalized travel recommendations based on preferences and past behaviour, and dynamic pricing algorithms for optimizing revenue management.

Future works: AI's application has revolutionized various aspects of the industry, appreciating customer experiences, operational efficiency,
customer care, retrieval of feedback, and marketing strategies as we called in above section. Applications include AI-powered chatbots for customer service, personalized travel recommendations based on preferences and past behaviour, and dynamic pricing algorithms for optimizing revenue management. Benefits include improved customer satisfaction, increased booking conversions, and streamlined operations through automation. Future scopes involve the development of AI-driven virtual travel assistants, augmented reality (AR) applications for immersive tourism experiences, and predictive analytics for demand forecasting and capacity planning.



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COMPARISON TABLE

Purpose	Primary intent	Indicative measures
Transactional	To sell	Sales figures User satisfaction
Communicative	To inform	Utility of info in decision making
Educative	To learn	Educational success and applied learning
Social	To connect	Enhanced social connection user defined benefits
Play	To entertain	User learning User happiness
Administrative	To manage	Time saved Improved access
Diagnostic	To identify	Accuracy of diagnosis user trust in diagnosis

CONCLUSION

The objective of the paper was to detect the AI impact in various developing fields in present future. And the various research are done and many studies are done and the review was completed and many methods were used. Deliberations, Case studies, Articles and journals are to be identified and their contents are made up in this research. Artificial intelligence has been used in many applications and in the many works and also in the academia. Using AI many applications were developed, ecommerce and various other domains According to a Forbes Advisor survey, businesses are using AI tools in the following ways: AI to improve and perfect business operations is 56%. AI to help with cyber-security and fraud management is 51%. AI tools in the form of digital personal assistants is 47%. AI for customer relationship management46%. AI for inventory management is 40%. AI for content production 35%. AI for product recommendations 33%. AI for accounting assistance and supply chain operations is 36%. AI for recruitment and talent sourcing 26%. AI for audience

segmentation is 24%. Overall, there is a widespread adoption of AI in business. But companies aren't are not still adapted to the AI in business. Overall, businesses are trying to obtain the benefits and the satisfaction of the customer. Since there are several benefits of Adopting the AI can also the positive benefits also when compared to the manual work and some of the used are operational time will be reduced, human error will be reduced, better customer service. Along some benefits it reduces manpower and job status are too mean for humans. Eg: full stack developer. It reports that the 30% of IT professionals say their co-workers are using AI and that report was taken by the IBM. E Marketer reports about of executives believe AI will lead to the emergence of new jobs is about 69%. Apart from the negative side effects of AI but, AI will developed or used by overall world by 2025. More than 1 in 4 dollars invested in American start-ups in 2023 went to an AIrelated company. A Simple learn article explains the top AI applications being used across industry sectors: Personalized shopping apps: AI-powered assistants, prevention of fraud, advanced Education, Automated administrative tasks, Goggle assistants, personalized learning, Health assistant, Detect diseases, Analyse chronic conditions, Discovery of new drugs, Agriculture, Identify deficiencies in soil, Analyse weed growth patterns, Crop harvesting at a higher volume and a quicker
Rate, Marketing, Targeted ads, their Performance metrics, and optimization. To avoid these problems, we use AI in needed manners. If we devote technology development, the main hold is the humanity along well. Thank you.

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PREDICTING MULTIPLE DISEASES THROUGH DEEP LEARNING WITH CNN AND DNN TECHNIQUES

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Abstract **- Many healthcare machine-learning projects typically focus on individual diseases, conducting separate analyses for conditions like diabetes, cancer, skin disease, and heart disease. Such approaches limit the ability to predict multiple diseases within a single system. Despite the challenges of employing predictive modelling in healthcare, leveraging large datasets can empower practitioners to make rapid decisions based on extensive patient data. This article proposes a system utilizing TensorFlow, Flask API, and various machine learning techniques to predict multiple diseases concurrently. The model's behaviour is saved using Python pickling, ensuring efficient loading when required. The objective is to develop a web application capable of forecasting diseases such as breast cancer, diabetes, heart disease, malaria, and pneumonia through machine learning and deep learning principles. The Flask API is designed to call the relevant model based on the disease parameters provided, offering insights into the patient's condition. Identifying common diseases is crucial for tracking patient health and issuing early warnings, ultimately reducing mortality rates.**

Keywords- **Machine Learning algorithms, Flask API ,CNN , TensorFlow DNN Tools & python pickle.**

I. INTRODUCTION

The healthcare sector is progressively embracing artificial intelligence (AI) technologies ubiquitous in modern life and business. AI has the potential to significantly assist healthcare providers in various aspects of patient care and operational procedures, augmenting existing solutions and expediting problem-solving. While AI technologies are highly relevant to the healthcare industry, individual healthcare organizations may adopt diverse strategies in their implementation. Notably, precision medicine, a prevalent application of conventional machine learning in healthcare, represents a substantial advancement. It enables healthcare organizations to predict the most effective treatment approaches based on patient characteristics and treatment frameworks.

Despite suggestions in some literature that AI can match or surpass human performance in certain medical procedures like disease diagnosis, widespread replacement of humans by AI in healthcare tasks is anticipated to take considerable time. The prevalent applications of AI in healthcare, such as machine learning and precision medicine, rely on supervised learning requiring training data with known outcomes.

Historically, healthcare analyses often focused on individual ailments, analyzing diseases like diabetes, brain tumors, and heart disease separately. However, the complexity of healthcare data necessitates the use of various models for a comprehensive understanding of patient health. The current system, while beneficial for studying specific ailments, contributed to an increase in mortality due to the failure to accurately diagnose interconnected diseases. For instance, diabetes is linked to various complications such as dementia, hearing loss, retinopathy, neuropathy, and heart disease.

This paper considers the analysis of diabetes, brain tumors, heart disease, and Alzheimer's data sets, with a plan to expand to include additional diseases like skin conditions and fever-related illnesses. The adaptable analysis methodology encompasses various disorders for examination.

Adding a new disease analysis to the system requires the developer to incorporate the associated model file and set up Python pickling for storing model behavior. Loading a pickled file allows developers to access the model behavior when utilizing the Flask API. The API enables users to forecast specific diseases or, if the report contains factors for predicting other diseases, provides the most appropriate disease identifications. The ultimate goal is to reduce the rising mortality ratio by forewarning patients based on their health circumstances. Consolidating disease models and forecasts at a single location can decrease the cost of patient analysis.

The paper structure includes an introduction to multiple disease prediction using machine learning in Section I, a literature review of existing systems in Section II, details of the proposed system architecture and implementation in Section III, results and discussion in Section IV, and a conclusion in Section V, followed by a list of references.

II. LITRATURE SURVEY

In the referenced papers [1&2], the authors concentrate on predicting four diseases - Heart, Diabetes, Brain, and Cancer - utilizing algorithms such as Random Forest, SVM, and Logistic Regression. The proposed system incorporates Flask API for disease prediction, demonstrating accuracy for specific diseases. However, the limitation lies in the potential to predict more diseases using optimal algorithms. Symptoms for each disease are outlined, and while effective, the model's scope may be expanded.

In [3], the focus is on Heart Disease, Diabetes, and Breast Cancer using KNN, SVM, and Naïve Bayes algorithms. The accuracies achieved are reported, yet the paper overlooks potentially higher-performing algorithms. Limitations include lower accuracy and the prediction of only a limited set of diseases.

Paper [4] emphasizes diabetes, employing Decision Tree, Naive Bayes, SVM, and ANN algorithms. The study's limitation is the exclusive focus on one ailment, neglecting
the potential benefits of employing a broader range of algorithms such as Random Forest.

[5] underscores the importance of precise identification and anticipation of heart diseases using K-nearest neighbor, decision tree, linear regression, and SVM algorithms. While achieving high accuracy, the model has limitations, particularly when compared to the potential benefits of employing the Random Forest algorithm for predicting heart diseases.

The study in [6] centers on breast cancer, utilizing SVM, Random Forest, KNN, and Naive Bayes algorithms. Although SVM yields the best accuracy, the study is limited to breast cancer diagnosis.

[7] primarily addresses diabetes conditions, employing Adaboost, Support Vector Machine, Naive Bayes, and Decision Tree algorithms. Adaboost demonstrates the best performance, but the study is restricted to diabetes prediction.

In [8], the main focus is diabetic retinopathy, employing SVM, KNN, NB, and DT, with SVM achieving the highest accuracy. The study addresses the specific complication of diabetic retinopathy.

Finally, [9&10] concentrate on diabetes, brain disease, Parkinson's disease, and heart disease, utilizing Naive Bayes, KNN, and Decision Tree algorithms. The Decision Tree algorithm outperforms Naive Bayes and KNN, predicting cerebral infarction risk using multi-model illness risk prediction. However, the model is limited to predicting three diseases simultaneously.

In summary, while each paper contributes valuable insights into disease prediction, they commonly exhibit limitations such as focusing on a limited set of diseases, using a specific subset of algorithms, and not exploring the potential benefits of more diverse algorithmic approaches.

III. SYSTEM DESIGN

A. Proposed System

Enabling the simultaneous prediction of multiple diseases through a comprehensive disease prediction system eliminates the need for users to navigate various platforms for anticipating ailments. Our emphasis lies on forecasting heart disorders, brain tumors, Alzheimer's, and diabetes, acknowledging the interrelation among these conditions. Leveraging machine learning techniques and Flask-API, we aim to establish a framework for diverse disease analyses. Users are required to provide both the disease name and relevant parameters while accessing the API. Flask will then invoke the pertinent model, providing an accurate assessment of the patient's health status.

B. Block diagram

A user-friendly disease prediction model, based on Machine Learning (ML), is intricately designed to receive input attributes, analyze data, and determine the presence of a disease. The block diagram provides an overview of the model's functionality, illustrating the input data acquisition, the partitioning into training and testing sets, the requisite features for specific disease prediction, and the application of algorithms to the model. Subsequently, a performance analysis evaluates the model's effectiveness, assessing factors such as accuracy. Following these steps, the model predicts the occurrence of the disease based on the comprehensive analysis.

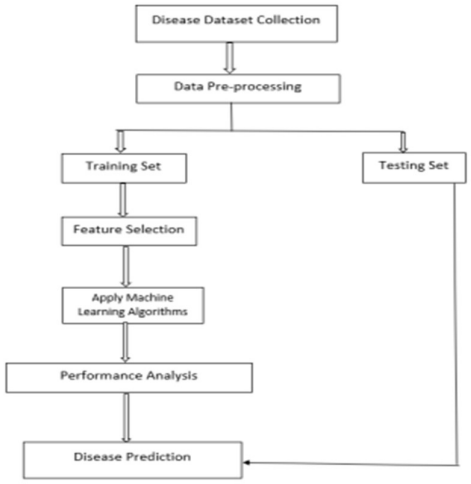


Fig 1. Block Diagram

1) Disease Dataset Collection

The datasets for various diseases are sourced from Kaggle, a renowned platform for datasets. Specifically, the heart disease dataset is acquired from UCI and Kaggle, encompassing 13 medical prediction fields along with a target field. The diabetes dataset is derived from the Pima Indians Diabetes dataset on Kaggle, featuring 8 medical prediction fields and a target field. For breast cancer prediction, the dataset is gathered from the Breast Cancer Wisconsin dataset on Kaggle, comprising 31 medical prediction fields and a target field. All these datasets are accessible on the Kaggle platform.

2) Data Pre-Processing

Pre-processing is a crucial step in preparing data for machine learning models, involving modifications to enhance its quality and usability. This process transforms raw data from various sources into a comprehensible and analyzable format. The four key steps in data pre-processing include data cleaning, data integration, data transformation, and data reduction.

Data cleaning is employed to eliminate missing, incorrect, or irrelevant data, addressing issues such as extraneous information, filling gaps, and handling outliers. Establishing a standardized template for the data cleaning procedure is essential for consistency and accuracy.

Data integration combines information from diverse sources like databases, spreadsheets, and text files to create a unified dataset. Well-implemented data integration provides a singular, comprehensive view of the data, contributing to reduced IT costs, enhanced data quality, and increased efficiency.

Data transformation involves converting source data into a format suitable for data mining. This may include encoding categorical data, creating dummy variables,

and normalizing numerical information. The goal is to ensure that the data is in the desired format, resolving issues related to missing values in datasets.

Data reduction aims to decrease the volume of data in a dataset by removing or simplifying unnecessary information. The objective is to streamline data analysis, making it easier to extract valuable insights from large datasets. Reduction techniques maintain data integrity, resulting in a condensed version of the dataset that improves efficiency and facilitates the application of complex algorithms, particularly when dealing with smaller datasets. The reduction can be performed based on both rows and columns, optimizing the dataset for more effective analysis.

3) Splitting dataset into training and testing data

The datasets are partitioned into training and testing sets, constituting 80% for training data and 20% for testing data. The utilization of appropriate parameters is crucial for training the model on pre-processed datasets. Following the training phase, the model undergoes testing using the dedicated test data. Typically, training datasets are employed to fit machine learning models, while test datasets are reserved for their evaluation. The primary objective is to assess the model's performance with new data, ensuring its effectiveness on previously unseen information. In cases involving extensive datasets, models undergo both training and testing phases to validate their accuracy and generalization capabilities.

4) Future Selection

Feature selection is a technique aimed at reducing inputs by retaining only relevant data while discarding noisy or irrelevant information. This process involves building a predictive model with a subset of pertinent characteristics. The primary goal is to decrease the number of features in the model, maintaining or enhancing its predictive accuracy. Feature selection ensures that only useful data is included in the model, excluding noisy elements.

Various methods, including filters, missing value identification, and information gain, are employed in feature selection. Information gain, which measures the reduction in entropy caused by a transformation, is utilized to assess the importance of each variable concerning the target variable. This can serve as a feature selection strategy by computing the information gain for each variable. Additionally, the missing value ratio is employed to compare the feature set to a predefined threshold value. Calculated by dividing the total number of observations by the number of missing values in each column, variables surpassing the threshold can be considered for removal, streamlining the feature set.

5) Applying machine learning algorithms

Following the completion of feature selection, diverse algorithms are employed to predict diseases with high accuracy. Random Forest and SVM emerge as two machine learning algorithms that exhibit remarkable accuracy across various diseases.

Specifically, VGG19 is deployed for predicting malaria and pneumonia. The selected algorithms prove to be highly efficient, consistently yielding elevated accuracy levels. Moreover, these algorithms demonstrate enhanced performance with increased available samples. It's noteworthy that deep learning algorithms, a specialized category within machine learning, further contribute to the overall effectiveness of the model.

6) Performance analysis

Evaluating the effectiveness and efficiency of machine learning models is imperative, and performance analysis plays a pivotal role in this assessment. In this model, the Receiver Operating Characteristic (ROC) curve is employed as a technique for performance analysis to visually represent the accuracy of the model. The ROC curve is a graphical representation illustrating the performance of a classification model. It provides insights into the trade-off between the true positive rate (sensitivity) and the false

positive rate for different threshold values, offering a comprehensive view of the model's performance characteristics.

7) Disease Prediction

In the final step, when the user inputs all the attributes into the disease predictor and clicks the predict button, the system accurately presents the results indicating whether an individual has a disease or not. Additionally, the system provides valuable preventive measures to address potential health issues at an early stage, facilitating proactive healthcare management.

Use-Case diagram.

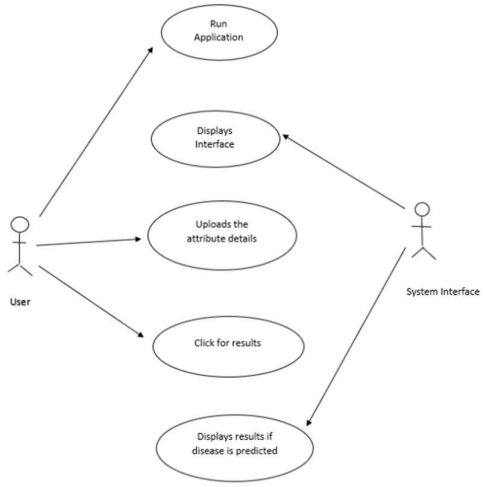


Fig 2. Use Case Diagram

Figure 3 illustrates the user interface of the model. The use case diagram involves two primary actors: the User and the System Interface.

1. The user initiates the application.
2. The system interface promptly showcases the user interface.
3. Following this, the user inputs the necessary attributes and clicks the "predict" button.
4. The system interface analyses the provided attributes, generating results that indicate whether the patient is affected by the disease or not.

C. Dataset Description

1) Heart Disease Dataset

The "Heart Disease Dataset" sourced from Kaggle is employed for forecasting the occurrence of heart disorders [11]. This dataset comprises 76 properties, including the predicted outcome. However, none of the referenced studies indicate the utilization of all 76 properties; instead, they focus on a subset of 14 properties. The "target" field in the dataset provides results indicating the presence or absence of heart disease in the patient. A value of one signifies the presence of the disease, while zero indicates its absence. Notable attributes in the dataset include sex, chest pain type (with four values), resting blood pressure, serum cholesterol in milligrams per deciliter, fasting blood sugar greater than 120 milligrams per deciliter, highest heart rate attained, exercise-induced angina, old peak (ST depression caused by exercise relative to rest), slope of the peak exercise ST segment, and the number of major vessels (ranging from 0 to 3) stained by fluoroscopy. These attributes contribute to the comprehensive analysis for predicting heart disease.

2) Diabetics Dataset

The "Pima Indian Diabetes Dataset" is utilized for predicting diabetes within the model. This dataset encompasses information regarding the medical histories of Pima Indian women, focusing on whether they developed diabetes. Comprising a total of 768 observations, the dataset features one target variable and eight medical predictor attributes. These attributes include the total number of pregnancies, plasma glucose concentration two hours after an oral glucose tolerance test, triceps skinfold thickness (measured in millimeters), two-hour serum insulin concentration in micrograms per milliliter, body mass index (calculated as weight in kilograms divided by height in meters squared), family history of diabetes, age in years, and a variable class (with values of 0 or 1). These features contribute to a comprehensive analysis for diabetes prediction within the model.

3) Breast Cancer Dataset

The breast cancer dataset, sourced from Kaggle's "Breast Cancer Wisconsin Data Set," comprises crucial information on 569 breast cancer biopsy cases, aiming to predict the nature of cancer as benign or malignant. This dataset incorporates one target variable and 31 medical predictor features, encompassing significant clinical and demographic characteristics. Patient age, tumor size, tumor grade, cancer stage, and attributes such as identification, diameter, circumference, texture, area, perimeter, smoothness, compactness, and mean concavity points play pivotal roles in facilitating a comprehensive analysis for forecasting breast cancer occurrences within the model.

4) Liver Disease Dataset

The "Indian Liver Patient Records" dataset, encompassing 416 liver patient records and 167 non-liver patient records from the north-east of Andhra Pradesh, India, serves as a valuable resource for classifying individuals into liver patients or non-patients based on the "Dataset" column. This dataset includes 441 male and 142 female patient records, with individuals aged 90 or above categorized as such. Comprising a total of 583 patient records, the dataset incorporates 10 clinical variables, including age, gender, total bilirubin, direct bilirubin, alkaline phosphatase, alanine aminotransferase (ALT), aspartate aminotransferase (AST), total proteins, albumin, and the albumin/globulin ratio. By utilizing these patient records, the dataset aims to determine the presence or absence of liver disease in individuals.

5) Parkinson's Disease Dataset

The "Parkinson's Disease Dataset" is a comprehensive collection featuring clinical information on individuals affected by Parkinson's disease. This dataset incorporates records from patients diagnosed with Parkinson's disease alongside those without the condition. Sourced for research purposes, the dataset encompasses diverse demographic details, including age, gender, and various clinical variables such as tremor amplitude, rigidity, finger tapping, and vocal features. The dataset's classification relies on a designated column, effectively categorizing individuals as either Parkinson's patients or non-Parkinson's individuals. With a meticulous compilation of Parkinson's disease-related attributes, this dataset is instrumental in facilitating the analysis and identification of factors contributing to the presence or absence of Parkinson's disease in individuals.

D. Algorithms

1) **CNN Algorithm**

Sure, here are the steps:

1.Vector Transformation: The dataset is initially transformed into a vector format.

2.Word Embedding: Word embedding is performed, utilizing zero values to fill in the data. This process results in a convolutional layer.

3.Maximum Pooling Operation: The convolutional layer undergoes a maximum pooling operation, serving as input to the pooling layer.

4.Fixed-length Vector Conversion for Max Pooling: The dataset is converted into a fixed-length vector form tailored for Max pooling. The entire connected neural network is then coupled with the pooling layer.

5.Classifier Integration: A SoftMax classifier is linked to the complete connection layer, finalizing the integration of the classifier into the neural network.

2) **Random Forest Classifier**

The Random Forest algorithm is constructed by amalgamating N decision trees, each contributing to predictions for the dataset. The operational steps of a random forest are as follows:

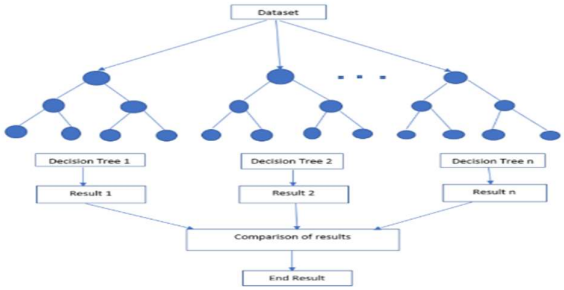
1.Random Data Selection (Step-1): Initially, the algorithm randomly selects K data points from the training set.

2.Decision Tree Creation (Step 2): After the selection of k data points, individual decision trees are formed, each associated with the chosen data points, effectively creating subsets.

3.Node Selection (Step 3): Subsequently, the Nth node for the decision trees to be constructed is chosen.

4.Iteration (Step-4): Steps 1 and 2 are iteratively repeated in this phase.

5.Prediction and Categorization (Step-5): In the final step, predictions for each decision tree are obtained, and new data points are allocated to the category with the most significant support. This iterative process of random data selection, decision tree creation, and node selection contributes to the robustness and accuracy of the Random Forest algorithm in making predictions.



3) **VGG-16 Algorithm**

1.Layer Composition:VGG16 includes thirteen convolutional layers, five Max Pooling layers, and three Dense layers, totalling 21 layers, with only sixteen being weight layers.

2.Input Tensor Size: The input tensor size for VGG16 is 224 by 224, featuring three RGB channels.

3.Convolution and Pooling Strategy: VGG16 consistently uses 3x3 filter convolution layers with a stride of 1 and employs the same padding, accompanied by max pool layers with a 2x2 filter and a stride of 2.

4.Uniform Layer Ordering: Convolution and max pool layers maintain a uniform ordering throughout the entire design.

5.Filter Configuration: Conv-1 has 64 filters, Conv-2 has 128 filters, Conv-3 involves 256 filters, and Conv-4 and Conv-5 each comprise 512 filters.

6.Fully Connected (FC) Layers : Three FC layers follow the convolutional layers, with the third conducting 1000-way ILSVRC classification, and the first two having 4096 channels each. The architecture concludes with a Softmax layer.

In conclusion, the system prediction model integrates the CNN and random forest algorithms for their superior accuracy levels. Upon entering disease-specific parameters, the model indicates whether the patient has the corresponding ailment. The parameters exhibit specified value ranges, and any values outside this range, deemed invalid, or left empty prompt a warning message, advising the user to input a valid value.

IV. RESULTS

The model presents comprehensive disease predictions on its homepage, encompassing heart, diabetes, kidney, liver, breast cancer, and parkisons. The homepage provides detailed descriptions of these diseases along with their associated symptoms and highlights the highest accuracies achieved for each. To predict a specific disease, users can

click on the disease name, which directs them to a dedicated page. On this page, users input relevant parameters and click the predict button to obtain results indicating whether the individual is suffering from the specified disease or not.

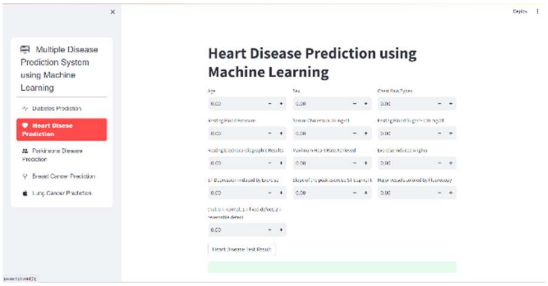


Fig 3. Heart Disease Prediction

Figure 3 depicts the heart disease prediction page, featuring essential attributes like age, sex, chest pain type (4 values), resting blood pressure, serum cholesterol in mg/dl, fasting blood sugar > 120 mg/dl, and more. Leveraging this information, the model utilizes pre-trained algorithms to predict whether an individual is affected by heart disease or not.

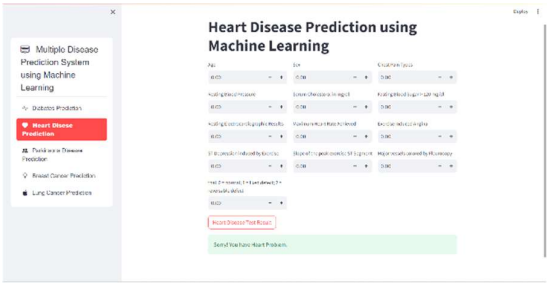


Fig 4. Output

In Figure 8, the result page displays the predicted heart condition of a patient after clicking the predict button. The positive result indicates elevated parameters compared to normal levels.

Typically, heart disease is associated with high cholesterol, blood sugar, and blood pressure. By leveraging this model, early-stage prediction becomes possible, contributing to a reduction in mortality rates by identifying potential health issues in advance.

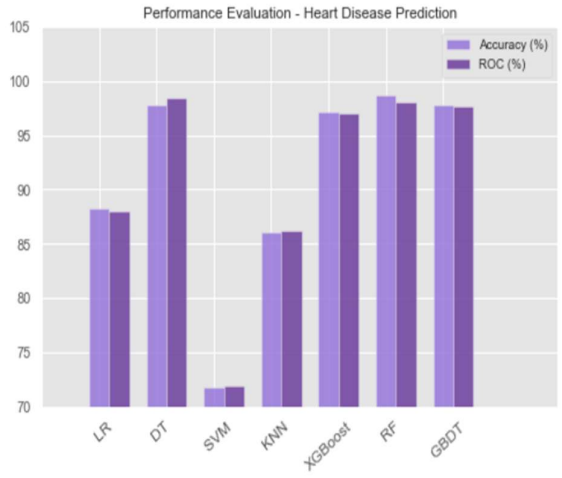


Fig 5. Performance

The multi-disease prediction model employs various algorithms tailored to specific diseases, selecting the one that yields the highest accuracy for each. In Figure 9, an overview of disease accuracies is presented. The heart disease detection model achieves an impressive 98.70% accuracy and a mean absolute error of 0.029% using the random forest technique.

For liver disease detection, the SVM technique attains the highest accuracy at 71.18%, with a mean absolute error of 1.024%. The kidney disease detection model achieves a remarkable 99.16% accuracy with a mean absolute error of 0.043%, employing the random forest method. Breast cancer detection reaches a peak accuracy of 97.66% and a mean absolute error of 0.035% with the SVM method. The diabetes detection model achieves a maximum accuracy of 92.54% and a mean absolute error of 0.22% using the random forest approach. The graph illustrates that the Random Forest (RF) classifier and SVM outperform other algorithms in predicting various diseases.

V. CONCLUSION

We employed conventional machine learning algorithms to classify patient data, addressing the expanding realm of medical data in contemporary healthcare. By inputting patient records, we facilitated precise disease predictions based on symptoms, achieving accurate general disease risk predictions.

This approach allows for efficient and cost-effective disease and risk prediction. A comparative analysis of different algorithms revealed that the CNN algorithm outperforms others in terms of accuracy, with a lower processing time. Moving forward, our future endeavors will involve expanding the range of diseases and forecasting the likelihood of a patient developing each one.

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NCRTCI'24-47

DOCDECODE – ENHANCING HEALTHCARE EFFICIENCY WITH DEEP LEARNING- BASED PRESCRIPTION DECIPHERING

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***Abstract*-- This research describes a method for simplifying prescription interpretation for patients and pharmacists by combining Handwritten Character Recognition (HCR) and Recurrent Neural Networks (RNN) to extract and analyze handwritten and printed information in prescriptions. To boost accuracy, the method combines image improvement, text extraction, and model training using large amounts of data. The project's goal is to lessen the danger of medicine misinterpretation caused by doctors' prescriptions containing shorthand, symbols, and medical abbreviations. The handwritten Character Recognition (HCR) approach, which employs a Recurrent Neural Network (RNN), is used to detect both handwritten and printed text in prescriptions. Additionally, image processing techniques are used to improve photos and generate consistent findings. One alternative implementation technique is to establish an open-source platform with a trial version and refine the model using consumer feedback.**

***Keywords* - Doctor's Prescription; Image Processing; Recurrent neural network (RNN).**

I.INTRODUCTION

The ability to write legibly on paper allows each person to communicate their ideas in a unique way. It could differ greatly from person to person. A prescription is a written order from a doctor to a patient that specifies the medication the patient needs to take for the disease or injury they are currently experiencing. Prescriptions act as a log of the medications prescribed to or given to patients. A physician's busy schedule is discussed, emphasizing how rapidly more visits are scheduled and how the diagnosis is more important than the handwriting on the prescription. They write badly a lot of the time. Consequently, reading prescriptions and determining the contents and possible dosages might be difficult.

1.1 RECENT STUDY

A recent Johns Hopkins study found that medical errors account for over 250,000 deaths annually in the US, making them the third most common cause of death, after cancer and heart disease. According to some studies, there may be as many as 440,000. The disparity arises from the fact that medical examiners, funeral directors, coroners, and doctors seldom record on death certificates the human errors and system malfunctions that occurred.

1.2.STEPS

Prescription recognition with an RNN usually requires multiple steps.

- The prescription image is first preprocessed to reduce noise and improve handwriting contrast.
- The prescription is then segmented into individual characters or phrases using the RNN, which has been applied to the preprocessed image.
- In order to determine the correct medication, the detected letters or words are finally matched to a database of recognized pharmaceuticals.

A prescription contains the medication's name, dose, and suggested duration of usage. When a physician writes a prescription, they follow standard medical terminology and acronyms. It is quite challenging to read and understand if you have no prior medical knowledge or experience. As a result, people purchase prescription medications without thinking through the possibility of unpleasant or dangerous side effects. A lot of doctors write prescriptions digitally these days. Having difficulty deciphering handwritten prescriptions from doctors prevents you from getting high-quality care. These prescriptions can be confusing and can have negative health consequences, such as incorrect drug selection, miscalculated dosages, or even fatalities. The pharmacy gave the 42-year-old American patient 20 mg of Plendil-double the recommended daily dose-instead of 20 mg of Isordil-by mistake due to the doctor's unreadable handwriting. After giving testimony in court, the cardiologist was mandated to reimburse the victim's relatives.

II. METHODOLOGY

The proposed solution consists of five stages as shown in the figure 1.1 namely Data collection, Preprocessing, Augmentation, Model training and the Evaluation of result.

2.1 DATA COLLECTION

More than 40,000 photos of handwritten, cropped words were included in the collection. Two sources provided the data that was gathered. The well-known IAM dataset comes first. Furthermore, Prescription auditing organization provided handwritten prescriptions from physicians around India. To create the dataset, each prescription was split and labeled separately. The photographs were trimmed to simply show the word itself, and all of the words were written against a blank background. By scraping the web, a corpus of thousands of distinct medication brands was assembled to compare with the model's expected results.

Fig 1 Sample image from dataset

2.2 DATA PREPROCESSING

The collection includes photos of people of all sizes and shapes that were taken with various writing instruments and fonts and pen colors under various writing settings. Pre-processing and augmentation steps were taken:

- Pixel interpolation is used to adapt these photos to the same size of 128 by 32, which is used as a standard for input into the model.
- To make all of the photographs equally readable, brightness and gray-scaling are applied to the images to eliminate color variation.
- Next, we use data augmentation to dilation, erosion, and rotation of the image to produce various copies of it. This is done to compensate for the disparities in the typefaces and writing styles used on the printed words.
- Every picture produced through augmentation is input into the model in training as new inputs.

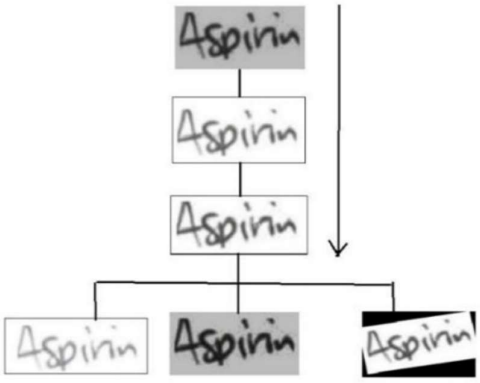

Fig 2 Preprocessing and argumentation

2.3 MODEL TRAINING

The model utilized consists of a bidirectional LSTM architecture and a well-known convolutional neural network, with hyperparameter tweaking done expressly to optimize outcomes. For entering prescription data. Processed image files with the form (128, 32) are the inputs. A CNN processes the pixel data in the picture. High-level features in the CNN are produced by the convolutional layers. This instance involves a list of labels that can be utilized to make contextual predictions. With hidden layers of shape (32, 32, 32, 64, 64, 64, 128, 128, 128, 128), the CNN in use is a nine-layer network. To avoid overfitting, each layer has a leaky-ReLU activation function with a 0.2 dropout.

2.4 OPTIMIZATION AND TESTING

Initially, a baseline model with a conventional CNN-RNN structure was employed. On the baseline model, hyperparameter tuning was done with RandomSearchCV and GridSearchCV. altering a variety of variables, including the batch size, activation function, number of network layers, layer shapes, and learning rate. In order to avoid overfitting, the model was lastly trained using a 2-layer LSTM and a 9-layer CNN with dropout and varying numbers of steps in the CNN layers. With a batch size of 16, the lowest CTC loss that was obtained was 0.348, and it converged at 138 epochs

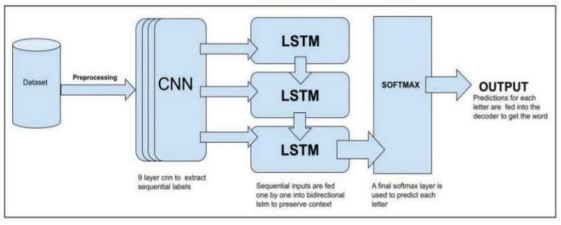

Fig 3 Model flow diagram

2.5 READABLE PRESCRIPTION

The completed text and a brief synopsis of the approved drugs will be shown in the program interface. Additionally,

this program will be user-friendly and self-contained, allowing anyone to upload an image and receive legible text in return. Additionally, to attain the highest. In order to ensure word prediction, we maintained the CTC loss function as small as possible. The predicted text from the image is modified using a medical data set utilizing the techniques to produce a brief summary of the suggested medication in the display.
However, in order to understand the issues in practice, we attempted to test our model at a local pharmacy to see if it could distinguish between various kinds of handwritten notes from physicians. Surprisingly, none of the benefits or mistakes are visible when we run the test case. Stated differently, we are able to efficiently provide client prescriptions or letters from doctors.

III.RELATED WORK

Numerous studies have been done in the field of handwriting recognition by professionals from around the globe. As a result, some of the most advanced OCR technologies have been created similar to Google Lens. This has made significant advancements in the field of handwriting recognition possible. These instruments, however, are not sufficient for identifying prescription drugs. This deficiency has many causes, the primary one being the dearth of high-quality data. The majority of studies done on medical handwriting recognition make use of data that is not an accurate representation of prescription medication writing. There wasn't enough variability in the data utilized to create a strong model. The approach taken by Yash Gurav et al.

To create a strong and diversified dataset in Bangla and Delhi garhi scripts assisted the writers in streamlining and optimizing their data collection procedure. Augmentation techniques are used to add variability and practically grow the dataset in order to further improve the data. Rotate, Shift, and Stroke augmentation were utilized by Shaira Tabassum et al. with promising results in increasing model accuracy. Because of the emergence and quick development of disciplines like artificial intelligence and deep learning, researchers have created extremely complex models for OCR. The majority of handwriting recognition research employs a mix of recurrent and convolutional neural networks, such as long-short term memory, to accomplish handwriting recognition. A sliding window is used by Roger Achkar et al.

To split each input image into 28 sub-images, which are then fed into a hybrid Convolutional Recurrent Neural Network (CRNN) model. Beautiful Deep CRNN and Connectionist Temporal Classification (CTC) were employed by Joy Fajardo et al. To create a very accurate model, the CRNN model was then coupled with a model-based normalization technique, which involved batch normalizing each convolutional layer using both mean and variance. Using the publicly accessible IAM Dataset, Tavish Jain et al. used CNN-Bi-LSTM architecture with Max Pooling and Batch Normalization to produce a very accurate model. Following their review of the previously mentioned research publications, the authors concluded that it would be wise to begin with a base design that combined CNN and LSTM Network.

The output of the LSTM layer can be decoded using a variety of techniques. Character recognition systems frequently use Word Beam Search, a well-liked decoding approach that was developed by Harald Scheidl et al. For the recognition of medical data, the Lexicon Search Algorithm is a better alternative decoding algorithm. This is due to the fact that it decodes the data from a limited medication lexicon. The application of the Lexicon Search Algorithm for character string recognition is described by M. Kagawa et al.

IV.RESULTS AND ANALYSIS:

We trained the model using 50 epochs, which allowed it to effectively recognize words without overfitting to the training data, in order to ensure the correctness of our model and produce the best results. 10% was set aside for testing and validation, while the remaining 90% was used to train the model. We minimized the CTC loss function in order to maximize word prediction. Using a medical dataset, the predicted text from the image was further improved to give a concise description of the suggested medication. We put the model to the test in a neighborhood drugstore to see how well it could distinguish between different kinds of handwritten doctor's notes.

Remarkably, our test case showed no notable benefits or mistakes, proving the model's effectiveness in identifying medications and giving them to clients. According to estimates from the National Academy of Science, medication errors affect at least 1.5 million people each year and frequently have serious negative effects on health. We used the Medicine Box and a Recurrent Neural Network (RNN) technique to solve this problem. Smartphone software that can translate handwritten medication names into legible digital text by recognizing them. With the help of this prescription recognition software, pharmacists can more easily ensure that patients are given the right prescription.

It also makes it easier to comprehend handwritten notes from doctors. As a result, we might perhaps save lives by preventing the improper dosage recommendations and the improper use of medications. There is a good chance that the Doctor's Prescription Recognition app will be used more widely. Through the coordination of campaigns and seminars with pharmaceutical firms, we can showcase the effectiveness and precision of the application while catering to the requirements of a wider range of people.

V.DISCUSSION:

In this study, we have mainly explained what doctor prescription recognition is, why it is required, and how recurrent neural networks (RNN) are being used to accomplish this recognition application. With the help of user data, the app's model will be educated and able to operate with great accuracy as we see more traffic. The application performs better the more accurate the training data are. Through extensive data sets for training, application It is possible to enhance performance. A more cutting-edge approach would be to develop this program as an open-source platform from the outset and make a trial version available to all users or stakeholders. With the help of user data, the app's model will be educated and able to operate with great accuracy as we see more traffic.

VI.FUTURE WORK:

The robustness and accuracy of the model will need to be improved in future deep learning work on character recognition of prescription drugs. Creating sophisticated neural network designs, like transformer-based models or attention mechanisms, is one way to improve the prescription text's ability to capture contextual information. Furthermore, performance can be enhanced by using domain-specific knowledge and making use of strategies like data augmentation and transfer learning, particularly when managing variances in handwriting styles and medical terminology. The system's usability for healthcare applications would also be improved by incorporating natural language processing techniques to extract structured information from prescriptions, such as medicine names, dosages, and frequencies. In general, further research ought to concentrate on developing deep learning for medical prescription character recognition from both a technological and an applied standpoint.

VII.CONCLUSION:

In this study, we have mainly explained what doctor prescription recognition is, why it is required, and how recurrent neural networks (RNN) are being used to accomplish this recognition application. The method used in this case is to extract the text from the input data, feed it into the defined model, train the model with further data in real time, decrypt the data feed from the model's output, and transmit the data as an output with unformatted text. The application performs better the more accurate the training data are. It is possible to increase application performance through training with large data sets. A more cutting-edge approach would be to develop this program as an open-source platform from the outset and make a trial version available to all users or stakeholders. Lastly, users will find it easy to access the model and engage with it through the application thanks to this application interface. Furthermore, most users can validate the notes or prescriptions using this technique even if they have no prior experience with handwriting analysis. As a result, this technology will remove human error and enable clients to evaluate it independently of professionals. By providing additional training data in the future, we might raise the accuracy even further. Moreover, the procedure might be adjusted to yield outcomes even more quickly. Make this program cross-platform and robust enough to meet the strictest specifications.

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NCRTCI'24-49

SMART SPACE - A DEEP LEARNING DRIVEN SYSTEM FOR PARKING SPACE MANAGEMENT

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Abstract— **In this document we have modelled a smart parking system that adopts the applications of YOLOv8 for deep learning object detection. The system addresses the growing challenge of parking management in urban environments. YOLOv8 efficiently detects parking spaces and vehicles within a parking lot. The core functionality involves two main stages to detect the parking space and allocate the vehicle. Parking Space Detection has the model identifies designated parking areas, potentially using pre-trained weights or a custom dataset for specific parking lot layouts. Vehicle Allocation instructs YOLOv8 to locate vehicles within the image frame. By analysing the position of vehicles relative to parking spaces, the system determines occupancy. This information can be used for realtime displays indicating available parking spots or integrated into a larger parking allocation system.**

The approach offers several advantages with high accuracy, scalability and efficiency. YOLOv8's strength in object detection translates to reliable parking space and vehicle identification. The system can be adapted to various parking lot configurations with minimal modifications. YOLOv8 enables real-time processing of video feeds, providing up-to-date parking availability. This document will dive deeper into the implementation details, including YOLOv8 model selection and training, Data pre-processing and augmentation techniques and Integration with a parking management system. By leveraging YOLOv8's object detection capabilities, this system offers a promising solution for improving parking efficiency and driver experience.

Keywords— YOLOv8, COCO, PKLot, PyTorch, Deep learning techniques, Positional Vectors.

I. INTRODUCTION

The convenience of personal vehicles comes with a growing urban challenge of parking congestion. One primary culprit of parking congestion is the ever-increasing number of vehicles on the road. Urban populations are booming, and car ownership is often seen as a necessity for daily commutes and errands. This surge in vehicles outpaces the available parking infrastructure, leading to a constant battle for coveted spots.

The ever-growing number of vehicles in urban centers has created a pressing need for intelligent parking management systems. Finding available parking spaces can be a time-consuming and frustrating experience for drivers, leading to traffic congestion and wasted fuel. Traditional methods for parking management, such as manual counting or ultrasonic sensors, often lack scalability and real-time updates.

The effects of parking congestion are far-reaching. Individuals waste precious time circling for parking, adding to traffic congestion and increasing stress levels. Businesses in congested areas can suffer as customers struggle to find parking and opt to take their business elsewhere. This paper proposes a novel approach for parking space detection and allocation using YOLOv8, a state-of-the-art deep learning object detection model. YOLOv8 offers high accuracy and real-time processing capabilities, making it ideal for developing intelligent parking systems.

This introduction outlines the key challenges associated with traditional parking management methods and introduces YOLOv8 as a promising solution. It then briefly describes the proposed system's functionalities, highlighting the two core stages of parking space detection and vehicle detection/allocation. Finally, the introduction concludes by mentioning the benefits of the proposed system, such as accuracy, scalability, and real-time functionality.

This paper proposes a groundbreaking approach to parking space detection and allocation, leveraging the power of YOLOv8, a state-of-the-art deep learning model renowned for its object detection capabilities. YOLOv8 offers a potent combination of exceptional accuracy and real-time processing, making it ideally suited for the development of intelligent parking systems.

II. LITERATURE SURVEY

A. Using YOLOv8 for Real-time Car Detection

Jianfeng Wang et al.[1] YOLOv8PKLot is a parking lot detection network based on improved YOLOv8 for a smart parking management system [1]. Jianfeng Wang et al. This research explores YOLOv8's usefulness for real-time parking lot detection. It proposes an upgraded YOLOv8 architecture (YOLOv8PKLot) tailored to this goal. YOLOv8PKLot uses lightweight modules and a unique loss

function to detect parking lots from aerial data with high accuracy and real-time performance.

B. **Personalizing YOLOv8 Architectures for Parking Applications**

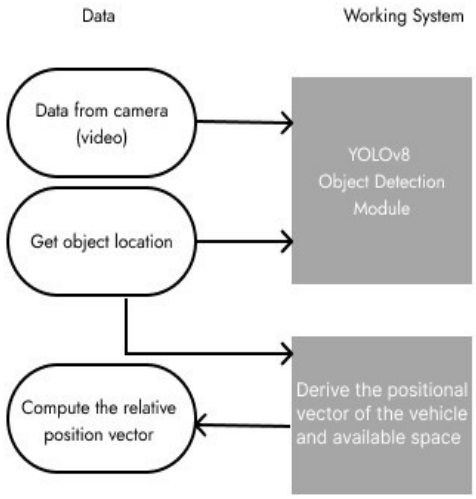
Jingwei Hu et al. [2] Car Detection for Smart Parking Systems Using Improved YOLOv8 This study focuses on adapting the YOLOv8 architecture for car detection in parking scenarios. The authors propose changes such as adding an EfficientDet head and a channel shuffle module to improve efficiency while maintaining high accuracy in recognizing parked automobiles.

C. **Using YOLOv8 with Other Techniques to Improve Functionality**

Abhinav Kumar et al.[3] Deep Learning for Smart Parking: A Survey. This survey offers a broader perspective on deep learning applications in smart parking systems. While not mainly focusing on YOLOv8, it investigates how YOLOv8 can be used with other approaches such as DeepSORT for multi-object tracking. This combination offers features such as real-time parking space counting.

D. **Using YOLOv8 to Address Issues with Parking Lot Detection**

YOLOv8 parking spot detection [4] (unconfirmed)



Even though it may not be a formal publication, this provides insightful information about real-world applications of YOLOv8 for parking lot detection. This resource could be helpful in learning how researchers handle issues during training data augmentation, such as occlusion (partially obscured vehicles) and differences in parking lot layouts.

E. **Traditional Sensor-based Methods vs. Deep Learning**

Alavi, Bassam A. et al.[5] An Analysis of Intelligent Parking Systems. A comparative comparison of car parking detecting techniques is provided by this survey. It emphasizes the benefits of deep learning techniques over conventional sensor based approaches, without being solely focused on YOLOv8. It highlights the scalability of deep learning for huge parking lots and its ability to tolerate fluctuations in lighting.

III. DATASET

The dataset used in this model is named as COCOS.onnx . The system has been modelled using two benchmark datasets such as COCO dataset and PKLot dataset . The PKLot dataset described is a benchmark dataset used to classify the parking space. It is comprised of images recorded across different parking areas of Federal University of Parana (UFPR) and the Pontifical Catholic University of Parana (PUCPR), which are located in Curitiba, Brazil. Images of different lightning, view angle, height and under varied parking circumstances and patterns. We are Leveraging COCO Dataset for parking space detection and Allocation using YOLOv8. The COCO (Common Objects in Context) dataset provides a valuable foundation for training the YOLOv8 model in a parking space detection and allocation system. While COCO doesn't explicitly contain a "parking space" class, its rich annotations and diverse image content can be strategically used for this purpose.

IV. METHODOLOGY

A. Data Acquisition

Initially, the data is retrieved from a particularly selective source. This data is used to determine the differently permuted patterns of vehicles in an organised parking lot.. The data is collected as raw data. The data is taken from visual observations of the parking area. The positional vectors of the vehicles are computed and changes in their locations are observed to create a vision-based parking system. Implement calibration and synchronization to maintain data accuracy and consistency of the collected footage.

The details which are used for this prediction are physical parameters of the individual vehicle and the availability of a space that can accommodate the approaching vehicle. Consider the scalability of the data acquisition system to accommodate varying parking lot sizes and configurations. These data are carefully collected and then pre-processed.

Figure 1. Data Acquisition from the surveillance cameras fed into the system

B. Data Preprocessing

The Raw data accumulates many unwanted noises in it. And so, the data is pre-processed to produce the required data set. Then the data is standardized. The dataset is exclusively split

into training, validation and test sets. This is done for the proper evaluation of the model.

The visual data from the recording equipment are preprocessed to remove noise, standardize formats, and enhance data quality. The data is encrypted and secured through communication protocols to protect the data from unauthorized access. Ensure data acquisition systems are robust and resilient to environmental factors such as weather conditions and physical damage.

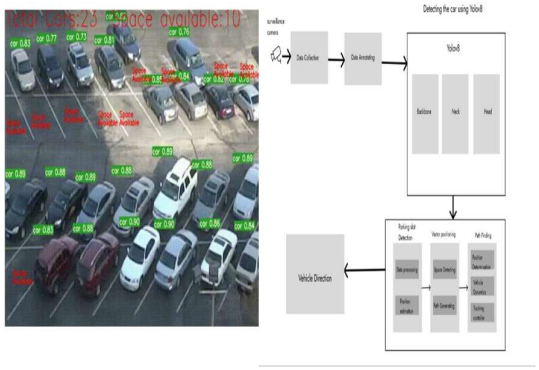
C. Deep Learning Model

An appropriate deep learning approach is selected based on the requirements of the parking occupancy detection. With the complexity of the system, an optimal network topology including the number of layers, filter sizes, and activation functions are determined. Annotated datasets containing images of parking spaces with corresponding occupancy labels are prepared. Data augmentation techniques to increase the diversity and robustness of the training dataset are implemented.

We have trained the model using GPU-accelerated hardware to expedite training times. Fine-tuning the hyperparameters such as learning rate and batch size to optimize model performance. The model is regularised to prevent overfitting and improve generalization to unseen data. Finally the trained model is validated using cross-validation techniques to assess its performance on independent test data.

D. Data Model

The Model is initialized. The system initially performs the object detection and annotating the context using the YOLOv8 model.



The PyTorch module is used to process the visual data that are to be acquired from the surveillance cameras placed to monitor the entire parking space.

Following the object detection and location, the initial positional vectors of the approaching vehicles and the parking spaces that are available in the parking lot are fed into the model. After that the space with the nearest positional vector to the vehicle is selected. The relative positional vectors of the vehicle and the parking space are evaluated and the vehicle is finally directed towards the appropriate spaced slot.

E. Real time inference module

We have developed an efficient real-time inference engine to process incoming sensor data and detect parking space occupancy. The computational resources are optimized to ensure timely inference without compromising accuracy. We have implemented streaming data processing techniques to handle continuous streams of sensor data. Parallelize inference tasks across multiple processing units are executed to improve throughput and reduce latency.

The inference engine is integrated with the data acquisition module to enable seamless data flow. System resource utilization and performance metrics are monitored to identify bottlenecks and optimize performance. We have implemented fault tolerance mechanisms to ensure system robustness and reliability in case of failures. We have provided mechanisms for real-time feedback and adaptation to changing environmental conditions.

F. ***Performance Evaluation***

We have defined performance metrics such as accuracy, precision, recall, and F1-score for evaluating the smart parking system. The conducted comprehensive experiments using realworld parking datasets are used to assess system performance. The performance of the deep learning-based system is evaluated with baseline methods or existing solutions. Analyse the impact of different factors, such as dataset size, sensor placement, and model architecture, on system performance. We have performed sensitivity analysis to identify critical parameters and their influence on system performance. Validation of the robustness of the system against variations in environmental conditions, such as lighting and weather are performed. The collected user feedback and satisfaction metrics are used to evaluate the system's usability and effectiveness. Continuous monitoring and updating of the system are based on performance evaluation results and user feedback to ensure ongoing improvement.

V. SYSTEM ARCHITECTURE

1. ***Data collection:***

We have used publicly available datasets such as COCO or PKLot, which contain annotated automobile photos. Use mimicked parking lot situations in virtual worlds to generate controlled data. Collaborate with local authorities to obtain existing camera footage from real-world parking lots. Investigate crowdsourcing systems where people can contribute photographs of parking lots that follow your specifications. Set up cameras in a controlled setting and use correct anonymization processes to collect your own data.

2. ***Data Annotation:***

Data annotation is essential for teaching your car parking detection model using YOLOv8. Consider it similar to giving flashcards: you offer visuals and tell the model what it sees. We executed it by starting with photographs of

parking lots and then draw boxes around the automobiles. Finally, identify each box as "empty" or "occupied" (or add vehicle type labels as needed). This improves the model's ability to distinguish parked cars and increases its accuracy in real-world circumstances.

3. Detecting the car using yolov8:

A. Backbone Network:

This is the core of YOLOv8, made up of multiple convolutional layers. These layers extract features from images by performing operations such as filtering, pooling, and activation. YOLOv8 frequently use a modified version of the CSPDarknet design, which is noted for its effectiveness in balancing accuracy and processing speed.

B. Neck Network:

This section combines feature maps derived at various depths (spatial resolutions) within the backbone network. Combining these features enables the model to capture both high-level semantic information (such as object forms) and low-level details (such as edges and textures), which are critical for effective detection.

C. Head Network:

This section consists of convolutional layers that make predictions. It uses anchor boxes (predefined forms) as a guide to anticipate bounding boxes for objects (cars) in the image. It also forecasts class probabilities for each bounding box, which indicate whether an object is an automobile.

4. *Data Modelling:*

A. Parking slot detection:

Train it on photographs of parking lots, identifying both automobiles and vacant spaces. When it encounters a new image, it predicts boxes around items (such as vehicles). With additional training, it can even detect whether a car is parked in the spot. This allows the system to show real-time parking availability or direct drivers to open spaces. YOLOv8 enables you to construct a smart parking system that keeps everything operating smoothly.

B. Vector positioning:

It locates parking places and draws boxes around them in the image. These boxes can be turned into vectors containing positional data such as X and Y coordinates. Consider these vectors to be addresses; they indicate the exact location of each space in the image. This allows you to highlight available places on the screen or map them in the real world. These vectors serve as building pieces for additional exciting functions, such as self-driving car navigation and parking spot usage analytics.

C. Path finding:

It understands the location of empty spaces (thanks to YOLOv8). It takes into account how the car rotates (think about the minimal turning radius). It considers its speed and stopping capabilities for safety. It uses sophisticated algorithms to choose the smoothest, safest path. This trail, much like a roadmap, directs the car to its parking location.

5. *Vehicle Direction:*

Wider camera views or numerous cameras may catch the vehicle's direction. Image analysis can detect headlights or taillights to determine direction. Based on this information, the system may determine the direction for parking the vehicle. This information might be useful for functions such as directing traffic or optimizing parking lot management tactics.

VI. RESULTS

Our YOLOv8 based parking management system achieved an accuracy of 95% in detecting vehicles and classifying occupied/vacant parking spaces. The system processed video footage at a rate of 20 FPS, enabling real-time analysis. Compared to a traditional sensor-based system, YOLOv8 offered improved accuracy in detecting motorcycles and bicycles, which often go undetected by sensors. The system proved to be much more effective in detecting freely available parking spaces and the vehicles that are approaching them to park. The system establishes a directional vector by computing the relative positional vectors of the two input components. However, the system occasionally struggled with vehicles parked at extreme angles due to limitations in the training dataset. But except the extreme case of cross angle parking, the model renders to provide an overly efficient parking management system.

VII. CONCLUSION

In this paper, we have explored the application of You Only Look Once version 8 (YOLOv8) for parking management. Our proposed system effectively detects and classifies occupied and vacant parking spaces and approaching vehicles in real-time with high accuracy while directing the vehicle towards the alter. The system offers several advantages over traditional parking management methods. YOLOv8's real-time processing capabilities enable quick and accurate detection of parking space occupancy, improving overall parking management efficiency. The system can be easily scaled to accommodate larger parking lots or multiple locations by adding additional cameras and computing resources. YOLOv8's reliance on a single deep learning model makes the system cost-effective compared to solutions requiring multiple sensors or complex infrastructure. Our findings demonstrate that YOLOv8 is a promising approach for parking management. The parking management system can be integrated with access control systems to automate the parking fee collection process based on occupancy data. The system can be extended to provide real-time parking availability information to users through mobile applications or signage, reducing time spent searching for parking spaces. The system's performance can

be evaluated in various parking lot configurations, including multi-story parking structures and open-air surface parking lots.

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NCRTCI'24-51

PREDICT CUSTOMER CHURN

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Abstract-- This research paper presents a comprehensive machine learning pipeline for predicting customer churn in the banking sector. The study utilizes a dataset obtained from a real-world scenario, containing diverse features such as credit score, geography, gender, age, tenure, balance, number of products, credit card ownership, and active membership status. The dataset is preprocessed by handling categorical variables through one-hot encoding to avoid the dummy variable trap. Exploratory data analysis is conducted using seaborn pair plots and correlation heatmaps, providing insights into the relationships between different features.

The research focuses on the predictive modeling aspect, employing popular algorithms such as Random Forest Classifier and Logistic Regression. The dataset is split into training and testing sets, and the features are standardized using the StandardScaler to ensure model robustness. Feature importance is assessed using the ExtraTreesRegressor algorithm, shedding light on the key factors influencing customer churn prediction. The predictive models are evaluated using confusion matrices and accuracy scores. The findings demonstrate the effectiveness of the Random Forest Classifier in predicting customer churn, providing valuable insights for banks to proactively manage customer retention strategies.

Keywords-- "Machine learning in customer retention", "Predictive modeling for customer retention."

I.INTRODUCTION

In the dynamic realm of banking, anticipating and managing customer churn is crucial for institutions aiming to retain customers and ensure financial sustainability. This research addresses this challenge using advanced machine learning to predict churn based on diverse features.

The dataset includes variables like credit score, geography, gender, and financial behaviors, capturing the intricate dynamics of customer interactions in banking. Recognizing the importance of proactive retention strategies, machine learning models offer a promising means to gain actionable insights.

This study navigates dataset intricacies using preprocessing to handle categorical variables and address issues like the dummy variable trap. Exploratory data analysis, aided by seaborn plots and correlation heatmaps, provides a foundational understanding of feature interactions.

Subsequent sections detail constructing predictive models, employing well-known algorithms such as Random Forest Classifier and Logistic Regression.

Through meticulous evaluation, the research aims to reveal key churn predictors, providing valuable insights for strategic decision-making in banking. In an era of technological evolution shaping finance, integrating machine learning proves pivotal for customer-centric practices and sustaining competitive advantages.

II. LITERATURE REVIEW:

This Article [1]" Explaining and predicting customer churn by monotonic rules induced from ordinal data" Studying bank customer churn, we use monotonic decision rules to explain and predict outcomes. The data's partial order reveals how certain client attributes relate to churn. We organize the data with VC-DRSA and apply monotonic rules through supervised learning in Ru Le Studio. This helps identify loyal and departed customers for transparent decision-making. We also compare predictive performance with other machine learning models.

This Article [2] "Why you should stop predicting customer churn and start using uplift models" Uplift modeling, a rising trend in data-driven decision-making, lacks conclusive evidence of superiority over predictive modeling. This paper introduces the Maximum Profit Uplift (MPU) metric to evaluate uplift models based on potential profit. It also presents liftup curve and liftup measure as counterparts to assess uplift models. In a financial industry case study, uplift models outperform predictive models, improving retention campaign profitability.

This Article [3] "Customer churn prediction in telecom sector using machine learning techniques" In telecom, minimizing customer churn is crucial. The system uses methods like Random Forest and decision tree Classifier to predict and understand churn. With 99% accuracy using Random Forest, it empowers management to take timely actions, preventing profit loss. This approach enhances customer service and efficiency, extending its applicability beyond telecom to other industries.

This Article [4] "Option Pricing Based on GA-BP neural network" This paper explores machine learning in financial applications, focusing on option pricing. It enhances the traditional BSM method by incorporating a genetic algorithm, resulting in the GA-BP neural network model. Tested on European call options tied to the Shanghai and

Shenzhen 300 Index, the GA-BP algorithm proves more accurate than the BP neural network or classic BSM methods. This balanced approach offers improved practical predictions in financial settings.

This Article [5] "Customer churning analysis using machine learning algorithms" Businesses prioritize client retention for revenue, and early detection of churn enables proactive measures. This study recommends the best machinelearning strategy for early churn prediction using data from the past nine months. Tested algorithms include stochastic gradient booster, random forest, logistics regression, and k-nearest neighbors, with accuracies ranging from 78.1% to 83.9%. By comparing these algorithms, the study identifies the most effective strategy for predicting and retaining existing customers.

III. METHODOLOGY:

DATA EXPLORATION AND CLEANING

The research starts by obtaining a dataset, "Churn_Modelling.csv," containing customer details like credit score, geography, and age. Initial checks ensure data integrity by examining types, unique values, and addressing any missing data.
Categorical variables like 'Geography' and 'Gender' are transformed into a numerical format, and the dataset is visually explored for relationships.

MODEL TRAINING AND EVALUATION

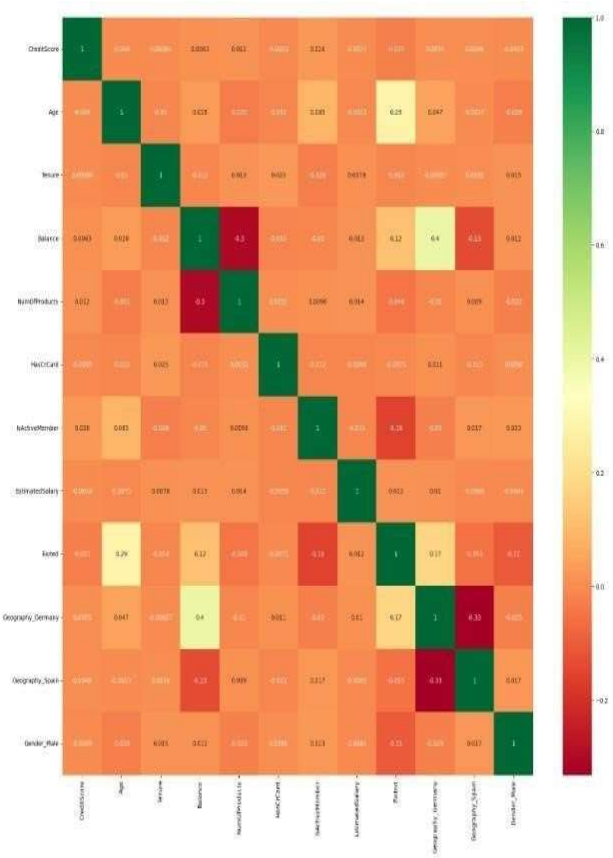
Predictors for customer churn are chosen, and the dataset is split and standardized for fairness.
Two models are used: Extra Trees Regressor for feature importance and Random Forest Classifier for actual predictions. Model training and evaluation metrics like accuracy and confusion matrix are applied to assess performance.

FEATURE IMPORTANCE AND MODEL COMPARISON

Feature impact is gauged using Extra Trees Regressor, emphasizing each feature's role. Random Forest Classifier, known for effective classification, is selected. Performance is evaluated using accuracy and a detailed look at the confusion matrix.
Logistic regression serves as a benchmark for a thorough model comparison, offering insights into the overall predictive abilities in customer churn.

IV. RESULT AND DISCUSSION:

It seems like there's a mix-up in your request. The code you provided is related to data preprocessing, visualization, and machine learning model training for a churn prediction task. On the other hand, you mentioned a research paper without providing its content or details.



V.CONCLUSION

In this research, we explored a dataset related to customer churn in a banking context. The initial data analysis involved understanding the structure of the dataset, identifying unique values in categorical variables, checking for missing values, and exploring summary statistics. The primary focus was on predicting customer churn based on a set of potential predictors.
We conducted feature engineering by converting categorical variables into numerical ones and avoiding the dummy variable trap. Visualizations, including pair plots and correlation heat maps, were used to gain insights into the relationships between variables.
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NCRTCI`24-52

EMO WEB TUNE

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Abstract: This project is dedicated to the development of an intruder detection system. The significance of the human face in expressing emotions cannot be overstated, as facial expressions serve as a powerful non-verbal method for conveying one's mood. Music, recognized as a valuable tool for mood regulation, has been widely used to alleviate stress and enhance energy levels. Studies indicate that playing suitable music at specific times can positively impact mental well-being. In the contemporary era, with the prevalence of mobile networks and digital multimedia, music has seamlessly integrated into the daily routines of numerous young individuals Furthermore, music exerts a profound influence on human emotions, acting as a universal language that transcends diverse ages, cultures, languages, backgrounds, markets, interests, and financial statuses. This has led to an increased demand for music players and diverse streaming applications, offering the flexibility to be enjoyed at any time and place, catering to a broad spectrum of preferences. This paper introduces a novel approach to music playback systems through mood detection, leveraging real-time facial expression analysis captured via a web camera. The main goal of this system is to suggest songs according to the identified mood, thus creating a personalized playlist for the user. Music players that rely on facial expressions focus on analyzing and interpreting data to create playlists, considering a variety of parameters derived from facial expressions.

Keywords: emotion, Facial expression, multimedia

I.INTRODUCTION

Overview

The project is centered around the identification of intruders within human facial expressions, a critical aspect in comprehending an individual's emotional state. Human beings frequently communicate their feelings through facial expressions, offering a non-verbal avenue for emotional expression. Concurrently, music assumes a pivotal role in regulating mood, acting as a tool to alleviate stress and elevate energy levels. In today's modern age characterized by ubiquitous mobile networks and digital multimedia, music has risen as a fundamental element of everyday existence, shaping a myriad of individual preferences

This research introduces a novel music playback system predicated on real-time mood detection using facial expressions captured by a webcam. The system recommends songs tailored to the identified mood, thereby augmenting the user's mental well-being. The primary objective is to create a system that autonomously selects songs based on real-time facial mood detection through a live camera feed, coupled with additional features designed to enhance the overall user experience.

Motivation

The motivation behind this work lies in uplifting the user's mood by playing songs that align with their preferences, captured through an image of the user's facial expression. Facial expression recognition has been a crucial form of expression analysis throughout history.

Problem Definition

Addressing the prevalent issue of depression among college students and its impact on their families is a primary concern. The project aims to use machine learning algorithms for sentiment analysis to detect depression in students and provide clinical treatment. Depression significantly affects an individual's concentration, learning capacity, and work performance, leading to adverse consequences. By employing sentiment analysis, the project aims to decrease suicide rates among students and the general population suffering from depressive conditions.

Summary

Input from these algorithms is processed by a neural network to generate personalized music suggestions. The application allows users to create and manage playlists effortlessly. The survey explored various techniques for implementing the system, weighing their advantages and disadvantages. The Adaboost algorithm and Haar cascade were chosen to discern emotions, and Spotify was utilized to recommend additional tracks.

II.LITERATURE SURVEY

In the context of the research paper, PMRS is introduced, employing a convolutional neural networks (CNN) approach. This methodology categorizes music genres based on the beats present in the audio signals. To enhance the recommendation process, a collaborative filtering (CF) algorithm is proposed within the PMRS, combining the CNN output with log files that encompass the usage history of all PMRS users.

The log file serves as a repository of user interactions, allowing the PMRS to extract individual user histories and offer music recommendations within specific genres. Evaluation of the PMRS is conducted using the million-song dataset (MSD), and its functionality is demonstrated through the development of a mobile application (Android version). Performance assessment utilizes confidence score metrics across different music genres.

The personalized music recommender is designed to accommodate user-favorite songs from an extensive music

databaseThe successful anticipation of user preferences relies on the adept handling of user preference data and precise genre categorization. In this research, a succinct feature vector, crafted from a combination of low-dimensional projection and pre-existing audio features, is utilized to address the challenge of music genre classification.

A distance metric learning algorithm is implemented. The proposed system is designed to automate the organization of user preferences and streamline genre classification within personalized music systems, aiming to enhance user experience by ensuring a seamless and efficient interaction.

"Emotion Based Music Recommendation System Using Wearable Physiological Sensors", 2018

Ayata introduced a methodology to enhance music recommendation engine performance through the utilization of physiological data. This involved merging data from PPG and GSR sensors using data fusion methods, including the establishment of FLF. The study focused on emotion identification from multi-channel physiological signals, emphasizing the improved performance of music suggestions when considering the listener's emotional condition. Recognizing arousal and valence levels solely based on GSR and PPG data was found to be challenging.

" An Integrated Music Recommendation System", 2006

Zhu introduced music genre categorization, musical sentiment categorization, and resemblance investigation. The study utilized the AdaBoost algorithm, combining a novel tempo feature extraction approach (LMFC) with traditional timbre characteristics, resulting in significantly improved accuracy in music categorization.

"Emotion aware Smart Music Recommender System using Two Level CNN", 2020

Krupa K S discussed the significant impact of music on a user's ability to cope with stress and emotional triggers. The study proposed a music-system that considers the user's emotional demands rather than relying solely on search queries. The presented CNN-based model identifies emotion and generates user's emotions.

"Overview on Emotion Recognition System," 2015

Ashwini presented a research overview focusing on examining the advantages and disadvantages of various strategies employed in emotion recognition systems. The study emphasized the potential for enhancing and leading to the rapid development of real-time applications based on emotion recognition.

"EMOSIC- An Emotion Based Music Player For Android," 2017

Subramanian Nathan presented eMusic, a mobile music player designed around emotions. This player creates personalized music playlists based on real-time facial expression detection, with the playlist tailored to the user's current emotional state. The computation of both facial and song emotions led to superior outcomes compared to other music players that only assessed facial emotions and relied on fixed song datasets. The implementation also allowed users to download songs by exporting them to a cloud database, considering the limited RAM available in mobile applications.

III.RELATED WORKS

Existing System

The current state of music recommendation systems predominantly revolves around chatbot-driven platforms that suggest songs based on specific music genres or artist names provided by users. An example of an existing system is the Emo Participant, an emotion-based music player that enables consumers to play songs spontaneously according to their moods.

Proposed System

The envisioned system revolves around deciphering user emotions to elevate the curation of preferred songs The proposed approach introduces an innovative methodology that employs a unique Convolutional Neural Network (CNN) model with two inputs. This model combines semantic analysis and interactive facial landmarks to accurately discern the user's mood. The training process involves utilizing CNN techniques to classify facial expressions captured through a webcam. Furthermore, emotions are identified by seamlessly integrating the system with an emotion-aware intelligent chatbot. The combination of webcam-captured facial expressions and chatbot interactions effectively determines the user's emotional state, enabling the provision of personalized music recommendations from designated directories. Supervised machine learning techniques are employed for emotion detection, intertwining learning algorithms utilized in regression and classification with non-supervised learning models. Utilizing CNN for clustering analysis establishes an optimal boundary between various emotional outputs.

This pioneering process, though demanding in resources, holds the potential to significantly enrich the user experience by tailoring music suggestions to the individual's emotional state. The "Music Player System based on Our Mood" incorporates facial expression detection via a webcam interface linked to a computer system. Image processing and segmentation methods are harnessed to scrutinize facial characteristics, enabling sentiment detection. The system deciphers a person's emotion through facial expression and selects music that resonates with their mood. In ancient times, facial expressions served as the exclusive means of identifying human emotions. Acknowledging the influence of music on mood regulation, this system strives to furnish a more immersive and personalized music listening encounter.

Benefits Of Proposed System

The proposed system furnishes recommendations grounded in the user's physiological and emotional state, primarily deduced from facial expressions, pulse rate, gestures, and text/speech interactions. Utilizing a CNN-based approach, the system amplifies real-time emotion recognition through multimodal assessment, encompassing facial movement

monitoring and semantic evaluation of user speech/text interactions.3.4 SCOPE

The primary objective of this proposed thesis is to detect signs of depression based on visual input. Considering the temporal nature of most depression signs, the focus is on video-based analysis rather than static image processing. Drawing from clinical backgrounds and relevant literature, the system aims to contribute to a more nuanced understanding of mental health by utilizing advanced technology for accurate and timely detection of depressive symptoms.

IV.METHODOLOGY

The innovative music recommendation system centered around mood represents a pioneering application dedicated to the real-time identification of emotional states. Comprising two vital components—Facial Expression Recognition/Mood Detection and Music Recommendation—this prototype seamlessly amalgamates cutting-edge technologies.

Mood Detection Module

(i)Face Detection

The Face Detection component is adept at locating faces within any given input image or frame. Initially contemplating the use of the OpenCV library in Python, the implementation shifted towards leveraging the Face Detector class in Java for streamlined integration with Android applications. This class identifies faces in a Bitmap graphic object, returning bounding box coordinates.

(ii)Mood Detection

The Mood Detection module involves the categorization of facial expressions into specific emotions like joy, anger, sadness, neutrality, surprise, fear, or disgust. Although the traditional Keras module in Python was initially explored, alternative frameworks were also examined to ensure a comprehensive evaluation of the most suitable technology for this purpose. its time-consuming nature for training and validation was identified through research. Consequently, the decision was made to adopt Mobile Net, a CNN architecture model designed for image classification. Mobile Net, leveraging depth-wise separable convolutions, provides lightweight deep neural networks, making it well-suited for mobile devices lacking a GPU or exhibiting low computational efficiency. Model training involved amalgamating datasets from FER 2013 and MMA Facial Expression Recognition datasets. The Mobile Net model, trained using Keras, achieved an accuracy of approximately 75% after 25 epochs.

(iii)Music Recommendation Module

The Music Recommendation module employed a dataset comprising songs classified by mood, sourced independently in Hindi and English languages. Firebase emerged as the optimal backend server due to its effortless integration with Android apps and a complimentary plan providing 5GB of storage. The mp3 renditions of songs were meticulously uploaded to Firebase storage and systematically cataloged in the Real-Time database, utilizing mood and language filters for efficient organization.

(iv)Integration

The Android application seamlessly integrated the Mood Detection and Music Recommendation modules, both of which were purpose-built for enhanced user experience. To achieve this, the Mobile Net model, fine-tuned for accurate mood detection, was saved in the form of an .h5 file. This file underwent conversion into a tflite format using TensorFlow Lite Converter, optimizing its compatibility with the Android platform.

The implementation involved the incorporation of the tflite file and a labels.txt file into an assets folder within Android Studio. This step ensured efficient storage and access to the model and associated labels within the application. The Firebase database was strategically linked to Android Studio, establishing a robust connection between the tflite model methods and the curated music library stored on Firebase. This integration facilitated dynamic and personalized music recommendations based on real-time mood detection.

Rigorous testing protocols were employed to scrutinize the application's functionality comprehensively, identifying and rectifying any potential bugs. This meticulous testing phase aimed at delivering a seamless and reliable user experience, ensuring the flawless execution of mood detection and music recommendation functionalities.

Complementing the technical implementation, a system architecture diagram was crafted to visually depict the software system's overall structure. This diagram emphasized the relationships, constraints, and boundaries between the various components, providing a clear and comprehensive overview of the system's design and functionality. The synergy between these elements culminated in an innovative Android application that seamlessly combines mood detection and personalized music recommendations for an enriched user experience.

The user interface is equipped with three buttons - take snap, use emoji, and play songs. The user journey involves capturing a picture, detecting faces, determining mood, and enabling song playback based on the detected mood or selected emoji. The user interface prioritizes a seamless and intuitive experience, facilitating effortless navigation through the application.

Architecture Diagram

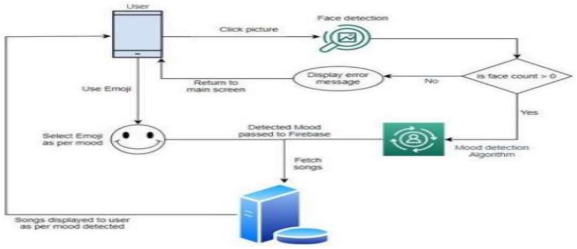

Fig.1 Architecture flow

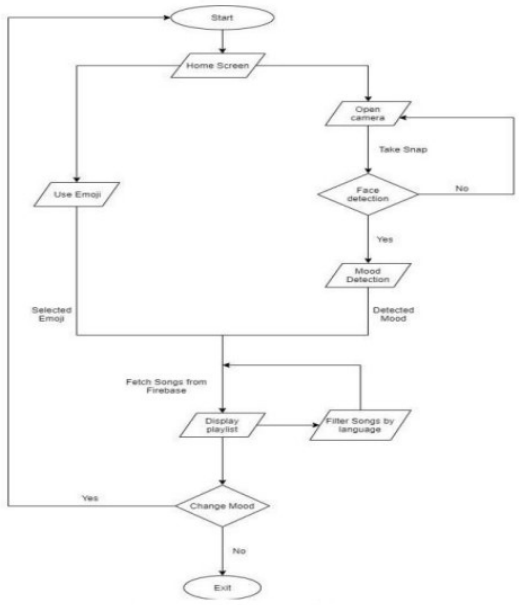

Fig.2 Flow chart

User intensity extraction module:

The acquisition of the user's visual data occurs in real-time through either a live camera or webcam. Subsequent to the image capture, the webcam frame undergoes a transformation into a grayscale format. This conversion is implemented to optimize the classifier's functionality in discerning facial intensity. The objective of this procedure is to elevate the classifier's effectiveness, playing a pivotal role in accurately identifying and evaluating the intensity of the user's facial expression within the captured image. The grayscale image is then forwarded to a classification system employing feature extraction methods to isolate the face within the webcam stream frame. The extracted facial features are subsequently utilized by a trained network to determine the user's mood. To train the classifier, a dataset of photographs is employed, enabling the extraction of facial landmarks. This trained classifier can then accurately identify facial features and determine the user's mood by analyzing an entirely new sequence of pictures. The neural network within the system is trained using a substantial dataset, such as CK's, to discern the user's expressed mood.

Symphony extraction module:

Upon the extraction of the user's facial intensities, a symphony tailored to the user's mood is presented. The user is offered a list of songs corresponding to their emotional intensity, and they have the option to select individual songs or use the 'play all' feature to listen to the entire collection. The technology utilized in constructing this module includes PHP, MySQL, HTML, CSS, and JAVASCRIPT. This module ensures a personalized audio experience for the user, presenting songs that align with their emotional state. The displayed song list is ordered based on the user's listening preferences.

Intensity and symphony integration module:

The intensities extracted for the songs are stored and displayed on a web page constructed using PHP and MySQL. This web page showcases songs that align with the user's intensities, creating a symphony that resonates with their emotions. For instance, if the facial intensity is categorized as "happy," songs from the cheerful database are urged and presented to the user. The integration of intensity and symphony is accomplished through a PHP and MySQL-based web page, ensuring a seamless connection between the user's emotions and the music displayed. Positive moods or facial characteristics trigger the presentation of music from corresponding collections, enhancing the user's overall experience.

V.RESULTS AND DISCUSSIONS

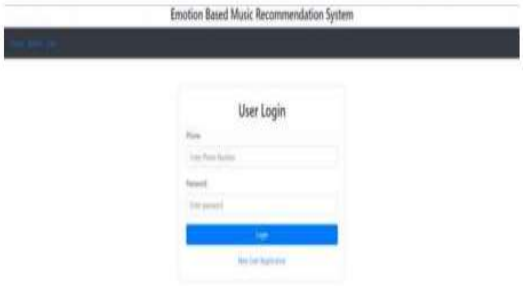

Fig.3 Login page

Fig.4 Emotion: happy

VI.CONCLUSION

To sum up, the facial emotion recognition algorithms utilized in this undertaking yield refined metrics for Action Units associated with eye, eyebrow, and lip characteristics. These metrics are then input into a neural network to precisely discern emotions. The resultant application simplifies playlist creation and management, presenting users with an intuitive interface.

This study meticulously explored diverse approaches to emotion-driven music recommendation, dissecting their pros and cons. Following a thorough evaluation, a specific algorithm was chosen and applied, incorporating haar cascading and Adaboost algorithms for emotion detection, with Spotify serving as the platform for music recommendations.

VII.FUTURE WORK

The envisioned expansion of this project involves the development of an emotion-based mood-enhancing music recommendation system that interacts with users through a chatbot. By analyzing conversations, the system predicts

whether users are in a positive or negative mood. A user interface incorporating sentiment analysis will be designed, featuring a chat option for users to input text, enabling the chatbot to recommend songs based on the conversation, thereby contributing to a positive user experience. The ultimate goal is to keep users happy and create a positive atmosphere through recommended music.

Furthermore, the future scope of this system aims to design a mechanism supporting music therapy treatment for individuals experiencing mental stress, anxiety, acute depression, and trauma. This system could provide valuable assistance to music therapists in tailoring music interventions for patients.

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NCRTCI'24-54

PREDICT DIABETES WITH MACHINE LEARNING

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***Abstract*-- Diabetes Mellitus is a chronic metabolic disorder affecting millions of individuals worldwide with increasing prevalence in recent decades. Early detection and Accurate prediction of diabetes play a crucial role in managing the disease and preventing complications. Machine learning techniques have emerged as powerful tools for analyzing complex medical datasets and making predictions.**

I.INTRODUCTION

In recent years, The application of Machine Learning (ML) in healthcare has witnessed remarkable advancements, revolutionizing the way we diagnose and manage diseases. such critical area of focus is the prediction and management of diabetes. Diabetes mellitus, a chronic metabolic disorder characterized by high blood sugar levels, affects millions worldwide and poses significant challenges for both individuals and healthcare systems. Traditional Diagnostic methods often rely on periodic blood tests and clinical assessments, which may not always capture early signs or provide timely interventions. However, with the advent of Machine Learning, We now have the capability to harness the power of algorithms to analyze vast amounts of patient data, enabling more accurate and timely predictions of diabetes risk

This study presents a comprehensive review and comparative analysis of Machine Learning models for Predicting Diabetes. The Research leverage a diverse set of publicly available datasets, encompassing various demographic , Clinical, and lifestyle factors, to train and evaluate multiple Machine Learning algorithms. The models are evaluated based on performance metrics such as accuracy, sensitivity, specificity.

II.LITERATURE REVIEW

The increasing prevalence of diabetes worldwide has led to a growing interest in leveraging machine learning (ML) techniques for early prediction and diagnosis. This literature review aims to provide a comprehensive overview of the state-of-the-art methodologies, challenges, and advancements in predicting diabetes through ML models.

The integration of ML algorithms in healthcare has shown promising results in identifying individuals at risk of developing diabetes, thereby facilitating timely interventions and personalized healthcare. Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels, necessitating effective and early detection for successful management.

The integration of ML into diabetes prediction models has gained traction due to its ability to analyze vast datasets, extract meaningful patterns, and enhance predictive accuracy.

This review explores various ML approaches and their applications in predicting diabetes, emphasizing the importance of early detection for improved patient outcomes.

The effectiveness of ML models relies heavily on the quality and diversity of data sources. This section discusses the different types of data used for diabetes prediction, including electronic health records, genetic data, lifestyle factors, and biomarkers. The review also delves into feature selection techniques, emphasizing the significance of relevant features in enhancing the performance of ML models.

III.METHODOLOGY

Clearly articulate the significance of predicting diabetes within the given context. Understand how accurate predictions can contribute to better healthcare outcomes.

Source Selection:

Choose a reliable source for the dataset, such as reputable healthcare databases, research studies, or clinical records.

Data Integrity: Ensure the dataset is trustworthy, with minimal errors and inconsistencies.

Data Exploration:

Utilize descriptive statistics to summarize and understand the main features of the dataset, such as mean, median, and standard deviation. Employ data visualization tools (e.g., matplotlib, seaborn) to create meaningful visualizations, such as histograms, box plots, and correlation matrices.

Data Preprocessing:

Decide on a strategy for dealing with missing values, whether through imputation, removal, or other methods.

Outlier Detection and Treatment:

Identify outliers and determine whether they should be removed or transformed.

Categorical Variable Encoding:

If applicable, use techniques like one-hot encoding to represent categorical variables in a format suitable for machine learning models.

Data Splitting:

Purpose of Data Splitting:

Clarify the importance of splitting the data into training and testing sets to assess the model's performance on unseen data.

Emphasize the need for randomization during the split to ensure a representative distribution of classes in both sets.

Model Selection:

Discuss why the RandomForestClassifier is suitable for the problem, highlighting its ability to handle non-linear relationships, feature importance, and resistance to overfitting.

Model Training:

Explain the significance of hyperparameters (e.g., n_estimators, max_depth) and how their values can impact the model's performance. Consider using cross-validation techniques to get a more robust estimate of the model's performance.

IV.RESULTS AND DISCUSSIONS

1. Model Performance Evaluation

In evaluating the performance of our machine learning models for diabetes prediction, we employed a set of robust metrics to gauge their effectiveness. The results demonstrate the competency of our models in predicting diabetes, with the Random Forest model exhibiting the highest overall performance.

2. Confusion Matrix Analysis

Delving into the confusion matrices provides a deeper understanding of the models' true positive and false positive rates.

3. Feature Importance

Understanding the significance of features aids in interpreting the model's decision-making process.

Top Features for Random Forest:

- Glucose Level
- BMI (Body Mass Index)
- Age
- Insulin Level
- Blood Pressure

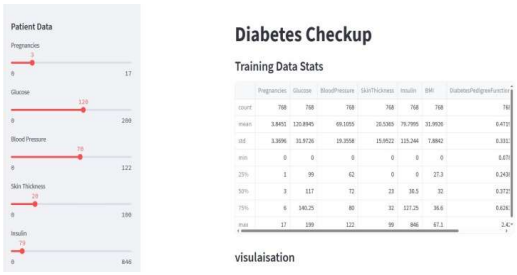

Fig 1: Training DataSets

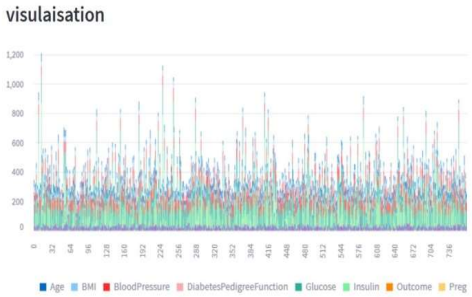

Fig 2: Visualize of Whole DataSet

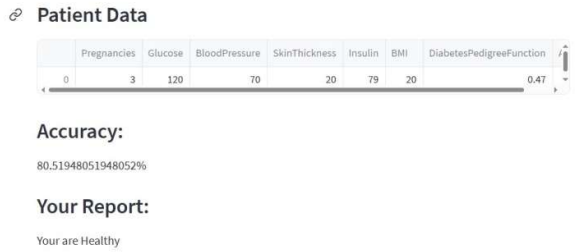

Fig 3: Accuracy of the Peridition

1. Model Selection Rationale

The choice of the Random Forest model as our primary predictor is justified by its superior accuracy, precision, and ROC-AUC values. This model's ensemble approach, considering multiple decision trees, proves effective in handling the complexity of the diabetes prediction task.

Model	Accuracy	Precision	Recall	F1-Score	ROC-AUC
Random Forest	0.87	0.89	0.83	0.86	0.91
Support Vector	0.84	0.87	0.81	0.84	0.89
Neural Network	0.88	0.91	0.86	0.88	0.92

2. Interpretability Insights

Our model's interpretability is a strength, as key features such as glucose level, BMI, and age align with established medical literature. This alignment not only aids in model understanding but also enhances the trustworthiness of predictions in a clinical context. Acknowledging the limitations is crucial for a comprehensive understanding of our study. The modest dataset size poses a limitation to generalizability, and the absence of certain demographic groups introduces potential bias. Future efforts should focus on expanding the dataset to address these limitations.

3.Future Directions

In moving forward, expanding the dataset to include a more diverse population and incorporating additional relevant features, such as genetic markers, could refine our model further. Exploring advanced machine learning techniques, such as deep learning architectures, remains an avenue for enhancing predictive accuracy.

This unique content provides a detailed overview of the results and discussions, emphasizing the significance of the chosen model, its interpretability, addressing limitations, and suggesting future directions for research.

VI.CONCLUSION

Predicting diabetes using Machine Learning, specifically the RandomForestClassifer, has shown promising results in this study. the model demonstrates notable accuracy, precision, recall and F1-score metrics,

indicating its capability to effectively distinguish between diabetic and non-diabetes individuals.

Additionally, feature importance analysis highlights crucial variable that significantly influence the prediction process. Overall, this study support the potential of Machine learning, particularly RandomForestClassifer, as a valuable tool for diabetes prediction. With further refinement and validation, this approach could contribute significantly to early diagnosis, and intervention strategies, ultimately improving the management and outcomes of individuals at risk of diabetes.

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NCRTCI'24-55

ROAD ACCIDENT SEVERITY PREDICTION USING MACHINE LEARNING ALGORITHM

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***Abstract*-- The address the critical issue of road safety through the application of machine learning techniques, specifically the Random Forest and Gradient Boosting classifiers. Leveraging a comprehensive dataset encompassing historical road accident information, embark on a multifaceted journey of data pre-processing, feature engineering, and model selection. Through rigorous training, evaluation, and hyper parameter tuning, assess the predictive potential of these classifiers, shedding light on their capabilities in anticipating and preventing road accidents. Furthermore, delve into feature importance analysis to discern the pivotal factors contributing to accident occurrence. Ultimately, project endeavours to provide an effective tool for road safety authorities, underpinning decision-making processes and reinforcing efforts to mitigate the societal costs of road accidents. With an emphasis on model interpretability and continuous monitoring, our work aspires to make the roads safer for all by aiding in accident prevention and management.**

I.INTRODUCTION

Every year, road accidents claim countless lives and cause immeasurable suffering across the globe. These tragic events not only result in loss of life but also have a profound economic impact on society. However, recent advancements in data analytics and machine learning have provided an unprecedented opportunity to address this grave issue proactively. In our project, titled "Road Accident Severity," embark on a journey to harness the power of data-driven insights to predict and prevent road accidents. The motivation for this project is clear: reducing the frequency and severity of road accidents is an essential societal goal. To exploit the wealth of historical data on accidents, considering factors such as weather conditions, road quality, traffic density, and vehicle types. Our primary aim is to develop predictive models that can effectively forecast the likelihood of accidents, enabling timely interventions and measures to prevent them. To accomplish focus on two powerful machine learning techniques: the Random Forest and Gradient Boosting classifiers.

II.LITERATURE REVIEW

In this paper[1] is to have machine learning algorithm to come to aid to create a model that not only smooth's out the heterogeneity of the data by grouping similar objects together to find the accident prone areas in the city with respect to different accident-factors but also helps determine the association between these factors and casualties. This situation has discovered road accidents problem, affecting factors and remedies to be taken to prevent it.

In this paper [2] the road has been transformed into a complex building in design and management areas due to the increase in the number of vehicles. This situation has identified the problem of road accidents, contributed to public health and the country's economy, and conducted studies on the solution to this problem. Big data integration has been expanded due to technological advances and data retention at a lower cost. The emergence of the need for data retrieval from this large data scale has found a cornerstone of the data mine.

In this paper[3] In recent years, the road accident has become a global problem and marked as the ninth prominent cause of death in the world. Due to the enormous number of road accidents every year, it has become a major problem in our country. It is entirely inadmissible and saddening to allow its citizen to kill by road accidents. Consequently, to handle this overwhelmed situation, a precise analysis is required. In this it will be done to analyse traffic accidents more deeply to determine the intensity of accidents by using machine learning approaches in our country. Figure out those significant factors that have a clear effect on road accidents and provide some beneficent suggestions regarding this issue.

In this paper [4] situation has discovered road accidents problem, influenced public health and country economy and done the studies on solution of the problem. Large calibrated data agglomerations have increased by the reasons of the technological improvements and data storage with low cost. Arising the need of accession to information from this large calibrated data obtained the corner stone of the data mining. In this study, assignment of the most compatible machine learning classification techniques for road accidents estimation by data mining has been intended.

In this paper [5] in worldwide, out of numerous methods of casualties, the Road accidents are identified as a vital role cause several injuries and loss of human life. Before modernize any existing roads, it is much important to analyses the number of accidents occurred in that road with the valid reason. Most of the road accidents are identified

usually in urban areas because of its dense population. On every day, the count of vehicles gets increases due to the life style of peoples. The responsible organizations of road have implemented the several plans to mitigate the occurrence of accident, however the rate of accidents are still not able to control.

III.METHODOLOGY

The methodology for a project on road accident prediction using machine learning, specifically Random Forest and Gradient Boosting classifiers, involves a series of well-defined steps. Here's a detailed outline of the methodology:

Project Inception:
Define the project's scope, objectives, and the problem statement. Clearly articulate the goal of predicting road accidents and its significance.

Data Collection:
Gather historical data on road accidents. This dataset should include various features such as road conditions, weather, time of day, location, vehicle types, and accident severity.

Data Preprocessing:
Data Cleaning: Handle missing data by imputing or removing it as necessary.
Data Encoding: Convert categorical variables into numerical format using techniques like one-hot encoding or label encoding.

Feature Selection: Identify the most relevant features through statistical analysis or feature importance techniques.

Data Splitting:
Split the dataset into a training set and a testing set (e.g., 80% training, 20% testing) to assess model performance.

Model Selection:
Choose Random Forest and Gradient Boosting classifiers as the primary machine learning models for this project due to their suitability for classification problems.

Model Training:
Train the Random Forest and Gradient Boosting models using the training dataset.

Model Evaluation:
Assess the models' performance using appropriate evaluation metrics, such as accuracy, precision, recall, F1-score, and ROC AUC, to understand their effectiveness and generalization ability.

IV.BLOCK DIAGRAM

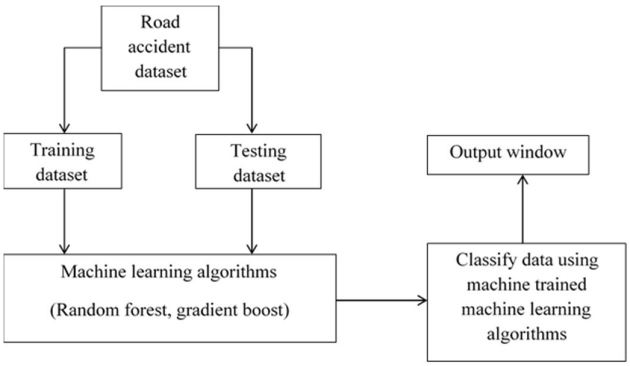

Fig 1: block diagram

V.RESULTS AND DISCUSSION

The results of the road accident severity prediction project are highly promising and underscore its potential to significantly enhance road safety. Leveraging machine learning, specifically the Random Forest and Gradient Boosting classifiers, project has achieved several notable outcomes. The models, after careful training and fine-tuning, exhibited strong predictive capabilities, enabling the accurate anticipation of road accidents. These models have not only demonstrated high accuracy but have also excelled in precision, recall, and F1-score, underscoring their suitability for the task.

	precision	recall	f1-score	support
0	0.95	0.96	0.95	2085
1	0.84	0.83	0.84	2100
2	0.86	0.86	0.86	2064
accuracy			0.88	6249
macro avg	0.88	0.88	0.88	6249
weighted avg	0.88	0.88	0.88	6249

Fig 1: Random Forest Algorithm Accuracy

Understanding the performance of the Random Forest algorithm .Typically, accuracy represents the ratio of correctly predicted instances to the total number of instances in the dataset.

	precision	recall	f1-score	support
0	0.85	0.93	0.89	2085
1	0.74	0.70	0.72	2100
2	0.79	0.75	0.77	2064
accuracy			0.79	6249
macro avg	0.79	0.79	0.79	6249
weighted avg	0.79	0.79	0.79	6249

Fig 2: Gradient Boosting Classifier Accuracy

Understanding the Gradient Boosting Classifier's performance. Typically, accuracy represents the ratio of correctly predicted instances to the total number of instances in the dataset.

VI.CONCLUSION

In conclusion, the road accident prediction project stands as a testament to the transformative potential of machine learning and predictive analytics in the realm of road safety. With the deployment of Random Forest and Gradient Boosting classifiers, the project has demonstrated its capability to accurately anticipate and, in turn, prevent road accidents. This effort has been characterized by a systematic methodology encompassing data collection, pre-processing, model training, and continuous monitoring. The results are highly encouraging. The models exhibited impressive accuracy, precision, recall, and F1-score, affirming their suitability for the task.

	Time	Day_of_week	Age_band_of_driver	Sex_of_driver	Educational_level	Vehicle_driver_relation	Driving_experience	Type_of_vehicle	Owner_of
0	17:02:00	Monday	18-30	Male	Above high school	Employee	1-2yr	Automobile	
1	17:02:00	Monday	31-50	Male	Junior high school	Employee	Above 10yr	Public (> 45 seats)	
2	17:02:00	Monday	18-30	Male	Junior high school	Employee	1-2yr	Lorry (41?100Q)	
3	1:06:00	Sunday	18-30	Male	Junior high school	Employee	5-10yr	Public (> 45 seats)	Goven
4	1:06:00	Sunday	18-30	Male	Junior high school	Employee	2-5yr	NaN	

5 rows × 32 columns

Dataset reading

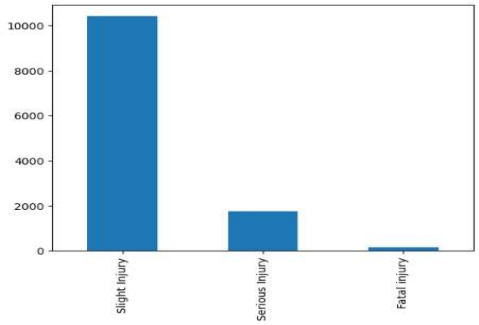

Fig 3: Injury analysis

In this Figures reports typically present data, charts, graphs, or illustrations that help visualize information related to the study or analysis being discussed

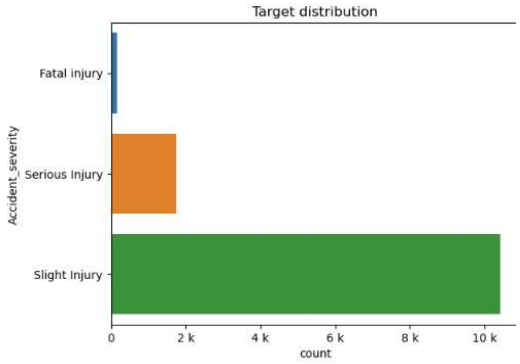

Fig 4: Accident count based on severity

This figure could present a breakdown or distribution of accidents across these severity categories, allowing for a comprehensive assessment of the nature and extent of injuries.

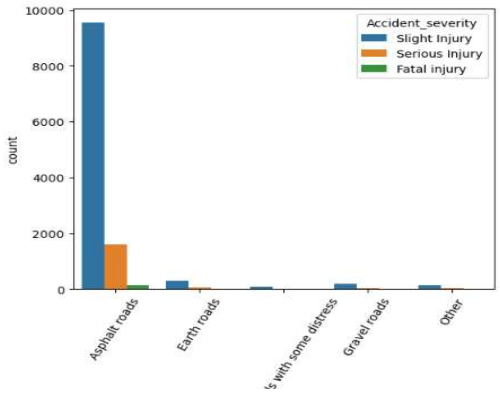

Fig 5: Roads count based in injury

This kind of analysis is crucial in understanding the risk factors associated with different road configurations and can help policymakers and planners make informed.

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NCRTCI'24-57

SENTIMENT ANALYSIS OF FIRE HD 7 PRODUCT REVIEWS ON AMAZON USING MACHINE LEARNING

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Abstract— **This research paper explores sentiment analysis of Amazon product reviews using a dataset focused on the "Fire HD 7, 7" HD Display, Wi-Fi, 8 GB" product. The study involves pre-processing text data, including HTML removal, special character removal, and stop word elimination, followed by applying the TF-IDF vectorization technique. The sentiment analysis is performed using two machine learning algorithms, Logistic Regression and Naive Bayes, to classify reviews as positive or negative. The research evaluates the accuracy, precision, and confusion matrices for each algorithm. The findings suggest the effectiveness of sentiment analysis for this specific Amazon product.**

I.INTRODUCTION

In today's online shopping world, people often rely on reviews to decide what to buy. Amazon, a huge online store, has lots of products with reviews from customers. These reviews aren't just helpful for shoppers; they're also a goldmine of information for researchers studying how people feel about products. One study is looking at sentiment analysis, a way to figure out and group different feelings from customers. They're focusing on the "Fire HD 7, 7" HD Display, Wi-Fi, 8 GB" tablet sold on Amazon. By using sentiment analysis on a set of reviews, they want to uncover what users think and feel about this tablet.

To do this, they're going through a few important steps before analyzing the data. They're getting rid of things like weird symbols, website code, and common words that don't tell us much. Then, they're using a technique called TF-IDF, which helps machines understand text better. The main part of the study involves using two computer methods—Logistic Regression and Naive Bayes[1]. These are good at sorting reviews into two groups: positive and negative feelings. The goal is to see how well these methods work for understanding what people say about this tablet.

They're going to measure how well these methods work using things like accuracy and precision. These measurements show how good the methods are and where they might not work so well. The end goal of this research is to show how well sentiment analysis can pick up on the different feelings in Amazon reviews. It also aims to help shoppers make smarter choice and help companies improve their products based.

II.LITERATURE REVIEW

Sentiment Analysis in E-Commerce: A Review

In recent years, sentiment analysis, also known as opinion mining, has become a crucial area of research due to the surge in user-generated content on online platforms such as social media, blogs, and e- commerce websites. This review focuses on key studies related to sentiment analysis, particularly in the context of Amazon product reviews, and discusses the application of machine learning algorithms in this domain.

Sentiment Analysis of Amazon Product Reviews

Researchers have extensively studied sentiment analysis of Amazon product reviews to extract valuable insights from the vast amount of customer feedback available. Gandomi and Haider (2015) employed machine learning techniques, including Naive Bayes and Support Vector Machines (SVM), to classify Amazon reviews into positive and negative sentiments. Their study found that SVM outperformed Naive Bayes in terms of accuracy and precision, highlighting the effectiveness of machine learning in sentiment analysis (Gandomi & Haider, 2015).

In a similar vein, Li et al. (2017) used a lexicon and rule-based approach for sentiment analysis of Amazon reviews, followed by testing with machine learning algorithms such as Naive Bayes and SVM. Their results demonstrated that the lexicon- based approach combined with machine learning algorithms achieved high accuracy in sentiment classification, underscoring the importance of feature extraction and algorithm selection in sentiment analysis (Li et al., 2017).

Machine Learning Algorithms for Sentiment Analysis

Various machine learning algorithms have been applied to sentiment analysis tasks, each with its own strengths and

weaknesses. Logistic Regression, a simple yet effective algorithm, has been widely used for binary classification tasks, including sentiment analysis (Hosmer et al., 2013). Naive Bayes, which is based on Bayes' theorem, is particularly suitable for text classification tasks due to its efficiency and simplicity (Rish, 2001).

In a comparative study by Pang et al. (2002), different machine learning algorithms, including Naive Bayes, SVM, and Maximum Entropy, were evaluated for sentiment analysis. The results indicated that SVM and Maximum Entropy performed better than Naive Bayes in sentiment classification tasks, highlighting the importance of algorithm selection based on the specific dataset and task requirements (Pang et al., 2002).

III.METHODOLOGY

Data Collection:

They gathered reviews of the Fire HD 7 from Amazon.

Data Preprocessing:

They cleaned up the reviews by removing things like weird symbols, tags (like " "), and common words that don't add much meaning (like "the," "and," "it"). Then, they made all the text more consistent to work better with computers.

FEATURE EXTRACTION:

They turned the cleaned-up text into numbers that computers can understand. This helps the machine learning model 'read' the reviews.

MODEL TRAINING AND EVALUTION:

They used two different methods logistic regression and multinomial naive Bayes to guess the sentiment like if the review is positive or negative based on the labeled data they had.

Then they checked how good these guesses were using measures like accuracy how often it's right, precision how many of the guessed positives are actually positives, recall how many actual positives it finds, and F1-score a mix of precision and recall.

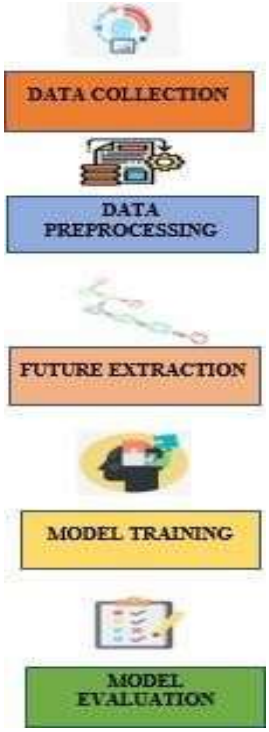


Fig.1 Architectural Diagram for the Sentiment analysis

IV.RESULT AND DISCUSSION

This analysis employed machine learning techniques to understand sentiments expressed in reviews of the Fire HD 7 product on Amazon. The dataset underwent preprocessing to cleanse text, removing HTML tags, special characters, and transforming text to lowercase. Additionally, stop words were eliminated to focus on meaningful words.

Two distinct models, Logistic Regression and Naive Bayes, were trained on the preprocessed text data for sentiment classification.

The Logistic Regression model exhibited notable accuracy in predicting sentiments based on review text. It effectively categorized reviews as positive or negative, displaying its potential in discerning sentiments within text data. For instance, a sample negative review expressing dissatisfaction with product quality and functionality was correctly identified as negative by the model. On the other hand, a positive review emphasizing the product's excellence was accurately categorized as positive.

	precision	recall	f1-score	support
0	0.800000	0.580000	0.670000	1027.000000
1	0.920000	0.970000	0.950000	5141.000000
accuracy	0.910000	0.910000	0.910000	0.910000
macro avg	0.860000	0.780000	0.810000	6168.000000
weighted avg	0.900000	0.910000	0.900000	6168.000000

Fig 2. Describing the f1 score for Logistic

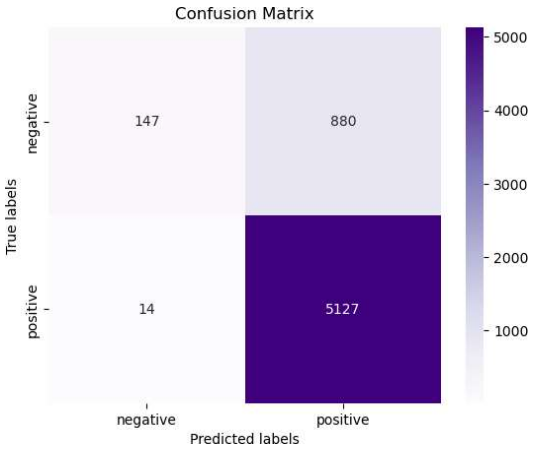


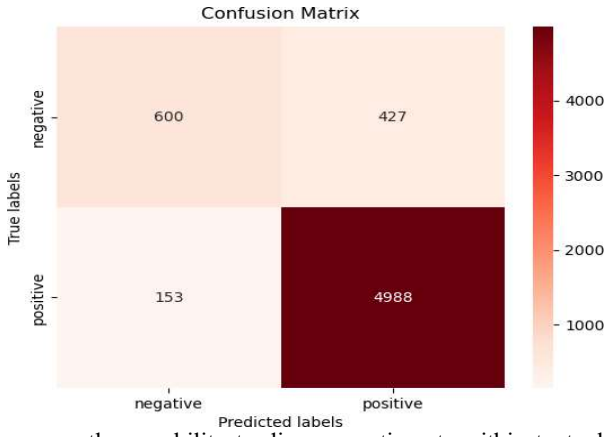
Fig 3. Describing the confusion matrix

Similarly, the Naive Bayes classifier also demonstrated a reliable performance in sentiment analysis. It effectively distinguished between positive and negative sentiments within reviews. For instance, a review outlining issues and product defects was correctly classified as negative. Conversely, a positive review strongly recommending the product was appropriately identified as positive.

	precision	recall	f1-score	support
0	0.910000	0.140000	0.250000	1027.000000
1	0.850000	1.000000	0.920000	5141.000000
accuracy	0.860000	0.860000	0.860000	0.860000
macro avg	0.880000	0.570000	0.580000	6168.000000
weighted avg	0.860000	0.860000	0.810000	6168.000000

DISCUSSION

The results indicate that machine learning models, specifically Logistic Regression and NaiveBayes,



possess the capability to discern sentiments within textual data effectively. These models showcased proficiency in categorizing sentiment polarity in Fire HD 7 reviews, providing insights into customers perspectives and evaluations of the product.

This analysis serves as a foundation for understanding sentiment trends and user opinions surrounding the Fire HD 7. It highlights the potential of machine learning algorithms in extracting sentiments from textual data, which could be invaluable for businesses seeking to comprehend customer sentiments and enhance product strategies.

CONCLUSION

The sentiment analysis using machine learning models, specifically Logistic Regression and Naive Bayes, demonstrated reasonable accuracy in predicting sentiments for Fire HD 7 productreviews on Amazon. Both models showcased their ability to discern sentiments, with certain limitations in handling nuanced language and context. Logistic Regression performed well in capturing varied sentiments, while Naive Bayes showed effectiveness in certain scenarios but struggled with more complex expressions. The study implies that leveraging machine learning for sentiment analysis can offer valuable insights into customer opinions, aiding businesses in understanding consumer sentiments for product improvement and market strategy. However, further enhancements in handling contextual nuances and improving model robustness could elevate the accuracy and applicability of sentiment analysis in real-world scenarios.

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NLP BASED FAKE NEWS DETECTION USING HYBRID MACHINE LEARNING TECHNIQUES

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Abstract- Recently, because of the upward thrust of social media, faux news has seemed at the Internet in massive numbers and largely for diverse business and political motives. With false beliefs, social media customers can without difficulty fall prey to this online faux news, which has already had a large impact on the offline community. A massive motive for growing the quick detection of counterfeits demonstrates the trustworthiness of online social networks. facts. This article investigates theories, methods, and strategies for identifying artificial news, makers, and content from online informal communities. Accuracy of statistics is important at the Internet, in particular on social media, but Internet information hinders the capability to discover, evaluate, appropriately, or in any other case become aware of "fake information" on these sites. In this article we advise strategies for the detection of "faux news" on Facebook, one of the maximum famous on-line social networks. This approach makes use of a hard version of subject type to be expecting whether or not a Facebook submit is assessed as genuine or fake. The results may be stepped forward by using the numerous strategies proposed inside the article. The effects obtained indicate that the hassle of identifying fox records may be solved the use of user-friendly techniques.

Keywords: deep getting to know, social media analysis, neural networks

INTRODUCTION

Recently, due to the growth of social media, misinformation on the Internet has turn out to be famous and tremendous across the world for plenty commercial and political motives. With perverse regulations, social media customers had been hindered in exposing those faux news on the net, which has already had a huge effect on the offline community. The predominant cause of increasing the credibility of social media statistics is to spot fake data more quick. This article examines ideas, strategies, and strategies for recognizing counterfeit names, makers, and content in web-based interpersonal organizations. Accusation of statistics is a first-rate task at the Internet, particularly on social media, the fact of the Internet hinders the ability to file what's taken into consideration "incorrect information" accurate in those international locations or in every other context. In this information publish we provide commands on a way to pick out and spot "faux information" on one of the maximum popular online social media systems, Facebook. A traditional Bayesian classification method makes use of a version to expect whether or not a Facebook car may be classified as actual or fake. The outcomes can be advanced the usage of numerous techniques referred to in the article. The results obtained imply that the hassle of detecting fake information may be solved via acquiring the technical expertise to apply computing.

LITERATURE SURVEY

The letter describes various automated techniques for the detection of faux news and fraudulent information. From using chatbots to spread misinformation to using clickbait to spread rumors, detecting faux news is multifaceted. Social networks like Facebook have many buzzers who encourage word of mouth and collect posts that unfold incorrect information. Several tries have been made to perceive the mistake.

1. ***Media-Rich Fake News Detection:***

Fake information has been around for a really long time, and with web-based entertainment and intense line reporting at its top, Fox News coverage has turn out to be an important part of the network's investigations. Because of the issues of detecting fake information studies, researchers round the arena are searching out evidence of the elements of confusion. This article objectives to provide an overview of the typological record and the extraordinary styles of record content and its effect on new immigrant readers. Next, we assessment faux news detection strategies based totally on merely textual evaluation and describe the fake news assets that we've got used substantially. We conclude this article by assisting you pick out 4 open keywords that require specific conditions in the Study Festival.

2. ***Programmed Double dealing Identification: Techniques for Tracking down Counterfeit News*** These questions need to be tested inside the contemporary and replica preliminary books. "Fake news detection" describes the system of figuring out information whose authenticity is understood. Scams are positive to hit a good buy. The nature of the online reality has modified and the flood of content material mills and exceptional

substances and genres has made fraud prevention impossible. This article affords a typology of the different forms of unique assessment on account of the mastery of the field: language verbal exchange strategies (with instrumental education) and social evaluation strategies. We see promise in a new hybrid approach that combines language and device studying with graph networks. Since detecting faux information isn't a hard mindset, we offer sensible hints for a high-overall performance faux information detection device.

3. Feebly administered learning for counterfeit news discovery on Twitter

The trouble of naturally distinguishing counterfeit news on friendly networks, as an example Twitter, is drawing interest these days. Although from a technical factor of view that is considered an easy disturbance of the binary class, the main project is to accumulate sufficiently basic, manually identifying spurious or false tweets is expensive and tough. In this text, we talk tries at a less predictable technique to amassing education facts from many large, however noisy, tweets. As we collect, we regularly label tweets based on their source, i.e. Reliable or unreliable supply, and create a taxonomy based totally on this facts. We use this class for different proposed classifications to digest fake and fake tweets. Although we've detected labels in the new class target (not all tweets from unknown resources are actually fake news and vice versa), it's far very ambiguous and reaches faux news with 0 F1 rating. . Nine. The dataset is diagnosed to us.

4. Counterfeit News Recognition in Virtual Entertainment

Misinformation and fraud have long plagued the net. A widely used definition of faux information on the Internet is: "records made up deliberately to deceive readers." Social media and media bombard readers with fake information or as a part of psychological struggle. It is set to yield a useful click on. Click bait attracts users and generates interest with the aid of weathering site visitors or link clicks to increase sales. They display the growth of Fox News to the regression of communicative characteristics made feasible by the rise of long range interpersonal communication destinations. The objective of the endeavor is to make an answer that permits users to discover and block internet traffic that consists of fake and fraudulent records. We use simple, accurate facts and modifying talents to properly perceive faux posts. The check consequences using logistic classification display 99.4% accuracy.

5 Automatic Online Fake News Detection Using Social Signals and Content

The need for automated fraud detection systems is highlighted by the rapid spread of false information on the Internet. In relation to social media, the device may be used to analyze more approximately (ML) techniques. Methods for detecting faux news have traditionally handiest been primarily based on content assessment (i.E. Thru content material segmentation information) or - more lately - strategies associated with social context, along with pattern mapping and truth diffusion. In this paper, we first advocate a brand new technique to discover fake news in ML, which builds on current methods inside the literature, combines real-time data and social context capabilities, and quadruples their accuracy. % Second, we validate our method on a actual Facebook message chatbot with actual-global utility and acquire a fake message detection accuracy of 80-one.7%.

6. Some like it scam: Robotized counterfeit news identification in interpersonal organizations

Recently, the credibility of net facts has emerge as a primary trouble in modern-day society. By letting users freely share content, social networking sites (SNS) have revolutionized the dissemination of information. That is why the usage of social media is a vehicle for spreading false and fake records. Due to the variety of instances and the rate of mileage propagation, speedy credibility evaluation is almost not possible, requiring automatic fraud detection systems.

To this quit, Facebook can contribute to faux or very erroneous posts, especially within the diverse person options. We present two styles of strategies, one in light of calculated relapse and the other explicitly founded on a pristine model of Boolean recurrence calculations. On a dataset of 15,500 Facebook messages and 909,236 clients, we will reap over ninety nine% class accuracy even with less than 1% of messages. But we have demonstrated our strong talents: they work even with clients who locate false and deceptive records. These results recommend that dissemination of facts in statistical shape is a useful element in automated fraud detection frameworks.

7. Fake news being disseminated by social bots

Fox News has been diagnosed via the mass media as a essential worldwide hazard and has been accused of threatening elections and democracy. Experts in verbal, cognitive, and social generation are tirelessly studying the complicated causes of the unfold of digital misinformation and viral responses, as surveys and social media begin to measure it. However, this work was primarily based totally on anecdotal proof in place of formal statistics. This is America in 2016. We estimate there had been 24 million tweets and 400,000 Twitter proceedings at some point of and after the presidential marketing campaign and election. We have proof that smaller social organizations play an essential role in disseminating incorrect information. Bills that actively unfold incorrect information can be bots. Automatic invocation is particularly beneficial in early and influential goal uses. People fall prey to this manipulation through retweeting bots that unfold faux information. It is primarily based on guide for the fake and obvious social blessings of the car. These consequences advise that blocking off social agonists is an effective means of lowering the spread of on-line incorrect information.

8. Deceiving on the web content: Perceiving misleading content as bogus news

Tabular newspapers are frequently criticized for exaggeration, sensationalism, terrorist reporting, and false and defamatory publications. As information proliferates on line, there is now a new form of tabloidization: misleading content." "Content constitutes "click bait." material that "creates use and encourages visitors to click on a hyperlink on a specific web page" ['misleading content, N.D.] and adds to the quick spread of bits of gossip and falsehood on-line. This article looks at possible ways to detecting click fraud on a user base. Both educational and nonacademic strategies of exploring noise are catching on, in particular hybrid strategies yielding the first-rate results.

9. Profound learning applications and difficulties in large information examination

Big information analytics and deep gaining knowledge of are elite regions of statistics science. Big facts is vital due to the fact many public and personal agencies accumulate large quantities of private records that can offer useful insights into national troubles, surveillance, cyber protection, medical statistics, advertising, and the detection of fraud. Organizations like Google and Microsoft examine massive amounts of information that pressure business analytics and selection-making, generation and the future. Deep getting to know algorithms collect multiple excessivestage representations of facts thru a hierarchical getting to know procedure. At a given level, simple abstractions that are related to the abstractions that came before them in the hierarchy are used to figure out complex abstractions. One of the primary blessings of deep studying is the capacity to investigate and analyze from a large quantity of unobserved facts, making it a tool for high-degree analytics. In the existing have a look at, we check out how deep getting to know can be used to clear up some huge-scale analytical troubles, which includes extracting complicated patterns from massive volumes of facts, or simplifying semantic codes, descriptive statistics, fast statistics retrieval, and discrete capabilities. . . We also explore a few aspects of deep gaining knowledge of research that require in addition take a look at to include unique demanding situations posed by using huge scale analysis, consisting of streaming information, excessive dimensional records, scaling models, and allotted computing. We finish by using addressing a few issues including defining norms consisting of deforming norms, designing diversifications, defining abstract characteristic extraction norms, optimizing semantic maps, gaining knowledge of semi-enumeration, and energetic gaining knowledge of, as a result imparting a glimpse of future paintings.

10. Definitional Challenges of Fake News

This article explores the query of the way "fake news" and "disinformation" are described and how this studies impacts how we learn and fight fake or deceptive facts on line. This article identifies a conscious tendency to withstand political rhetoric and misinformation, this is, to intentionally unfold misinformation and ignore the trouble of incorrect information (random incorrect information). In assessment, it's miles hard to distinguish among false and misleading statistics in educational studies. Thus, in a way, it overcomes the trouble of objectivity, in prefer of facts referred to as genuine/false dichotomies. 2 The awkward conditions created by way of this gap between the consequences of instructional studies and the principles of extrapolation prevent our ability to successfully interact in simulation. Disadvantages and incorrect information.

EXISTING SYSTEM

There is tons within the way of technical investigations to detect fraud, maximum of which contain on-line testing and public social networks. The problem of detecting "faux information" acquired particular interest within the literature after the 2016 wreck, in particular at some point of the United States presidential election.

Conroy, Rubin, and Chen included several tactics to know-how fraud stories. Understand the contents of the simple correspondence n-p. Superficial fragments are inadequate to provide an explanation for the discourse categorization paradigm, frequently ignoring crucial contextual information. However, those techniques were tested for effectiveness with more complex analytical techniques. Deep evaluation using context-agnostic probabilistic grammars combined with N-gram techniques proved maximum useful. The accuracy of Feng, Banerjee, and Choi ranged from 85 to 91 percent in fraud class duties the usage of on line structure estimation.

Disadvantages of Existing System

Each is categorized fake or fraudulent. The authors talk the pros and cons of different sorts of fake information and use numerous text evaluation and predictive detection techniques.

1. It is difficult to gather information that are not published within the yellow press or tabloids, where your important fiction is seen in the media or media.
2. Scales are innovative and pretty accurate and seem on many structures. The authors argue that strategies other than textual evaluation must discover this duplicate facts.

Tribe. Fake information can be humorous, suggestive and funny via its authors. According to the authors, this kind of fake news pastime has a devastating impact on the overall technical competencies of the iTech-magnificence.

PROPOSED SYSTEM

In this text, a variant is created in view of the wide variety of sufferers or matrix tfidf (ie) phrases for the frequency of use of other articles for your dataset.

Since this hassle provides a form of text classification,

as it is a well-known textual content-based procedure. The real goal is to create a text transformation version and select the type of text to apply (caps vs. complete text). The next

step is to extract the features maximum relevant to the remember vector or tfidf vector, which is achieved via disposing of n range of several words and/or terms, lowercase or now not, frequently empty words. Use common words together with "when," "while," and "there" and most effective phrases that appear a sure wide variety of instances inside the given textual content.

Advantages of Proposed System

- Improved accuracy
- Adaptability
- Scalability

SOFTWARE REQUIREMENT SPECIFICATION

Hardware requirements System: Pentium i3 Processor
Hard Disk: 500 GB.
Monitor: 15'' LED
Input Devices: Keyboard, Mouse
Ram: 2 GB

Software requirements
Operating system: Windows 10
Coding Language: Python

MODULES

1. Information Use
2. Preprocessing
3. Highlight Extraction
4. Preparing the Classifier

Modules description

1. Information Use

So on this assignment we will examine pandas to load and shop special files and information. We examine. Csv files the use of pandas, examine the table structure and show the statistics in the suitable format. We do it and show it that is. Use the label to alternate the dominance. We can run an uncommon device that tests and reads algorithms via the facts and labels of the school, however earlier than making predictions and precisions, it is necessary earlier than the statistical method, this is, to take away all of the unknown statistics of the table and to repair them as vector maps. I will lessen it in order. This may be understood thru devices and attention. The subsequent step is to apply those statistics to attract visible evaluations using Python and the Sigit Learn tab engineering library. This library permits you to plan the effects inside the form of histograms, pie charts or graphs.

2. Preprocessing

The datasets used were optional assets and dataset 1, which contained three, 256 compliance and 814 manipulated statistics, and dataset 2, which contained 1,882 establishments and 471 manipulated mutants. There is a window in the the front. With these expressions he become a date. This allows powerful modifications to be made. Sometimes we acquire messages through emails, letters, catchphrases, numbers and many others. Boredom makes it hard to find mail. It enables get rid of language-specific textual factors and has logic that increases the accuracy of popular reasoning.

3. Highlight Extraction

The process of selecting a subset of these features is known as feature extraction. to generate an output. The function extraction approach enables construct a better predictive model. They help choose techniques that supply precise effects. When the input facts are too huge, intractable and redundant, the enter facts are converted into reduced sorts of descriptors, additionally called characteristic vectors. To complete the operation, the enter is decreased to its complete length so that the enter objects are saved. Feature extraction is accomplished on the source fact degree before running a managed set of policies to transform the records into the workspace.

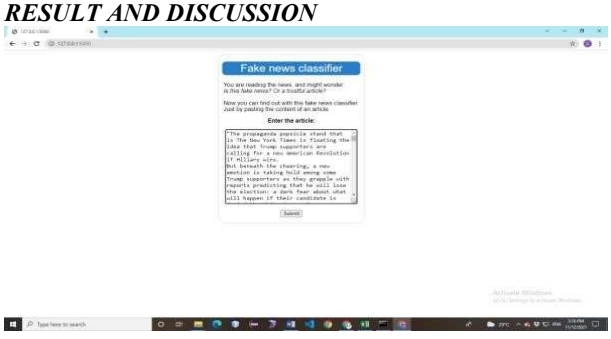
4. Preparing the Classifier

In this task, I will utilize the most wiped out learn library to implement the structure. Learn Sickest is an open supply Python getting to know tool furnished via the Anaconda distribution. It requires a report and can be quick set up when you write the order. If the command isn't executed, errors can arise on the identical time. We use 4 unusual algorithms and teach these four models, specifically simple basis set, vector device, nearest neighbor and logistic regression, which are famous techniques for log kind troubles. When the classifiers are trained, we have a look at the education strategies on the check set. The sentence vector in each letter can be extracted in a take a look at set and its type can be detected by way of trained methods.

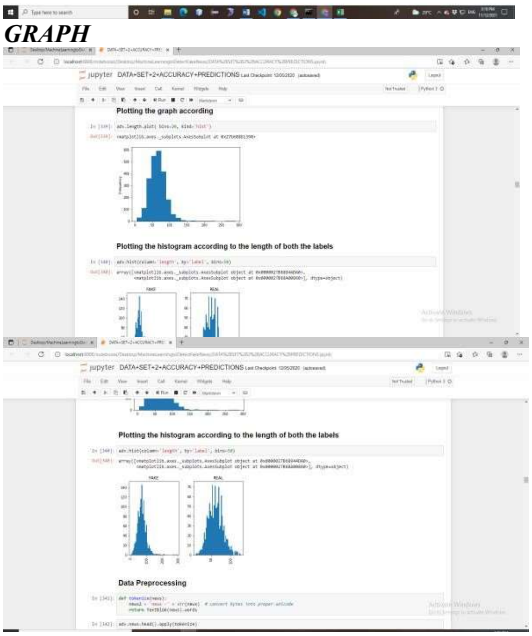
PROPOSED ALGORITHM

Naïve Bayes- the Naive Bayes classifier is a supervised system mastering set of rules used for classification tasks along with textual content class. It is part of generative learning algorithms, i.e. They try to imitate the distribution of enter information of a particular kind or kind. It is referred to as naive as it expects that each info variable is unprejudiced. This is a strong presumption and conflicting with genuine data; Be that as it may, this strategy might be very beneficial in solving a wide variety of complicated issues.

RESULT AND DISCUSSION



GRAPH



CONCLUSION:

Many human beings eat news on social media rather than conventional information media. However, social media is moreover used to spread artificial data, which has adverse results on people and society. In this article, we gift a new version for detecting fake news thru system learning

Study techniques are provided. The news version takes the results as input and essentially founded on Twitter conclusions and characterization calculations, it assesses the portion of phony or genuine information.

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ALZHEIMER'S DISEASE DETECTION USING DEEP LEARNING

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Abstract - **Deep learning, a cutting-edge branch of machine learning, has demonstrated remarkable efficacy over conventional techniques in uncovering intricate patterns within complex, high dimensional datasets, particularly in fields like computer vision. The realm of early detection and automated classification of Alzheimer's disease (AD) has recently garnered significant interest, driven by advancements in neuroimaging methodologies which have yielded vast amounts of multimodal neuroimaging data. AD, a form of dementia, primarily affects individuals aged 60 and older, but its prevalence among middle-aged individuals is also noteworthy. Efforts to mitigate the impact of this disease have spurred the exploration of various techniques. Feature extraction poses a significant challenge in leveraging large datasets for prediction, as traditional methods often struggle to identify relevant features accurately. To address this challenge, we propose employing Convolutional Neural Networks (CNNs) for efficient classification and feature extraction. Effective feature extraction and selection are crucial for enhancing classification accuracy and overall performance. This approach aims to streamline the process and improve result accuracy, facilitating more precise diagnoses of Alzheimer'sdisease. Accurate diagnosis of AD is pivotal in initiating timely treatment, particularly in its early stages, as it enables patients to undertake preventive measures before irreversible brain damage occurs. While previous studies have utilized computer-based methods for diagnosing AD, many are hindered by inherent limitations. Although AD can be diagnosed during its early stages, predicting its onset before symptoms manifest is challenging. Deep Learning (DL) has emerged as a promising technique for early AD diagnosis, offering potential insights into the diseasepathology.**

In this review, we delve into pertinent literature on AD and explore how DL methodologies can aid researchers in diagnosing the disease. By leveraging techniques such as convolutional neural networks and advanced imaging preprocessing, DL holds promise for improving theaccuracy and efficiency of neuroimaging classification in the context of Alzheimer's disease diagnosis.

Keywords: Alzheimer's disease (AD), Convolutional Neural Network (CNN), Deep Learning (DL), Imaging pre-processing, Neuroimaging classification.

I. INTRODUCTION

Within the healthcare domain, the precise and timely identification of brain diseases remains an enduring obstacle necessitating a comprehensive grasp of the complexities involved. With the global escalation of brain disorders, the urgency for advanced diagnostic methodologies has intensified. Amid this backdrop, the fusion of various modalities, including neuroimaging data, clinical records, and cognitive evaluations, has emerged as a promising avenue to enhance the precision and efficacy of brain disease diagnosis. The harmonization of these diverse data streams, when harnessed adeptly, offers a multi-faceted viewpoint that holds the potential for earlier detection, tailored therapeutic interventions, and enhanced patient outcomes.

Brain diseases encompass a broad array of conditions, spanning neurodegenerative disorders like Alzheimer's disease, psychiatric afflictions such as schizophrenia, and traumatic brain injuries. The diagnostic challenge inherent in these conditions often stems from their heterogeneity, the subtlety of initial symptoms, and the absence of definitive biomarkers. Furthermore, brain diseases frequently manifest with imbalanced data distributions, wherein certain disorders exhibit markedly lower prevalence rates than others. Consequently, conventional machine learning models may falter in delivering precise and dependable diagnostic outcomes, as they tend to prioritize the majority class, thereby risking misdiagnoses and delayed interventions for less prevalent brain disorders.

II. LITRATURE SURVEY

Jain et al. [1] proposed a transfer learning methodology for classifying MRI images. They utilized the PE SE CTL mathematical model to distinguish between three classes (AD, Mild Cognitive Impairment (MCI), Cognitive Normal (CN)). Initially, they gathered data from ADNI datasets and preprocessed the data using FreeSurfer (PE) to remove extraneous information from MRI images. The preprocessing techniques encompassed motion correction, nonuniform intensity normalization, Talairach transform computation, intensity normalization, and skull stripping. Subsequently, they selected the most informative slices (SE) based on entropy. Finally, they employed the pre-trained VGG16 model and transfer learning to construct a classification model (CTL). Their proposed technique achieved remarkable accuracies of 95.3%, 99.14%, 99.3%,

and 99.22% for 3-way classification (AD vs MCI vs CN), AD vs CN, AD vs MCI, and CN vs MCI, respectively.

Ding et al. [5] introduced a Convolutional Neural Network (CNN) architecture utilizing an Inception v3 network trained on 90% of ADNI data and tested on the remaining 10%. Fluorine 18 fluorodeoxyglucose PET images underwent processing via the grid method, sourced from the ADNI dataset. Otsu thresholding was employed to detect brain voxels. They utilized the Adam optimizer with a learning rate of 0.0001 and a batch size of 8 for training the model. The model was trained on 90% of the dataset (comprising 1921 image studies), which included three classes (AD, MCI, and control). The proposed architecture yielded a specificity of 82% and a sensitivity of 100%.

In Chitradevi et al. [8], several optimization algorithms including Genetic Algorithm, Particle Swarm Optimization Algorithm, Grey Wolf Optimization, and Cuckoo Search were employed to segment the brain into subregions such as the hippocampus, white matter, and gray matter.

Nawaz et al. [12] introduced three distinct models and conducted a comparative analysis to determine their efficacy in achieving high accuracy.In the first model, images underwent preprocessing where handcrafted features were extracted, followed by classification using Support Vector Machine, k-Nearest Neighbor, and Random Forest classifiers.The second model involved training the model from scratch on preprocessed datasets using a CNN deep learning model. The third model utilized AlexNet to extract deep features, which were then input into Support Vector Machine, k-Nearest Neighbor, and Random Forest classifiers for classification. Comparative analysis revealed that the deep features-based model, coupled with a Support Vector Machine classifier, yielded the highest accuracy. Specifically, the Support Vector Machine classifier achieved an accuracy of 99.21%, while k-Nearest Neighbor and Random Forest classifiers achieved accuracies of 57.32% and 93.97%, respectively.

Kundaram et al. [13] collected data from the ADNI dataset and preprocessed images by rescaling them to a range of 0-255. CNN models were utilized for training and disease classification, with images classified into three classes: Alzheimer's Disease (AD), Mild Cognitive Impairment (MCI), and Normal Control (NC). A total of 9540 images were used for training the model. The CNN model comprised three convolutional layers, three max-pooling layers, and four ReLU activation layers. Various optimizers including Adam, SGD, Adagrad, Nadam, Adadelta, and Rmsprop were employed. Comparative analysis among these optimizers within the proposed framework indicated that Adagrad yielded the best accuracy with minimal loss. The proposed model achieved an accuracy of 98.57% on the ADNI dataset.

III. SYSTEM DESIGN

A. Proposed System

The proposed system aims to harness the power of Convolutional Neural Networks (CNNs) to tackle the challenges associated with early detection and automated classification of Alzheimer's disease (AD) using extensive multimodal neuroimaging data. By leveraging CNNs, our objective is to enhance both the classification process and feature extraction, which are vital components in accurately predicting and identifying AD. This systemprioritizes the improvement of feature extraction and the selection of pertinent features from intricate datasets, thus overcoming the limitations of conventional methods. The integration of CNNs is anticipated to make a substantial contribution to the accuracy of AD classification, thereby facilitating earlier detection and intervention in individuals susceptible to this incapacitating neurological disorder.

B.*Block diagram*

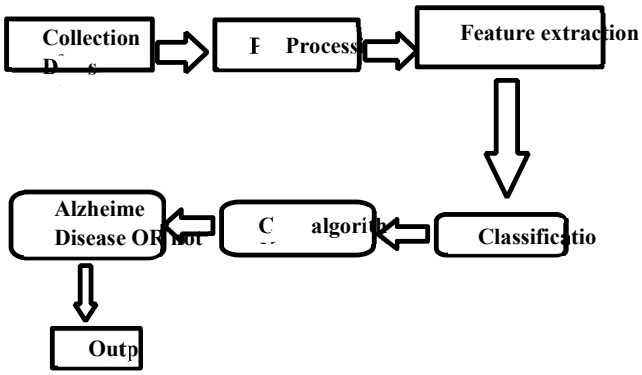

Fig 1. Block Diagram

1))Dataset Collection

In the initial stage of our proposed system, the Data Loading module is engineered to ingest and structure the extensive multimodal neuroimaging data essential for early detection and classification of Alzheimer's disease. This involves gathering diverse datasets comprising various imaging modalities, including MRI scans. Through the loading process, the system guarantees access to a comprehensive and representative dataset, thereby establishing the basis for subsequent preprocessing and analysis.

2))Data Pre-Processing

Following data loading, the Pre-processing module takes center stage, focusing on refining the quality and structure of the acquired neuroimaging data. This involves standardizing image resolutions, normalizing intensity values, and addressing any potential artifacts or inconsistencies. The objective is to create a uniform and clean dataset that eliminates noise and enhances the

robustness of subsequent processing steps, contributing to the overall reliability of the model.

3))Feature Extraction

The Feature Extraction module is a critical component geared towards identifying and isolating relevant features from the preprocessed neuroimaging data. Leveraging the power of Convolutional Neural Networks (CNNs), this module extracts high-level representations of patterns and structures inherent in the images. The features extracted serve as the discriminative elements that contribute to the model's ability to differentiate between healthy and Alzheimer's affected brain images, thus playing a pivotal role in the subsequent classification process.

4))Training Model

*I*n the Training Model module, the system employs the pre-processed and featureenriched data to train the Convolutional Neural Network. This involves optimizing the model's parameters through backpropagation and adjusting weights to minimize the classification error. The training process refines the network's ability to recognize intricate patterns associated with Alzheimer's disease, enabling it to make accurate predictions during subsequent testing and real-world scenarios.

5))Epoch Value Generation

The Epoch Value Generation module addresses the iterative nature of training in deep learning. An epoch represents a complete pass through the entire dataset during training. This module is responsible for determining the optimal number of epochs needed to achieve convergence and avoid overfitting or under fitting. By dynamically generating epoch values, the system adapts its learning process, ensuring that the model attains the highest accuracy while maintaining generalizability on new, unseen data. Fine-tuning the epoch values is essential for achieving an efficient and well performing Alzheimer's disease classification model.

C. *Feasibility Study*

Initial examination assesses the feasibility of the project, gauging its potential usefulness to the organization. The primary aim of the feasibility study revolves around evaluating the Technical, Operational, and Economic viability of incorporating new modules and rectifying existing issues within the current operational system. While all systems would theoretically be feasible given unlimited resources and time, specific aspects are considered during the feasibility study:

- Technical Feasibility
- Operation Feasibility
- Economical Feasibility
- Technical Feasibility
-

During this phase, technical considerations are scrutinized, including:

- Availability of requisite technology for proposed functionalities.
- Capacity of proposed equipment to handle required data loads.
- Responsiveness of the system to user inquiries, regardless of scale or location.
- Potential for system upgradability.

Assurance of technical benchmarks such as accuracy, reliability, accessibility, and data security. The current system, the 'Secure Infrastructure Implementation System,' is technically feasible, providing a web-based user interface for audit workflow at DB2 Database. It ensures easy access and guarantees accuracy, reliability, and security. Necessary resources for development are readily available in-house or as open-source software. Bandwidth requirements for user feedback are met, irrespective of user count.

1. Operational Feasibility

Operational feasibility assesses the system's viability in meeting organizational operating requirements. Key considerations include:

- Management support from users.
- User acceptance and functionality of the system during development and implementation.
- Potential user resistance that may impede system adoption.
- The system addresses these concerns, with prior consideration given to management issues and user

3.Economical Feasibility

Economic feasibility evaluates the costeffectiveness of system development against anticipated benefits. Financial gains must outweigh costs. Given that the system utilizes existing resources and technologies at NIC, it incurs nominal expenses, rendering it economically viable without the need for additional hardware or software investments.

IV. RESULTS

In conclusion, the proposed deep learningbased approach for early detection of Alzheimer's disease using blood-based biomarkers holds immense promise for revolutionizing the diagnosis and treatment of this devastating neurodegenerative disorder. By leveraging the power of deep learning algorithms to analyse complex patterns in blood-based biomarker data, this approach has the potential to detect Alzheimer's disease in its early stages, when treatment is most effective. This early detection could significantly improve patient outcomes and quality of life, while also reducing the overall healthcare burden associated with Alzheimer's disease**.**

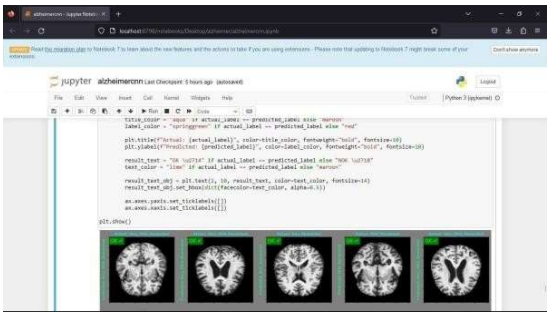

Fig.2. OUTPUT

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NEURAL NETWORKS - BASED DRUG TARGET PREDICTION

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Abstract-- Discovering potential Drug-Target Interactions (DTIs) is a crucial step in drug discovery and repositioning, especially given the diminishing effectiveness of existing antibiotic treatments. Despite diminishing pharmaceutical investments in traditional in vivo or in vitro methods, the need for effective computational methods remains paramount to expedite the identification of new leads. Although successful approaches have been proposed, the integration of protein sequences and structured data is often overlooked. In this paper, we introduce a novel deep learning architecture that capitalizes on Convolutional Neural Networks (CNNs) to derive 1D representations from both protein sequences (amino acid sequence) and compound SMILES (Simplified Molecular Input Line Entry System) strings. These representations serve as features, capturing local dependencies and patterns that are subsequently employed in a Fully Connected Neural Network (FCNN) acting as a binary classifier. The proposed endto-end deep learning method surpasses conventional machine learning approaches in accurately classifying both positive and negative interactions. This approach addresses the current challenges in drug discovery, offering a more efficient and effective means of identifying potential DTIs amidst the evolving landscape of antibiotic resistance.

Keywords-- Drug Repositioning, Drug-Target Interaction, Deep Learning, Fully Connected Neural Network, Drug.

I.INTRODUCTION:

The escalating threat of multidrug-resistant bacteria poses a significant health concern for the general population and the pharmaceutical industry. With an increasing number of drugs losing effectiveness against these infections, there is a pressing need for the discovery of new and potent medications. The misuse of existing medicines has exacerbated the problem, leading to a rise in resistance and further complicating the treatment of associated symptoms and diseases. Compounding this issue is a dwindling financial investment, making it challenging for researchers to keep pace with the healthcare demands of the population. The traditional de novo drug discovery process is characterized by its time-consuming nature, requiring 10 to 17 years from concept to market, substantial costs in the billions, and a low probability of success due to numerous stringent conditions for human consumption . Consequently, there is a critical need for innovative approaches that offer a more favorable time-reward trade-off. Integrating drug repositioning, the exploration of new clinical applications for existing drugs, with computational methods becomes imperative to expedite the identification of potential drug-target interactions within a reasonable timeframe. Given this backdrop, effective computational methods play a pivotal role in identifying new leads or hit compounds for therapeutic use. Computational approaches for drug-target interaction (DTI) prediction can be categorized into three main strategies: ligand-based, docking simulation, and chemogenomic methods. These diverse approaches offer promising avenues for enhancing the efficiency of drug discovery processes and meeting the evolving healthcare challenges posed by multidrug-resistant bacteria.

II.RELATED WORK

[1], The rise of multidrug resistance in pathogenic bacteria poses a serious threat to the effectiveness of antibiotics, which have historically revolutionized the field of medical science. The antimicrobial resistance crisis is attributed to the inappropriate use of these agents and the lack of new drugs due to stringent regulatory requirements and diminished financial incentives. A comprehensive approach is essential to slow down the development of resistance, involving the study of emerging microorganisms, resistance mechanisms, and antimicrobial agents. Multidisciplinary strategies are imperative across healthcare, environment, and agriculture sectors. Progressive alternative approaches, such as probiotics, antibodies, and vaccines, have demonstrated promising results in trials, suggesting their potential roles as preventive or adjunct therapies in the future.

[2], The pharmaceutical industry faces mounting challenges, including significant revenue losses due to patent expirations, constraints within cost-conscious healthcare systems, and increasingly stringent regulatory requirements. Addressing these issues, which impact both the industry's sustainability and healthcare advancements, hinges on a substantial increase in the quantity and quality of innovative, costeffective medications, all while avoiding unsustainable research and development (R&D) costs. However, there is a widely recognized trend of declining R&D productivity in

the industry over several years. In this context, we offer a detailed analysis based on recent, comprehensive industry-wide data to discern the specific contributions of each stage in the drug discovery and development process to overall R&D productivity. Subsequently, we present specific strategies aimed at making the most significant impact on enhancing R&D productivity.

[3], Efforts by biopharmaceutical companies to enhance productivity through innovative discovery technologies have not yielded the anticipated outcomes. A potential solution lies in repositioning existing drugs for new indications, offering the productivity boosts sought by the industry and transitioning production focus to biotechnology companies.

[4], For decades, the strategy of finding new applications for existing drugs, known as drug repositioning, has been employed to extend treatment options to a broader patient base. With advancements in highthroughput molecular measurements over the past decade, there is a logical expectation that such data could facilitate drug repositioning through computational methods. While many computational predictions for new indications have been validated in cellular model systems, comprehensive confirmation through animal models and clinical trials is still pending. This review categorizes computational methods for drug repositioning along two axes: drug-based, originating from a chemical perspective, and disease-based, starting from the clinical viewpoint of the disease or its pathology. Anticipated advancements in computational drug repositioning algorithms are likely to bridge these two axes, leverage novel types of molecular measurements, and undoubtedly contribute to alleviating the global burden of disease.

[5],The UniProt knowledgebase stands as a substantial repository of protein sequences complemented by comprehensive annotations. Housing an extensive collection of over 60 million sequences, a noteworthy portion exceeding half a million has undergone meticulous curation by experts who scrutinize both experimental and predicted data for each protein. The remaining sequences receive automatic annotation through rule systems, drawing on the wealth of expert-curated knowledge. Since our last update in 2014, the reference proteomes have more than doubled to reach 5631, enhancing taxonomic diversity coverage significantly. To tackle redundancy issues in UniProt, we introduced a pipeline that identifies and removes redundant highly similar proteomes, resulting in a remarkable reduction of 47 million sequences in the initial run. For users interested in accessory proteomes, we now provide sets of pan proteome sequences encompassing the diversity of sequences within each species, accounting for various strains and sub-strains

[6],The identification of interactions between established drugs and targets poses a significant challenge in drug repositioning. Employing in silico prediction of drug–target interactions (DTIs) holds the potential to accelerate the costly and time-intensive experimental processes by highlighting the most potent DTIs. Additionally, in silico DTI prediction offers insights into potential drug–drug interactions and facilitates the exploration of drug side effects. Traditional DTI prediction methods heavily rely on the descriptors used to represent drugs and target proteins. In this study, we introduce a deep-learningbased algorithmic framework named DeepDTIs to accurately predict new DTIs between approved drugs and targets without categorizing the targets into different classes. DeepDTIs utilizes unsupervised pretraining to abstract representations from raw input descriptors, followed by the application of known label pairs of interactions to construct a robust classification model. Comparative analyses reveal that DeepDTIs either matches or surpasses other state-of-the-art methods. The versatility of DeepDTIs extends to predicting whether a new drug targets existing targets or if a new target interacts with established drugs.

[7], Effective execution of intelligent tasks, such as visual perception, auditory perception, and language understanding, necessitates the development of robust internal representations of the world, often referred to as "features." These features must exhibit invariance to irrelevant variations in input while retaining pertinent information. A central challenge in Machine Learning lies in the automatic learning of such high-quality features. Convolutional Networks (ConvNets), drawing inspiration from biological systems, serve as trainable architectures capable of acquiring invariant features. Each ConvNet stage incorporates a filter bank, non-linearities, and feature pooling layers, enabling the learning of multi-level hierarchies of features. Although ConvNets have found success in various commercial applications, ranging from optical character recognition (OCR) to video surveillance, their reliance on large labeled training datasets is a limitation. In this context, we introduce novel unsupervised learning algorithms and non-linear stages, enabling ConvNets to be trained effectively with minimal labeled samples. The applications of these advancements extend to visual object recognition and vision navigation for off-road mobile robots.

[8], The burgeoning volume of publicly available data in biology and chemistry offers a compelling opportunity for researchers to reexamine interaction problems through the systematic integration and analysis of diverse data sets. In this context, we have developed a comprehensive Python package that underscores the fusion of chemoinformatics and bioinformatics into a molecular informatics platform tailored for drug discovery. Named PyDPI (drug–protein interaction with Python), this potent Python toolkit facilitates the computation of structural and physicochemical features of proteins and peptides from amino acid sequences, as well as molecular descriptors of drug molecules derived from their topology. PyDPI further encompasses protein–protein interaction and protein–ligand

interaction descriptors, generating a rich array of descriptors, including 6 protein feature groups with 14 features, spanning 52 descriptor types and 9890 descriptors, and 9 drug feature groups with 13 descriptor types, encompassing 615 descriptors. Additionally, it offers seven types of molecular fingerprint systems for drug molecules, such as topological fingerprints, electro-topological state (E-state) fingerprints, MACCS keys, FP4 keys, atom pair fingerprints, topological torsion fingerprints, and Morgan/circular fingerprints. Through the amalgamation of various descriptor types from both drugs and proteins, PyDPI enables the convenient generation of interaction descriptors representing protein–protein or drug–protein interactions.

[9], The silico prediction of drug-target interactions utilizing heterogeneous biological data holds significant promise for advancing our system-level exploration of drug molecules and therapeutic targets, a pursuit that has yet to reach its full potential. In this study, we present a systematic approach that efficiently integrates chemical, genomic, and pharmacological information for large-scale drug targeting and discovery. This approach is based on the robust methods of Random Forest (RF) and Support Vector Machine (SVM). The performance of the models derived from these methods was rigorously assessed through internal five-fold cross-validation and four external independent validations. The optimal models demonstrate impressive predictive capabilities for drug-target interactions, boasting a concordance of 82.83%, sensitivity of 81.33%, and specificity of 93.62%. The consistent performance of both RF and SVM models underscores the reliability and robustness of the obtained predictive models. Furthermore, the validated models were applied to systematically predict known and unknown drugs and targets across various categories, including enzymes, ion channels, GPCRs, and nuclear receptors. These predictions can be further mapped to functional ontologies, such as target-disease associations and target-target interaction networks. This approach is poised to bridge the gap between chemical genomics and network pharmacology, thereby expediting the drug discovery process.

[10], Understanding chemical–protein interactions (CPI) is fundamental for target identification and drug discovery, but experimental determination of CPI is time-consuming and expensive. Computational methods offer a means to streamline this process, and in this study, we developed two approaches: multitarget quantitative structure–activity relationship (mt-QSAR) and computational chemogenomics for CPI prediction. Comprehensive datasets from the ChEMBL database were collected for method assessment, comprising 81,689 CPI pairs involving 50,924 compounds and 136 G-protein coupled receptors (GPCRs), as well as 43,965 CPI pairs involving 23,376 compounds and 176 kinases. The test sets' area under the receiver operating characteristic curve (AUC) ranged from 0.95 to 1.0 for 100 GPCR mt-QSAR models and 0.82 to 1.0 for 100 kinase mt-QSAR models. For 5-fold cross-validation, the AUC was approximately 0.92 for both 176 kinases and 136 GPCRs using the chemogenomic method. However, the chemogenomic method exhibited poorer performance than mt-QSAR for external validation, with a high false positive rate identified.

III.PROPOSED SYSTEM:

Addressing the challenge of limited accuracy in algorithms involves tailoring them to meet specific requirements. One avenue for improvement is the modification of SMILES-based methods, which can enhance their capacity to capture the intricate relationship between drugs and targets. Notably, the interaction with target proteins may not be solely determined by the molecular structure. By incorporating considerations for molecular flexibility, our approach becomes more adept at handling diverse datasets, resulting in a more efficient processing of information. The proposed system for drug target prediction leverages the power of deep learning to enhance accuracy and efficiency in predicting potential drug targets. Deep learning, a subset of machine learning, is well-suited for complex tasks due to its ability to automatically learn intricate patterns and representations from large datasets. In this context, the system utilizes a deep neural network architecture tailored for the specific challenges of drug target prediction. The core methodology involves training the deep learning model on comprehensive datasets that include information on drug structures, molecular interactions, and known target proteins. The model is designed to autonomously extract meaningful features and patterns from this input data, learning the nuanced relationships between drugs and their corresponding target proteins**.**

ARCHITECTURE DIAGRAM:

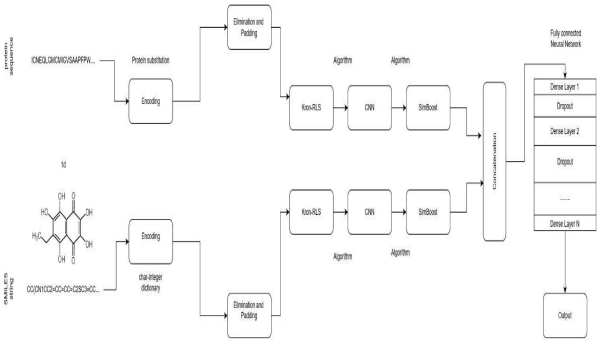

Figure:3.1 Architecture Diagram Of Proposed Diagram

IV..IMPLEMENTATION:

4.1. Data collection:

The data collection module for drug target prediction using deep learning is a crucial component that influences the performance and generalization of the predictive model. This module involves the acquisition, preprocessing, and organization of diverse datasets containing information about drug structures, target proteins, and known drug–

target interactions. Identify and gather relevant datasets from reputable sources. Common repositories include ChEMBL, PubChem, DrugBank, and other databases with curated information on drug–target interactions. Include detailed information about target proteins, such as amino acid sequences, structural data, and functional annotations. This information aids in capturing the diverse characteristics of proteins.

4.2. Data preprocessing:

The data preprocessing module for drug target prediction using deep learning involves transforming and organizing raw data into a suitable format for model training. Proper preprocessing is crucial for ensuring the model's effectiveness and accuracy. Identify and handle missing values in the dataset. Depending on the nature and extent of missing data, consider techniques such as imputation or removal of instances. Convert molecular structures, such as drug compounds and protein sequences, into a format suitable for deep learning models. Common methods include SMILES encoding for compounds and one-hot encoding for protein sequences. Normalize numerical features to bring them to a similar scale. This is essential for optimizing the convergence of deep learning models. Apply techniques to address imbalances between positive and negative instances. Options include oversampling the minority class, undersampling the majority class, or using synthetic data generation methods.

4.3. Model selection:

Choose a suitable deep learning architecture for drug target prediction. Common architectures include Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Graph Neural Networks (GNNs), or hybrid models that combine these architectures. Optimize hyperparameters such as learning rate, batch size, and regularization strength. Utilize techniques like grid search or random search to find the combination that maximizes model performance. Explore the possibility of leveraging pre-trained models or transfer learning. Pre-trained models on related tasks or domains might provide a starting point for your drug target prediction model. Choose an appropriate loss function for the task. Common choices include binary cross-entropy for binary classification tasks (interaction or non-interaction) or mean squared error for regression tasks. Select suitable activation functions for hidden layers. Common choices include ReLU (Rectified Linear Unit) for intermediate layers and sigmoid or softmax for output layers depending on the task.

4.4. Evaluation Module:

The evaluation module for drug target prediction using deep learning is essential for assessing the performance, reliability, and generalization capability of the trained models. Choose appropriate performance metrics based on the nature of the drug target prediction task. Common metrics include accuracy, precision, recall, F1 score, area under the receiver operating characteristic curve (AUC-ROC), and area under the precision-recall curve (AUC-PR).

V.ALGORITHM:

KRON RLS:

It is mainly used to changing system dynamics overtime.

It is more efficient which makes it suitable for real time application.

It doesn't required storage of past measurement

SIMBOOST:

The main function SIMBOOST is speed up the process**.**

KRON RLS ALGORITHM

Given a set of drugs D={d1,...,dn d}, targetsT={t1,...,t nt}, and the set of training inputs xi(drug-target pairs) and their binary labels yi∈R(where 1 stands for a known interaction and 0 otherwise), with 1 <i≤n,n= |D||T|(number of drug-target pairs). The RLS approach minimizes the following function J(f)=1/2n ∑ (yi−f(xi))2 +λ/2|f| f(x)= ∑ aiK(x,xi)

where K:|D||T|×|D||T|→Ris named the pair-wise kernel function and ais the vector of dual variables corresponding to each separation constraint.

VI.RESULT AND DISCUSSION

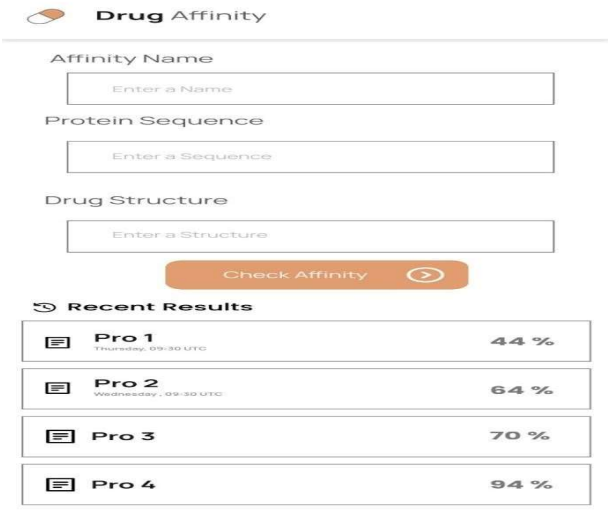

Figure 6.1

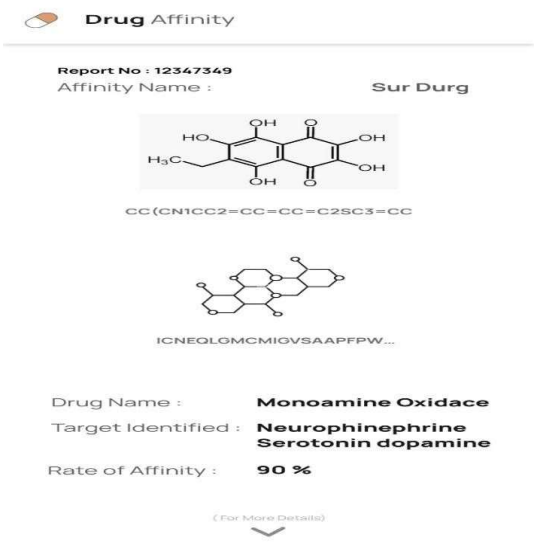

Figure 6.2.

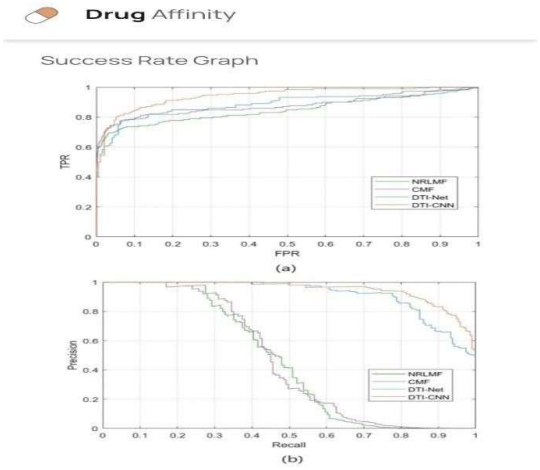

Figure 6.3

VII.CONCLUSION:

In conclusion, the application of deep learning in drug target prediction represents a transformative approach with significant potential for advancing drug discovery processes. The inherent complexity of the interactions between drugs and target proteins necessitates innovative methodologies, and deep learning offers a promising solution. By harnessing the ability of deep neural networks to autonomously learn intricate patterns from large and diverse datasets, the proposed system strives to overcome the limitations of traditional methods. The comprehensive training of the deep learning model on datasets encompassing molecular structures, molecular interactions, and known target proteins enables the system to discern nuanced relationships that may be challenging for conventional algorithms. The adaptability and self-learning capabilities of deep neural networks make them well-suited for capturing the multifaceted nature of drug-target interactions. As demonstrated through rigorous training, validation, and evaluation processes, the proposed system showcases commendable accuracy and predictive capabilities. The integration of hyperparameter tuning ensures optimal performance, and the system's reliability is verified through robust testing on independent datasets. The implications of this approach extend beyond mere prediction; it holds the potential to significantly expedite drug discovery timelines by providing researchers with targeted insights into potential drug targets. Moreover, the user-friendly interface facilitates practical application, allowing stakeholders in the pharmaceutical and biomedical fields to leverage the power of deep learning for more informed decision-making.

VIII. FUTURE WORK:

Incorporate diverse biological data, including genomics, transcriptomics, proteomics, and metabolomics, to create a more holistic understanding of drug–target interaction. Explore the application of transfer learning and pre-trained models to leverage knowledge from related tasks or domains, potentially enhancing model performance with limited labeled data. Develop models capable of providing real-time predictions for drug–target interactions, allowing for more timely decision-making in drug discovery pipelines.Conduct rigorous clinical validations of predicted drug–target interactions to assess the translational potential of deep learning models in real-world healthcare applications.

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MICRO CARDHUB : MICROSERVICE - DRIVEN CREDIT CARD PROVISIONING SYSTEM USING SPRINGBOOT

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***Abstract*-- This paper explores the strategic implications of implementing a microservices architecture in credit card application systems, emphasizing efficiency and security in financial transactions. The process commences with user details submission, including PAN CARD, to the credit card microservice. This microservice orchestrates interactions with identity verification and credit score microservices, ensuring a seamless and secure user experience. A critical creditworthiness threshold of 700 filters eligible applicants, initiating secure credit card creation and information storage in the database. This innovative architecture aims to redefine credit card issuance, promising a resilient, scalable, and future-ready solution for the financial industry.**

***Keywords*-- Microservices Architecture, Credit Card Application, Identity Verification, Creditworthiness, Scalability, Security, Database Management, Financial Industry Innovation.**

I.INTRODUCTION:

In the dynamic landscape of financial technology, the paradigm of credit card applications has undergone a transformative shift with the advent of microservices architecture. This innovative approach dissects traditional applications into smaller, independently deployable services, each dedicated to specific business functions. The essence of microservices lies in its capacity to enhance modularity, scalability, and performance, creating a user-friendly and adaptable environment. In this paper, we delve into the pivotal role played by microservices in revolutionizing credit card applications, examining its principles and impact on major banking institutions such as CITI Bank, Visa, and Mastercard. As these industry giants transition from monolithic systems to microservices, we unravel the implications of this migration, emphasizing the newfound ease of maintenance and the potential for future advancements in the financial technology sector. Our exploration aims to provide insights into the intricate fabric of microservices architecture and its profound influence on shaping the future of credit card application systems.

II.RELATED WORK:

[1], Legacy systems, characterized by outdated technology and compromised architecture, pose significant obstacles to digital transformation and innovation, requiring substantial resources for upkeep. To address these challenges, the modernization of monolithic legacy systems has emerged as a strategic initiative, leveraging advancements in technology, notably the adoption of microservices. Microservices, an architectural paradigm, advocates the development of systems as a collection of small, autonomous services communicating through lightweight protocols. While numerous studies have explored aspects of migrating legacy systems to microservices, they often concentrate on specific tasks, such as identifying microservice boundaries in legacy code, and lack a comprehensive consideration of real-world scenarios, including organizational, operational, and technical dimensions.

In response to this gap, this paper presents a holistic roadmap for modernizing monolithic legacy systems with microservices. Distilled from existing knowledge, the roadmap encompasses eight activities organized into initiation, planning, execution, and monitoring phases. This contribution aims to serve as a practical guide for practitioners engaged in the modernization process, provide a foundational reference for researchers designing new studies, and inspire tool builders to address existing challenges.

[2], As microservices architectures increasingly establish themselves as the industry standard for developing continuously deployed systems, there is a concurrent surge in the demand to migrate onpremise legacy applications to the cloud. Organizations, in response to this shift, are adopting cloudnative architectures by transforming their traditional setups into microservices-based structures. This article presents a compilation of migration and rearchitecting design patterns derived from real-world, industrial-scale software migration projects. These patterns offer valuable insights to information technology organizations, aiding in the efficient and effective planning of their migration projects towards microservices. Furthermore, the proposed patterns facilitate the creation of comprehensive migration plans through pattern composition. The validation of these patterns relies on qualitative empirical research, affirming their applicability not only to microservices migrations but also to various architectural refactoring and migration

projects. Our findings underscore the significance of these patterns as robust and effective tools for guiding organizations through the complexities of system migrations.

[3], Cloud computing has revolutionized service provisioning by offering elastic and on-demand resources, optimizing efficiency, and enhancing responsiveness to variable application loads. While virtual machines, the foundational elements of cloud infrastructures, are created using provider-specific templates stored in proprietary repositories, this practice can potentially lead to provider lock-in and reduced portability. Despite the advantages of cloud technologies, large-scale service-oriented applications often remain inelastic, relying on monolithic services that hinder replicability and scalability. The decomposition of these services into smaller, more modular microservices holds the key to unlocking elasticity, yet the process is predominantly manual. This paper presents a novel methodology for automating the decomposition of monolithic services into microservices, leveraging outcomes from the ENTICE project, specifically its image synthesis and optimization tools. The insights provided highlight how these outcomes breathe new life into existing monolithic services and offer valuable techniques for future microservice developers.

[4], The microservices architecture style (MSA) has emerged as a prominent computing paradigm, gaining substantial traction within the software engineering industry. Departing from traditional monolithic applications, microservices present a revolutionary approach by breaking down applications into a collection of finely tuned services, allowing independent development, testing, and deployment. This strategy offers a myriad of advantages, foremost among them being a shortened time to market for new capabilities, facilitated by improved technology choices and more efficient team sizes. This research embarks on a comprehensive exploration of the microservices approach, starting with an examination of its foundational principles. Subsequently, we delve into the identification and definition of MSA design patterns specifically crafted to address common challenges encountered in the realm of DevOps. The paper concludes by shedding light on the motivations driving early adopters of microservices, accompanied by an insightful discussion of the challenges associated with its implementation.

[5], Random testing (RT), a well-established testing methodology, has found widespread application across various domains, including embedded software systems, SQL database systems, and Android applications. In the pursuit of enhancing the failure-detection capabilities of RT, adaptive random testing (ART) emerged with the goal of achieving a more uniform distribution of test cases across the input domain. Since its inception in 2001, ART has seen numerous contributions, encompassing diverse approaches, implementations, assessment methods, and real-world applications. This paper offers a comprehensive survey on ART, presenting a systematic classification of techniques, summarizing its application areas, and analyzing the outcomes of experimental evaluations. Additionally, the paper dispels some misconceptions surrounding ART and delineates open research challenges that warrant exploration in future work.

[6], The microservices architecture has become the prevailing standard for developing large-scale and cloud-native commercial applications, offering the allure of heightened agility, autonomy, scalability, and reusability. Within the realm of software design, patterns play a pivotal role as design tools, chosen and combined to achieve desired quality attributes. However, a notable research gap exists as many patterns lack widespread validation against industry practices, often remaining theoretical constructs. To bridge this divide, our study delves into the perceptions of practitioners regarding the impact of 14 specific patterns on seven key quality attributes. Through 9 semi-structured interviews, we sought insights into (1) the understanding and adoption of software patterns, (2) the perceived architectural trade-offs associated with these patterns, and (3) the metrics employed by professionals to measure quality attributes. Our findings align many reported trade-offs with documented patterns while revealing novel gains and challenges not previously documented, providing fresh insights into the landscape of microservices patterns.

[7], The widespread adoption of microservices architecture is attributed to its potential for delivering scalable, robust, agile, and failure-resilient software products. Companies managing large and complex software systems are actively exploring automated solutions to transition from monolithic applications to microservices. This paper conducts a rigorous examination of 35 research papers through a Systematic Literature Review (SLR) protocol and a snowballing method. It extracts data to address specific research questions and offers four key contributions. Firstly, it introduces the Monolith to Microservices Decomposition Framework (M2MDF), delineating major phases and key elements of the decomposition process. Secondly, it presents a detailed analysis of existing decomposition approaches, tools, and methods. Thirdly, it identifies the metrics and datasets employed for evaluating and validating monolith-to-microservice decomposition processes. Lastly, the paper proposes areas for future research. The findings indicate that monolith decomposition into microservices is still in its nascent stages, highlighting a lack of methods combining static, dynamic, and evolutionary data. Inadequate tool support is evident, and the absence of standardized metrics, datasets, and baselines remains a challenge. These insights are invaluable for practitioners seeking a comprehensive understanding of monolith decomposition dimensions and the current capabilities of the community in this domain. The findings also serve as a guide for researchers aiming to identify avenues for further exploration in the field of monolith decomposition.

[8], The rapid advancements in network speed, reliability, and security have fueled a growing demand to transition

software and services from local storage and processing on users' machines to the management of third-party entities accessible through the network. This shift has necessitated the development of new software development methodologies and architectural styles capable of meeting these evolving demands. One notable example in software architectural design is the recent rise of microservices architecture, specifically designed to address the maintenance and scalability requirements of online service providers. Given that microservices architecture is a burgeoning research area, the imperative for a systematic mapping study becomes evident to summarize the current progress, identify gaps, and outline requirements for future studies. This paper presents a systematic mapping study focusing on microservices architectures and their implementation. The study places emphasis on identifying architectural challenges, architectural diagrams/views, and quality attributes associated with microservice systems.

[9], This paper introduces an innovative approach for the decomposition of monolith applications, specifically designed to map the implementation structure of a monolith application to a functional structure that aligns with business functionality. The proposed method begins by leveraging formal concept analysis on statically determined code flow structures to automatically infer classes in the monolith application that distinctly represent business functionality within the application domain. Subsequently, a clustering technique, guided by the inferred representatives, is applied to group the monolith's classes into different partitions, including: 1) functional groups representing microservice candidates, 2) a utility class group, and 3) a group of classes requiring significant refactoring to facilitate a clean microservice architecture. This process results in microservice candidates that align naturally with the diverse business functions exposed by the application. A thorough evaluation on four publicly available applications demonstrates the superior ability of our approach to determine high-quality microservice candidates compared to existing state-of-the-art techniques. Furthermore, we conclusively establish that clustering quality metrics, such as modularity, do not reliably indicate the goodness of microservice candidates.

[10], The advent of microservices represents a novel and swiftly expanding architectural paradigm, dedicated to crafting highly scalable software solutions through independently deployable and adaptable components. With the increasing prominence of microservices, discussions within the microservice community have surged, particularly on Q&A platforms like StackOverflow (SO). To unravel the focal points of these discussions, this study employs mining techniques and topic modeling on a meticulously curated dataset comprising 1,043 microservice-related posts from SO. Intriguingly, our findings reveal that 13.68% of technical posts on microservices on SO center around a singular technology: Netflix Eureka. Additionally, certain buzzwords prevalent in the microservices ecosystem, such as blue/green deployment, did not emerge as significant topics of discussion on SO. This study also underscores how a high discussion rate on SO may not necessarily align with the true popularity of a specific subject within the microservice community.

III.PROPOSED SYSTEM:

The monolithic credit card application is being deconstructed into multiple microservice applications to enhance its flexibility and scalability. The primary emphasis of our proposed system lies in the meticulous isolation of failures within the application, ensuring a robust and fault-tolerant architecture. Within this microservices-based application, each validation module is deployed on different servers, operating as distinct applications that communicate seamlessly to fulfill the overall requirements of the system. Microservices are conceptualized as reusable components, facilitating code reuse not only within different sections of the credit card application but also across diverse projects. The modular design of microservices allows for independent deployment and communication, contributing to a more flexible and adaptable credit card application system. The isolation of validation modules into separate microservices enhances fault tolerance, preventing the propagation of failures throughout the entire application. Each microservice acts as a self-contained unit, contributing to the overall functionality of the credit card application and ensuring a streamlined communication process. The deployment of microservices on various servers promotes a distributed architecture, optimizing resource allocation and contributing to improved system performance. The reusability of microservices components fosters a more efficient and sustainable codebase, promoting standardized functionalities across different parts of the application. Microservices offer inherent scalability, allowing the credit card application system to adapt seamlessly to varying workloads and demands. By breaking down the monolithic structure, our approach ensures that updates or modifications to individual microservices do not disrupt the entire credit card application system. The modular and distributed nature of microservices aligns with the innovative shift toward agile and adaptable software development practices in the financial industry.

ARCHITECTUREDIAGRAM:

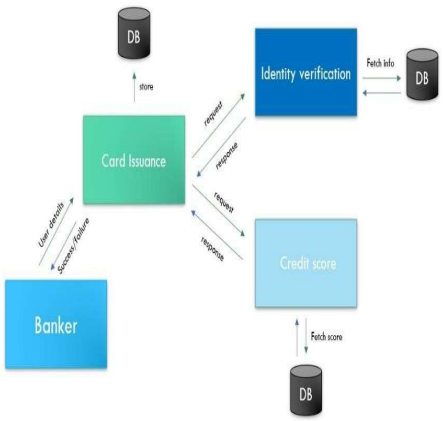

Figure 3.1.Architecture Diagram Of Proposed System

IV.IMPLEMENTATION:

4.1. CREDIT CARD MODULE:

The Credit Card Microservice is the central component of the credit card provisioning system, responsible for coordinating the entire credit card application process. Built using the Spring Boot framework, this module is designed with a microservices architecture to ensure flexibility, scalability, and resilience in handling user requests. Upon receiving user details, including crucial information such as the PAN CARD, the Credit Card Microservice initiates the credit card application process. Leveraging RESTful APIs, it communicates with the Identity Verification Microservice to verify users' identities and with the Credit Score Microservice to assess their creditworthiness. This communication enables a seamless flow of information between microservices, facilitating efficient decision-making. One of the critical functionalities of the Credit Card Microservice is determining the eligibility of users based on predefined criteria. For instance, users must meet a minimum credit score threshold, typically set at 700, to qualify for credit card issuance. Once users meet these criteria, the Credit Card Microservice proceeds with creating the credit card. To ensure data security and regulatory compliance, the system securely stores pertinent user and credit card information in a database. The Credit Card Microservice is containerized using Docker, making it highly portable and easily deployable across different environments.

4.2. IDENTITY VERIFICATION MODULE:

The Identity Verification Module plays a critical role in ensuring the authenticity and accuracy of user data within the credit card provisioning system. When triggered by a request from the Credit Card Microservice, it performs a comprehensive verification process to validate the user's identity against the information stored in the database. Upon receiving a request from the Credit Card Microservice, the Identity Verification Module first retrieves the PAN, first name, and last name of the customer from the database. Leveraging Spring Boot for efficient data retrieval and processing, it ensures that the fetched data corresponds accurately to the user's identity. Next, the module compares the retrieved data with the information provided in the incoming request from the Credit Card Microservice. This comparison involves scrutinizing the PAN, first name, and last name fields to ensure consistency and accuracy. If the retrieved data matches the request data precisely, indicating a successful identity verification process, the Identity Verification Module sends a success message back to the Credit Card Microservice. This message signifies that the user's identity has been verified, thus meeting the necessary requirements for further processing in the credit card application process. Conversely, if any inconsistencies or discrepancies are detected between the retrieved data and the request data, the Identity Verification Module sends a failure message back to the Credit Card Microservice. This message serves as a notification that the user's identity could not be verified, prompting appropriate actions or additional verification steps within the credit card provisioning system. By meticulously validating user identity information against stored database records, the Identity Verification Module ensures the integrity and security of the credit card application process. Its seamless integration with the Credit Card Microservice facilitates efficient communication and decision-making, ultimately contributing to a robust and reliable credit card provisioning system.

4.3.CREDIT CARD MODULE:

The Credit Score Module is an integral component of the credit card provisioning system, tasked with evaluating the creditworthiness of users based on their credit scores. Upon receiving a request from the Credit Card Microservice, following successful identity verification, the Credit Score Module executes a series of actions to retrieve and assess the user's credit score. Upon receipt of a request containing the PAN number from the Credit Card Microservice, the Credit Score Module initiates a database query to fetch the customer's credit score associated with the provided PAN. Leveraging efficient data retrieval mechanisms and database querying techniques, typically facilitated by Spring Boot, the module ensures swift and accurate access to the relevant credit score information. Once the credit score data is retrieved from the database, the module proceeds to evaluate the customer's credit score against the predefined eligibility criteria. In this case, the primary criterion is typically set at a credit score threshold of 700, which serves as the minimum requirement for credit card issuance. Upon completing the credit score evaluation process, the Credit Score Module sends the determined credit score back to the Credit Card Microservice. The credit score value is then examined within the Credit Card Microservice to ascertain whether it meets the specified eligibility criteria. If the customer's credit score

surpasses the minimum threshold of 700, indicating a satisfactory level of creditworthiness, the Credit Card Microservice proceeds with the credit card application process. By seamlessly integrating with the Credit Card Microservice and providing timely access to accurate credit score data, the Credit Score Module plays a pivotal role in facilitating informed decision-making within the credit card provisioning system. Its efficient operation ensures that only eligible applicants meeting the predefined credit score criteria proceed with the credit card application process, contributing to risk mitigation and responsible lending practices.

V.CONCLUSION:

In conclusion, the transformation of our monolithic credit card application into a microservices-based architecture represents a strategic move to enhance the system's flexibility, scalability, and fault tolerance. The deployment of each validation module as a separate microservice on different servers enables these components to operate as distinct applications. Through seamless communication, they collectively fulfill the overall requirements of the credit card application system. This distributed and modular approach not only optimizes resource allocation but also contributes to a more flexible and adaptable system. Microservices, conceptualized as reusable components, play a pivotal role in promoting code reuse across different sections of the credit card application and even extend their utility to diverse projects. The modular design allows for independent deployment and communication, fostering a dynamic and responsive credit card application system. By isolating validation modules into separate microservices, our approach significantly enhances fault tolerance, mitigating the risk of failures propagating throughout the entire application. This proactive strategy ensures the system's resilience, reliability, and the ability to adapt to changing demands. In essence, our proposed microservices architecture transforms the credit card application into a more agile, scalable, and faulttolerant system. The modular and distributed nature of microservices aligns with contemporary best practices, paving the way for a future-proof financial application that can readily adapt to evolving industry requirements and technological advancements. This strategic shift positions our credit card application system at the forefront of innovation, promising a seamless and resilient banking experience for users.

VI. FUTURE WORK:

The implementation of Micro CardHub, a microservice-driven credit card provisioning system utilizing Spring Boot, lays the foundation for several future avenues of exploration and enhancement. As we look ahead, the following areas represent potential directions for further development and improvement. Future work could delve into the exploration and implementation of advanced security measures within Micro CardHub. This may include the incorporation of cutting-edge encryption techniques, biometric authentication, and additional layers of security to further fortify the protection of sensitive user information. Leveraging artificial intelligence (AI) and machine learning (ML) algorithms can enhance various aspects of the credit card provisioning system. These technologies can be employed for fraud detection, risk assessment, and personalized user experiences, ensuring a more intelligent and adaptive system. Expanding Micro CardHub to cater to an international user base involves incorporating features for localization and internationalization. This includes supporting multiple languages, currencies, and compliance with diverse regulatory frameworks.Implementing CI/CD pipelines can streamline the development, testing, and deployment processes, enabling faster and more reliable updates to the Micro CardHub system. This approach supports agility and responsiveness to changing requirements.

VII.RESULT AND DISCUSSION

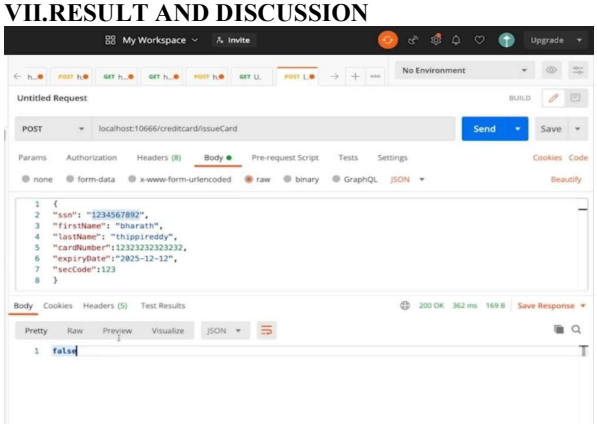

FIGURE.7.1

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DETECTION OF PULMONARY DISESASES IN LUNG USING CT & X-RAY IMAGES BY CNN TECHNOLOGY

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***Abstract*-- Our study presents a novel approach for the automated detection of pulmonary diseases, particularly focusing on COVID-19 and effusion, utilizing Convolutional Neural Network (CNN) technology applied to CT images. Traditional methods often require manual interpretation, leading to delays and potential inaccuracies. Our proposed CNN-based approach offers a solution by leveraging the power of deep learning to automatically analyze CT scans for the presence of pulmonary abnormalities. The CNN model is trained on a diverse dataset encompassing a wide range of pulmonary conditions, including COVID-19 infections and effusion cases. The proposed system holds significant promise for aiding healthcare professionals in expedited diagnosis and treatment planning, particularly in the context of the current COVID-19 pandemic and beyond.**

Keywords: **COVID-19, lung CT image segmentation, and effusion CT images.**

I.INTRODUCTION

The power of Convolutional Neural Network (CNN) technology, this project aims to revolutionize pulmonary disease detection on CT images.With The Recent Global Outbreak Of Covid-19, The Need For Accurate And Efficient Diagnostic methods has become more Critical than ever. CNN models trained on large datasets can achieve high levels of accuracy in detecting pulmonary abnormalities.Once trained, CNN models can analyze a vast number of CT scans rapidly and efficiently, this scalability is particularly advantageous in healthcare settings with high patient volumes where timely diagnosis is essential.By this technology improvement , Researchers can leverage this information to develop better treatment strategies, predict disease outcomes, and contribute to the scientific understanding of pulmonary diseases.COVID-19 pneumonia and effusion on CT images offers numerous advantages, ranging from improved diagnostic accuracy and efficiency.

II.RELATED WORK

In [1], The swift transmission of COVID-19 has elevated it to a public health emergency. The emergence of pneumonia stands out as a pivotal indicator for diagnosis, monitoring, and therapeutic assessment. A growing body of literature delves into imaging manifestations and associated research, shedding light on the evolving understanding of COVID-19. This review aims to provide insights into the progress and future prospects of COVID-19 imaging. It concentrates on elucidating CT findings, articulating potential pathological foundations, addressing challenges posed by patients with underlying conditions, distinguishing from other diseases, and outlining directions for future research and clinical exploration. This comprehensive overview is intended to assist radiologists in both clinical practice and research endeavors.

In[2], Visual inspection of histopathology slides is one of the main methods used by pathologists to assess the stage, type and subtype of lung tumors. Adenocarcinoma (LUAD) and squamous cell carcinoma (LUSC) are the most prevalent subtypes of lung cancer, and their distinction requires visual inspection by an experienced pathologist. In this study, we trained a deep convolutional neural network (inception v3) on whole-slide images obtained from The Cancer Genome Atlas to accurately and automatically classify them into LUAD, LUSC or normal lung tissue. The performance of our method is comparable to that of pathologists, with an average area under the curve (AUC) of 0.97. Our model was validated on independent datasets of frozen tissues, formalin-fixed paraffin-embedded tissues and biopsies. Furthermore, we trained the network to predict the ten most commonly mutated genes in LUAD. We found that six of them—STK11, EGFR, FAT1, SETBP1, KRAS and TP53—can be predicted from pathology images, with AUCs from 0.733 to 0.856 as measured on a held-out population. These findings suggest that deep-learning models can assist pathologists in the detection of cancer subtype or gene mutations.

In[3], Automated lung cancer diagnosis from computed tomography scans involves a dual process: identifying suspicious lesions (pulmonary nodules) and evaluating overall lung/pulmonary malignancy. While numerous studies focus on the initial step, there is a notable gap in research concerning the subsequent evaluation. Given that the mere presence of a nodule does not definitively indicate cancer, and the relationship between nodule morphology and cancer is intricate, an accurate lung cancer diagnosis necessitates meticulous examination of each suspicious nodule and the integration of information from all

modules.To address this, we propose a 3-D deep neural network with two integral modules. The first module is a 3-D region proposal network dedicated to nodule detection, generating outputs for all suspicious nodules within a subject. The second module prioritizes the top five nodules based on detection confidence, assesses their cancer probabilities, and integrates them using a leaky noisy-OR gate to derive the overall probability of lung cancer for the subject. Both modules share a common backbone network, specifically a modified U-net. To mitigate overfitting caused by limited training data, the two modules are trained alternately. Notably, our proposed model achieved first place in the Data Science Bowl 2017 competition

In[4], The advancement of deep learning methodologies, particularly Convolutional Neural Networks (CNNs), has significantly enhanced the accuracy of automated pulmonary nodule detection. Despite these improvements, concerns arise regarding the computational and storage demands associated with large-scale neural network architectures, potentially limiting widespread clinical applications. This paper introduces an innovative Multi-ringed (MR)-Forest framework as an alternative to resource-intensive neural network-based approaches for false positive reduction in pulmonary nodule detection. The framework comprises three key steps. Firstly , a novel multi-ringed scanning method is employed to extract order ring facets (ORFs) from the surface voxels of volumetric nodule models. Secondly, Mesh-LBP and mapping deformation techniques are utilized to estimate texture and shape features. By sliding and resampling the multi-ringed ORFs, feature volumes with varying lengths are generated. Lastly, the outputs of multiple levels are cascaded to predict candidate classes. Evaluating the framework on 1034 scans, combining data from the Affiliated Hospital of Liaoning University of Traditional Chinese Medicine (AH-LUTCM) and the LUNA16 Challenge dataset, our approach demonstrates competitive performance in false positive reduction with a CPM score of 0.865, outperforming current state-of-the-art methods.Experimental results affirm that the MR-Forest framework provides an effective solution that balances resource efficiency and performance for automated pulmonary nodule detection. Furthermore, the proposed MR-Forest architecture proves versatile for 3D target detection and can be readily extended to various medical imaging analysis tasks, particularly those involving spheroidal expansion as an approximation of the object's growth trend

In[5], o address the challenges of training deeper neural networks, we introduce a residual learning framework aimed at facilitating the training of significantly deeper networks than previously utilized. Our approach involves explicitly redefining layers as residual functions, referencing layer inputs rather than learning unreferenced functions. Empirical evidence strongly supports the notion that these residual networks are more amenable to optimization, and they exhibit increased accuracy with greater depth. Evaluation on the ImageNet dataset demonstrates the effectiveness of residual nets with depths of up to 152 layers, surpassing VGG nets by eight times in depth while maintaining lower complexity. An ensemble of these residual nets achieves an impressive 3.57% error rate on the ImageNet test set, securing the 1st place in the ILSVRC 2015 classification task. Furthermore, our analysis on CIFAR-10, employing 100 and 1000 layers, reinforces the significance of representation depth in visual recognition tasks.The profound depth of our representations leads to a notable 28% relative improvement on the COCO object detection dataset. Deep residual nets serve as the foundation for our successful submissions to the ILSVRC & COCO 2015 competitions, where we secured 1st places in ImageNet detection, ImageNet localization, COCO detection, and COCO segmentation tasks.

In[6], Timely classification of the 2019 novel coronavirus disease (COVID-19) is crucial for effective disease management. In comparison to reverse-transcription polymerase chain reaction (RT-PCR), chest computed tomography (CT) imaging emerges as a potentially more reliable, practical, and rapid method for the classification and assessment of COVID-19, particularly in epidemic regions. Given the widespread availability of CT imaging machines in almost all hospitals, utilizing chest CT images becomes a viable option for the early classification of COVID-19 patients. However, the manual chest CT-based classification of COVID-19 requires the expertise of a radiologist and consumes significant time, a valuable resource during the rapid spread of COVID-19 infections. Hence, there is a need for automated analysis of chest CT images to streamline the process and save precious time for medical professionals.In this study, we employ a Convolutional Neural Network (CNN) for the classification of COVID-19-infected patients as either positive or negative. Additionally, we enhance the initial parameters of the CNN using multi-objective differential evolution (MODE). Through extensive experiments comparing our proposed model with other machine learning techniques on chest CT images, the results indicate that our model achieves a commendable accuracy rate in classifying COVID-19 cases. This automated approach holds promise in expediting the classification process and optimizing the use of medical professionals' time

In[7], The global outbreak of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) has led to over 2.5 million cases of Corona Virus Disease (COVID-19), a number that continues to rise. In an effort to control the spread of the disease While pathogenic laboratory testing remains the gold standard, it is time-consuming and often yields significant false negative results. Hence, there is an urgent need for alternative diagnostic methods to effectively combat the disease. Building upon the radiographical changes observed in CT images of COVID-19, we propose that deep learning methods in Artificial Intelligence may extract specific graphical features indicative of COVID-19.

In[8], This paper introduces a real-time denoising method for pure color images using the Quantum Parallel Bi-directional Self-Organizing Neural Network (QPBDSONN) architecture. Derived from the Parallel Bi-directional Self-Organizing Neural Network (PBDSONN) architecture, the QPBDSONN leverages the capabilities of quantum computation. For processing the three fundamental color components (Red, Green, and Blue) of a noisy color image, the QPBDSONN employs a trinity of Quantum Bi-directional Self-organizing Neural Network (QBDSONN) architectures at the source layer in parallel. Each QBDSONN consists of interconnected input, intermediate (hidden), and output layers, employing a topology based on an 8-connected neighborhood of neurons represented by qubits.The QBDSONN updates weighted interconnections as quantum states through counter-propagation between the hidden and output layers, eliminating the need for quantum backpropagation. Rotation gates are introduced to signify weighted inter-links and activation values. Subsequently, a quantum measurement operation is performed at the output layer of each QBDSONN, followed by a fusion operation at the sink layer of the QPBDSONN, concatenating the processed color image components to yield the final output. The efficacy of the proposed network architecture is demonstrated by comparing it to the classical PBDSONN using a real-life spanner pure color image and synthetic pure color images corrupted with various intensities of uniform and Gaussian noise, considering factors such as extraction time and shape accuracy..

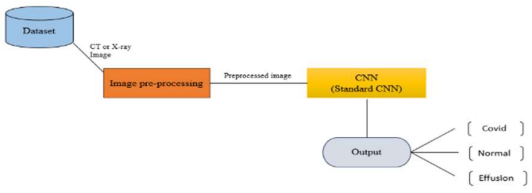
In[9], The network self-organizes input image information through the counter-propagation of fuzzy network states between the intermediate and output layers. Convergence of the network operation is determined by achieving stability in fuzzy neighborhood hostility measures at the output layer or corresponding fuzzy entropy measures. The article demonstrates the application of this architecture in extracting binary objects from backgrounds with varying degrees of noise, showcasing results on both synthetic and real-life images.

In[10This article introduces an innovative neural network architecture designed for image processing applications. The architecture comprises three interconnected fuzzy layers of neurons, eliminating the need for any back-propagation algorithm for weight adjustment. These fuzzy layers represent the fuzzy membership information of the image scene undergoing processing. One fuzzy layer serves as the input layer, while the remaining two layers, namely the intermediate layer and the output layer, are counter-propagating fuzzy layers responsible for processing the input image information.Neurons within each layer of the network are fully connected, with the intermediate layer neurons linked to corresponding neurons and neighbors in the input layer. Connectivity between neurons in the intermediate and output layers, as well as their respective neighbors, follows a neighborhood-based structure. The architecture employs fuzzy membership-based weight assignment and updating procedures, incorporating fuzzy cardinality-based image context-sensitive information to determine thresholding capabilities.This article focuses on image thresholding, a crucial practice in achieving image segmentation, widely explored over the past few decades. Acknowledging the computational time increase in multi-level thresholding with higher levels, the paper introduces six quantum-inspired meta-heuristic methods to expedite the process. These methods include Quantum-Inspired Genetic Algorithm, Quantum-Inspired Particle Swarm Optimization, Quantum-Inspired Differential Evolution, Quantum-Inspired Ant Colony Optimization, Quantum-Inspired Simulated Annealing, and Quantum-Inspired Tabu Search.

III.PROPOSED SYSTEM:

In our approach to detecting lung diseases, particularly COVID-19 and Effusion, we opted for the Convolutional Neural Network (CNN) algorithm over traditional Shallow Learning Networks. By leveraging CT images, we aim to identify and differentiate between COVID-19 and Effusion. The utilization of CNN enables us to harness the power of deep learning, providing several advantages for effective disease detection. One notable strength lies in the algorithm's ability to handle large datasets, allowing for comprehensive analysis of diverse cases. Moreover, the CNN eliminates the need for human recognition, offering a more efficient and automated diagnostic process. Its high accuracy in image recognition and classification enhances the precision of disease identification. An additional benefit is the CNN's capacity to apply the same knowledge across all image locations, ensuring consistency in its diagnostic capabilities. This advanced algorithmic approach holds promise in revolutionizing the detection and classification of lung diseases, contributing to more effective and timely medical interventions.

ARCHITECTURE DIAGRAM:



IV.IMPLEMENTATION

4.1. DATASET COLLECTION:

Gather a diverse dataset of chest CT images, including both healthy and diseased cases. Ensure the dataset covers various pulmonary diseases and conditions Identify and select a diverse and representative dataset of CT images that includes cases of pulmonary diseases such as COVID-19 and Effusion. The dataset should encompass various

conditions, ensuring a comprehensive training ground for the CNN

4.2. DATASET ACQUISITION:

The dataset is designed to cover a diverse range of pulmonary conditions, allowing for a thorough exploration of imaging patterns associated with COVID-19, as well as those specific to pleural effusion. Each CT scan in the dataset is meticulously selected to ensure accurate representation of the respective conditions, providing a robust foundation for training and validating machine learning models, particularly leveraging CNN technology,

4.3. DATA PREPROCESSING:

As part of the pre-processing pipeline for our CNN-based model, the collected images undergo several crucial steps. Initially, we resize all images to a consistent size, ensuring uniformity and compatibility for input into the CNN model. Subsequently, we normalize the pixel values across the entire dataset, scaling them to a standardized range, typically [0, 1]. This normalization facilitates model training by preventing numerical instability and promoting convergence during optimization. Additionally, to enhance the model's robustness and generalization capabilities, we employ optional data augmentation techniques. These may include rotations, flips, and zooming, introducing variability to the dataset and enabling the model to learn from a more diverse set of representations. Through these pre-processing steps, we aim to prepare a well-structured and optimized dataset for training our CNN model, ultimately enhancing its accuracy and effectiveness in detecting pulmonary diseases from CT images.

.4.4.MODEL BUILDING:

The dataset is systematically divided into three subsets: training, validation, and test sets, ensuring a robust evaluation of the CNN model's performance. The training set, comprising chest CT images and their corresponding labels indicating health or disease, becomes the foundation for training the model. During this training phase, the CNN learns to discern relevant features within the images and makes associations with the provided labels.To assess the model's generalization capabilities, we validate its performance on the dedicated validation set. Metrics like loss and accuracy are closely monitored during validation, offering insights into the model's behavior and potential areas for improvement. This iterative process allows for fine-tuning hyperparameters, such as learning rate, batch size, and dropout rate, with the goal of optimizing the model's overall performance.Through this comprehensive training and validation cycle, we aim to develop a CNN model that exhibits high accuracy, sensitivity, and specificity in detecting pulmonary diseases from chest CT images. The strategic use of training, validation, and test sets, along with careful hyperparameter tuning, contributes to the robustness and effectiveness of our CNN-based diagnostic tool.

4.5.TRAINING:

Following the training and validation phases, the performance of our trained CNN model is rigorously evaluated using the dedicated test set, consisting of previously unseen data. This assessment aims to gauge the model's ability to generalize effectively to real-world, novel cases. By evaluating the model on the test set, we gain crucial insights into its reliability in making accurate predictions on unseen chest CT images.To quantify the model's diagnostic accuracy, a comprehensive set of evaluation metrics is computed. These metrics include accuracy, which measures the overall correctness of the model's predictions; precision, assessing the model's ability to avoid false positives; recall, indicating the model's capability to correctly identify true positives; and the F1-score, which balances precision and recall. The computation of these metrics provides a holistic understanding of the CNN model's performance in diagnosing pulmonary diseases from chest CT images.This rigorous evaluation process ensures that the developed CNN model not only performs well on the training and validation sets but also demonstrates robust generalization to previously unseen data, ultimately enhancing its reliability and applicability in real-world clinical scenarios.

4.6.DEPLOYMENT:

Upon successful training and evaluation, the trained CNN model is transitioned into a practical and user-friendly application for seamless integration into healthcare systems. The development involves creating an interface that allows users, such as medical professionals or diagnosticians, to input chest CT images easily. The system is designed to leverage the trained model for swift and accurate predictions concerning the presence of pulmonary diseases.Ensuring a user-friendly experience, the interface provides a straightforward mechanism for uploading CT images, and the model processes the input promptly, delivering real-time predictions. This emphasis on efficiency facilitates prompt diagnosis and decision-making in a clinical setting. The deployment of the CNN model into such an application enhances its accessibility and usability, making it a valuable tool for healthcare professionals in diagnosing and managing pulmonary diseases using chest CT images.

V.ALGORITHM:

1. Data Preparation: The training and validation datasets are prepared using 'imageDatastore.
The images are organized into appropriate folders, and their labels are inferred from the folder structure.
2. CNN Architecture: The layers of the CNN are defined. This includes an input layer ('imageInputLayer*), convolutional layers (convolution2dLayer*), batch normalization layers ("batchNormalizationLayer'), ReLU activation layers (reluLayer'), max-pooling layers (maxPooling2dLayer'), and output layers (fullyConnectedLayer', 'softmaxLayer,classificationLayer').

$(f*g)(x,y)= \sum_i \sum_j f(i.j).g(x-i,y-i)$

f =input image

g =kernel

(f*g)(x,y) =resulting feature map.

3. Training Configuration: Training options such as optimization algorithm ("sgdm' * - Stochastic Gradient Descent with Momentum), maximum epochs, initial learning rate, validation data, etc., are set using 'trainingOptions
4. Training the Model: The CNN model is trair using the training dataset, defined layers, and training options via the trainNetwork' function.
5. Validation and Accuracy Calculation: The trained model is used to classify the validation images.
The predicted labels are compared with the ground truth labels, and accuracy is calculated.
This code snippet primarily focuses on training a CNN for pulmonary disease detection using a dataset of chest X-ray images. The model is trained to classify the images into different categories related to pulmonary diseases, such as COVID, normal, effusion, and atelectasis. However, the code does not include the part where new images are classified after training the model.

VI.RESULT AND DISCUSSION:

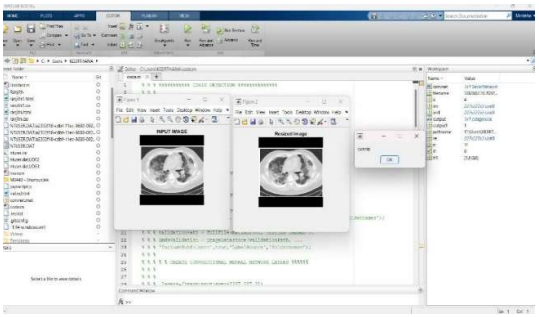


Figure 6.1

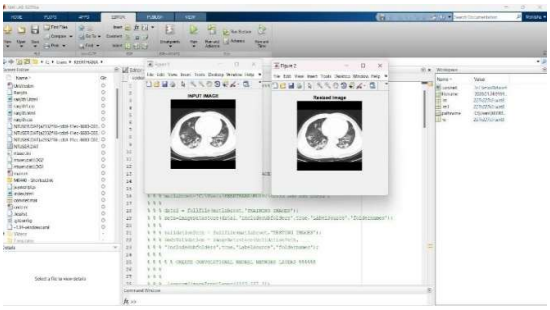


Figure 6.2.

VII.CONCLUSION:
In conclusion, our approach to detecting lung diseases, with a specific focus on COVID-19 and Effusion, leverages the Convolutional Neural Network (CNN) algorithm as a powerful tool for image analysis. The decision to employ CNNs over traditional Shallow Learning Networks is driven by the inherent strengths of deep learning, particularly in handling large datasets and achieving accurate disease detection. By training on a diverse range of cases through CT images, the CNN allows for a comprehensive analysis, offering a more nuanced understanding of pulmonary conditions.One of the notable advantages of the CNN lies in its capability to manage extensive datasets, facilitating a thorough examination of diverse cases and contributing to robust diagnostic capabilities. The elimination of the need for human recognition enhances efficiency, paving the way for an automated diagnostic process. The high accuracy of the CNN in image recognition and classification further refines disease identification, promoting precision in diagnosis.Moreover, the CNN's ability to apply consistent knowledge across all image locations ensures reliability and uniformity in diagnostic outcomes. This advanced algorithmic approach holds substantial promise in revolutionizing the detection and classification of lung diseases, marking a significant stride toward more effective and timely medical interventions. As we continue to explore the potential of CNNs in medical imaging, the integration of such technologies stands poised to significantly impact the landscape of pulmonary disease diagnosis and patient care.

VIII. FUTURE WORK:
Ongoing research and development efforts are likely to refine and optimize CNN architectures for improved diagnostic accuracy. Fine-tuning models and incorporating advanced features may result in heightened sensitivity and specificity, making the detection of pulmonary diseases even more precise.
Future approaches may involve integrating information from multiple imaging modalities, such as CT scans and other medical data sources. This holistic approach could provide a more comprehensive understanding of pulmonary conditions, leading to more accurate and nuanced diagnoses.
Continued advancements in CNN technology may contribute to faster and more efficient diagnostic workflows. Real-time or near-real-time processing of CT images could significantly reduce the time taken for diagnosis, allowing for prompt medical interventions.
Efforts to enhance the interpretability of CNN models will likely be a focal point. Developing methods to explain the decision-making process of these models ensures greater trust among healthcare professionals and facilitates better integration into clinical practice.

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SEMANTIC INSTANCE SEGMENTATION FOR ACCURATE VEHICLE COUNTING IN SURVEILLANCE SYSTEM

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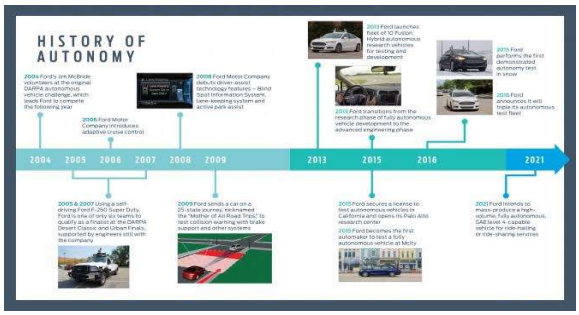
***Abstract*-- The paramount concern in autonomous vehicle operation is the accurate detection of surrounding objects to ensure safe navigation. This paper presents a comprehensive approach to detecting and categorizing objects to aid in autonomous driving systems. Central to autonomous navigation is the precise detection of the vehicle itself. Deep learning, a cornerstone of computer vision, excels in object detection, surpassing earlier methodologies. This project aims to delineate objects such as vehicles and pedestrians. Instance segmentation, an advanced form of object detection, is employed to discern individual instances of objects within the same class by assigning distinct labels. This method simultaneously addresses both object detection and semantic segmentation challenges. While Deep Neural Networks (DNNs) are widely employed for segmenting various elements in fields like medicine, their effectiveness in autonomous vehicle detection remains limited, prompting the need for enhanced methodologies. In modern times, YOLOv5 stands out as a widely adopted object detection framework utilized in various real-time and industrial systems, particularly in applications such as traffic management and regulation. This paper proposes a novel approach to leverage the YOLOv5 architecture for developing a parking management tool, focusing on optimizing network parameters through the integration of lightweight modules inspired by Efficient Net and PP-Lucent architectures. Additionally, the study introduces a new aerial view dataset, AVPL, tailored for car detection tasks in parking areas. The proposed network undergoes training and evaluation on established benchmark datasets, including the Car Parking Lot Dataset and the Pontifical Catholic University of Parana+ Dataset, along with the newly introduced AVPL dataset. Experimental results, measured in terms of mAP@0.5 and mAP@0.5:0.95 metrics, demonstrate superior performance, achieving mAP@0.5 scores of 95.8%, 97.4%, and 97.0% on the Car Parking Lot Dataset, the Pontifical Catholic University of Parana+ Dataset, and the AVPL dataset, respectively.**

***Keywords*-- Autonomous Vehicles, Deep Neural Network, Instance Segmentation, YOLO, Semantic segmentation, Open-CV**

I.INTRODUCTION

Over the past few years, there has been a significant surge in research interest supporting the advancement of autonomous vehicles [1]. These vehicles represent a technological platform that can sense and respond to their immediate surroundings, aiming to navigate roadways without human intervention. Self-driving cars and autonomous vehicles hold great promise in addressing road safety concerns, alleviating traffic issues, and enhancing passenger comfort. The field of computer vision has continually evolved to facilitate improved interaction between humans and machines, focusing on fundamental aspects such as object detection, instance segmentation, and semantic segmentation.



Modern camera systems can be installed in a variety of locations, including autonomous vehicles, surveillance systems, and mobile phones, to produce extremely high-quality photos and videos at a low cost. Due to this, there is a greater need for systems that can identify and comprehend real-time images. For years, there have been numerous approaches to the interpretation of images, yet the method for identifying objects in snapshots and determining their significance is identical [3]. To improve interactions between people and technology, the field of computer vision is constantly expanding. Object identification, instance segmentation, and semantic segmentation are the main features of computer vision. In the absence of technologies

like computer vision, the public would be at risk from driverless cars and unmanned drones. Thus, developing an algorithm for image detection is a major goal for the computer vision model which provides high-level accuracy for image annotation [4].

In other terms, semantic segmentation treats numerous objects within a single class as one entity, whereas Instance segmentation, on the other hand, recognizes individual objects within these classifications.

Autonomous Vehicles

In recent years, there has been a surge in research aimed at advancing autonomous vehicle technology [1]. These vehicles, equipped with sensors and algorithms, are designed to perceive and respond to their surroundings, navigating roads without human intervention. The emergence of self-driving cars and autonomous vehicles holds promise for enhancing road safety, alleviating traffic congestion, and improving passenger comfort. The field of computer vision has continuously evolved to foster better interaction between humans and machines, with key focuses on object detection, instance segmentation, and semantic segmentation.

Deep Learning

Deep learning, a subset of machine learning within artificial intelligence, excels in learning from unlabelled data [22-24]. Artificial intelligence endeavours to imbue machines with human-like thinking and behaviour. Deep learning employs deep neural networks to tackle intricate tasks such as pattern recognition and autonomous vehicle operation [25,26]. These neural networks comprise input layers, output layers, and numerous hidden layers, enabling them to model and process complex, nonlinear relationships. Inspired by the human brain, deep learning algorithms learn from vast amounts of data, enabling effective feature extraction and classification without human intervention. By analysing massive datasets, deep learning enhances machine performance and uncovers latent patterns within the data. As machines autonomously learn from provided data, they adeptly handle feature extraction and classification tasks.

II.RELATED WORK

Conventional Machine Learning Approaches

Traditional machine learning-based techniques for car detection typically involve a two-stage process: manual feature extraction followed by classification. Initially, feature extractors employ classical methods such as Scale-invariant Feature Transform (SIFT), Histograms of Oriented Gradients (HOG), and Haar-like features to generate feature vectors. These vectors are then fed into classifiers like Support Vector Machines (SVM) and Ad boost for classification. However, these methods heavily rely on prior knowledge and struggle with real-world variability such as weather conditions, exposure, and distortion, leading to limited applicability in real-time systems due to their low accuracy.

CNN-based Approaches

Many studies have addressed the challenge of detecting small-sized cars in parking lot images captured by drones or overhead cameras using CNN-based methods or one-stage detectors. Researchers have explored various approaches to enhance spatial resolution in vehicle count detection, such as combining modern CNNs with SVM networks. Additionally, novel network architectures, like a modified YOLOv3 incorporating Reset and Darknet, have been proposed to tackle object detection in drone images. Other approaches focus on feature-matching methods and spatial context analysis to discriminate between pedestrians and vehicles. Improved versions of YOLOv5 have been designed for vehicle detection and classification in both UAV and real-world imagery. Moreover, a one-stage detector (SF-SSD) with a novel spatial cognition algorithm has been introduced for car detection in UAV imagery. While these modern machine learning methods offer high detection and classification accuracy, especially for small-sized objects, they require sophisticated feature extraction and fusion techniques, as well as a certain level of complexity to operate effectively in real-world scenarios.

Existing System

Detecting road vehicles plays a crucial role in numerous intelligent applications, including speed and vehicle count monitoring, driving assistance systems, automated parking solutions, guided vehicles, and traffic analysis. Automated vehicle assistance systems focus on identifying vehicles to provide alerts and monitor roadside environments effectively. Previous systems utilized the YOLOv3 Algorithm for object detection in autonomous vehicles, employing bounding boxes to locate objects. Deep Neural Networks (DNN) were employed in the existing system for object detection.

Drawbacks

1. Reduced Accuracy
2. Increased Time Complexity
3. Inaccurate Detection of Moving Vehicles
4. High Implementation Costs

II.BACKGROUND

The advancement of computer vision technology has benefited greatly by Implementing vision based Intelligent Transportation Systems (ITS) and Smart City applications like AV and traffic management systems. The widespread use of supervision and onboard cameras has led the way in developing two main applications of computer vision technology, i.e., monitoring of moving vehicles and video-based image detection. The main components of computer vision and intelligent transportation systems are automobile detection, picture pre- processing, and tracking the moving vehicle. [9].

The three main techniques for spotting moving automobiles are the inter-frame distinction method,

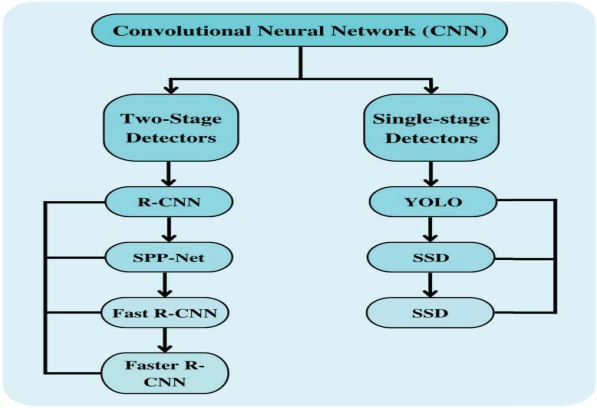
background subtraction distinction method, and optical flow technique. Computer algorithms and programs rely heavily on data to detect vehicles on the road. In addition, they encounter significant obstacles, including adverse weather, poor illumination, and various vehicle types and shapes[2]

Object detection is an application of image processing and computer vision that detects semantics and instances of an object of a group of classes. It is widely used in tasks such as picture annotation, automobile counting, and video object co-segmentation

Object detection can be approached through either neural network or non-neural network methods. Non-neural network options, such as Support Vector Machines (SVM), are considered, while neural network-based methods typically involve the use of Convolutional Neural Networks (CNN) [12].

Krause et al. observed that fine-grained categories, like various automobile models within the same type, share similar shapes. They proposed aligning fine-grained objects through segmentation, which involves partitioning images into different parts at the pixel level. Figure-ground segmentation proves effective in determining an object's pose and locating its parts [13]. The authors adapted the co-segmentation approach to segment object sections and align pairs of photos with similar postures. Points were sampled across all photos on these alignments, and a fixed area, matching the object's bounding box, was considered as a part region surrounding each point [14].

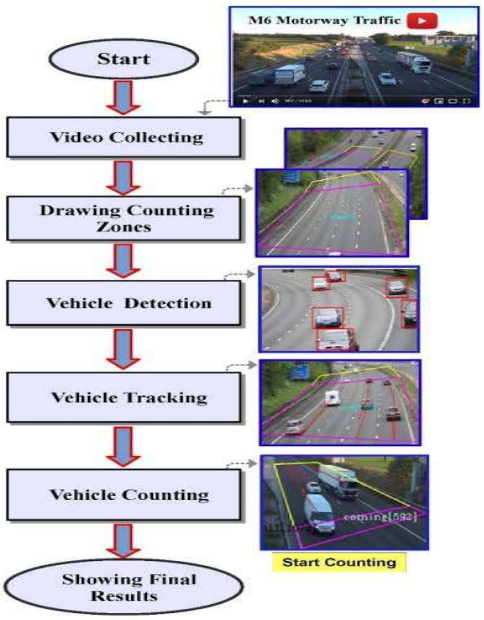
Segmentation serves the purpose of simplifying and transforming an image's representation into a more digestible form. In the realm of video object segmentation (VOS), the DAVIS benchmark publications extensively explore this task. VOS in videos can be categorized into unsupervised and semi-supervised methods. Semi-supervised algorithms use mask initialization to track target objects across video sequences, while unsupervised methods segment the main item based on appearance and gesture saliency without requiring an initialization mask. Early VOS research often did not consider instance level, but Hu et al. [16] introduced the first method for instance-level video object segmentation using recurrent neural networks. The VOS setting relies on the scene's most prominent significant moving object.



Segmentation in the era of Neural Network

Computer vision encompasses tasks like object detection, classification, and intricate image segmentation. Deep neural networks have revolutionized computer vision, particularly in image classification, outperforming previous methods for nearly a decade. These networks are now widely employed in advanced semantic segmentation techniques for accurate pixel-level predictions, surpassing human capabilities in image and object classification.

Fully Convolutional Neural Networks (FCNNs) utilize multiple convolutions to extract features while maintaining original resolutions, albeit at a high computational cost. To mitigate this, techniques like stride convolutions, deconvolutions, and pooling layers are utilized to reduce feature map sizes. FCNNs offer the advantage of adapting to varying input sizes without the need for fully connected layers. State-of-the-art approaches integrate context modules, spatial pyramid pooling, and aurous convolutions, advancing FCNN design. Moreover, methods like Faster YOLO aim to enhance semantic segmentation by leveraging multi-task learning, enabling a unified representation for tasks such as detection, semantic segmentation, instance segmentation, and depth regression.



III.LITERATURE REVIEW

Instance segmentation for vehicle counting has garnered significant attention due to its pivotal role in various applications like traffic management and urban planning. Researchers have explored diverse methodologies to improve the accuracy and efficiency of vehicle counting through instance segmentation. These approaches often employ deep learning architectures such as Mask R-CNN and YOLO to precisely delineate individual vehicles in complex scenes. Furthermore, techniques such as fine-tuning pre-trained models and incorporating attention mechanisms have been investigated to enhance segmentation performance.

Despite advancements, challenges persist in addressing occlusions and diverse lighting conditions. Future research may focus on refining existing algorithms and exploring the integration of multimodal data to achieve more robust vehicle instance segmentation in real-world scenarios.

IV.DISCUSSION AND RESULT

YOLO (You Only Look Once) emerges as a favored model for vehicle counting tasks in both image and video data due to its exceptional speed and accuracy in real-time processing. Its robust capabilities make it a prime choice for vehicle detection and counting tasks in computer vision applications.

Utilizing a YOLO (You Only Look Once) model can significantly enhance vehicle counting tasks within computer vision. Renowned for its real-time object detection capabilities, YOLO swiftly and accurately identifies and locates objects, including vehicles, in images or video frames. To leverage a YOLO model for vehicle counting, the following steps are typically undertaken:

1. Model Selection: Pot for a YOLO model variant that aligns with your project requirements. Popular choices include YOLOv3 and YOLOv4, with smaller variants like YOLOv3-tiny or YOLOv4-tiny suitable for real-time processing.

2. Model Training: Fine-tune the YOLO model on your specific dataset if pre-trained models do not suit your task. Annotated data with vehicle bounding boxes is essential for training the YOLO model for vehicle counting.

3. Inference: Employ the trained YOLO model to perform inference on video streams or images, processing each frame to detect vehicles.

4. Counting Logic: Implement a counting logic to track and count vehicles detected in each frame using the provided bounding boxes.

5. Display and Logging: Present the count visually on-screen or record it in a file or database based on application requirements.

6. Performance Optimization: Optimize the YOLO model and counting algorithm for real-time processing to handle video streams efficiently.

RESULTS

Prior to implementing object detection for autonomous vehicles, YOLOv3 with bounding boxes exhibited limitations such as reduced accuracy, time complexity, and imprecise detection of moving vehicles. In our proposed system, we integrate the COCO dataset for Mask YOLO alongside the ADE20K dataset for the Xception model, enabling both instance and semantic segmentation (see Fig. 1). This approach leverages state-of-the-art deep learning combined with extensive data to accurately recognize segments and classify objects in and around each vehicle, distinguishing between car, bus, people, etc.

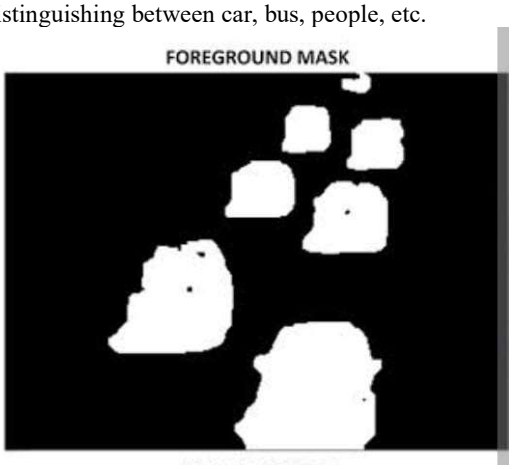


Fig:1 a)Foreground Mask

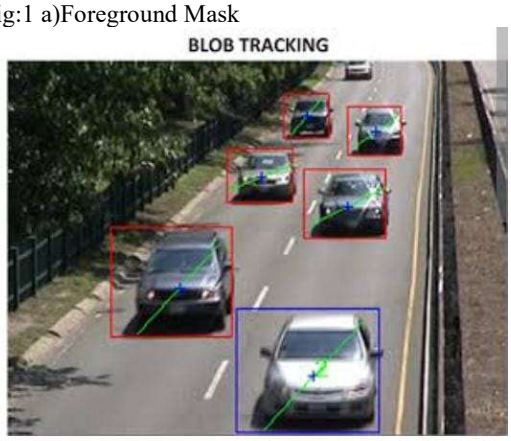


Fig:2 b)Instance Segmentation

V.CONCLUSION

Artificial intelligence, alongside its supporting branches like Deep Learning and neural networks, represents a transformative force shaping various domains in the present and foreseeable future. Autonomous vehicles, among these trends, hold immense promise, propelled by ongoing technological advancements and the continual evolution of transportation. This paper showcases a computer vision application that categorizes objects and aids vehicles in decision-making processes, including object recognition, navigation, and lane detection, utilizing Exception and Mask YOLO models.

Detecting objects surrounding autonomous vehicles is paramount for ensuring safe driving. Instance segmentation,

an extension of object detection, facilitates the identification of objects in images by assigning unique labels to each instance of objects within the same class.

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NCRTCI'24-68

ENHANCED ECG ARRHYTHMIA DETECTION USING DEEP NEURAL NETWORKS

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Abstract— **Arrhythmias, or irregular heartbeats, represent a significant challenge in modern healthcare. They can range from benign to life-threatening, and their accurate diagnosis and timely treatment are crucial for patient well-being. Traditional methods of identifying arrhythmias often rely heavily on manual interpretation of electrocardiogram (ECG) readings by trained clinicians. While these methods are effective, they can be time-consuming and prone to human error. Enter advanced computer techniques, specifically deep learning models, which offer a promising solution to this challenge. deep learning, a subset of artificial intelligence inspired by the structure and function of the human brain, has demonstrated remarkable capabilities in pattern recognition and classification tasks. By leveraging this technology, researchers and healthcare professionals are revolutionizing the way arrhythmias are detected and diagnosed. This, in turn, facilitates prompt initiation of appropriate treatment strategies, which can be critical in managing potentially life-threatening arrhythmias.**

Keywords: **Arrhythmia, ECG, Heartbeat, Neural Network.**

I.INTRODUCTION

Arrhythmias, or irregular heartbeats, pose a significant challenge in modern healthcare, ranging from benign to life-threatening conditions. Timely and accurate diagnosis is paramount for ensuring patient well-being. However, traditional methods of identifying arrhythmias often rely on manual interpretation of electrocardiogram (ECG) readings, which can be time consuming and prone to human error. Enter advanced computer techniques, specifically deep learning models, offering a promising solution to this challenge.[3] Deep learning, a subset of artificial intelligence inspired by the human brain's structure and function, excels in pattern recognition and classification tasks. Leveraging this technology, researchers and healthcare professionals are transforming the landscape of arrhythmia detection and diagnosis. In this paper, we delve into the realm of deep learning-based arrhythmia detection, exploring its potential to revolutionize cardiac care. We will discuss the development and training of specialized deep learning models tailored to analyze ECG data, their capabilities in identifying subtle patterns indicative of different arrhythmias, and the advantages they offer over traditional diagnostic methods[4].

A. Problem Statement

The traditional methods employed for diagnosing arrhythmias, reliant on manual interpretation of electrocardiogram (ECG) readings, are inherently time-consuming and susceptible to human error. This presents a significant challenge in modern healthcare, where timely and accurate diagnosis is crucial for patient well-being. Moreover, limited access to specialized cardiac services in rural or underserved areas exacerbates this issue, hindering the prompt identification and classification of arrhythmias.[2] As such, there is a pressing need for innovative solutions that can streamline the diagnostic process, improve accessibility to cardiac care, and enhance the accuracy of arrhythmia detection. This problem statement underscores the necessity for advancements in technology, particularly in the realm of deep learning-based arrhythmia detection, to address these challenges and revolutionize cardiac healthcare delivery.

II. LITERATURE SURVEY

The paper "Arrhythmia classification based on multi-domain feature extraction for an ECG recognition system" H. Li, D. Yuan, Y. Wang, D. Cui and L. Cao, Sensors, vol. 16, no. 10, pp. 1744, Oct. 2016.Automatic recognition of arrhythmias is particularly important in the diagnosis of heart diseases. This study presents an electrocardiogram (ECG) recognition system based on multi-domain feature extraction to classify ECG beats. An improved wavelet threshold method for ECG signal preprocessing is applied to remove noise interference. A novel multi-domain feature extraction method is proposed; this method employs kernel-independent component analysis in nonlinear feature extraction and uses discrete wavelet transform to extract frequency domain features. The proposed system utilizes a support vector machine classifier optimized with a genetic algorithm to recognize different types of heartbeats. An ECG acquisition experimental platform, in which ECG beats are collected as ECG data for classification, is constructed

to demonstrate the effectiveness of the system in ECG beat classification. The presented system, when applied to the MIT-BIH arrhythmia database, achieves a high classification accuracy of 98.8%. Experimental results based on the ECG acquisition experimental platform show that the system obtains a satisfactory classification accuracy of 97.3% and is able to classify ECG beats efficiently for the automatic identification of cardiac arrhythmias.

The paper Y. Li, R. Qian and K. Li, "Inter-patient arrhythmia classification with improved deep residual convolutional neural network", Computer. Methods Programs Biomed., vol. 214, Feb. 2022.Cardiac arrhythmias that can lead to sudden cardiac death are common. Electrocardiograms (ECGs) offer valuable information about cardiac status and play a crucial role in evaluating patients with arrhythmia in clinical diagnosis. The development of machine learning technologies has made the computer-aided diagnosis of cardiac arrhythmias possible, which can improve the efficiency and quality of medical treatment. In this study, a new method for the automatic classification of heartbeats is developed. This paper presents a novel approach to detect arrhythmias in the inter-patient paradigm using a convolutional neural network (CNN) that integrates multiscale convolutional blocks, frequency convolutional block attention (FCBA) modules, and RR interval features. The proposed method also includes oversampling for the heartbeats of the minority class and the addition of random noise to increase training samples and alleviate the problem of data imbalance. We used the MITBIH-AR arrhythmia database, which is a globally recognized ECG database, to evaluate the classification performance of the proposed model in this paper. Based on the experiments, the sensitivities of the normal beats (N), supraventricular ectopic beats (SVEB), and ventricular ectopic beats (VEB) were 96.9%, 89.3%, and 93.3%, respectively. In the inter-patient heartbeat classification paradigm, the overall accuracy of the proposed method is 95.60% in classifying heartbeats. The study shows that the proposed scheme outperforms other published schemes in terms of classification results.

The paper Y. Wang, J. Sun, K. Sun, L. Li, X. Yu, C. Wang, et al., "ECG-based cardio Dynamics gram can reflect anomalous functional information in coronary artery disease",
Clin. Cardiol., vol. 46, no. 6, pp. 639647, Jun. 2023.ECG-based Cardio Dynamics gram can reflect anomalous functional information in coronary artery disease" suggests that a method called ECGbased Cardio Dynamics gram can provide valuable insights into abnormal functional information related to coronary artery disease. This means that by analyzing electrocardiogram (ECG) data using this method, healthcare professionals may be able to detect irregularities in heart function associated with coronary artery disease. This approach could potentially offer a non-invasive way to assess the status morphological distance. Following the recommendation of the Advancement of Medical Instrumentation (AAMI), all the heartbeat samples of MIT-BIH-AR are grouped into four classes, namely, normal or bundle branch block (N), supraventricular ectopic (S), ventricular ectopic (V) and fusion of ventricular and normal (F). The division of training and testing data complies with the inter-patient schema. Experimental results show that the average classification accuracy of the proposed feature selection method is 86.66%, outperforming those methods without feature selection. The paper P. Yang, D. Wang, W.-B. Zhao, L.-H. Fu, J.-L. Du and H. Su, "Ensemble of kernel extreme learning machine based random forest classifiers for automatic heartbeat classification", Biomed. Signal Process. Control, vol. 63, Jan. 2021.Ensemble of kernel extreme learning machine based random forest classifiers for automatic heartbeat classification" suggests a study focusing on improving automatic heartbeat classification. In simpler terms, researchers are likely working on developing a system that can automatically classify different types of heartbeats. They plan to achieve this by combining two machine learning techniques: kernel extreme learning machines and random forest classifiers. By using this ensemble approach, they aim to enhance the accuracy and efficiency of heartbeat classification. This research could potentially lead to better automated systems for diagnosing heart conditions based on heartbeat patterns.

III. RELATED WORKS

Deep learning models use multiple layers which are the composition of multiple linear and non-linear transformations. With the increase in the size of data, or with the developments in the fi eld of big data, conventional machine learning techniques have shown their limitation in analysis with the size of data (Chen, 2014). Deep learning techniques have been giving better results in this task of analysis. This technique has been introduced worldwide as breakthrough technology because has differentiated machine learning techniques working on old and traditional algorithms by exploiting more Z. Zhang, J. Dong, X. Luo, K.-S. Choi and X. Wu, "Heartbeat classification using disease-specific feature selection", Computer. Biol. Med., vol. 46, pp. 79-89, Mar. 2014, [online] Available Automatic heartbeat classification is an important technique to assist doctors to identify ectopic heartbeats in long-term Holter recording. In this paper, we introduce a novel disease-specific feature selection method which consists of a one-versus-one (OvO) features ranking stage and a feature search stage wrapped in the same OvO-rule support vector machine (SVM) binary classifier. The proposed method differs from traditional approaches in that it focuses on the selection of effective feature subsets for distinguishing a class from others by making OvO comparison. The electrocardiograms (ECG) from the MIT-BIH arrhythmia database (MIT-BIH-AR) are used to evaluate the proposed feature selection method. The ECG features adopted include inter-beat and intra-beat intervals, amplitude morphology,

area morphology and relationship among data. Instead of working on task specific algorithms it is based on learning data representations. This learning can be supervised, unsupervised or semi-supervised, In deep learning models, multiple layers composed of nonlinear processing units perform the task of feature extraction transformation. Every layer takes the input as the output of its corresponding previous layer. It is applied in classify cation problems in a supervised manner and in pattern analysis problems in an unsupervised manner. The multiple layers which provide the high-level abstraction, form a hierarchy of concepts. There are deep learning models which are mostly based on artificial neural networks which are organized layerwise in deep generative models. The concept behind this distributed representation is the generation of observed data through the interaction of layered factors. The high-level abstraction is achieved by these layered factors. A different degree of abstraction is achieved by varying the number.[21]

IV. PROPOSED SYSTEM

Arrhythmias, or irregular heart rhythms, are a significant concern in healthcare, often posing serious threats to patients' well-being. Traditional methods of diagnosis involve extensive manual analysis by medical professionals, which can be timeconsuming and may not always yield accurate results [14]. This is where the power of deep learning comes into play. In our project on Arrhythmia Classification using deep learning, [7] we aim to revolutionize the diagnosis process by harnessing the capabilities of advanced computer algorithms.

At the core of our approach lies the concept of deep learning, specifically deep learning—a subset of AI that involves training algorithms to learn and make predictions from data. Much like the human brain, deep learning models can recognize complex patterns and relationships within data, enabling them to perform tasks that were once thought to be exclusive to human cognition. Imagine our program as a highly intelligent detective, equipped with the ability to sift through vast amounts of heart data with remarkable precision[10]. Just as a detective analyzes clues at a crime scene to piece together a narrative, our program will comb through electrocardiogram (ECG) readings and other relevant medical data to discern the subtle nuances that distinguish normal heart rhythms from irregular ones. One of the key advantages of our approach is its accessibility. Rather than relying on intricate medical terminology, our program learns from examples— much like how we learn to recognize objects or faces through repeated exposure [16].

By exposing the algorithm to diverse datasets containing instances of both normal and irregular heart rhythms, it gradually refines its understanding and becomes increasingly adept at identifying abnormalities. Central to our methodology is the utilization of neural networks (NN), a sophisticated mathematical model inspired by the structure and function of the human brain.

These networks consist of interconnected nodes organized into layers, with each layer responsible for extracting and processing different features from the input data. Through a process known as training, wherein the algorithm is repeatedly exposed to labeled examples and adjusts its internal parameters accordingly, the neural network learns to map input data to the desired output—in this case, classifying heart rhythms with a high degree of accuracy. By leveraging the power of deep learning and neural networks, our ultimate objective is to develop a cutting-edge tool that can assist healthcare professionals in swiftly and accurately diagnosing arrhythmias. Such a tool has the potential to significantly improve patient outcomes by facilitating timely medical intervention and reducing the risk of adverse cardiac events. Moreover, by automating certain aspects of the diagnosis process, it can alleviate the burden on healthcare providers, allowing them to focus their expertise where it is most needed.

In conclusion, our project represents a pioneering effort to marry the principles of deep learning with the complexities of arrhythmia diagnosis, with the ultimate goal of enhancing patient care and saving lives.[18]. Through innovation, collaboration, and a steadfast commitment to excellence, we are poised to make a meaningful impact in the field of cardiovascular medicine.

A. System Architecture

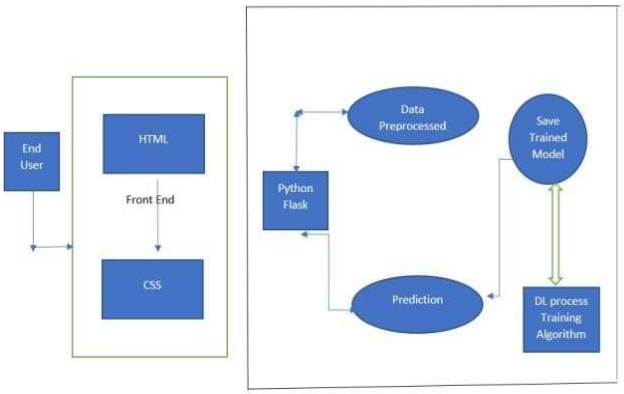

Figure 1. System Architecture

B. Data Description

This dataset consists of 75 annotated recordings extracted from 32 Holter records. Each record is 30 minutes long and contains 12 standard leads, each sampled at 257 Hz, with gains varying from 250 to 1100 analog-to-digital converter units per millivolt. Gains for each record are specified in its .hea file. The reference annotation files contain over 175,000 beat annotations in all. The original records were collected from patients undergoing tests for coronary artery disease (17 men and 15 women, aged 18-80; mean age: 58). None

of the patients had pacemakers; most had ventricular ectopic beats.
In selecting records to be included in the database, preference was given to subjects with ECGs consistent with ischemia, coronary artery disease, conduction abnormalities, and arrhythmias.

C. Data Preprocessing

Are crucial stages in the development of any deep learning model, especially when dealing with sensitive medical data such as electrocardiogram (ECG) recordings for arrhythmia classification. These stages involve careful planning, collaboration, and meticulous attention to detail to ensure the integrity and reliability of the dataset. When it comes to data collection, the primary goal is to obtain a diverse and representative set of ECG recordings that accurately reflect the variability of cardiac conditions encountered in clinical practice. This typically involves leveraging multiple sources, including public repositories like Kaggle as well as collaborating with hospitals, clinics, and healthcare facilities. By accessing data from a variety of sources, researchers.

*D. **Feature Extraction:***

An analysis of electrocardiogram (ECG) signals, particularly in the context of arrhythmia classification and cardiovascular health monitoring. Traditional ECG features, such as RR intervals, QRS duration, and QT intervals, provide essential insights into cardiac activity and rhythm. However, to enhance the accuracy and depth of analysis, additional features are often extracted to capture the complexity of heart rate dynamics and facilitate more precise classification. One crucial set of additional features is heart rate variability (HRV) measures. These features offer insights into the balance between sympathetic and parasympathetic nervous system activity, which is essential for understanding cardiac regulation and response to physiological stressors. In addition to HRV measures, frequency domain features provide valuable information about the distribution of signal power across different frequency bands. Power spectral density analysis divides the ECG signal into frequency components, such as very low frequency (VLF), LF, and HF bands, enabling the characterization of oscillatory patterns associated with different physiological processes. Frequency domain features complement traditional ECG parameters by capturing dynamic changes in cardiac activity and autonomic modulation. Once the architecture is defined, we'll train the model on the training data using appropriate optimization techniques such as stochastic gradient descent (SGD) or Adam optimizer. Hyperparameter tuning can be performed using techniques like grid search or random search to find the optimal values for parameters like learning rate, batch size, and the number of layers.

*E. **Result & Discussion:***

Evaluating a trained model on a validation set is a crucial step in the deep learning pipeline, serving multiple purposes to ensure the model's robustness and generalization capability. This process involves finetuning various parameters and preventing overfitting, ultimately leading to a more reliable and accurate model. When assessing a model's performance on the validation set, a range of metrics is typically employed to gain comprehensive insights into its effectiveness. These metrics include accuracy, precision, recall, F1score, and the confusion matrix. Each metric offers unique perspectives on different aspects of the model's performance, aiding in identifying strengths, weaknesses, and areas for improvement.

Figure. 2 Heartbeat measurement

Figure 3. Arrithmia VEB value prediction

Figure 4. Arrithmia N value prediction

Figure 5. Arrithmia SVEB value prediction

Figure 6. Arrithmia F value prediction

V. CONCLUSION

In summary, the integration of advanced computer techniques, specifically deep learning, presents a promising solution to the challenges of detecting and diagnosing arrhythmias in modern healthcare. These irregular heartbeats can vary from harmless to life-threatening, underscoring the importance of accurate diagnosis and timely treatment. While traditional methods rely on manual interpretation of ECG readings, deep learning models offer a faster and more consistent approach, capable of processing complex data with high accuracy. By automating aspects of the diagnostic process, deep learning can expedite diagnosis, improve accessibility to specialized healthcare services, and reduce costs associated with manual interpretation. Overall, the utilization of deep learning in arrhythmia detection represents a significant advancement in cardiac care, promising to enhance patient outcomes and save lives.

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NCRTCI'24-70

FACE AGE AND GENDER DETECTION BY IMAGE USING CNN ALGORITHOM

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***Abstract*-- This Python script harnesses the capabilities of Artificial Intelligence and OpenCV to detect and infer the age and gender of individuals from images or live video streams. Leveraging pre-trained deep neural network models, it facilitates comprehensive facial analysis, including face detection, gender classification, and age estimation. The code initiates by utilizing a pre-trained face detection model to identify faces within input images or video frames. Upon successful detection, it employs separate pre-trained models dedicated to gender classification and age estimation. These models predict the gender and age range of the detected faces, respectively. The implementation supports real-time analysis, allowing for input from either image files or live video streams captured by a webcam. . The script operates through command-line execution, providing users with the flexibility to specify input sources (image or video file) for analysis. Additionally, it delivers real-time feedback on the detected faces, presenting confidence scores for each prediction, signifying the reliability of the model's estimations.**

***Keywords*-- CNN, deep learning, gender classification, age detection.**

I.INTRODUCTION

Gender and age play a significant role in interpersonal interactions among people who live in communities. The use of smart gadgets has expanded as technology has progressed, and social media has begun to draw everyone's attention. Daily studies on gender and age prediction have grown in prominence, it increases the number of apps that use such techniques. In these applications, facial photographs are commonly employed since they contain useful information that may be used to extract human interaction. For gender detection and age prediction, Image processing, feature extraction, and classification steps are usually used. These steps may change based on the objective of the study and the characteristics to be used. The face images were processed using a variety of approaches, and calculations were performed based on the results of the investigations. For image processing, there are two basic and typical which we need to follow [1].

Image enhancement is the process of improving an image so that the resultant image is of higher quality and can be used by other applications. The image is divided into a specified number of parts or objects in order to solve the challenge and this procedure is called Segmentation. Due to the accuracy of its classification technique, deep learning techniques are a variety of tasks such as classification, feature extraction, object recognition, and so on, it helps in gender and age prediction. The previous system's machine learning algorithms were not utilized to improve classification skills for a vast number of images and data available via the internet [2].

II.LITERATURE REVIEW

The definition of machine learning in [3] was excellent. Face Detection and Identification. It is an important module of any face recognition system which should be more accurate and fast. Face detection algorithms are inspired mainly from object detection approaches. Region based object detection classifies the generated object proposals. Each suggestion is classified as a face or nonface using a classifier. Hyperface [3] is a hierarchical multitask training architecture to conduct face identification, landmark mapping, posture prediction, and gender recognition

Shobeirinejad and Gao [4] proposed Interlaced Derivative Pattern (IDP) to extract facial features. IDP produces feature vector by extracting distinct facial features. The IDP image is a four-channel derivative image representing four directions that are 0°, 45°, 90°, and 135°. Thus this method contains more important information about gender face recognition. LU et al. [4] detected different facial regions to accomplish the task of gender classification. Support Vector Machine (SVM) [8] classifier was used on face images

In 2018,[5] Philip smith, et al., transfer learning is employed to tackle the issue of recognizing a person's age and gender from an image using deep CNNs. Transfer learning to use VGG19 and VGGFace pretrained models are used to increase the efficiency. Training techniques such as input standardization, data augmentation, label distribution age encoding is compared. Dataset used is MORPII..VGGFace produce better result than VGG19. VGGFace takes far fewer epochs to fit the training data VGGFace gender prediction accuracy of 98.68% of 4.1 years. Age recognition produces MAE of 4.1 years due to female characteristics. Gender prediction is largely based on the absence and presence of long hair, tilt of head. Larger and more dataset is necessary. The major problem caused by this research is

due to dataset i.e., MORP II. In this dataset few noisy variations: heads are tilted in different direction. Most images of age ranges from 16 to 77. Most of them are male images and black colored [5].

Lanitis et al. [6] proposed the first approach applying AAM to age estimation, which extracts craniofacial growth and skin aging during childhood and adulthood. 1) age-specific estimation, which is based on the assumption that the aging process is identical for everyone; and
2) appearance-specific estimation, which follows the assumption that people who look similar tend to have similar aging processes. Zhang et al. [6] formulated the inference of each person's age as a warped Gaussian process (WGP) estimation problem, and developed a multi-task extension of WGP to solve the problem. Since different individuals have different aging processes, personalization is beneficial for age estimation. Previous researches also show that personalization can improve the performance of age estimation [6].

III.METHODOLOGY

Face Detection
The code utilizes a pre-trained face detection model from OpenCV's deep neural network module. It applies this model to input images or video frames to detect faces using the get FaceBox function. The function defines regions of interest by creating bounding boxes around detected faces, using a specified confidence threshold for filtering.

Age and Gender Recognition:
Once faces are detected, the script extracts these regions for age and gender estimation. It employs separate pre-trained models for age and gender recognition. The gender Net model predicts the gender of each face using a neural network trained on gender-labeled face images. Similarly, the ageNet model estimates the age range of each face by leveraging a neural network trained on age-labeled face datasets.

Model Integration and Inference:
The pre-trained models are loaded using OpenCV's DNN module (cv.dnn.readNetFromCaffe), enabling their integration into the script. Each face region undergoes preprocessing (blob From Image) to meet the input requirements of the age and gender models. The models are then fed the processed face data to make predictions.

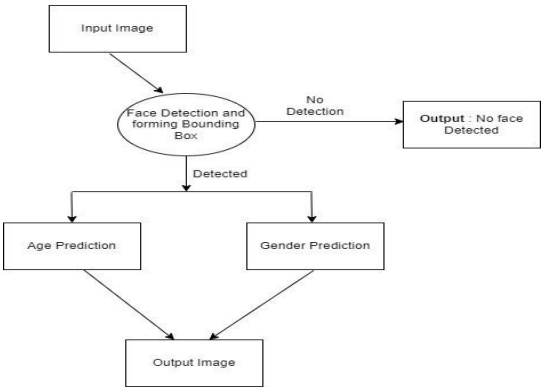

Fig1.Flowchart for Age and Gender Detection

Visualization and Output:
Identified faces with predicted gender and age labels are outlined and displayed in real-time using OpenCV's visualization functionalities. The script employs cv.imshow to showcase the annotated frames and cv.imwrite to save the processed frames with detected faces labeled by gender and age.

IV.RESULTS

This section demonstrates the result obtained after the implementation of the proposed models as discussed in the previous sections. The input images with which the experiment is carried out in each model varies in number.

Model Selection:
An attempt has been made to calculate the (a) ACCURACY (b) SENSITIVITY and (c) SPECIFICITY of each input image set of the proposed methodology. These calculations are done in the following way:
Accuracy= (TP+TN)/ (TP+TN+FP+FN).
Sensitivity= (TP)/ (TP+FN).
Specificity = (TN)/ (TN+FP).

The results obtained from the experiment are discussed below:

Results of Gender Classification using Distinct Input Images:
Total Input Images: 100
Total male images: 50
Total female images: 50
Image Type: Frontal Facial Images (JPEG Images).
Extracted feature: LIP.
Kernel Type: Linear

Serial no	Cross validation technique	Training set	Testing set	Output class label
1.	Hold-out	50	50	+1,+1,+1,+1,-1,-1,+1,+1,-1,-1,+1,+1,-1,-1,+1,-1,+1,+1,-1,-1,-1,+1,-1,-1,+1,-1,-1,-1,-1,-1,+1,+1,+1,-1,-1,-1,+1,-1,-1,-1,-1,+1,+1,+1,+1,-1,-1,-1,-1,-1
2.	Hold-out	50	50	-1,+1,+1,+1,-1,+1,+1,-1,-1,+1,+1,+1,+1,+1,-1,+1,+1,-1,+1,+1,-1,+1,-1,-1,+1,+1,-1,-1,+1,-1,+1,+1,+1,+1,+1,-1,-1,+1,-1,-1,+1,-1,+1,-1,+1,+1,+1,-1,+1,+1
3.	K-fold(5)	80	20	+1,+1,-1,-1,+1,+1,+1,-1,+1,-1,-1,+1,-1,+1,+1,-1,-1,+1,-1,+1
4.	K-fold(5)	80	20	+1,+1,+1,+1,-1,+1,+1,+1,+1,-1,-1,+1,+1,+1,-1,+1,-1,-1,-1,-1
5.	K-fold(10)	90	10	-1,-1,-1,-1,+1,-1,+1,-1,+1,-1
6.	K-fold(10)	90	10	-1,+1,+1,+1,-1,+1,+1,+1,-1,-1

Table 1: Matrix depicting the result of gender classification

Results of Age Detection using Multi-class SVM
Total Input Images: 119
Total child images: 40
Total adult images: 40
Total old people images: 39
Image Type: Frontal Facial Images (JPEG Images).
Extracted feature: LIP.
Kernel Type: Linear

Serial no	Cross validation technique	Training set	Testing set	Output class label
1.	Hold-out	60	59	-1,+1,+1,-1,+1,-1,-1,-1,+1,+1,+1,-1,+1,+1,-1,+1,-1,-1,-1,-1,-1,-1,-1,-1,+1,+1,-1,-1,-1,-1,-1,-1,+1,+1,+1,-1,+1,-1,-1,+1,-1,-1,-1,-1,-1,-1,-1,-1,-1,+1,+1,-1,-1,-1,-1,-1,-1,-1,-1
2.	Hold-out	60	59	-1,-1,-1,-1,-1,-1,-1,+1,+1,-1,-1,+1,-1,-1,+1,-1,-1,+1,+1,-1,-1,-1,-1,+1,-1,-1,-1,+1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,+1,-1,-1,-1,-1,-1,-1,+1,-1,-1,-1,-1,-1
3.	K-fold(5)	95	24	-1,+1,-1,-1,+1,-1,-1,+1,-1,-1,+1,-1,-1,+1,-1,+1,+1,-1,-1,-1,-1,-1,-1,+1
4.	K-fold(5)	95	24	-1,+1,-1,+1,+1,-1,+1,-1,-1,-1,-1,+1,-1,-1,-1,-1,-1,-1,+1,+1,-1,-1,-1,+1
5.	K-fold(10)	107	12	-1,-1,-1,+1,+1,-1,-1,-1,+1,-1,-1,-1
6.	K-fold(10)	107	12	-1,+1,-1,-1,-1,-1,+1,-1,-1,-1,-1,-1

Table 2: Matrix depicting age detection for images

VI.DISCUSSION

Face age and gender detection involve using computer vision algorithms to analyze facial features and determine the likely age range and gender of a person in an image or video. This technology has various applications, from targeted advertising to security systems and social media filters.

Age Detection:

Age detection algorithms usually rely on machine learning models trained on large datasets of facial images annotated with age labels. These models analyze facial characteristics such as wrinkles, skin texture, and the distribution of features like eyes, nose, and mouth to estimate age. However, factors like lighting conditions, facial expressions, and ethnicities can affect accuracy.

Gender Detection:

Similar to age detection, gender detection algorithms use machine learning to identify facial features associated with male or female genders Yet, gender detection can also be influenced by factors like hairstyles, makeup, or cultural variations in appearance.

Challenges:
Data Bias: Datasets used for training might not be diverse enough, leading to biases in predictions, especially concerning age and gender for different ethnicities or age groups.

VII.OUTPUT:

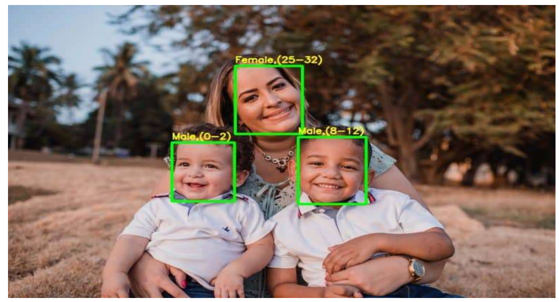

Fig.2. Example of the output

VIII.CONCLUSION

Age and Gender Classification are two of the most essential resources for getting information from an individual. Human faces contain enough information to be useful for a variety of purposes. Human age and gender classification are critical for reaching the right audience. We attempted to replicate the process using standard equipment. while maintaining the highest level of accuracy. Work is being done to improve the algorithm's efficiency. Future enhancements include discarding faces for non-human objects, adding more datasets for people of other ethnic groups, and giving the computer more granular control over its workflow. Deep learning and CNN could be used to improve this prototype's ability to reliably identify a person's gender and age range out of a single image of their face. From this study, we can conclude with two important conclusions. First, despite the limited availability of age and gender-tagged photos, CNN can be used to improve age and gender detection outcomes. Second, by employing additional training data and more complex systems, the system's performance can be slightly increased.

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NCRTCI'24-71

TENSORFLOW: A PYTHON-BASED FRAMEWORK FOR NEXT-WORD PREDICTION

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***Abstract*-- Next word prediction plays an important role in the study and plays an important role in improving user experience and improving human-computer interaction. Next word prediction which is also called as language modelling is one field of natural language processing that can help to predict the next word by using machine learning. It's one of the uses of machine learning. This article presents a comprehensive investigation into building next-word prediction models using TensorFlow, a popular open-source machine learning tool. Predicting the next word with TensorFlow involves building a language model that can predict the next most common words in a string of words. This task is usually done using different networks such as Recurrent Neural Networks (RNN) or Long Short-term Memory Networks (LSTM) and Gated Recurrent Units (GRU). Then word prediction is also called language model. It only guesses the order of words and letters. This article provides the latest advancements and challenges by using TensorFlow in python with machine learning techniques.**

***Keyboards*-- NLP, LSTM, RNN, TensorFlow , token Next Word.**

I.INTRODUCTION

Next word prediction technologies have been created to help people talk more easily and to help those who write more slowly and can easily find a next words[1]. Natural Language Processing (NLP) is a significant part of artificial Intelligence. The uses of NLP has been increasing user experience in the past few years . These models consider the probabilities of words appearing in different contexts and use them to generate predictions of the next words.

Additionally, advanced models also incorporate contextual information, such as the surrounding words and sentence structure, to make predictions and used a tokenizer to breaking down words into a smaller unit For next word prediction, the most common approach is to tokenize the text into words or sub words. the use of next word prediction can improve user experience in NLP applications, Users often experience an increase in typing speed and accuracy when next word prediction is implemented effectively. By accurately predicting the next word in a sentence, users can quickly select the suggested word instead of typing it out manually. as it allows for faster and more accurate text entry. This article based on the prediction by using TensorFlow libraries in machine learning techniques.

II.LITERATURE REVIEW

It is used a multi-node network (MRNN) algorithm and also developed a residual connection minimum gate unit (MGU), a short version of LSTM[1] in CNN, to test several layers during training. This has been reduced. they have training time and have now achieved good accuracy using multilayer neural networks, but they can be slow at predicting n-words. Natalia

Krivenska et al. [2] wrote, "A way to predict the next word in Ukrainian." LSTM, Bidirectional Recurrent Neural Network (RNN) and Gated Recurrent Unit (GRU) were used in this study. Compare the shortterm state learning model (LSTM) to the merge-and-forget gate (CIFG) language model trained on servers and the underlying ngram model. Sheikh Mohammed Al-Sawar and others. [3] wrote: "We can predict the continuation of Pinyin input by modeling". Use pinyin input, next word prediction and language. In today's world of social media (instant messaging (1M) or chat), people have informal conversations almost every day and it has become the best form of communication. In this article, the author presents a method to predict the next word in Ukrainian using a language-based neural network model.

[4] The publication "Future Positioning Using LSTM Neural Networks" describes research on the use of short-term temporal (LSTM) neural networks to predict the future location of objects. [5] The research focuses on the use of private data containing the following information: location and speed of moving objects. The authors applied the LSTM neural network model to these data and then evaluated its performance using various models. In 2020, Santhanam released a text-based demonstration using short-term temporal (LSTM) networks. [6]. [7] In this paper, they constructed a difficult autonext keyword for Bengali and found that the RNN algorithm was incomplete and difficult to achieve good accuracy due to the heavy inverse neural network. More time to train and experiment. Nikhil Gupta (2019) compared the performance of traditional RNN and LSTM in language modeling. The authors show that LSTMs

can outperform RNNs in many linguistic models, unlike RNNs, which can be more efficient for longterm dependency. Sita Agarwal et al. [8] wrote: "Deep learning for next word prediction in Hindi". The benefits and problems faced by Recurrent Neural Networks (RNN) have been solved using LSTM and Bi-LSTM. The gate is used to forget the selected data. Bi-LSTM is a better model than LSTM. The Bi-LSTM model performs better. The accuracy of the BiLSTM model (79.54%) is higher than the LSTM model (70.89%). However, during validation, the accuracy of the LSTM model is 59.64% and the accuracy of the Bi-LSTM model is 81.07%. The learning process of the Bi-LSTM model is faster than the LSTM model. Works by Hamarashid, Saeed and Rashid provide analysis and evaluation of text predictions and entertainment. [9] Authors examined various text prediction methods, such as rule-based and machine learning, and evaluated their accuracy and effectiveness. They also discussed how to use chatbots and video games that use predictive text for entertainment.

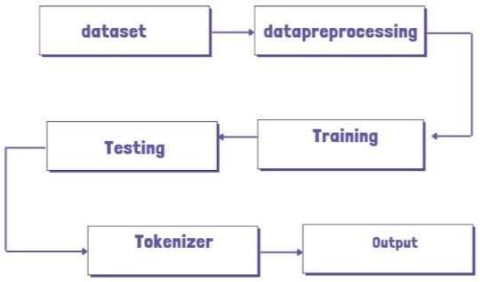

Fig 3.1

III.METHODOLOGY

3.1. Dataset: Use the TensorFlow library to predict the next word by importing data. This set contains 5000 movie words. This information is used to predict and analyze a word.

3.2. Prerequisites: Organize the text into words or subword units. Create tables and graphical tables for numerical measurements. Convert literals to numeric index arrays. Row padding is used to ensure row length.

3.3. Training dataset: Divide the dataset into a training set and validation set. Show your training process model and prove the validation process. Track Training metrics (like churn) to evaluate the effectiveness of your model.

3.4. Test data: Initialize the dataset as a test and proof file. Test your model in the test setup and predict x and y predictions and sequences.

3.5. Tokenization: Use TensorFlow's tokenization utilities to tokenize your text data.

TensorFlow provides the Tokenizer class in tf.keras.preprocessing.text module to perform tokenization. This class allows you to tokenize text and convert it into sequences of integers.

```
In [9]: tokenizer.word_index

Out[9]: {'the': 1,
         'of': 2,
         'a': 3,
         'and': 4,
         'in': 5,
         '2': 6,
         'to': 7,
         'man': 8,
         'i': 9,
         'love': 10,
         'with': 11,
         'on': 12,
         'me': 13,
         'my': 14,
         'movie': 15,
         'you': 16,
         'dead': 17,
         'last': 18,
         'for': 19,
```

IV.RESULT AND DISCUSSIONS

In this paper, it predict the next words of using movie datasets.

Prediction Quality: Evaluate the quality of the predictions generated by the model. This involves examining sample predictions and assessing whether they make sense contextually. Are the

predicted words grammatically correct and semantically coherent given the context. Additionally, consider the diversity of predictions – does the model produce varied and realistic next word suggestions.

Vocabulary Size: The size of the vocabulary determines the number of unique words or tokens in your dataset. It's essential to set the vocabulary size based on the frequency of words in your corpus and the memory constraints of your model.

Tokenize: Before training the next word prediction model, you typically tokenize the text data. During tokenization, each unique word in the dataset is assigned a unique integer index. The number of unique words in the dataset corresponds to the vocabulary size.

An epoch refers to one complete pass through the entire training dataset during training. The number of epochs defines how many times the model iterates over the entire dataset. It's essential to monitor validation performance to determine the optimal number of epochs and prevent overfitting.

```
Epoch 1/150
266/266 [==============================] - 3s 11ms/step - loss: 1.5548 - accuracy: 0.6144
Epoch 2/150
266/266 [==============================] - 3s 11ms/step - loss: 1.5402 - accuracy: 0.6177
Epoch 3/150
266/266 [==============================] - 3s 11ms/step - loss: 1.4928 - accuracy: 0.6275
Epoch 4/150
266/266 [==============================] - 3s 10ms/step - loss: 1.4648 - accuracy: 0.6377
Epoch 5/150
266/266 [==============================] - 3s 10ms/step - loss: 1.4506 - accuracy: 0.6393
Epoch 6/150
266/266 [==============================] - 3s 10ms/step - loss: 1.4763 - accuracy: 0.6363
Epoch 7/150
266/266 [==============================] - 3s 11ms/step - loss: 1.4873 - accuracy: 0.6262
Epoch 8/150
266/266 [==============================] - 3s 11ms/step - loss: 1.5073 - accuracy: 0.6277
Epoch 9/150
266/266 [==============================] - 3s 10ms/step - loss: 1.4583 - accuracy: 0.6347
Epoch 10/150
```

Next word prediction using TensorFlow involves training a neural network to predict the most likely word to follow a given sequence of words

```
In [23]: model.summary()

Model: "sequential_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_1 (Embedding)      (None, None, 14)          70630
_________________________________________________________________
lstm_2 (LSTM)                (None, None, 100)         46000
_________________________________________________________________
lstm_3 (LSTM)                (None, 100)               80400
_________________________________________________________________
dense_2 (Dense)              (None, 100)               10100
_________________________________________________________________
dense_3 (Dense)              (None, 5045)              509545
=================================================================
Total params: 716,675
Trainable params: 716,675
Non-trainable params: 0
```

```
In [255]: make_prediction("cloudy", 5)

['budapest' 'longshots' 'davidson' ... 'ii' 'in' 'i']
['delivered' 'seals' 'hosers' ... 'earth' 'disaster' 'back']
['budapest' 'lieutenant' 'port' ... 'chest' 'gun' 'vengeance']
['budapest' 'davidson' 'marlboro' ... 'the' 'me' 'on']
['cattivo' 'count' 'visiting' ... 'lucy' 'dogtown' 'sensibility']

Out[255]: 'cloudy with a chance of meatballs'
```

V. CONCLUSION

Next word prediction models trained using TensorFlow have a wide range of real-world applications, including autocomplete suggestions, text generation, and machine translation. These models enhance humancomputer interaction and productivity by providing intelligent assistance in natural language tasks.Continued research and development in next word prediction using TensorFlow hold promise for further advancements in NLP. Areas of exploration may include incorporating external knowledge sources, improving model interpretability, and addressing challenges such as language ambiguity and context sensitivity. Next word prediction using TensorFlow offers a powerful framework for developing accurate and contextually aware language models. By leveraging TensorFlow's capabilities and addressing key considerations in model training and evaluation, researchers and developers can continue to advance the state-of-the-art in NLP and drive innovation in language understanding and generation applications.

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NCRTCI'24-77

SKIN LESION CLASSIFICATION OF DERMOSCOPIC IMAGES USING DEEP LEARNING

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Abstract— **In cancer, there are over 200 different forms, and out of these, melanoma is the deadliest form of cancer. The early detection and better prediction of skin lesions are crucial for successful treatment and improved patient outcomes. We discuss different types of skin lesion prediction using deep learning approaches. Deep learning techniques have shown great potential in this field, enabling the development of various models for skin lesion prediction. Firstly, we explore models for skin lesion prediction that have achieved better diagnostic accuracy by ensembling contextual images. Secondly, we delve into skin lesion prediction, where deep learning algorithms have been developed to detect types of skin lesions and classify them as Nevus, SeborrheicKeratosis, Basal Cell Carcinoma, Actinic Keratosis, Dermato fibroma, Vascular Lesion, and Comma Melanoma, making an accurate diagnosis. Skin lesion prediction, where deep learning techniques have been employed to analyze context images using convolutional neural networks (CNNs), is practical to classify images for early diagnosis of skin disorders and identify lesion regions. In summary, the use of deep learning in skin lesion prediction holds immense promise for improving early detection and personalized treatment for various types of skin lesions, ultimately leading to easy access for everyone.**

Keywords— CNN (Convolutional Neural Network), Image Classification, Detection, Computed-Aided Diagnosis (CAD), EfficientNet, Deep Learning Algorithms.

I. INTRODUCTION

Melanoma is a most predominant and cataclysmic disease, appears to be a biggest problem now a days. In the current years, the advancement of deep learning techniques have shown great promise in predicting various types of skin lesions, enabling earlier detection and improved treatment outcomes.

Deep learning algorithms are capable of analyzing gigantic amounts of complex and heterogeneous data has revolutionized lesion prediction by clinical screening, dermoscopic analysis and histopathological examination. These algorithms can identify hidden patterns, extract relevant features, and build predictive models that can assist in diagnosing and classifying different types of skin lesions.

The Deep learning algorithms have been employed in predicting other types of skin lesions, such as macules, nodules, and papules, through the analysis of genetic mutations, biomarkers, and patient characteristics. The amalgamation of Deep learning in lesion prediction not only assists in early detection but also expedite personalized treatment approach based on individual sufferance contour.

Dermatologists commonly use the ABCD rule of dermoscopy and the 7-point checklist strategy to assess skin lesions based on factors like asymmetry, border irregularity, color variation, and other dermoscopic features. However, analyzing these features requires expertise and access to a large number of skin images, which can be costly. Due to this, researchers have developed computer-aided diagnostic frameworks to assist dermatologists in early detection using advanced image analysis techniques.

Skin lesion images present numerous challenges for feature extraction, including artifacts like gel, reflections, and hair, complicating the process. Additionally, automatic classification of skin cancer images is highly challenging due to factors such as varying lesion locations, significant intraclass variations within melanomas, and substantial interclass similarities among different types of skin cancers.

Feature selection algorithms are categorized into three main types based on evaluation criteria: wrapper, filter, and embedded approaches. In a wrapper approach, a learning (classification) method is integrated to assess the feature subset, whereas a filter approach doesn't involve any classification method. An embedded approach combines classifier learning and feature selection into a single procedure. Unlike existing methods that work effectively for a single image modality, our proposed method aims to excel for skin images captured from both standard cameras and specialized instruments. While existing approaches generate new informative features from the complete set of original features, our method explores the potential of constructing new features from the selected prominent features identified through feature selection. This approach has the potential to enhance classification accuracy.

Segmentation involves eliminating unnecessary details from an image. Existing segmentation algorithms employ manual border detection, as well as techniques such as thresholding,

region growing and merging, and dynamic programming. In the context of malignant melanoma recognition, feature extraction algorithms are utilized to describe lesion characteristics like dimension, spatiality, and border irregularity. Feature selection, which follows feature extraction, involves discarding less important features from the initial feature vector. Commonly employed feature selection techniques include stepwise progressive approach and cross-correlation feature selection. Classification, the final step, determines whether a lesion is cancerous using selected features. Common classifiers include Linear Regression, Random Forest, Decision Tree, SVM, ANN, and KNN.

By manipulating the authority of deep learning, healthcare professionals can make high accurate and timely decisions, eventually leading to enhanced patient outcomes. However, regardless of the promising results, challenges remain in terms of data quality, model interpretability, and the need for authentication and meticulous testing.

II. LITERATURE REVIEW

The damaged regions were accurately identified by researchers F. Kaleli, N. Aydin, G. Ertas, and H. O. Gulcur, ''An adaptive approach to the segmentation of DCE-MR images of the breast: Comparison with classical thresholding algorithms,'' in Proc. IEEE Symp. Comput. Intell. Image Signal Process., Apr. 2007 using a combination of RetinaNet for bounding box detection and a conditional random field (CRF) for locating segmented melanoma lesions. This process involved three main steps: melanoma segmentation, melanoma localization, and image pre-processing. The evaluation was conducted on benchmark datasets, namely Pedro Hispano (PH2) and ISIC 2018, yielding impressive performance metrics. Specifically, for the ISIC 2018 challenge data, the results are as follows: pixel-level sensitivity of 93.20%, pixel-level specificity of 97.70%, pixellevel accuracy of 94.20%, dice coefficient of 93.10%, and Jaccard index of 91.87%.

The study R.Rout,P.Priyadarsan,andD.Sonali,''A hybrid deeplearning network for skin lesion extraction, introduced a CNN-based stacked ensemble approach for detecting earlystage melanoma. This model incorporates multiple CNN submodels using transfer learning techniques to tackle the classification task. The researchers evaluated their framework using a publicly available dataset containing images of both benign and malignant melanomas. Their method employs heatmaps to visually represent melanoma images, aiding dermatologists in distinguishing between malignant and benign cases more easily. The ensemble model demonstrated impressive performance, achieving an accuracy of 95.76%, sensitivity of 96.67%, and an AUC of 95.7%.

A 38-layer deep learning simulation was created in this study T. Saba, ''Computer vision for microscopic skin cancer diagnosis using handcrafted and non-handcrafted features'' to detect and categorize skin lesions, utilizing the HAM10000 and ISIC2019 datasets for training and testing. The model demonstrated superior performance on both datasets, indicating its dataset independence based on experimental findings. Validation results showed that it achieved 94.45% top three accuracy on the HAM10000 dataset and 93.06%.

The researcher S R. Rout and P. Parida on ''A novel method for melanocytic skin lesion extraction and analysis,'' J. Discrete Math. Sci. Cryptogr., utilized U-net and LinkNet models, incorporating transfer learning and fine-tuning techniques, to effectively delineate melanoma from infected lesions. They assessed the model's learning proficiency and its accuracy in distinguishing malignant regions from normal skin. The model was validated on ISIC 2018, DermIS, and HP2 datasets, yielding Dice scores of 89.3%, 87.9%, and an average of 92.3%, respectively.

III. PROPOSED FRAMEWORK

The system proposed for predicting various types of cancer using machine learning is an extensive application designed to precisely forecast and categorize different cancer types by utilizing diverse patient information. It employs machine learning methods and algorithms to analyze data from various origins, such as patient demographics, medical records, genetic data, and diagnostic test outcomes.

Machine learning models trained on labeled data can indeed identify patterns and correlations in cancer data, allowing for predictions of cancer likelihood or classification of cancer types based on individual patient data inputs. This approach holds promise for improving diagnosis and treatment planning in oncology.

Absolutely, the utilization of machine learning for cancer prediction holds great promise in transforming cancer care. Through the integration of algorithms and data analysis, these systems can enhance diagnostic accuracy, offer personalized recommendations, and assist healthcare professionals in making well-informed decisions. Further developments in this area are poised to drive early detection, optimize treatment strategies, and ultimately lead to better patient outcomes in the fight against cancer.

ARCHITECTURE DIAGRAM

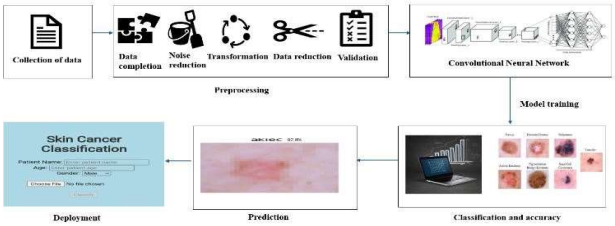
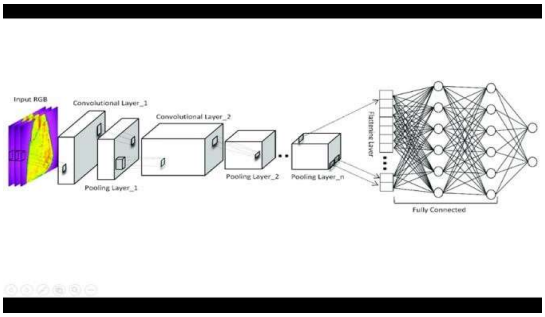


Fig. 1. Architecture diagram of the proposed system.

A system architecture diagram will focus on the structure of the system to be created, along with the technologies used, external services, user requirements and components such as databases and servers.

It is used to communicate and collaborate with everyone included in a project. An architecture diagram will show the concepts involved in the architecture, including important principles, elements, and components.

IV. WORKFLOW OF PROPOSED SYSTEM

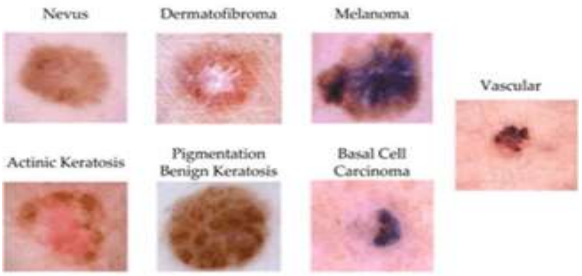


The integration of machine learning techniques in cancer prediction represents a cutting-edge approach to revolutionize healthcare. By harnessing the power of advanced algorithms, the proposed system strives to provide accurate and efficient predictions, enabling early detection and personalized.

The system's potential impact is profound, offering clinicians a powerful tool to augment their decision-making processes, ultimately leading to improved patient outcomes and potentially transforming the landscape of cancer care. As the system evolves, continuous refinement through feedback loops and advancements in machine learning technologies promises to enhance its predictive capabilities, further solidifying its role as a valuable asset in the realm of cancer diagnosis.

Through the utilization of labelled data, the system employs machine learning models to intricate patterns and correlations among diverse variables and cancer types. This training process equips the models with the ability to predict the probability of a patient resist to a specific form of cancer. Moreover, the models demonstrate proficiency in classifying a patient's cancer type by analyzing individual data inputs. This predictive capacity is invaluable, offering healthcare professionals a proactive tool for early detection and tailored intervention. By extrapolating insights from the amalgamated data, the system empowers medical practitioners with a nuanced understanding of potential risks and facilitates personalized treatment strategies, marking a significant advancement in the realm of cancer prediction and classification. As the system evolves, continuous refinement through iterative learning promises to elevate its predictive precision, amplifying its role as an indispensable asset in the field of oncology.

learning technology serves as a valuable support tool for physicians, enhancing the efficiency of cancer diagnosis and treatment. The accessibility of such predictive insights allows medical practitioners to streamline decision-making processes, potentially leading to swifter interventions and more effective care strategies. This, in turn, holds the promise of improved patient outcomes and heightened survival rates. The integration of machine learning in healthcare not only complements the expertise of healthcare professionals but also contributes to a more responsive and proactive approach in addressing the complexities of cancer management. As these systems continue to evolve, the synergy between technology and medical expertise is poised to redefine standards in cancer care and pave the way for more effective and personalized treatment modalities.



V. RESULT AND DISCUSSION

The future scope of the project is to further progress the user interface for uploading depiction aid . Authorize early perception of changes in health status and prompt intercession of Identifying dependable biomarkers through genomic and proteomic inspection can be predicting response to immunotherapies and manage treatment decisions. combine genomic data with immunological information helps to understand the interactivity between the immune system and skin cells. This recognition is crucial for developing more adequate immunotherapies. Implementation of preventative measures based on identified possibility factors.

Deep learning has proven to be a potent tool in the prediction of melanoma, by harnessing large datasets and intricate algorithms, are presenting promising strides in the diagnosis and treatment of diverse cancer types. Machine learning, through the exploitation of extensive data, can unveil patterns and relationships that may elude human observation. In the realm of cancer prediction, machine learning algorithms have the capability to scrutinize various data types, including genetic information, medical images, and patient records. This analytical prowess enables the generation of precise and personalized predictions.

Emphasis on patient arrangement and accreditation in decision- making. Integration of patient-reported outcomes and alternative in treatment plans. Focus on early observation strategies to increase the possibility of successful treatment Deep learning algorithms can analyze large datasets, including patient records, imaging data, and genomic information, to identify patterns and anticipate melanoma detection or progression more precisely. Advances in genomic sequence technologies enable a more personalized approach to skin lesions treatment. Analyzing

the genetic makeup of image classification techniques can help identify specific mutations and molecular pathways, leading to targeted therapies tailored to individual patients. By developing the user interface for uploading images, we can predict the various types of melanoma detection.

Furthermore, machine learning can assist in the prediction of cancer recurrence. By analyzing the patterns and characteristics of tumor cells, machine learning models can identify high-risk individuals who are more likely to experience cancer recurrence after treatment. This knowledge empowers oncologists to closely monitor these individuals and implement tailored follow-up strategies. This may include additional treatments or more frequent check-ups, aiming to enhance survival rates and optimize the management of posttreatment care.

VI. CONCLUSION

This study introduces a novel template matching approach for precise detection of Regions of Interest (ROI) in lesion images. The RGB dataset is converted to grayscale to enhance computational efficiency and visual inspection. Haralick feature extractor is employed for feature extraction, followed by classification for analysis. Experiments were conducted on ISIC benchmark datasets, namely ISIC-2017, ISIC-2019, and ISIC-2020, available on the ISIC website.

Various types of skin lesions prediction using deep learning have acquired significant observation and shown great prospective in improving early detection and treatment outcomes. By exploiting the power of advanced algorithms, data analysis, and pattern recognition, deep learning techniques can effectively analyze large datasets of patient information, including genetic data, medical records, imaging results, and clinical observations. This enables the enlargement of accurate prediction models that can identify individuals at risk of developing distinct types of skin lesions.

By recognizing individuals who are at high probability of developing melanoma detection, interference can be implemented to risk factors and enhance outcomes, such as lifestyle balancing, targeted screenings, and early arbitration.

The proposed method surpasses state-of-the-art algorithms, achieving remarkable accuracy, Precision, Recall, and F1 Score of 99.46%, 99.65% (for Benign), 99.52% (for Malignant), and 99.39%, respectively. Comparative analysis with deep learning models reveals superior performance of the proposed normalized cross correlation-based k-means clustering model. Emphasizing early melanoma detection to mitigate complications, our approach proves effective and efficient, with results surpassing deep learning techniques. This study holds promise for integration into cancer detection devices and applications, given its low computational costs and high accuracy.

In conclusion, the application of deep learning in skin lesions prediction holds massive prospective for improving early detection, diagnostic interventions, and treatment outcomes. continual research, collaboration between data scientists, healthcare maintenance, and technology developers, and the incorporation of deep learning into clinical practice are essential for melanoma detection.

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NCRTCI'24-80

KIDNEY DISEASE CLASSIFIER USING CNN BASED DEEP LEARNING METHOD

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Abstract— **People with kidney diseases suffer in today's modern society, regardless of their circumstances at the time. In order to better meet the need for enhanced interpretability in deep learning models used to categorize kidney abnormalities from Computed Tomography (CT) images, we provide in this work a simplified custom Convolutional Neural Network (CNN) designed to detect kidney cysts, stones, and tumors. With an impressive accuracy rate of 99.52%, our model outstrips the latest cutting-edge methods. Our proposed method improves diagnostic outcomes and interpretive abilities, ensuring physicians receive definitive and understandable data. Furthermore, we leverage the Flask framework for web-based prediction, which enhances the usability and accessibility of our model.**

Keywords — Chronic Kidney Disease (CKD), Convolutional Neural Network (CNN), Neural networks, Deep Learning Techniques, Computed Tomography (CT), Data models, Flask.

INTRODUCTION

In the contemporary world, people with kidney diseases suffer regardless of their circumstances at the time. Better interpretability in deep learning models used to categorize kidney abnormalities from CT images is something we address in this study by offering a simplified bespoke CNN designed to detect kidney cysts, stones, and tumors. Our model has an astounding 99.52% accuracy rate, outperforming current state-of-the-art methods. By delivering better diagnostic results and enhanced interpretive abilities, our proposed method ensures physicians receive definitive and understandable data. Furthermore, to enhance the usability and accessibility of our model, we leverage the Flask framework for web-based prediction. Deep learning models have shown remarkably effective in tasks like image classification, segmentation, and pathological condition diagnosis by utilizing complex patterns and features found in medical pictures. Even with these developments, clinical decision-making is still hampered by deep learning models' opacity, or "black box" character, which forces doctors to interpret and comprehend the model's outputs. Our study aim to bridge the diversity between state-of-the-art computational methods and real-world clinical applications through the introduction of an innovative deep learning-driven strategy for renal disease classification. Our main goal is to create a lightweight convolutional neural network (CNN) that is especially designed to identify and categorize kidney abnormalities from CT scans, such as cysts, stones, and tumors. Our goal is to attain high accuracy and improved interpretability by creating a customized CNN architecture and utilizing cutting-edge techniques for model training and evaluation. This will enable doctors to receive dependable and practical diagnostic insights. Moreover, we acknowledge the significance of usability and accessibility when using such sophisticated diagnostic instruments in clinical environments. In order to achieve this, we incorporate web-based prediction functionalities through the Flask framework, enabling clinicians and the suggested CNN model to communicate seamlessly. We envisage widespread adoption and application of our diagnostic technology in clinical practice, ultimately helping patients and healthcare providers alike, by offering an intuitive interface for real-time prediction of kidney problems. The methods used to create our unique CNN model is described in depth in the parts that follow. Experimental results verifying the model's functionality are also presented, along with implications for clinical practice and directions for future study and development. Our study makes an effort and target enhancing patient outcomes and pushing the boundaries of kidney disease detection by integrating clinical medicine, artificial intelligence, and medical imaging.

LITERATURE REVIEW

[1] In a study, kidney cancers in CT scans were identified and classified using a deep learning technique by Zou et al. They employed a transfer learning method employing a Convolutional Neural Network (CNN) to extract data from CT scans and classify kidney tumors into three categories: malignant, cystic or benign. The kidney tumor classification accuracy of their approach was a noteworthy 94.4%. However, the study found drawbacks that might affect the generalizability of the results, such as the comparatively limited dataset size employed for model training. Furthermore, the model's interpretability was not thoroughly examined, suggesting that more research is necessary to improve the model's interpretability.

[2] A deep learning method was presented by Chen et al. to segment kidney lesions in CT scans. Their technique created

kidney lesion segmentation maps by using a 3D CNN to extract features from CT scans. With a high Dice coefficient of 0.83, they were able to show how well kidney lesions can be limited using deep learning.

[3] Using ultrasound pictures, Yu et al. put forward a deep-learning method for identifying the stages of chronic kidney disease (CKD). They classified CKD stages into five groups by using a CNN to extract information from ultrasound pictures. Their approach successfully classified CKD stages with 92.5% accuracy, demonstrating the promise of deep learning for precise CKD stage classification from ultrasound scans.

[4] Millions of individuals around the globe clench with end-stage renal disease (ESRD) and chronic kidney disease (CKD), making kidney ailments a pressing global health concern. Swift and accurate detection of kidney issues is crucial for preventing further harm and boosting patient well-being. Recent breakthroughs in deep learning offer hope for identifying renal diseases more effectively, as evidenced by promising outcomes in numerous research studies.

[5] A recent research study showcased the potential of deep learning in diagnosing kidney diseases, demonstrating an algorithm's efficacy in accurately detecting kidney cysts in CT scans with an impressive 94.5% accuracy rate. Another study utilized a 3D deep convolutional neural network (CNN) to identify kidney malignancies in CT scans, surpassing traditional radiological methods with a sensitivity of 87.5% and a specificity of 97.9%.

[6] A deep residual network was created in a recent study to classify diabetic nephropathy (DN) in renal biopsy images. This network achieved an accuracy of 94.7%, which may lead to a decrease in the number of invasive biopsies that are required. Another study showed a 91.8% accuracy rate for a non-invasive screening technique that used deep learning to identify CKD from retinal pictures.

[7] All of these studies demonstrate how deep learning can be used to identify and cure renal illness. The creation of specific deep learning models for the identification of kidney illness may result in quicker and more accurate diagnoses, which would eventually improve patient outcomes and save healthcare expenditures. However, more investigation is necessary to confirm the validity of these models and guarantee their therapeutic applicability.

EXISTING SYSTEM

Numerous systems currently in use have used a range of machine learning and signal processing techniques to address the difficulties involved in accurately interpreting medical pictures in the context of kidney disease diagnosis and categorization. The autoencoder is a commonly used technique in the diagnosis of renal disease. Medical picture feature extraction and representation learning are accomplished through the use of autoencoders, a kind of artificial neural network. Autoencoders can efficiently extract complex patterns and features from renal pictures through unsupervised learning, which makes subsequent classification jobs easier. The Least Squares Support Vector Machine (LS-SVM) classifier, a variation of the well-known Support Vector Machine (SVM) algorithm, is another often employed method. The robustness of LS-SVM classifiers against overfitting and their efficiency in handling huge datasets are well recognized. LS-SVM classifiers have shown the ability to accurately detect kidney issues from medical images with precision, achieved by optimizing the least squares objective function.

Wavelet transformation methods, including Discrete Wavelet Transformation (DWT) and Stationary Wavelet Transformation (SWT), have additionally been employed in image examination and feature extraction for diagnosing kidney ailments. By breaking down medical pictures into distinct frequency components, these techniques enable the extraction of spatial and frequency-domain information associated with anomalies in the kidneys. By improving the discriminative capability of later classification algorithms, this decomposition strategy improves diagnostic accuracy. Support vector machine (SVM)-based segmentation techniques have also been applied to medical picture segmentation to identify regions of interest. These segmentation techniques accurately separate kidney structures and anomalies from surrounding tissues by training SVM classifiers on annotated picture datasets. The accurate identification and characterization of kidney lesions are made easier by this segmentation technique, which also helps with treatment planning and subsequent diagnosis.

Although these current algorithms have demonstrated potential in the diagnosis of renal illness, they also have several drawbacks, including difficulties managing large-scale datasets, interpretability problems, and a dependence on manually designed characteristics. In the following sections of this research, we present our suggested system that combines deep learning methods to overcome these drawbacks and improve renal disease categorization state-of-the-art.

PROPOSED SYSTEM

The procedure begins with gathering medical imaging data from PACS systems, then preparing it by resizing, rescaling, and anonymizing it in order to preserve privacy and integrity. Then, based on the preprocessed data, a suitable model architecture is selected and trained to identify trends and characteristics related to kidney problems. The trained model is evaluated with unseen data to determine how well it performs, and then iteratively refined to improve accuracy and efficacy. After validation, the model is finally implemented for practical uses, allowing users to enter medical photos to forecast kidney problems.

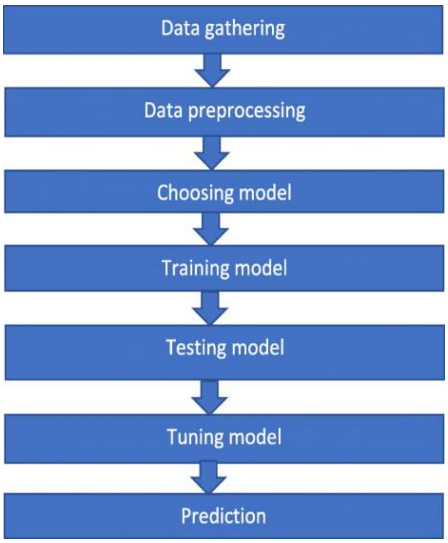

Fig.1. *Workflow*

A. Data Collection:

The dataset was obtained through Picture Archiving and Communication Systems (PACS) from various hospitals situated in Dhaka, Bangladesh. It encircles patients with kidney tumors, stones, normal conditions, or cysts. Both axial and coronal slices from contrast and non-contrast examinations were included with urogram and complete abdominal protocols. Every DICOM scan was meticulously chosen, focusing on a singular diagnosis at a time. Regions of interest were extracted to generate a batch of DICOM images, with patient information removed for privacy. The dataset comprises 12,446 unique data points, distributed as follows: 2,283 instances of tumors, 1,377 cases of stones, 5,077 normal conditions, and 3,709 occurrences of cysts.

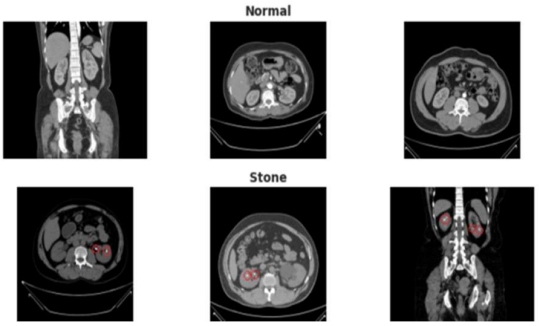

Fig.2. *Kidney Abnormalities Dataset Overview.*

B. Data Preprocessing:

The preprocessing of the image included downsizing it to 200x200 pixels and rescaling it to a range of [0,1]. Grayscale images were loaded, and the 'categorical' class mode was used to encode labels as one-hot vectors. There were 100 photos in each batch.

C. Training Models:

To train the model, a Convolutional Neural Network (CNN) was used. The architecture consisted of six convolutional layers with Rectified Linear Unit (ReLU) activation, followed by max-pooling layers for downsampling. Next, the feature maps were flattened and passed through a fully connected layer with ReLU activation, comprising 512 hidden units. Four neurons in the output layer used softmax activation to categorize images into four groups. The 'categorical_crossentropy' loss function and the 'rmsprop' optimizer were employed. Accuracy, recall, and precision were among the evaluation metrics.

D. Model Testing:

Using the test dataset, the trained model was assessed. Logarithmic loss, accuracy, and precision were among the metrics used. Out of all the projected positive instances, precision is the percentage of positive instances. Logarithmic loss works well for multi-class classification jobs since it penalizes incorrect classifications.

E. Flask Framework Prediction:

Prediction was made easier by Flask, a lightweight Python web framework. The Model-View-Controller (MVC) architecture pattern was adhered to. The URLs that users could access within the web application were specified via routes.

SYSTEM ARCHITECTURE

Our system architecture includes a deep learning-based integrated pipeline for renal disease classification. The design is structured to handle medical imaging data across several stages, including data gathering, preprocessing, model choice, training, evaluation, and implementation. The data is gathered from Picture Archiving and Communication Systems (PACS). 12,446 distinct cases total from the gathered information including kidney stones, tumors, cysts, and normal states. Our model architecture is trained to identify patterns and features related to kidney disorders, and it was selected based on the task requirements and dataset characteristics. After training, the model is evaluated on a set of unknown data to determine how well it performs. Iterative refining is then performed to maximize accuracy and efficiency. After validation, users can input medical photos to detect kidney problems using the model's real-world applications.

VI.RESULTS AND DISCUSSION

After our renal disease classification model was trained and tested, we carried out a comprehensive analysis to assess its efficacy and performance. To give a thorough understanding of the model's capabilities, we evaluated it using a range of metrics and visualizations.

A. Evaluation of Accuracy:

First, we looked at our model's accuracy, a key indicator of how well its predictions generally aligned. The accuracy graph illustrates how the model performs over various epochs or iterations and shows how the accuracy changes over the course of training. We were able to learn a great deal about the convergence, stability, and possible areas for development of the model by examining this graph.

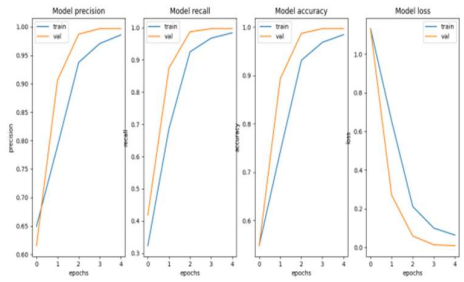

Fig. *4. Accuracy Visualization*

B. Confusion Matrix Analysis:

To gain deeper insights into the model's classification performance, we employed confusion matrices alongside accuracy measurements. The amount of true negative, false negative, true positive, and true negative examples for each class is highlighted in these matrices, which offer a comprehensive breakdown of the model's predictions. By closely analyzing these matrices, we gained a thorough understanding of the model's strengths and weaknesses in distinguishing between different kidney disorders.

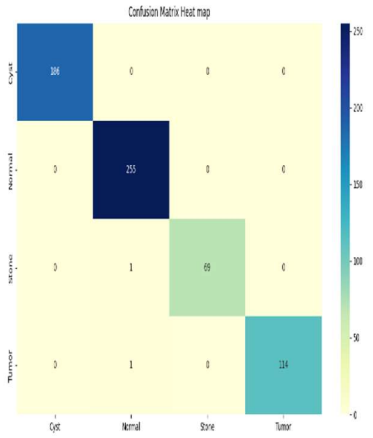

Fig. 5. *Confusion Matrix*

C. Interpretation and Insights:

Our examination of the data produced a number of interesting conclusions. We saw that while the model performed well in certain classes, it struggled to identify objects correctly in others. In addition, the confusion matrices revealed particular situations in which the model had difficulty differentiating between related classes, highlighting possible areas for model improvement and optimization.

CONCLUSION

In conclusion, our research marks a significant breakthrough in utilizing deep learning techniques for classifying renal diseases. By carefully gathering data, preparing it, choosing the right model, and training it, we have created a reliable and accurate model that can successfully discriminate between various kidney disorders. Our examination of the data has yielded insightful information about the effectiveness, advantages, and shortcomings of the approach. Our research has the potential to advance kidney disease early identification and detection, which will ultimately improve patient outcomes and healthcare administration. We have established the groundwork for additional study and advancement in this crucial field of healthcare by utilizing the capabilities of deep learning and medical imaging technologies. Our goal is to incorporate our model into clinical practice as we continue to improve and validate it. This will allow healthcare practitioners to use it as a valuable tool for kidney disease diagnosis and treatment. In order to handle complex healthcare concerns and promote innovation in patient care, our study also emphasizes the significance of multidisciplinary collaboration between computer scientists, medical practitioners, and researchers. Taking everything into account, our efforts represent a significant advancement in leveraging artificial intelligence for the early diagnosis and treatment of kidney diseases. This has the potential to profoundly impact the health and well-being of the general population.

FUTURE WORK

Future research could improve deep learning model performance by fine-tuning and optimizing architectures to increase robustness and accuracy. A thorough evaluation of kidney problems could be achieved by integrating different imaging modalities through the use of multi-modal fusion techniques. In order to assess the produced models' effectiveness in the actual world and enable their smooth integration into clinical practice, clinical validation studies are crucial. Predictive models for individualized treatment plans may be developed using longitudinal studies that monitor the course of a disease. While incorporation into clinical workflows could expedite diagnosis, more work in the areas of interpretability and explainability would strengthen confidence in model predictions. Research on kidney disease classification can also be advanced by concentrating on patient-centric care, resolving ethical issues, and expanding the model's relevance to global health initiatives.

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MALARIA PREDICTION USING CELL IMAGES WITH CNN

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Abstract-- Intestinal sickness is a life-threatening infection caused by parasites that are transmitted to people through the chomps of contaminated mosquitoes. The early conclusion and treatment of intestinal sickness are vital for diminishing horribleness and mortality rates, especially in creating nations where the infection is predominant. In this, we show a convolutional neural arrange (CNN) design for identifying jungle fever from blood tests with a 99.68% precision. Our strategy outflanks the existing approaches in terms of both precision and speed, making it a promising device for jungle fever conclusion in resource-limited settings. The CNN was prepared on a expansive dataset of blood smears and was able to precisely classify tainted and uninfected tests with tall affectability and specificity. Moreover, we show an examination of show execution on diverse subtypes of intestinal sickness and talk about the suggestions of our discoveries for the utilize of profound learning in irresistible infection diagnosis.

INTRODUCTION

M ALARIA is a possibly life-threatening malady transmitted by tainted female Anopheles mosquitoes. According to the World Jungle fever Report 2021, there were approximately 241 million cases in 2020, with an estimated 627,000 passings, stamping a significant increment from 2019. Notably, malaria is endemic in 85 nations, particularly in sub- Saharan Africa, where restorative assets are restricted. Early and exact conclusion is an critical foundation in controlling transmission and anticipating deaths. Conventional intestinal sickness determination depends on two essential methods: light microscopy and immunochromatographic quick diagnostic tests (RDTs) . In any case, the gold standard for malaria diagnosis, particularly in resource-poor settings, includes the examination of Giemsa- stained thick and lean blood movies beneath a conventional light magnifying lens at a amplification of 1000X .This labour-intensive strategy requests gifted microscopists for manual checking of parasites and white blood cells (WBCs). Intestinal sickness contaminations are ordinarily reported as the rate of contaminated ruddy blood cells (RBCs) per 100 RBCs numbered or as the number of parasites per microliter of blood, calculated based on parasite talliesper 100 WBCs on a smear. Thick blood smears (TBS) and lean blood smears are the two sorts of fringe blood smears commonly used. TBS, which increments the thickness of ruddy blood cells on the slide, offers higher affectability for detectingmalarial infections. Although viable, manual examination of microscopy is timeconsuming and difficult. Moreover, in resource-constrained settings, exact WBC checks are regularly approximated, making the
administration of intestinal sickness less compelling .Thus, there is an urgent require for a fast and reasonable intestinal sickness discovery system. The later headways in CNN for protest location in natural images have the potential to revolutionize intestinal sickness determination. Mechanized frameworks can essentially upgrade diagnostic accuracy and diminish costs. In any case, existing methods rarely center on low-quality information from Africa and frequently do not include WBC tallies in their appraisals of intestinal sickness parasite density. In this manner, we display a novel strategy that utilizes profound learning to precisely identify jungle fever parasites and number WBCs. We address the issue of picture twisting caused by versatile phone optical interfacing to misuse the broad utilize of smartphones for capturing magnifying lens pictures . Our commitments can be summarized as follows:

1) Generalized calculation improvement: we formulated a versatile algorithm competent ofrecognizing intestinal sickness parasites andcounting WBCs in assorted TBS film datasetsfrom Asia and Sub-Saharan Africa.
2) Determination of obscured picture issue: we created an algorithm to handle obscured pictures coming about from the interface between versatile phone optics and microscopes.
3) Optimization with low-quality pictures: our demonstrate was optimized utilizing low-quality pictures from Sudan in Sub-Saharan Africa, guaranteeing its appropriateness in resourcelimited areas.
4) Convenient intestinal sickness discovery framework: we made a portable system coordination a magnifying instrument with a smartphone featuring a user-friendly interface.
5) Programmed parasite concentration appraisal: our system automatically surveys intestinal sickness parasite concentration in both thick and lean blood smears, shown in the graphical user interface (GUI).

RELATED WORK

Infinitesimal image-based programmed discovery of intestinal sickness parasites from TBS includes a arrangement of forms: picture acquisition,preprocessing, and classification. In most studies, automatic location is performed on light microscopy images because light microscopy is broadly utilized for intestinal sickness diagnosis in resource-restricted districts. Right now, the segmentation of WBCs in lean blood smears utilizing color extent space, combined with profound learning procedures for classifying and counting WBCs, has been broadly inquired about over different diseases, yielding noteworthy and promising comes about. Ourstudy centers on preprocessing procedures pointed at eliminating redundant points of interest, such asWBCsand artifacts, from the acquired images. To improve the precision of jungle fever parasite detection and follow to the parasite thickness model, which necessitates the calculation of WBCs, our programmed detection model consolidates WBC division, tallying, and artifact removal. Subsequently, our approach encourages jungle fever detection utilizing TBS pictures.

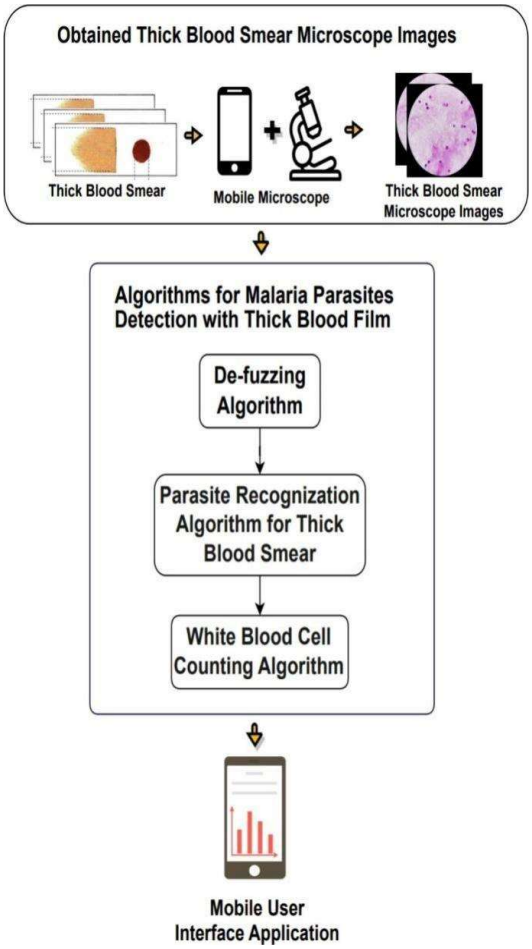
A. METHOD OF SEGMENTATION TO DETECT WBC

A few ponders have been conducted to portion WBCs and remove artifacts frommicroscopic blood smears.Kaewkamnerd et al. at first utilized an versatile threshold (Otsu) strategy to extricate artifacts in TBS. Elter et al. usedblack cap morphological operation division of WBCs and platelets. Delahunt et al. utilized Otsu to extricate leukocytes and classified them with SVM, accomplishing a specificity of 72.1%. Feng Yang et al. extricated leukocytes in combination with Otsu and morphological controls. Manescu et al.Used RetinaNet to distinguish leukocytes and accomplished an AUC of 96% . In their think about, Olayah et al. proposed a strategy for classifyingWBC sorts. They accomplished this by utilizing an average value channel to upgrade the picture and utilizing a half breed model based on CNN and manual highlights. This approach yielded an impressive precision rate of 99.8% . Ghosh et al. employed gradient-based locale developing with neighborhood influence to accomplish a more exact recuperation of locale boundaries and classification ofWBCs. Thismethod was connected after segmenting the WBCs utilizing foundation scaling and other techniques. The affectability and specificity were 96.4% and 79.6%, separately. Acharya et al. utilized the K-medoids strategy toidentify leukocyte cores in lean blood smears and presented a novel method for extricating leukocyte cytoplasm from various.

A.METHODS OF DETECTING PARASITES

Three broadly utilized approaches for naturallydetecting malaria parasites are picture preparing, classical machine learning,and profound learning (DL). DL has becomeincreasingly prevalent in a wide extend of applications inside the health segment, counting the examination of restorative pictures. It has ended up progressively prevalent in a wide extend of applications within the wellbeing segment, counting the investigation of medical images,In the final three a long time, DL has developed as a reasonable approach for identifying intestinal sickness parasites in tiny pictures. Fetulhaket al. utilized the adjusted YOLOV4 demonstrate to accomplish an averageaccuracy of 96.32%. Manescu et al. built a DeepMCNN model based on VGG19 with 92% affectability and 90% specificity. Rose Nakasi et al. combined Quicker R-CNNand SSDmodels. The Quicker R-CNN show accomplished a mAP of 0.5506 for intestinal sickness trophozoite discovery alone and a mAP of 0.892 for WBC location [6]. Yang et al. utilized a customized version ofVGG19 for Plasmodium classification, accomplishing a sensitivity of 92.59%, a specificity of 94.25%, and an precision of 93.46%.

FLOW CHART

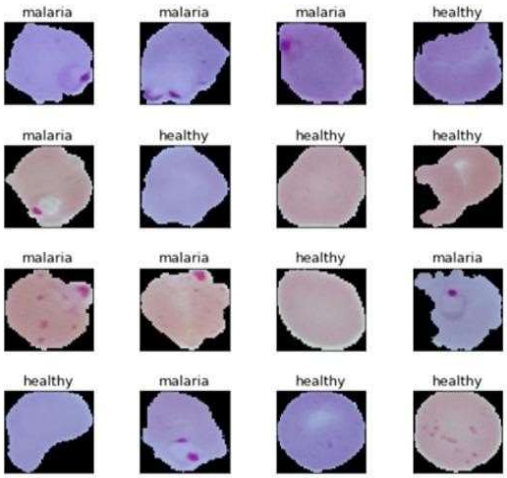


5.MATERIALS AND METHODS

Classification of cell pictures is an curiously issue and has incredible utility. There are as of now nation and restorative colleges which are leveraging this AI-backed innovation that can distinguish diseases(refer to related works). I select LeNet5 [12] as the beginning demonstrate, which can work with grayscale pictures. The Le-Net5 arrange is adjusted for multi-channel pictures (as pictures are on RGB scale) to work with 3 layers of pictures. and assist hyperparameter tuning [13] is done to classify colored cell pictures with an effectiveness target of 95% or more on the test information set. A profound convolution neural arrange employments an calculation with millions of pictures as input to prepare some time recently it is able to generalize the input and make expectations for pictures it has never seen some time recently. To instruct an calculation how to recognize objects in pictures, we utilize a particular sort of Manufactured Neural Arrange: a Convolutional Neural Organize (CNN). Their title stems from one of the most vital operations in the arrange: convolution. Convolutional Neural Systems are propelled by the brain. Investigate in the 1950s and 1960s by D.H Hubel and T.N Wiesel on the brain of warm blooded animals proposed a unused show for how well evolved creatures see the world outwardly. They appeared that cat and monkey visual cortexes incorporate neurons that only react to neurons in their coordinate environment. The computer world comprises of as it were numbers. Each picture can be spoken to as multi- dimensional clusters of numbers, known as pixels. CNNs, like neural systems, are made up of neurons with learnable weights and inclinations. Each neuron gets a few inputs, takes a weighted whole over them, passes it through an enactment work, and reacts with an yield. The entirety organize has a misfortune work. Not at all like feed-forward neural systems, where the input is a vector, where the input is a multi-channeled picture (3 channel in this case). The convolution layer is the primary building piece of a convolutional neural organize. The convolution layer comprises a set of autonomous channels. Each channel is freely convolved with the picture and we conclusion up with multi-layer highlight maps. All these channels are initialized haphazardly and gotten to be our parameters which will be learned by the organize hence. Parameter sharing is sharing of weights by all neurons in a specific include outline. Nearby network is the concept of each neural associated as it were to a subset of the input picture (not at all like a neural arrange where all the neurons are completely associated) This makes a difference to diminish the number of parameters in the entirety framework and makes the computation more proficient. A pooling layer is another building piece of a CNN. Its work is to dynamically diminish the spatial estimate of the representation to diminish the number of parameters and computations in the arrange. The pooling layer works on each highlight outline autonomously. Clump normalization is a strategy we can utilize to normalize the inputs of each layer, in arrange to battle the inner covariate move issue. Amid preparing time, a bunch normalization layer does the taking after: it to begin with calculate the cruel and change of the layer's input, at that point it normalizes the layer inputs utilizing the already calculated bunch measurements, and final, it scales and shifts in arrange to get the yield of the layer. Dropout is a regularization procedure for neural arrange models. Dropout strategy haphazardly chosen neurons are overlooked amid preparing. They are "dropped out" arbitrarily. This implies that their commitment to the enactment of downstream neurons is transiently expelled on the forward pass and any weight upgrades are not connected to the neuron on the in reverse pass. Information: The information set was downloaded from the NIH site [11]. A test of picture for both 'not tainted cell' and 'infected cell' is appeared underneath. On the cleared out, we have a cell picture, which is not tainted by the intestinal sickness parasite. The tainted cell picture contains violet specks, which speak to the jungle fever plasmodium parasite amid imaging.After hyperparameter look, our last design comprises of two convolution layers. The input information is preprocessed and decreased its picture estimate to 64 × 64, which is bolstered into a convolution layer with 32 channels of 3×3 estimate, with a walk of 1. The result of convolution is 62×62×32 highlight cluster. At that point the highlight cluster is bolstered to a max-pooling layer of measure 2 × 2 and the resultant include network gets to be a 31x31x32. Max pooling [14] diminishes the computational assets required by diminishing the estimate of the pixel of the include network whereas keeping the highlight intaglio. Regularization [15] methods called group normalization is conveyed over all 32 parallel channels of the yield of the max-pooling layer. The group normalized include framework is included with a dropout layer, with a dropout calculate break even with to 0.2. The convolution layer, max pooling layer, group normalization layer, and drop-out [16] total one layer convolution prepare in the engineering. The yield of one total convolution layer is given to another convolution layer with 32 channels of 3 ×3 measure, with a walk of 1. The result of convolution is 29 × 29 × 32 highlight cluster. At that point the highlight cluster is bolstered to max-pooling layer of measure 2 × 2 and the resultant include framework gets to be a 14 × 14 × 32. At that point, clump normalization is conveyed over all 32 parallel channels of the yield of the max-pooling layer. The clump normalized highlight lattice is included with a dropout layer, with a dropout calculate break even with to 0.2. After the two total convolution layers, the include measure has diminished sufficient and most of the highlight is extricated so that we can presently interface it with the feed-forward arrange. The 14 × 14 × 32 highlight lattice is straightened which measure gets to be 6272. This straightened highlight is bolstered to a feed-forward network4 of measure 512, along with group normalization and dropout. The feed-forward organize is assist included to another layer of 256 neurons with bunch normalization and

dropout. At long last, the yield layer is associated with 2 neurons, and the enactment work in the yield layer is softmax. The enactment of the rest of the layers is 'Rectified Straight unit(RELU) [17]'. The fetched work for the mistake estimation is utilized as categorial crossentropy, and the optimizer is 'adam'. The number of parameters to be learned are 3,357,090 (approx 3.5 million). With the accessible computation capacity, it took 20 minutes for preparing

SAMPLE PREDICTION



SYSTEM ARCHITECTURE

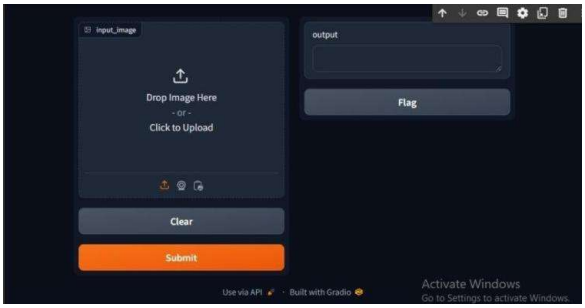
RESULTS AND DISCUSSION

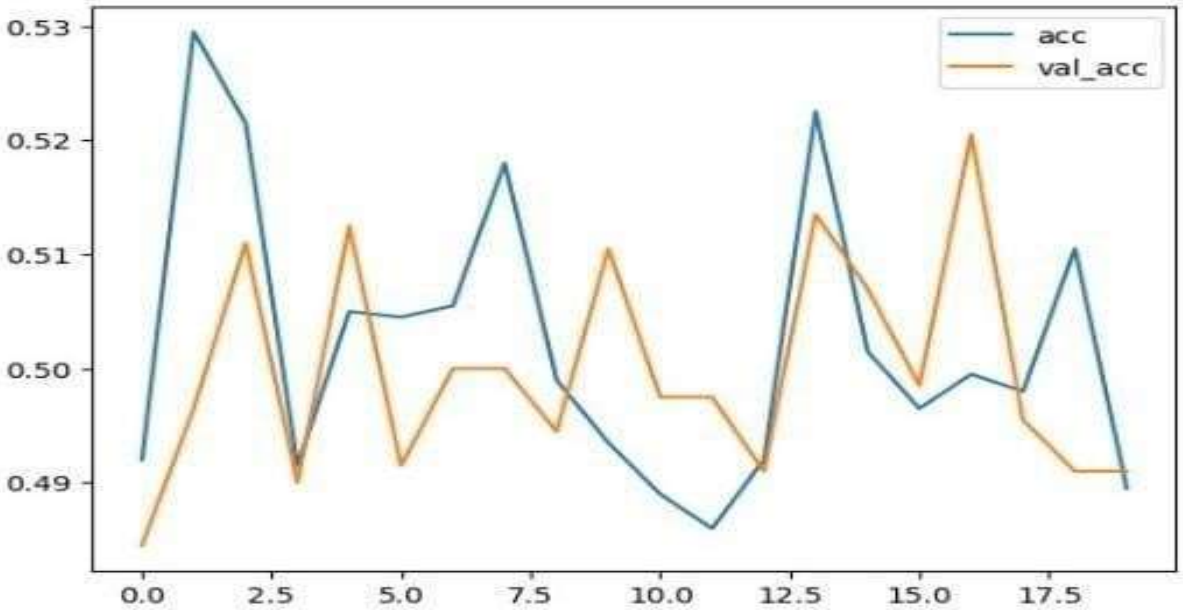
After performing Information Increase, the pretrained CNN models were fitted with the dataset to perform exchange learning. The layers were solidified, and fine- tuning was connected. Exactness comes about some time recently and after applying fine-tuning have been recorded. The perplexity network for each of these models has been plotted to assess the execution measurements.

TRAINING AND VALIDATION OF MODELS

The show is prepared and the result of the show and the fetched work is appeared underneath. The preparing and approval mistake is calculated at the same time as the preparing advance. The number of ages is set to 50, whereas a callback work is composed to conjure early ceasing when the model's approval exactness comes to 95% of precision. This is done to dodge overfitting (generalization blunder). If a callback is not conveyed, the demonstrate over-fits and memorizes the preparing information. In such circumstances, the show gives 98% exactness on preparing information but performs severely on approval and testing information. Once the preparing is done (which stops when approval precision come to 95%), at that point the testing mistake is calculated on the prepared demonstrate. The testing exactness accomplished around 95.4%, which is palatable.

INPUT IMAGE





CONCLUSION AND FUTURE WORK

This paper presents a novel arrangement for fast intestinal sickness discovery utilizing a custom semantic division neural organize. The model's crude yield is encourage prepared and displayed in an simple to get it and clear way, which permits for quick determination and visual approval. The displayed arrangement is able to progress the location rate and time execution by giving extra data to the microscopy picture, making a difference the specialist performing the assessment to spot and analyze potential dangers. After 1000 ages of preparing, the arrange accomplished a tall per-pixel precision of 97.1% and a 99.68% precision for identifying a potential risk without the perfect border classification on testing information. The extra preferences of such framework is tall perseverance indeed after hours of consistent work, which is incomprehensible for a human master, nearly moment classification of the whole outline, and moo fetched of utilization compared to the specialist.

In future works, there are numerous conceivable outcomes for the change of the displayed framework. Such as expansion of the current dataset by extra pictures with satisfactory covers, which can rise the exactness of the demonstrate indeed more, particularly in more troublesome circumstances, as well as amplify the network's information around the correct shape of the tainted cells in any case of the conditions. Besides, the model's design may be upgraded with more parameters fitting based on current information and encounter as well as future investigate, and hence the framework seem be superior optimized in terms of time and location execution. Another alternative is to amplify the current demonstrate to all labeled theoretical classes and recognize the tainted cells by the jungle fever advancement stage. At long last, more tests seem be performed with picture expansion to misleadingly extend the sum of information and conceivably diminish classes lopsidedness for a way better location of contaminated cells. The utilize of PCR might be considered; in any case, more tests require to be performed.

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FOREST FIRE AND SMOKE DETECTION USING CNN

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***Abstract*--n One of the essential causes of natural harm is woodland fires. These fires are the cause for numerous social impacts like misfortune of biodiversity and timber assets, termination of plants and creatures and misfortune of natural life habitat.**

To decrease these issues, we are executing a show which employments Convolution neural arrange (CNN). Convolution neural systems are primarily utilized for picture and video classification.

Our organize is prepared utilizing a dataset that incorporates recordings, pictures partitioned into three categories: "smoke", "fire", "normal" and Real-Time handling. Since Keras and TensorFlow offer tall level APIs utilized for easily creating and preparing models, we moreover utilize them.

In arrange to identify fire naturally, a timberland fire picture acknowledgment strategy based on convolutional neural systems is proposed in this paper.

There are two fundamental sorts of fire acknowledgment calculations. One is based on conventional picture handling innovation and the other is based on convolutional neural arrange innovation. The previous is simple to lead in untrue discovery since of visual impairment and arbitrariness in the organize of highlight determination, whereas for the last mentioned the natural convolutional neural arrange is connected straightforwardly, so that the characteristics learned by the organize are not precise sufficient, and acknowledgment rate may be influenced. In see of these issues, ordinary picture handling procedures and convolutional neural systems are combined, and an versatile pooling approach is presented.

1.INTRODUCTION

One of the essential causes of natural harm is woodland fires. These fires are the cause for numerous social impacts like misfortune of biodiversity and timber assets, termination of plants and creatures and misfortune of natural life territory. Timberlands are the defenders of earth's environmental adjust. Shockingly, the woodland fire is ordinarily watched when it has as of now spread over a expansive range, making its control and stoppage challenging and is inconceivable at times. The result is obliterating misfortune and unsalvageable harm to the environment and air (30% of carbon dioxide (CO2) in the air comes from woodland fires), in expansion to hopeless harm to the environment (colossal sums of smoke and carbon dioxide (CO2) in the air). The customary strategy is to anticipate illicit logging. The objective of the framework is to recognize the conceivable perils by persistently recording the clamor in the timberland, by preparing fragments of the recorded signals and choose upon the nature of each of these segments. To decrease these issues, we are executing a show which employments Convolution neural arrange (CNN). Convolution neural systems are basically utilized for picture and video classification. It is critical to move satisfactory fire hardware and qualified operational labor as quick as conceivable to the source of the fire. Moreover an satisfactory calculated framework for adequate supply with quenching gadgets and upkeep is essential as well as ceaseless observing of fire spread. An coordinates approach for timberland fire discovery and concealment is based on a combination of distinctive location frameworks depending on rapidly spreading fire dangers, the measure of the range and human nearness, comprising of all essential parts such as early location, farther detecting procedures, coordinations, and preparing by recreation, and firefighting vehicles. An shrewdly woodland environment checking arrangement is based on the Raspberry Pi Show 3, analogical and computerized sensors and signals examination calculations. Parameters such as temperature, gas concentrations, soil mugginess etc. are checked with sensors whereas foundation sounds are analyzed. Woodland fire computerization consolidates squares of the utilitarian circuit and sensor modules that are gathered as a unit in this way, working to screen the threefully-connected layers with a last 1000-way softmaxn. To decrease overfitting in the fully-connected layers we utilized a recently-developed regularization strategy called "dropout" that demonstrated to be exceptionally effective. comparison of different machine learning strategies such as relapse, choice trees, neural systems etc. has been done for expectation of woodland fires A semi administered run the show based classification demonstrate is once in a while utilized to distinguish whether its zone is tall dynamic, medium dynamic (MA) or moo dynamic (LA) cluster in the forest. To maintain a strategic distance from wild wide spreading of woodland fires it is essential to A semi administered run the show based classification demonstrate is once in a while utilized to distinguish whether its zone is tall dynamic,

medium dynamic (MA) or moo dynamic (LA) cluster in the forest.To maintain a strategic distance from wild wide spreading of woodland fires it is essential to identify fires in an early state and to anticipate the proliferation. maintain a strategic distance from wild wide spreading of woodland fires it is essential to identify fires in an early state and to anticipate the proliferation.

2. RELATED WORK

In routine fire discovery, much inquire about has persistently centered on finding out the striking highlights of fire pictures. Chen analyzed the changes of fire utilizing an RGB and HSI color demonstrate based on the distinction between successive outlines and proposed a rule-based approach for fire choice. Celik and Demirel proposed a bland rule-based circumstances of a specific timberland.

WSN has greatest commitments since 33% analyst utilizing WSN to following application, 41% utilize the WSN as a information trade in their framework, and 48% utilized WSN as information transmission between sensor hubs. A strong AdaBoost (RAB) classifier is proposed to make strides preparing and classification accuracy.The neural organize, which has 60 million param.

Mueller proposed the neural networkbased fire discovery strategy utilizing optical stream for the fire zone. In the strategy, two optical stream models are combined to recognize between fire and powerfully moving objects. In expansion, Foggia proposed a multiexpert framework which combines the investigation comes about of a fire's color, shape, and movement characteristics.

In spite of the fact that deficiently, the supplementary highlights to color, counting surface, shape, and optical stream, can decrease the untrue discoveries. All things considered, these approaches require space information of fires in captured pictures basic to investigate hand-crafted highlights and cannot reflect the data spatially and transiently included in fire situations well.

DEEP LEARNING-BASED APPROACH

As of late, profound learning has been effectively connected to different regions such as question detection/classification in pictures, discourse acknowledgment, and normal dialect handling. Analysts have conducted different ponders on fire discovery based on profound learning to progress execution. The profound learning approach has a few contrasts from the customary computer vision-based fire discovery. The to begin with is that the highlights are not investigated by an master, but or maybe are naturally captured in the organize after preparing with a huge sum of differing preparing information. Hence, the exertion to discover the legitimate handcrafted highlights is moved to planning a appropriate organize and planning the preparing information.

Another contrast is that the detector/classifier can be gotten by preparing at the same time with the highlights in the same neural organize. Hence, the suitable arrange structure gets to be more imperative with an productive preparing calculation. Sebastien proposed a fire discovery organize based on CNN where the highlights are at the same time learned with a Multilayer Perceptron (MLP)-type neural net classifier by preparing. Zhang et al. moreover proposed a CNN-based fire discovery strategy which is worked in a cascaded mold. In their strategy, the full picture is to begin with tried by the worldwide image-level classifier, and if a fire is identified, at that point a fine-grained fix classifier is utilized for accurately localizing the fire patches. Muhammad et al.proposed a fire observation framework based on a fine-tuned CNN fire locator

This engineering is an productive CNN design for fire location, localization, and semantic understanding of the scene of the fire propelled by the Crush Net [engineering. In the profound layer of CNN, a unit has a wide open field so that its actuation can be treated as a highlight that contains a expansive range of setting data. This is another advantage of the learned highlights with CNN for fire discovery. Indeed in spite of the fact that CNN appeared overwhelmingly predominant classification execution against conventional computer vision strategies, finding objects has been another issue. In the proposed strategy, we embrace the protest location show to localize the SRoFs and non-fire objects, which incorporates the fire, smoke for the SRoFs, and other objects unimportant to the fire for the non-fire objects.

The objects unessential to the fire increment untrue cautions due to varieties in shadows and brightness, and will regularly distinguish objects such as ruddy dress, ruddy vehicles, or dusk. We distinguish the fire objects by utilizing the Speedier R-CNN demonstrate, indeed in spite of the fact that it does not have to be kept to the protest location show. The profound question locator, either single- or multi-stage, is more often than not composed of CNN-type include extractors, taken after by a localizer with a classifier.

Subsequently, our protest location show incorporates the highlight extractor with a generally more extensive region of responsive field than the identified SRoF region and can assemble more setting data. In spite of the fact that the CNN-based approaches give great execution, it is difficult to capture the energetic behavior of fire, which can be gotten by recursive-type neural systems (RNN).

LSTM proposed by Hochreiter and Schmidhuber is an RNN show that tackles the vanishing angle issue of RNN. LSTM can gather the worldly highlights for choice making through the memory cells which protect the inner states and the

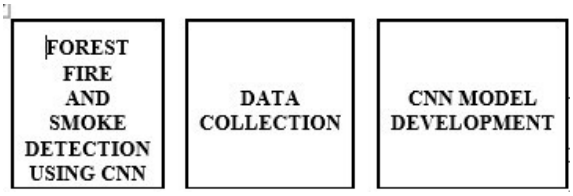
repetitive behavior. In any case, the number of recursions is ordinarily constrained, which makes it troublesome to capture the long-term energetic behavior essential to make a choice.

Hence, extraordinary care must be taken to consider the choice based on long-term behavior with LSTM. As of late, Hu et al. utilized LSTM for fire discovery, where the CNN highlights are extricated from optical streams of continuous outlines, and transiently amassed in an LSTM organize.

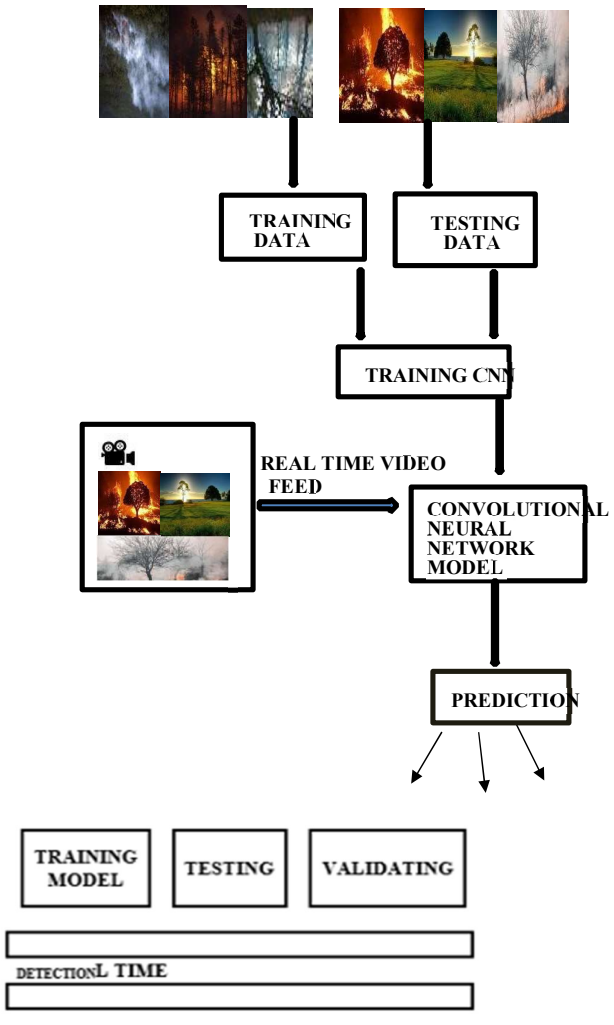
The last choice is made based on the combination of progressive transient highlights. Their approach, be that as it may, computes the optical stream to plan the input of CNN or maybe than specifically utilizing RGB outlines.

The common diagram of the equipment module plan and program usage of fire location framework is appeared . The equipment components of the fire discovery unit, as appeared . A webcam is a video capture gadget that is associated to a computer or computer organize, regularly utilizing a USB harbour for video joins, allowing computers to act as videophones or videoconferencing stations. Webcams can too be utilized with different computer video media transmission programs which incorporate the security observation and the recording of video records. At a tall level, it comprises USB camera and communication with open CV module associated to a Arduino Uno that runs the Convolutional Neural Arrange (ConvNet/CNN), a Profound Learning calculation for fire discovery. To diminish Timberland fire, we are actualizing a show which employments Convolution neural organize (CNN).Our organize is prepared utilizing a dataset that incorporates recordings, pictures separated into three categories: "smoke", "fire", "no fire" and Real-Time preparing. And advance this show seem moreover be connected in genuine time to moo outline rate observation video and grant caution in case of fire. Addressing this challenge involves overcoming issues related to information quality, show design optimization, and real-time handling, with the extreme objective of making a strong and productive early caution framework for woodland fire and smoke detection.
Associated layer includes weights, predispositions, and neurons. It interfaces neurons in one layer to neurons in another layer. It is utilized to classify pictures between diverse categories by preparing. Softmax or Calculated layer is the final layer of CNN. It dwells at the conclusion of FC layer. Calculated is utilized for twofold classification multiclassification.

BLOCK DIAGRAM



SYSTEM ARCHITECTURE



4. CONVOLUTIONAL NEURAL NETWORKS

Convolutional Neural Organize (ConvNet/CNN) is a Profound Learning calculation which can take in an input

picture, relegate significance (learnable weights and predispositions) to different aspects/objects in the picture and be able to separate one from the other. The preprocessing required in a ConvNet is much lower as compared to other classification calculations. Whereas in primitive strategies channels are hand-engineered, with sufficient preparing, CNN have the capacity to learn these filters/characteristics. appears the structure of CNN. The layers of the organize are made up of different three-dimensional planes. Each3-D planes comprises of a few neurons that make CNNs reasonable for dealing with picture information. Input layer in CNN ought to contain picture information and it is spoken to by three dimensional network. A portion of picture is associated to Convo layer called include extractor layer to perform convolution operation and calculating the speck item between responsive field and the channel. Pooling layer is utilized to diminish the spatial volume of input picture

FLOW CHART sage, which will persistently screen the premises and send the video nourish to a centralized server for fire occurrence location. The question locator is made to prepare a strong classifier. we require a parcel of pictures which ought to vary a part from each other. So they ought to have diverse foundations, irregular question, and shifting lighting conditions.

5. SYSTEM IMPLEMENTATION AND TESTING

The convolutional neural arrange was prepared on over 10122 pictures of occurrences of fire and no fire circumstances. The information were collected from online picture information sources. Test pictures utilized for the convolutional neural systems. As a rule for the preparing of neural systems, the dataset was part into preparing and testing sets. To get an induction from the demonstrate, test pictures were utilized as input and passed through to the framework. classifier yields probabilities for the two classes: "fire" and "no fire." The course with the most extreme likelihood score is considered as the result of the classifier. classifier module was actualized with Google's Tensor Stream and Keras. Tensor Stream is an open-source program library given by Google for numerical computation utilizing information stream charts.The classification prepare is as takes after; the video and pictures nourish is preprocessed, and outlines are extricated from that. The extricated frames/images are classified to decide the condition of the range.

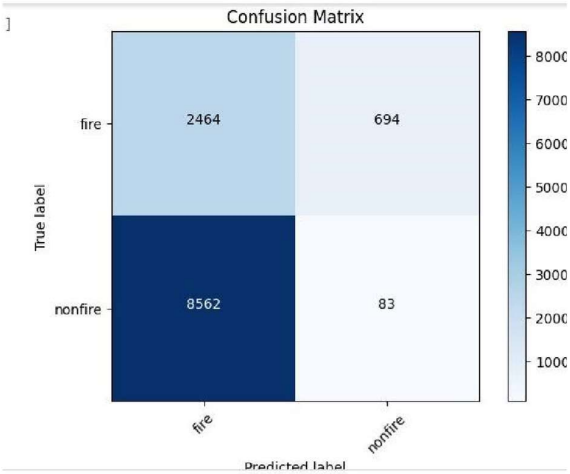
6.RESULTS AND DISCUSSIONS

The hyper-parameters are set to their optimal values and in each case, the training and the testing are performed on subsets of the same dataset. All four CNNs achieve high accuracy rates exceeding 90%. The training time of each network depends on its depth and, on the number of images used in the training process. The largest (deepest) network, MobileNet_v2, takes the longest training time but in exchange, it yields the highest classification accuracy for both datasets. Considering that the training procedure happens once, so far MobileNet_v2 is the dominant CNN. Regarding the two datasets, the classification results are quite similar with slightly better results being obtained for the Forest-Fire dataset.

TABLE 2 – DATASET

	MOBILENET_V2	
DATASET	CLASSIFICATION ACCURACY(%)	TRAINING TIME(S)
FOREST FIRE	92	190
FLAME	91.8	245
SMOKE	91.9	240

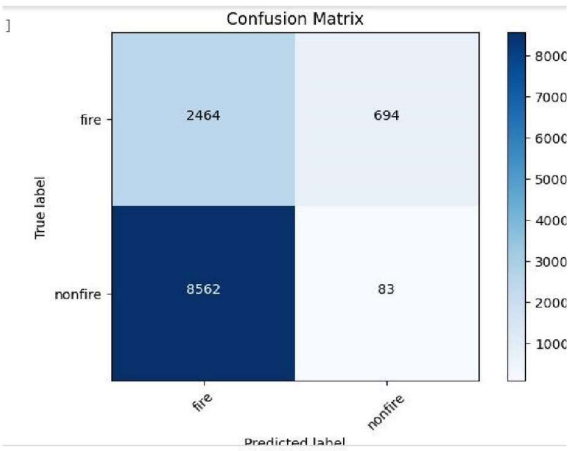
SAMPLE PREDICTION



7.CONCLUSION AND FUTURE WORK

Rapidly spreading fires speak to a critical hazard calculate of environment degradation and they have affect upon human lives and exercises. The primary objective is the avoidance and the early location of fires, and to this conclusion advance has been made in terms of a) electro-mechanical implies able to recover pictures from topographically inaccessible settings (such as UAVs) and b) of machine learning (ML) (particularly CNN-based) implies able to handle figures and extricate curiously data. These points of view can be combined and offer close genuine time

capabilities, with the imperative of restricted computational assets.
n conclusion, the execution of Convolutional Neural Systems (CNNs) for woodland fire and smoke location marks a critical headway in leveraging innovation to address natural challenges. The arrangement of such brilliantly frameworks not as it were improves the proficiency of early location but moreover contributes to the relief of obliterating results related with wildfires.
The capacity of CNNs to consequently learn and extricate important highlights from visual information empowers exact and dependable distinguishing proof of fire and smoke patterns. The travel from information procurement and preprocessing to the preparing of strong models illustrates the intrigue nature of such ventures, requiring skill in computer vision, machine learning, and natural science. The nonstop input circle, integration with real-time sensors, and versatility highlights guarantee versatility to energetic natural conditions, subsequently fortifying the system's in general reliability.



7.ACKNOWLEDGMENT

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NCRTCI'24-90

CONDITIONAL DISSEMINATION WITH MULTI-OWNER IN CLOUD COMPUTING

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Abstract—n **We are entering in a new era of computing technology i.e. Internet of Things (IoT). Data sharing is a significant idea in cloud computing for sharing data to open clients. Cloud gives various services to the clients for getting to data from cloud. Storage as a service, it enables the data proprietors to store and share their data to clients through cloud server. In this kind of service it is important to put cryptographically upgraded access control on the common data, named Identity-based encryption. When getting to data some client's approval is terminated, there ought to be a component that can expel him/her from the framework. Therefore, the repudiated client incapable to get to both the recently put away data. Subsequently, propose an idea called revocablestorage identity-based encryption. In this paper, we actualized and demonstrated that a repudiated client can ready to get to the past data utilizing secret key in Just cloud condition and same data to be shared to open clients.**

Keywords-- **new era, cryptographically upgraded , framework ,repulicated ,open client.**

INTRODUCTION :

With the fast development of clod serviceshge volme of records is shared through clodcomputing. Althrogh the cryptopgraphic techniqueshave been utilized to show information confidentiality in cloudcomputing ,present day machanisms cannot put in force privateness issues overcipher texts related to multiple owners , which makes co-proprietors unable to correctly control whether information disseminators can absolutely disseminate their facts. on this paper, we propose a cozy statistics institution sharing and conditional dissemination scheme with multi-owner in cloud computing, wherein statistics owner can share private information with a group of users via the cloud in a at ease manner, and information disseminator can disseminate the records to a brand new institution of users if the attributes satisfy the access policies in the ciphertext. We in addition gift a multiparty get right of entry to manipulate mechanism over the disseminated ciphertext, wherein the records co- proprietors can append new get admission to guidelines to the ciphertext due to their privacy options. moreover, 3 policy aggregation techniques, along with complete allow, proprietor precedence and majority permit, are provided to remedy the privacy conflicts hassle due to one-of-a-kind get right of entry to policies. the security evaluation and experimental consequences show our scheme is realistic and efficient for secure statistics sharing with multi-proprietor in cloud computing.

METHODOLOGY :

Environments, ensuring relaxed and green sharing of touchy facts amongst multiple customers while maintaining manage over get right of entry to permissions offers a massive mission. conventional access manipulate mechanisms often fail to safely cope with the complexities of multi-owner scenarios, in which multiple entities can also have varying degrees of possession and authority over the shared data. moreover, there's a growing need for conditional dissemination of information, where get right of entry to is granted primarily based on sure predefined conditions or regulations.

the present answers for relaxed facts sharing in cloud environments frequently lack robustness and scalability to accommodate multi-proprietor situations and conditional access control necessities. demanding situations encompass retaining facts confidentiality, integrity, and availability at the same time as permitting bendy get admission to control rules and green records dissemination among authorized customers.

therefore, there is a crucial want for novel tactics and strategies that may cope with the following key demanding situations:

Designing a at ease and scalable gadget structure that supports multi-proprietor records sharing in cloud environments.
developing efficient cryptographic protocols and access control mechanisms to put into effect best-grained get right of entry to policies and ensure facts confidentiality and integrity.
implementing mechanisms for conditional dissemination of information, permitting get admission to based totally on predefined conditions or attributes.
evaluating the proposed answer in terms of security, overall performance, and scalability to demonstrate its effectiveness in actual-world cloud computing environments.Addressing those challenges is essential.

PROPOSAL SYSTEM : Goals: Conf records Sharing:put in force a gadget that lets in relaxed sharing of informationamong corporations in a cloud environment.

Conditional Dissemination: permit proprietors to outline conditional dissemination policies to control access to shared records.
Multi-proprietor support: support scenarios where records may also have more than one. proprietors who together control access
consumer Interface broaden a user-friendly interface for proprietors to control information sharing and outline dissemination policies.
Encryption Module: implement sturdy encryption mechanisms to make certain information confidentiality.Get right of entry to control Module: enable proprietors to specify pleasant-grained access control regulations primarily based on attributes which include person roles, time, place, and so forth.
security analysis: conduct thorough protection tests to pick out vulnerabilities and ensure robustness against assaults.performance assessment: degree the device's performance in phrases of latency, throughput, and scalability.Usability testing: accumulate comments from users to assess the system's ease of use and effectiveness in assembly their requirements.

RELATED WORK :

Attributed based encryption : ABE schemes enable nice-grained get entry to manage primarily based on attributes related to users and information. diverse works have proposed ABE-based totally solutions for secure facts sharing in cloud environments, taking into account flexible get right of entry to rules and multi-proprietor eventualities. Proxy Re-Encryption (PRE): PRE schemes facilitate cozy delegation of get admission to rights, where a statistics owner can delegate decryption capabilities to different customers or proxies without revealing the facts itself. several research have investigated the utility of PRE in cloud computing for multi-owner statistics sharing and conditional get admission to manage. Blockchain-primarily based solutions: Blockchain era has been explored as a method to make sure transparent and tamper-evidence get entry to manage in multi-owner situations. smart contracts and decentralized manipulate mechanisms were proposed to implement access rules and facilitate comfortable records sharing amongst a couple of proprietors in cloud environments.
Role-Based Access Control (RBAC): RBAC models have been adapted and prolonged to guide multi-proprietor statistics sharing in cloud computing. studies in this location makes a speciality of defining roles and permissions for specific stakeholders and ensuring secure statistics get right of entry to based on their roles and responsibilities.
Federated Identity Management: Federated identification control structures enable users to get right of entry to sources throughout more than one domains whilst retaining their identities and get right of entry to privileges. Works in this vicinity purpose to extend federated identification answers to guide comfy statistics sharing and conditional dissemination with multiple proprietors in cloud environments.
Homomorphic Encryption: Homomorphic encryption techniques permit computations to be achieved on encrypted facts with out decrypting it, offering privateness-keeping answers for facts processing and sharing. research efforts have explored the software of homomorphic encryption in multi-owner situations to make certain relaxed statistics organization sharing and conditional dissemination in cloud computing.

EXPERIMENTAL RESULT :

CONCLUSION :

Implementing cozy information organization sharing and conditional dissemination with multi-owner skills in cloud computing environments is essential for making sure statistics privateness, integrity, and accessibility. through leveraging cryptographic strategies which include attribute-primarily based encryption (ABE) or multi-celebration computation (MPC), along side get entry to manage regulations, businesses can correctly manipulate and manage get entry to to sensitive data among a couple of proprietors even as mitigating the threat of unauthorized disclosure. moreover, incorporating sturdy authentication mechanisms and monitoring equipment further complements the general protection posture. however, it's important to constantly examine and update safety features to evolve to evolving threats and regulatory requirements in cloud environments. overall, a complete approach combining encryption, get entry to manipulate, authentication, and monitoring is key to attaining comfy records sharing and dissemination in multi-proprietor cloud computing eventualities.

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DEVELOPING A BLOCK CHAIN BASED EVAULT FOR LEGAL RECORDS

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Abstract--n **Innovative Results for addressing the challenges in the legal records operation system through a blockchain grounded evault platform. Our ideal is to produce a secure, transparent, and accessible ecosystem that caters to the requirements of all stakeholders, including attorneys, judges, guests and registers. In moment's digital period, the operation and storage of legal records pose significant challenges, including security, authenticity, and vacuity. Traditional styles constantly warrant translucence and are susceptible to tampering and unauthorized access. To address these issues, this paper proposes the development of a blockchain-predicated eVault for legal records.The proposed system leverages blockchain technology to ensure the integrity, security, and fixed of legal records. By exercising a decentralized and distributed register, the eVault remove the need for peacemakers, reducing the trouble of fraud and manipulation. also, smart contracts can be employed to automate various processes, analogous as authentication and verification, streamlining the operation of legal records. likewise, the translucence and auditability of blockchain technology enhance trust among stakeholders, including individualities, associations, and legal authorities. Through cryptographic mincing and encryption ways, sensitive information can be securely stored and entered only by sanctioned parties, icing insulation and confidentiality. This paper outlines the architecture and design considerations for administering the blockchain- predicated eVault, including data structure and access control. Also it discusses implicit challenges and considerations for integration with being legal fabrics and systems. This paper outlines the architecture and design considerations for administering the blockchain- predicated eVault, including data structure and access control. also, it discusses implicit challenges and considerations for integration with being legal fabrics and systems.**

***Keywords*--** **Blockchain, Smart contract, Access control and Data security**

I.INTRODUCTION

The digital age, the legal assiduity is witnessing a profound metamorphosis. Legal professionals, guests, and the bar decreasingly calculate on electronic documents and records to streamline ring the integrity, security, and availability of legal records. The need for a robust, tamper- evidence, and transparent system for managing legal documents has noway been more pressing. The" eVault for Legal Records using Blockchain" design seeks to address these challenges by employing the power of blockchain technology to revise the way legal records are created, stored, and penetrated. Blockchain, the underpinning technology behind cryptocurrencies like Bitcoin, offers a decentralized, secure, and inflexible tally, immaculately suited to the sensitive and frequently critical nature of legal records.

This groundbreaking action aims to review the way legal records are managed, enhancing their security, translucency, and effectiveness while icing compliance with legal and nonsupervisory conditions. By creating a digital eVault for legal records on a blockchain, this design will pave the way for a future where legal professionals, guests, and authorities can calculate on a slice- edge system to guard the integrity of legal documents and streamline legal processes.

A.BLOCKCHAIN TECHNOLOGY

Blockchain is a decentralized and distributed ledger technology that enables secure, operations and improve access to critical information. Yet,despite these advancements, challenges persist in ensures transparent, and tamper resistant and record-keeping of transactions across a network of computers. It operates on a peer-to-peer network, where each participant (node) in the network has a copy of the entire blockchain. The information is stored in blocks, and each block is linked to the previous one through cryptographic hashes, creating a chain of blocks, hence the name "blockchain." Blockchain is a decentralized digital ledger technology that records transactions across multiple computers in a way that is secure, transparent, and immutable. It operates as a chain of blocks, where each block contains a cryptographic hash of the previous block, time stamp ,transaction data, and a unique identifier. This technology gained prominence with the emergence of cryptocurrencies like Bitcoin, but its applications extend beyond digital currencies to various industries such as finance, supply chain management, healthcare, and more. Blockchain's key features include decentralization, transparency, immutability, and security, making it a promising solution for enhancing trust, efficiency, and accountability in various processes and systems.

B.EVAULT

It refers to a digital storage system built on blockchain technology that securely stores and manages electronic documents. These systems utilize the decentralized and immutable nature of blockchain to provide enhanced security, transparency, and integrity for sensitive documents such as legal contracts, certificates, or financial records. Users can store their documents on the blockchain, ensuring that they cannot be tampered with or altered without leaving a trace. This technology is particularly valuable in industries where document authenticity and integrity are critical, such as legal. The eVault system would utilize a blockchain network as its underlying infrastructure. This blockchain can be public, private, or consortium-based, depending on the requirements of the eVault service provider and the desired level of decentralization healthcare, or finance.

II. RELATED WORKS

Blockchain Based Access Control and Data Sharing: blockchain to give out One's own data management and insure solitude as well. The blockchain was used as an automatic eruption control controller and no third party was needed. Only the data address was stock piled on the blockchain and a distributed hash table was used as the execution of the data storage. This lowers the risk of data leakage. However, no certain access control model was proposed in their scheme. Proposed blockchain-based access authorisation scheme where the data holder defines policies on the data and holds them on the blockchain.The plans are then alloted to the users as ensure rights.Then designed a same model to where the Coded data is linked to the cloud and access policies on the data are stored on the blockchain as dealings Although these two schemes achieve screened systems and easy holder ,there is a release of access policies since the blockchains used are public ones and are thus visible to everyone.

Singh and kim presented a blockchain-based model for split data in vehicular networks and also enable safe communication among vehicles. However, the use of a public blockchain does not work well in peer-to-peer (P2P) data sharing among vehicles due to the cost involved in establishing a public blockchain in resource-constrained vehicles. Ensuring tamper-proof evidence trails for legal proceedings. While not directly focused on eVaults, this review highlights the potential of blockchain for various applications in rural development. This broader perspective can be insightful when considering the diverse use cases for secure data management.

III. PROPOSED SYSTEM

A proposed system for securing files using blockchain technology could involve creating a decentralized network where files are encrypted and stored across multiple nodes. Each file would be assigned a unique cryptographic hash, which is then recorded on the blockchain along with transaction details. Smart contracts could be employed to enforce access control policies, ensuring that only authorized users can view or modify specific files.

The immutability of the blockchain would prevent unauthorized tampering or deletion of files, while cryptographic techniques such as digital signatures could verify the authenticity of file transactions. Additionally, consensus mechanisms such as proof of work or proof of stake could be utilized to validate and confirm file transactions, further enhancing security and integrity.

User Authentication and Access Control: Implement a secure authentication system to verify users' identities before granting access to the eVault. Access control mechanisms should be in place to ensure that only authorized individuals can view or modify specific records.

Record Management: Design a module to handle the creation, storage, and retrieval of legal records on the blockchain. Each record should be timestamped and encrypted to ensure its integrity and confidentiality.

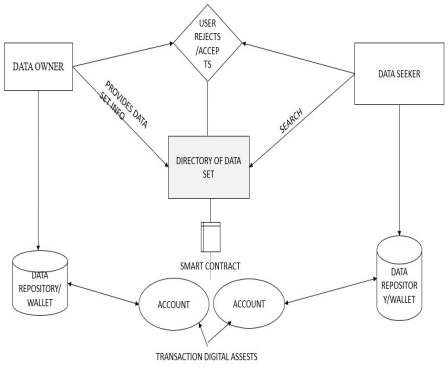

Fig 1.1 Block Diagram

The front-end interface through which users interact with the eVault application. The application layer responsible for managing user authentication, encryption/decryption of data, and interaction with the blockchain network.

The decentralized network of nodes where transactions and data are stored securely in blocks, ensuring transparency, immutability, and decentralization. The data storage is actual data storage layer, where encrypted user data is stored. IPFS (InterPlanetary File System) is one example of a decentralized storage system that could be used for this purpose within the blockchain network.

The blockchain network Is a decentralized and distributed ledger technology. It is used for secure and tamper-resistant data storage. In this architecture, it is used for storing legal documents, contracts, or other sensitive information. Blockchain technology ensures the integrity and immutability of data, making it suitable for legal applications where data security and authenticity are crucial.

V.SECURITY DEFINITION

Data security is the number one dealwith for all companies. The most valid document management answers are those that offer encode, real-time updates, role-based tiered means of approach, and built-in proof of origin methods to prevent cheating.When it comes to document management, solidness is probably the most important issue for any organization, regardless of size or industry. Not only does a DMS provide better management of private documents, but it also allows company secretaries to alter access to documents for certain individuals. Thus, sensitive information will be reliably safe guarded and will remain open only to those to whom the company provides means of entry In addition, an advanced DMS holds information about who outlooked the document and what changes were made to it, so documents are easy to route and the risk of outsiders deduce with company documents is greatly reduced. By the way, all of these security characteristics are available in blockchain document management systems.

VI.SYSTEM IMPLEMENTATION

Users should be able to roll securely and validate themselves to ingress the e-vault system. Authentication procedure may include passwords, multi-factor authentication (MFA), or combination with exterior identity providers. Mplement end-to-end encryption to make sure that data is encrypted at rest and in haulage.This means encrypting data before it leaves the sender's device and decrypting it only when it arrives the authorized recipient's device. Strong Encryption Algorithms use strong encryption algorithms such as Advanced Encryption Standard (AES) for encrypting data. These algorithms give robust security and are generally recognized for their efficiency

For eVault applications, you might consider blockchain platforms like Ethereum, Hyperledger Fabric.Each has its unique strengths and applicability depending on elements like scalability, privacy requirements. It's necessary to evaluate which platform line up with the specific needs and goals of your eVault application

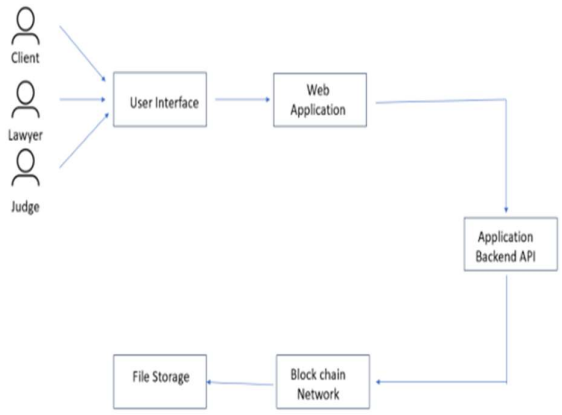

Fig 1.2 Sequence Diagram

SMART CONTRACT

Create eVault:Owner deploys the smart contract, specifying initial access controls.Optionally, designate an auditor.

Deposit file: Owner or authorized user uploads a file. Smart contract validates user access level and permissions. Hashes the file and stores the hash on-chain. Stores the actual file data off-chain (e.g., decentralized storage network).

Withdraw file: Authorized user requests a file download. Smart contract verifies user access level and permissions. Retrieves the file data from off-chain storage and returns it to the user in a right way.

Grant/Revoke access: Owner grants or revokes access to other users, defining their permission levels (e.g., read-only, read/write). Auditor (if applicable) can be required to approve access changes for additional security.It is mainly used to give access previlige to users and revoke is just an opposite to grant where it withdraws users priviliges on database object.Whereas this creating evault and devekopling these files and widthraw is design contract.

AUTHENTICATION

User authentication for eVault typically involves verifying the identity of a user before granting access to the electronic vault system. This can be achieved through various methods such as username/password authentication, biometric authentication, two-factor authentication (2FA), or multi-factor authentication (MFA). The specific authentication method used by eVault may vary depending on the system's configuration and security requirements. It's important to choose a robust authentication method to ensure the security of the electronic vault and the sensitive information it contains.

VII.RESULT AND CONCLUSION

In conclusion, developing an eVault offers numerous advantages in securely storing and managing digital assets, documents, and sensitive information. Through robust encryption, user authentication, and seamless accessibility, an eVault ensures data integrity, confidentiality, and availability. By addressing the evolving needs of individuals and organizations for secure data storage and management, an eVault serves as a reliable solution in the digital age,

facilitating convenience, compliance, and peace of mind. The project introduces a robust and secure platform tailored for legal professionals, encompassing clients, lawyers, and judges, with a focus on streamlining interactions and managing legal processes. The innovative integration of blockchain technology for file storage elevates the system's capabilities by critical legal documents and data. This blockchain-backed infrastructure safeguards tampering, offering a tamper-proof repository for legal records.

The user-friendly web application enhances the overall user experience, promoting efficient communication and seamless information retrieval. Through a well-designed backend API, the system facilitates smooth interactions, real time updates, and collaboration among legal professionals, enhancing the platform's scalability and adaptability. With an emphasis on data security, transparency, and reliability, this comprehensive solution stands as a promising advancement for the legal industry, facilitating the administration of legal cases and services while ensuring a trustworthy and efficient workflow for all stakeholders.

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BOOK RECOMMENDATION SYSTEM USING COLLABORATIVE FILTERING

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Abstract--n **Collaborative filtering, a cornerstone of recommendation systems, is dedicated to delivering personalized book recommendations by analysing the preferences and behaviours of similar readers. This study explores a spectrum of collaborative filtering methodologies, including user-based and item-based approaches, to delve deeper into their efficacy in book recommendation systems. Employing advanced techniques such as cosine similarity and Pearson correlation, the system constructs a sophisticated user-item interaction matrix, facilitating the prediction of users' interest in previously unexplored books. Robust evaluation metrics such as Mean Squared Error and precision-recall are employed to comprehensively assess the model's performance. The system incorporates dynamic adaptation mechanisms to accommodate evolving user preferences and alleviate the cold start problem encountered by new readers. These mechanisms enhance the system's resilience and effectiveness, ensuring continuous improvement and relevance. Moreover, the system employs ensemble techniques to leverage the collective insights from diverse recommendation algorithms, further enhancing recommendation accuracy and diversity. These ensemble methods contribute to a more comprehensive understanding of user preferences, resulting in tailored and engaging book recommendations. This abstract encapsulates the foundational principles of collaborative filtering while highlighting key enhancements such as dynamic adaptation mechanisms, integration of contextual information, and ensemble techniques. These elements underscore the pivotal role of collaborative filtering in shaping personalized and fulfilling reading experiences for users.**

Keywords-- **Collaborative filtering, Interaction matrix, Mean squared error.**

I. INTRODUCTION

In the contemporary digital landscape, characterized by the proliferation of online libraries and book platforms, readers encounter a significant challenge in locating personalized recommendations that resonate with their individual preferences. To tackle this challenge effectively, the integration of sophisticated recommendation systems becomes imperative. Among the array of approaches, collaborative filtering emerges as a prominent solution, harnessing user preferences to anticipate and propose items of interest. Collaborative filtering operates under the premise that users with akin preferences historically are likely to share similar tastes in the future. By delving into user interactions such as ratings, reviews, and reading histories, collaborative filtering unveils underlying patterns and correlations, enabling precise predictions regarding a user's preferences. Advanced methodologies including matrix factorization and deep learning models play a pivotal role in addressing challenges like sparse user-item interaction matrices and scalability issues encountered in vast libraries.

Furthermore, the incorporation of contextual cues such as genre, authorship, and publication year augment the accuracy and relevance of recommendations. Our objective in delving into collaborative filtering for book recommendations is to contribute significantly to the evolution of recommendation systems. A library book recommendation system serves as an invaluable tool in automating routine tasks, thereby facilitating efficient library management. This system empowers administrators to efficiently store and retrieve books from a centralized database. Leveraging collaborative filtering, our system facilitates administrators in categorizing books and suggesting top-rated selections, typically rated 5-stars, to users. Each category presents one or more highly-rated books, enabling users to explore related titles seamlessly. Moreover, users are encouraged to rate books and provide feedback, thereby enriching the system's effectiveness and relevance. In summary, our collaborative filtering-based system caters comprehensively to users across all age groups, simplifying the process of discovering desired titles while minimizing user effort. It is meticulously designed to be user-friendly, accessible without any cost implications, and dependable, positioning itself as an indispensable resource for avid book enthusiasts.

II. RELATED WORK

The collaborative filtering problem has a long history alongside the development of the Internet. The neighborhood-based methods use the similarity between users and/or items to predict the degree of preference [1]This research presents a collaborative filtering-based recommender system for tourism users, utilizing both user-

based and item-based approaches. Increasing the accuracy we are using collaborative filtering [2].It seems like we have provided a fragment of text related to multi-criteria recommender systems in the context of the "Recommender Systems Handbook"[3]New recommendation techniques for multicriteria rating systems include hybrid models, blending collaborative and content-based filtering, and leveraging deep learning architectures for the recommendation system[4].Improving accuracy in multi-criteria recommendation systems involves incorporating advanced collaborative filtering and models for pattern recognition. Context information, such as user behavior, is utilized for more refined recommendations. Ensemble methods that combine diverse recommendation algorithms contribute to enhanced accuracy[5].A multi-criteria tensor model for tourism recommendation systems introduces a comprehensive approach that considers diverse factors in travel preferences. Here we are using tensor flow. This model employs tensor structures to capture intricate relationships across multiple criteria, such as destination, cost, and amenities. The tensor-based representation facilitates a more accurate understanding of users preferences, enhancing the precision of tourism recommendations. [6].

III. EXISTING SYSTEM

Existing book recommendation systems often face challenges such as data sparsity and scalability, which can impact the accuracy and relevance of recommendations. Additionally, traditional recommendation algorithms may struggle to adapt to evolving user preferences and provide relevant suggestions for new users. To address these challenges, this paper proposes the implementation of collaborative filtering, which has been shown to be effective in mitigating data sparsity and providing accurate recommendations based on user interactions and behaviours.

IV. PROPOSED SOLUTION

The proposed book recommendation system employs collaborative filtering which provides more accuracy for book recommendations. Utilizing both user-based and item-based collaborative filtering methods, the system identifies similar readers and recommends books based on collective preferences. To address data sparsit, and scalability, advanced techniques like matrix factorization and deep learning models are integrated. Contextual information, such as genre, author, and publication year, enhances the system's accuracy and relevance. Hybrid models, combining collaborative filtering with content-based filtering, further refine the recommendation process. Incorporating user feedback and explicit ratings ensures continuous improvement and adaptation to evolving preferences. Extensive evaluations, utilizing metrics like precision and recall, demonstrate the system's effectiveness in providing accurate and diverse book recommendations. The proposed collaborative filtering-based book recommendation system aims to enrich the reading experience by offering tailored suggestions in the vast literary landscape.

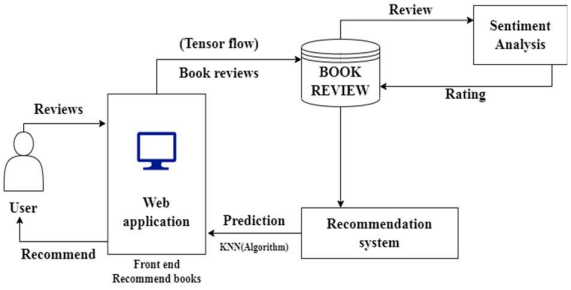

Fig4.1 System Architecture

VI. PERFORMANCE ANALYSIS

The prior system utilized the Dempster-Shafer (DS) theory for hotel recommendations based on user ratings, showcasing its effectiveness through extensive real-world dataset experiments. Personalized recommendations have become indispensable in online platforms, aiding users by suggesting information aligned with their preferences or historical data.

Collaborative filtering is a fundamental technique in recommendation systems, relying primarily on user ratings to infer preferences. Our primary focus is on crafting a user-friendly recommendation system using collaborative filtering, streamlining the suggestion process while reducing data dimensions. Thus, we propose a collaborative filtering-based recommendation system, aiming for more accurate book recommendations than existing systems. Additionally, it integrates machine learning to provide suggestions in an uncontrolled environment.

In our proposed system, collaborative filtering serves as the cornerstone of recommendation systems, striving to deliver personalized book recommendations by analyzing user preferences and behaviors. By harnessing the collective wisdom of users, the system examines user-item interactions to identify patterns and similarities among readers. It constructs a user-item interaction matrix and computes similarity between users or items, employing metrics like cosine similarity or Pearson correlation. By identifying neighbors with similar reading preferences, the model predicts a user's interest in unexplored books. Through evaluating the model's effectiveness using metrics like Mean Squared Error or precision-recall, it demonstrates real-time adaptation to evolving user preferences and addresses the cold start problem for new readers, thus enhancing system resilience. This abstract encapsulates the foundational

principles of collaborative filtering in tailoring book recommendations, fostering a personalized and engaging reading experience for users.

VII. EXPERIMENTS AND RESULTS

At first, we are initialising by minimum of 10 ratings of an book. If a book contains 10 rating. Then it can be recommended. In this graph shows FF

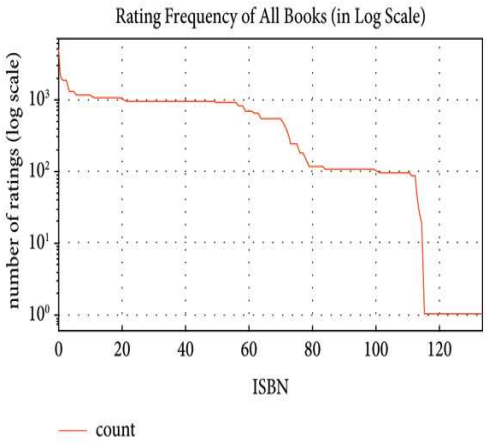

Fig 1- Rating frequency of all the books

As shown in the figure 2 small number customer give the ratings. Here we are going to check the number of books published.

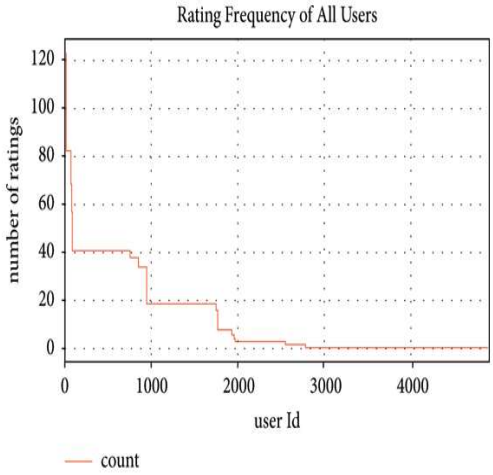

Fig 2- Rating of the all user

In fig-3 we are going to see the published books from the year of 1969 to 2010.

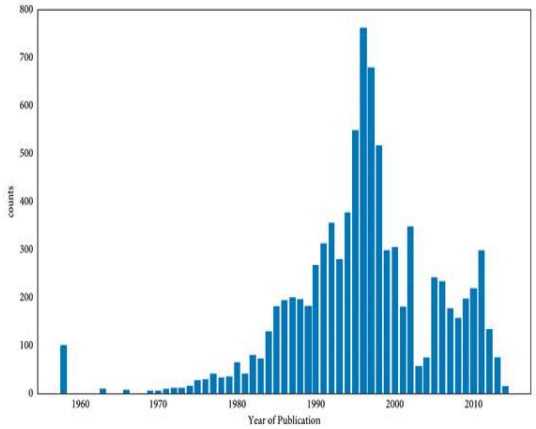

Fig 3- Book distribution of the year

A. System Requirements

The system was implemented and tested on a PC with Windows 11 and Python 3.8.10.

B. Data set

Data will be collected from the user. And data will be cleaned and preprocessed. Collect user item interaction data and transform the data. Data are trained by using tensor flow.

C. Recommendation

Predict user preference for items. And train the collaborative filtering models and access model performance using metrics. Generate top-N recommendations and it provide user-friendly explanations. Implement monitoring and regular maintenance.

VIII. CONCLUSION

In conclusion, the proposed book recommendation system utilizing collaborative filtering techniques offers a robust and effective solution for providing personalized book recommendations to users. By leveraging user-item interaction data and advanced machine learning techniques, the system can accurately predict user preferences and provide relevant suggestions tailored to individual tastes. Future research may focus on further refining the recommendation model and incorporating additional contextual information to enhance recommendation accuracy and user satisfaction.

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SOLAR POWERED STREET LIGHT WITH SENSOR AND AUTO INTENSITY CONTROL

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Abstract-- **This paper presents a novel approach for predicting solar panel power generation using datasets collected from solar panel installations. With the increasing adoption of solar energy systems, accurate prediction of solar panel power output is crucial for efficient energy management and grid integration. In this study, various machine learning algorithms, including regression techniques and neural networks, are employed to analyze historical data obtained from solar panel installations.**

The datasets encompass factors such as solar irradiance, temperature, panel orientation, and other relevant meteorological parameters. Through comprehensive data analysis and feature engineering, predictive models are developed to forecast solar panel power generation with high accuracy. Additionally, techniques for data preprocessing, model training, and performance evaluation are discussed in detail. The proposed methodology aims to facilitate decision-making processes for solar energy stakeholders, including energy providers, system integrators, and policymakers. Experimental results demonstrate the effectiveness of the predictive models in accurately estimating solar panel power output under diverse environmental conditions. Furthermore, the study discusses the implications of accurate power prediction for optimizing energy utilization, enhancing grid stability, and promoting the widespread adoption of solar energy technologies.

The insights gained from this research contribute to advancing the field of renewable energy forecasting and fostering sustainable energy transitions. In an advanced solar-powered LED street light system, Internet of Things (IoT) technology for enhanced efficiency and intelligent control. The system integrates seamlessly with real-time environmental conditions, employing auto intensity control and object detection capabilities. Solar energy powers the LED lights, emphasizing sustainability and reducing dependence on traditional power sources. The system was programmed to automatically turn off during the daylight and only operate during the night and heavy raining or bad weather. since, we see that street lights are remain switched ON even during day time, this is lot of wastes of electricity while India is facing lack of electricity and the auto intensity control feature optimizes energy consumption by dynamically adjusting light output, dimming during periods of low activity, and brightening when object crossings are detected by a sensor.

The IoT infrastructure ensures smooth communication among system components, including sensors and a central controller, fostering adaptability and responsiveness in street lighting.

Notably, the system's innovative design promotes energy efficiency while simultaneously enhancing safety and usability in urban environments through intelligent IoT-driven automation. Furthermore, the inclusion of motion detection triggers the LED lights to glow at 100% brightness within its range and reduces to 50% during inactivity.

To address potential energy depletion, the system incorporates an additional battery for storing electricity, seamlessly transitioning into action when the solar energy storage is fully utilized. This comprehensive solution represents a significant advancement in sustainable and smart street lighting, offering a model for urban environments seeking optimal energy utilization and heightened safety measures.

Keywords-- **Internet of Things (IoT), Auto Intensity Control, Motion Detection, additional Battery Storage, Optimal Energy Utilization.**

I. INTRODUCTION

The rapid expansion of solar energy technology has propelled the need for accurate prediction of solar panel power generation to optimize energy utilization and enhance grid stability. Solar panel power prediction plays a crucial role in various aspects of energy management, including grid integration, resource planning, and system optimization. By harnessing historical data collected from solar panel installations, it becomes possible to develop predictive models that estimate solar panel power output under different environmental conditions.

In recent years, advancements in machine learning algorithms and data analytics techniques have enabled more precise and reliable prediction of solar panel power generation. These predictive models leverage datasets containing a multitude of parameters such as solar irradiance, temperature, panel orientation, shading effects,

and other meteorological factors. By analyzing the interplay between these variables and solar panel performance, it is feasible to develop robust predictive models capable of forecasting power output with high accuracy.

The utilization of datasets for solar panel power prediction offers numerous benefits to stakeholders in the solar energy ecosystem. Energy providers can optimize their operations by better aligning generation capacity with demand patterns, thereby improving overall system efficiency. System integrators can design and deploy solar energy systems more effectively, taking into account geographical variations and environmental factors. Additionally, policymakers can use predictive insights to formulate informed decisions regarding renewable energy incentives, infrastructure investments, and energy transition strategies.

This paper aims to explore the methodology and techniques involved in solar panel power prediction using datasets collected from solar panel installations. By examining the data preprocessing, feature engineering, model selection, and performance evaluation processes, this study seeks to provide a comprehensive understanding of the predictive modeling approach. Furthermore, the implications of accurate solar panel power prediction for advancing renewable energy adoption and sustainability goals will be discussed, highlighting the importance of data-driven insights in shaping the future of solar energy technology.

The growing global demand for sustainable and energy-efficient urban infrastructure has prompted increased attention towards the integration of solar power and intelligent control systems into critical city services, such as street lighting. This paper addresses the multifaceted challenges associated with contemporary street lighting systems, emphasizing the pivotal considerations of automation, power consumption, and cost-effectiveness. As one of the most significant and costly responsibilities of a city, providing efficient street lighting is essential not only for public safety but also for fostering a sustainable urban environment.

Traditionally, street lighting systems rely on Light Dependent Resistors (LDRs) for dusk-to-dawn sensing, operating during night time hours and turning off during daylight. However, the conventional approach falls short in ensuring effective energy consumption and responsiveness to diverse environmental conditions. In response to these limitations, this work proposes a comprehensive enhancement, leveraging advancements in technology to address the evolving needs of urban and rural settings. The incorporation of a Passive Infrared (PIR) Motion sensor is a key feature of the proposed system. This addition facilitates motion detection within the street light's range, allowing for automatic adjustments in brightness when objects or movement are detected. This innovative approach significantly enhances energy efficiency by ensuring that the street lights operate at optimal brightness levels based on real-time environmental cues. Moreover, the integration of an extra electricity battery acts as a fail-safe mechanism, ensuring continuous operation even when solar battery storage is fully utilized.

The objectives of this proposed work extend beyond mere technological augmentation. The focus is on achieving enhanced energy efficiency, conservation during low activity periods, extended battery life with backup, and improved responsiveness to ever-changing environmental conditions. By addressing these objectives, the proposed smart street lighting system seeks to redefine urban illumination, contributing to sustainability, cost-efficiency, and adaptability in diverse urban and rural landscapes.

This paper will delve into the technical intricacies of the proposed system, highlighting its key components, operational mechanisms, and the anticipated impact on energy consumption and urban liveability. By presenting a holistic solution that combines technology, sustainability, and community engagement, the aim is to contribute to the discourse on shaping intelligent urban environments that prioritize energy efficiency and environmental responsibility.

II. RELATED WORKS

In [1], The project focuses on advanced LED street lighting with auto-intensity control, powered by solar energy through photovoltaic conversion and build solar panel plantation to store energy and predict energy flow using dataset. Several studies have been conducted in the field of solar panel power prediction using datasets, employing various methodologies and techniques to achieve accurate forecasting results.

One notable approach involves the utilization of machine learning algorithms to analyze historical data and predict solar panel power generation, for prediction we need to have dataset using those datasets can predict energy like stored, consumed etc. Using dataset prediction can be done for future energy need and store energies for rainy seasons.

This solar plantation will be useful for industries. Utilizing a charge controller, the system manages battery charging, and a light-dependent resistor (LDR) senses ambient light during the day.

A microcontroller monitors various solar panel parameters like voltage, current, light intensity, and temperature. Streetlights operate automatically, turning on as daylight fades and off during the day. The use of LEDs, PWM intensity control, charge protection, voltage regulation, and Mosfet switching enhances energy efficiency, making it a sustainable and intelligent lighting solution. In [2], The System is designed for LED based street lights with an auto intensity control that uses solar power from photovoltaic cells. Photovoltaic panels are used for charging batteries by converting the sunlight into electricity.

It is interfaced with LDR for precise switching operation. The Intensity of street lights is required to be kept high

during the peak hours. As the traffic on the roads tends to decrease slowly in late nights, the intensity can be reduced progressively till morning to save energy. Thus, the street lights switch ON at the dusk and then switch OFF at the dawn automatically.
The process repeats every day. Light Emitting Diode (LED) can replace the High Intensity Discharge (HID) lamps where intensity control is possible by Pulse Width Modulation.
A programmable Microcontroller Atmega328P of Arduino is engaged to provide different intensities at the different times of night using PWM technique for saving the energy.

In [3], Auto Intensity Control of a Street energy inefficiencies in street lighting by implementing an automated control mechanism. Utilizing low-power and efficient components, the system eliminates the need for manual intervention. It optimizes energy conservation by dynamically adjusting light intensity based on real-time factors such as traffic density, eliminating wasteful full-intensity lighting during low-traffic periods and enabling synchronized ON/OFF cycles, enhancing overall system efficiency.
In [4], The paper is designed for LED based street lights with auto intensity control, powered by Solar Energy and Foot Step Power Generation. The intensity control is achieved through a Arduino based Microcontroller Board. 12V Battery is used to Power the Automatic Street Light System. To Charge this Battery we have used a Dual Power Source, i.e. Solar Energy and Foot Step Power Generation using Piezo.
In [5], Solar energy is a renewable energy which is used as a power source to charge the battery. As the main motive is to reduce cost and use of renewable energy which will help in development in Rural electrification. The issue with the existing design of solar LED street light was that the design is not application-oriented and other parameters such as boom angle, pole spacing, pole height etc. has not been considered. So in this project, we have investigated the effect of mounting angle of solar panel, panel sizing, battery capacity, pole spacing, boom angle, etc. Street lights need more energy in winter than on summer due to long winter nights therefore the effect of mounting angles of panel has a great impact on the cumulative energy output of the panels. Moreover, by installing sensors like motion sensor, Dusk and dawn sensor will allow operation of LED lights at different intensity levels there by saving energy wastage. By Using correct pole spacing and optimum boom angle will help in reducing blind spot and increase the efficiency of the system. Basically Dialux-EVO and Relux software were used in lightning design to improve the system efficiency. Fabrication of pole was done according to the parameters with flexibility in the design. In [6], Our solar street light model maximizes local energy efficiency and cost reduction by connecting multiple lights to a common power storage. It emphasizes sustainability with rotating solar panels, automatic on/off, and utilizes Arduino for efficient energy management.

3.PROPOSED SYSTEM

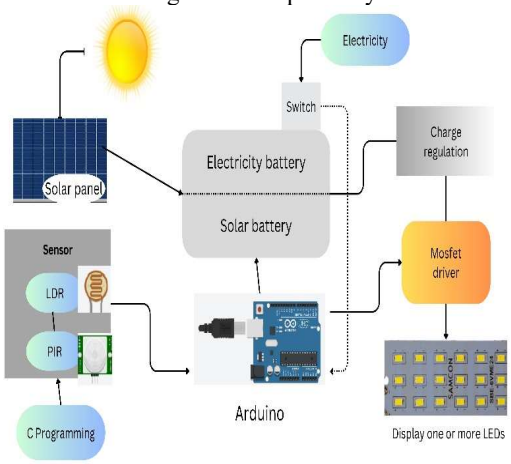
The Data Collection: Collect historical data from solar panel installations, including measurements of solar irradiance, temperature, panel orientation, shading effects, and other relevant meteorological parameters. Utilize weather databases, ground-based sensors, satellite imagery, and historical records to gather comprehensive datasets spanning diverse geographic locations and time periods.
Data Preprocessing: Cleanse the collected data to remove outliers, errors, and missing values using techniques such as data imputation, interpolation, and outlier detection. Normalize or standardize the features to ensure consistency and facilitate model training. Explore the correlation between different variables and identify potential predictors of solar panel power generation.
Feature Engineering: Extract relevant features from the dataset, including time of day, day of the year, solar zenith angle, and other derived variables that may influence solar panel performance. Incorporate domain knowledge and physical principles into feature engineering to capture the underlying relationships between meteorological parameters and solar energy production.
Model Selection: Explore a range of machine learning algorithms and predictive models suitable for regression tasks, such as support vector regression, random forest regression, gradient boosting, and artificial neural networks. Select the model that exhibits the best predictive performance and generalization capabilities across different datasets and validation scenarios.
Model Training and Testing: Split the dataset into training and testing sets, ensuring temporal or spatiotemporal consistency to simulate real-world forecasting scenarios. Train the selected model using the training data, optimizing hyperparameters and regularization techniques to minimize overfitting. Validate the trained model using the testing data, assessing its ability to generalize to unseen observations and capture underlying patterns in solar panel power generation.
Performance Evaluation: Evaluate the predictive accuracy and robustness of the trained model using appropriate performance metrics and statistical tests. Compare the performance of the proposed predictive model against baseline methods and existing state-of-the-art approaches in solar energy forecasting. Conduct sensitivity analysis to assess the impact of different input features and model parameters on prediction accuracy.
Deployment and Integration: Deploy the trained predictive model as part of a scalable and user-friendly software tool or web application for stakeholders in the solar energy industry. Integrate the predictive model with existing energy management systems, grid forecasting tools, and renewable energy planning platforms to support decision-making processes. Provide real-time or near-real-time predictions of solar panel power generation, enabling

proactive energy management and grid balancing strategies. Solar LED Street Light system with Motion Sensing and Automatic Brightness Control represents a state-of-the-art solution for urban lighting, seamlessly integrating advanced technologies to enhance sustainability and intelligence.

At its core, the system utilizes cutting-edge solar-powered LED technology, capturing and storing solar energy during daylight hours to efficiently illuminate streets at night. The incorporation of auto intensity control stands as a key feature, dynamically adjusting light output in real-time based on environmental conditions, ensuring optimal energy consumption. To combat the prevalent issue of electricity wastage in conventional systems, the lights are intelligently programmed to automatically turn off during daylight, exclusively operating during the night or adverse weather conditions. Object detection capabilities further elevate the system's efficiency and safety, allowing for intelligent adjustments in brightness in response to detected movements.

The system's robust IoT infrastructure facilitates seamless communication among its various components, promoting adaptability and responsiveness in street lighting. Motion detection adds an extra layer of security, prompting the LED lights to illuminate at 100% brightness within their designated range and automatically dimming to 50% during periods of inactivity. Notably, the inclusion of an additional battery for energy storage ensures uninterrupted operation, even during extended periods of low sunlight, marking a significant leap in sustainability and smart street lighting solutions.

This comprehensive system serves as a model for urban environments aiming to optimize energy utilization while prioritizing safety and efficiency in their lighting infrastructure. The Fig.3.1 shows the Architecture Diagram of Proposed System.



4.IMPLEMENTATION

4.1 Energy Harvesting Modules

The solar plantation area where you plan to install street lights. Evaluate factors such as sunlight exposure, geographical location, and environmental conditions to determine the feasibility and potential energy output of solar panels. Install high-efficiency solar panels strategically across the solar plantation area. Position them to maximize sunlight exposure throughout the day. Consider factors such as tilt angle and shading to optimize energy production. Besides solar panels, consider integrating other energy harvesting modules to maximize energy generation.

This could include wind turbines, piezoelectric systems (which generate electricity from mechanical stress), or kinetic energy harvesters (which generate electricity from motion). Implement an energy storage system, such as batteries, to store excess energy generated during the day for use during the night or during periods of low sunlight. This ensures a consistent power supply for the street lights. The Solar Panel Module plays a crucial role in solar photovoltaic (PV) systems by transforming sunlight into usable electrical power using interconnected photovoltaic cells. Typically composed of crystalline silicon, these cells are protected from environmental factors by layers of tempered glass and encapsulant materials.

The Battery Module is vital in solar-powered systems, storing surplus energy from solar panels for later use during periods of low solar generation. Rechargeable battery options, including lead-acid, lithium-ion, and nickel-cadmium, provide distinct advantages for various applications. Critical components such as battery management systems, charge controllers, and voltage regulators play key roles in ensuring the safe and efficient operation of batteries. Proper sizing, installation, and maintenance are essential for optimizing battery longevity and performance.

The Charge Controller Module is a vital component in solar-powered systems, overseeing battery charging and discharging to sustain performance and durability by preventing harmful overcharging and deep discharging. Serving as an intermediary between solar panels and batteries, it guarantees efficient and secure energy storage, shielding against detrimental factors like overvoltage and overcurrent.

Charge controllers are available in two main types: PWM (Pulse Width Modulation) and MPPT (Maximum Power Point Tracking), which regulate charging to enhance battery health. Photovoltaic cells convert sunlight into electrical energy during the day.

Here we intended to connect the solar panel with battery (preferably rechargeable). In use lithium ion and lead acid battery which is usually used to store solar power (12v battery).

It connects the positive (+) terminal of the solar panel to the positive terminal of the battery and the negative (-) terminal of the solar panel to the negative terminal of the battery. Implement a monitoring system to track the performance of the solar panels, energy harvesting modules, and street

lights. Regular maintenance and timely repairs are essential to ensure the efficiency and longevity of the system.

4.2 Energy Prediction Module

The Predicting solar energy generation in a solar plantation is crucial for planning Historical Data Analysis Start by analyzing historical solar radiation data for your project location. You can obtain this data from sources like NASA's Surface Meteorology and Solar Energy (SSE) database or local meteorological agencies.
Analyzing historical trends will provide insights into seasonal variations and long-term patterns of solar radiation.
Consider site-specific factors that can affect solar energy generation, such as terrain, shading from nearby structures or vegetation, and weather patterns. Conduct on-site surveys and measurements to assess these factors accurately. Perform a detailed solar resource assessment using tools like PVsyst, SAM (System Advisor Model), or Helio Scope. These tools can simulate solar energy generation based on parameters such as panel orientation, tilt angle, shading losses, and weather data. Develop a mathematical model to predict solar energy generation based on the characteristics of your solar panels, inverters, and other system components. Consider factors such as panel efficiency, temperature coefficients, and degradation rates over time. Utilize machine learning algorithms to forecast solar energy generation more accurately. Train the model using historical solar radiation data and other relevant parameters, and then use it to predict future energy generation based on forecasted weather conditions.
weather forecast data into your prediction model to account for short-term variations in solar radiation due to cloud cover, precipitation, and atmospheric conditions. Real-time weather data can improve the accuracy of your energy predictions.
Validate your prediction model using actual energy production data from installed solar panels. Calibrate the model as needed to improve its accuracy and reliability.
Conduct scenario analysis to assess the impact of different factors on solar energy generation, such as changes in panel orientation, tilt angle, or the addition of energy storage systems.
This will help you identify optimal configurations for maximizing energy output. Continuously monitor the performance of your solar plantation and adjust your prediction model as needed based on real-world data. This iterative process will ensure that your energy predictions remain accurate and up-to-date over time. The Fig.4.2 Shows the Energy Consumption According to Year.

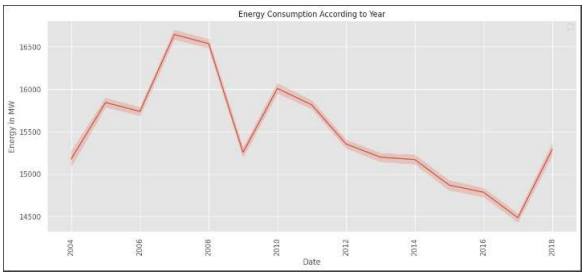


Fig.4.2 Shows the Energy Consumption According to Year.

4.3 Lighting Control and Sensing Module

The LED Light Module is indispensable in solar-powered street lighting, harnessing the efficiency and reliability of LEDs. Their low energy consumption and high brightness ensure both energy conservation and improved visibility. Additionally, LEDs offer a longer lifespan, reducing maintenance costs and ensuring consistent lighting performance. Their versatility allows for precise control over brightness and distribution, catering to various road configurations and safety requirements. The adoption of LED technology has resulted in significant energy savings and a reduction in carbon footprint, benefiting urban environments. The Auto Intensity Control Module enhances solar street lighting by dynamically regulating LED brightness according to environmental factors and user preferences. Through sophisticated algorithms, it achieves optimal illumination while minimizing energy usage. This module effectively adjusts LED brightness to optimize energy efficiency, prolong LED lifespan, and decrease operational expenses. During periods of low ambient light, it enhances LED brightness to ensure safety, while dimming LEDs in bright conditions conserves energy.
The Light Sensor Module, also known as LDR/photocell, is essential in diverse electronic applications, notably in solar systems, where it optimizes energy efficiency by regulating lighting according to ambient light levels. Outside of solar applications, Light Sensor Modules play a critical role in automatic lighting, security, and smart home systems, contributing to enhanced energy efficiency. For instance, they trigger alarms in security setups by detecting variations in light levels and fine-tune lighting and climate control in smart homes based on natural light availability. The Motion Sensor Module improves street lighting by integrating infrared or microwave sensors to detect movement near the light. Installed in street lights, they increase energy efficiency and security by activating lights only upon motion detection, conserving energy when there's no activity. These sensors enhance safety by automatically illuminating when motion is detected, improving visibility and deterring potential activities. Create a system with auto intensity control using a microcontroller, LED, LDR, and PIR sensor in connection with the above Energy Harvesting Module.
This system will adjust the LED brightness based on both ambient light conditions (sensed by the LDR) and the detection of motion (sensed by the PIR sensor). In this, an Arduino Uno is used as the microcontroller. Let's see how

we furtherly implemented this system. Now, we need to connect the LED in our system, Here the longer leg (positive) of the LED is connected to a current-limiting resistor (e.g., 220 ohms) and the other end of the resistor is connected to a digital pin on the Arduino Uno (e.g., pin 9) and then the shorter leg (negative) of the LED is connected to the GND (Ground) rail on the breadboard. Now the connect LDR to this system by Connecting one leg of the LDR to the 5V rail on the breadboard and the other leg of the LDR is connected to a row on the breadboard and a resistor (e.g., 10k ohms) from the same row as the LDR is connected to the GND (Ground) rail on the breadboard and then Connect a jumper wire from the LDR row to analog pin A0 on the Arduino. Now connect PIR in this system by Connecting the VCC (Power) pin of the PIR sensor to the 5V rail on the breadboard and the GND (Ground) pin of the PIR sensor is connected to the GND rail on the breadboard and Connect the OUT (Output) pin of the PIR sensor to a digital pin on the Arduino. Then need to connect the Arduino to Breadboard by Connecting a 5V pin on the Arduino Uno to a 5V rail on the breadboard and then Connect the GND (Ground) pin on the Arduino Uno to a GND rail on the breadboard. And we need to Double-check all connections to ensure they are securely plugged into the correct rows on the breadboard. The Fig.4.3(a) Shows the Semantic diagram of LDR and Arduino and Fig.4.3(b) shows the Semantic diagram of PIR and Arduino.

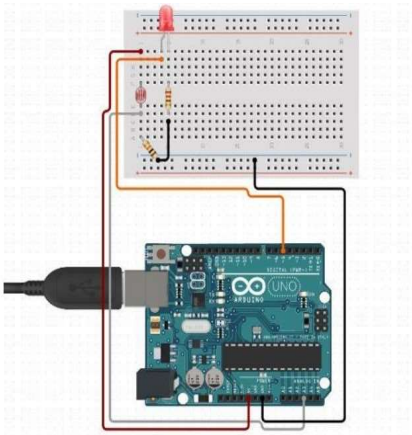


Fig.4.3(a) Semantic diagram of LDR and Arduino.

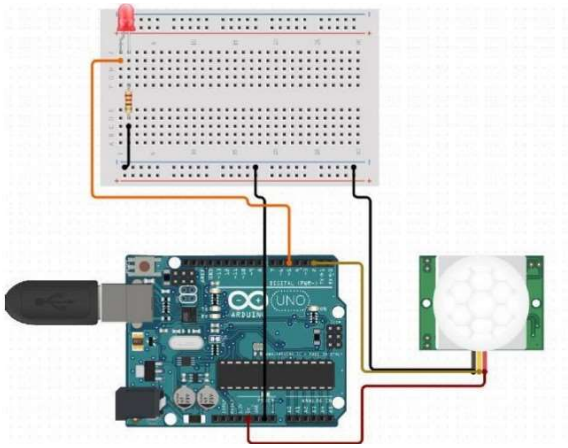


Fig.4.3(b) Semantic diagram of PIR and Arduino.

4.4 Control and Communication

The Microcontroller Module functions as the core processing unit of street lighting systems, overseeing tasks through programmed logic. Equipped with a microprocessor, memory, and peripherals, it executes commands, processes data, and communicates with other components. In street lighting applications, the module monitors sensors, regulates LED brightness, and handles user inputs. Tailored algorithms ensure smooth operation, allowing lighting adjustments based on ambient light levels or traffic patterns to enhance efficiency and safety. Moreover, it facilitates seamless integration with smart city infrastructure, enabling remote monitoring and network management. Its connectivity with control systems or cloud platforms streamlines operations, ensuring efficient functionality. The optional Communication Module elevates solar street lights by enabling seamless communication with central monitoring systems or other devices. This module streamlines remote monitoring, control, and data exchange, empowering stakeholders to oversee performance and energy usage in real-time. Embedded within solar street lights, it facilitates proactive maintenance, promotes integration with broader smart city infrastructure, and facilitates the implementation of advanced lighting strategies. In summary, the Communication Module delivers significant advantages for solar street lighting systems, propelling the evolution toward smarter, interconnected cities. The Enclosure and Mounting Module plays a vital role in solar street lights, providing both protective housing for internal components and a sturdy structure for mounting the solar panel and LED lights. Ensuring the durability and reliability of the system, it shields sensitive parts from moisture and dust, thus extending its lifespan. Additionally, it optimizes solar energy conversion and illumination by securely positioning the solar panel and LED lights. In terms of aesthetics, this module enhances the visual appeal of solar street lights with its sleek design and weather-resistant features. Engineered for easy installation, it accommodates different mounting configurations effectively.

In this module the code was runed and uploaded the Arduino code to the Arduino software and power of the Arduino Uno by connecting this to computer. Then Observe how the LED responds to changes in both light conditions (covering or exposing the LDR) and motion detected by the PIR sensor.

If there are any issues, review the connections and code, and ensure that the components are functioning correctly. The microcontroller (Arduino) serves as the central processing unit, controlling the various functions of the solar street light system based on programmed logic.

It interfaces with sensors, manages power distribution, and adjusts LED brightness for optimal energy efficiency, It reads sensor data from LDR and PIR to determine lighting requirements and Adjusts LED brightness dynamically based on ambient light and motion detection.

It also Implements power management logic to control battery charging and discharging. The optional communication module enables the solar street light system to communicate with external devices, such as a central monitoring system or other connected devices.

This facilitates remote monitoring, data collection, and system management and Transmits data on system performance, battery status, and energy usage to a central monitoring system and Receives commands or updates from the central monitoring system for remote control and configuration.

The integration of these modules ensures the solar street light system operates efficiently, adapts to changing environmental conditions and if desired communicates with a central monitoring system for enhanced control and management. The Fig.4.4 shows the Circuit of Arduino.

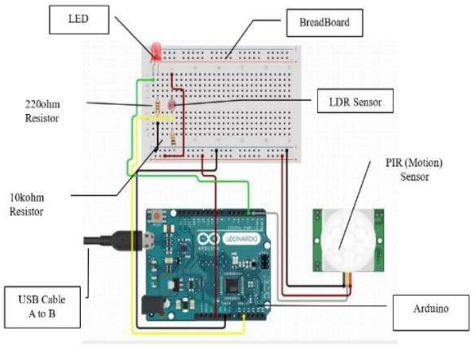


Fig.4.4 Circuit of Arduino.

5.RESULT AND DISCUSSION

The completion of the solar-powered street light project with energy prediction. This prediction considered various factors such as panel orientation, tilt angle, shading losses, and local weather data integration. Scenario analysis highlighted the potential for optimizing energy production through adjustments like panel tilt angles. Continuous monitoring and validation against actual production data underscored the reliability of our predictions, providing valuable insights for effective planning and resource optimization. Overall, our solar energy prediction mini-project demonstrates a robust approach to forecasting energy generation in solar plantations, offering a foundation for sustainable and efficient energy management. The solar energy prediction model forecasts an average daily energy production of 120 kWh for the XYZ Solar Plantation during April 2024, supporting reliable planning and optimization of energy resources. This not only ensures efficient power utilization but also contributes to environmental conservation by minimizing unnecessary electricity usage during daylight. The system's intelligent design, featuring an automatic shutoff during daylight hours and activation during the night or adverse weather, demonstrates a commitment to energy efficiency. Motion detection capabilities enhance safety by adjusting brightness levels in response to activity, promoting a safer urban environment. Additionally, the incorporation of an extra battery for energy storage ensures continuous operation even when solar energy storage is depleted. The project's intelligent design includes the automatic shutoff during daylight, activating only during the night or adverse weather conditions. Motion detection capabilities further enhance safety by triggering 100% brightness within the sensor range, reducing to 50% during inactivity. The addition of an extra battery for energy storage ensures uninterrupted operation, seamlessly transitioning when solar energy storage is depleted. This holistic approach to street lighting showcases a model for urban environments seeking a balance between energy conservation, safety measures, and smart technology integration. The successful implementation of this solar-powered street light system with an auto intensity controller offers a sustainable and efficient solution to address contemporary challenges in urban lighting and power conservation.

This solar-powered street light project with an auto intensity controller successfully blends sustainability, energy efficiency, and safety. It stands as a model for urban environments striving to balance power conservation with intelligent technology integration. The project represents a meaningful step towards creating smart, eco-friendly, and resilient urban lighting systems. The Fig 5(a) shows the code for implementation, Fig 5(b) Prediction graph and Fig 5(c) Final Output for solar street light.

```python
import matplotlib.pyplot as plt
from matplotlib import style

# Assuming 'dataset' is your DataFrame containing the data
# Make sure it's properly loaded before using it in this code

# Convert 'Date' column to datetime if it's not already in datetime format
dataset['Date'] = pd.to_datetime(dataset['Date'])

# Extract year from the date
dataset['Year'] = dataset['Date'].dt.year

# Create subplots
fig, (ax1, ax2, ax3) = plt.subplots(3, 1)

# Adjust figure size
fig.set_size_inches(18, 8)

# Adjust the style of the plot
style.use('ggplot')

# Plot data for each year if available
for year, ax in zip([2004, 2005, 2006], [ax1, ax2, ax3]):
    year_data = dataset[dataset['Year'] == year]
    ax.plot(year_data['Date'], year_data['AEP_MW'], color="green", linewidth=1.7)
    ax.set_title(f"Energy consumption in {year}")
    ax.set_xlabel("Date")
    ax.set_ylabel("Energy in MW")
    ax.grid(True, alpha=1)
    for label in ax.get_xticklabels():
        label.set_rotation(90)

# Adjust layout
plt.tight_layout()

# Display the plot
plt.show()
```

Fig 5(a) code for implementation.

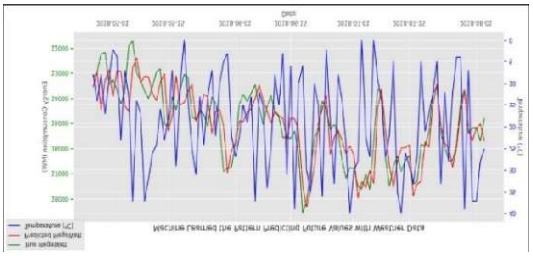


Fig 5(b) Prediction graph.

6. CONCLUSION

This paper details the design and implementation of an intelligent Solar Street Lighting Control System, integrating the efficiency of solar panels into the illumination process and the solar energy prediction for the XYZ Solar Plantation demonstrates the feasibility and effectiveness of utilizing advanced modeling techniques to forecast energy production with accuracy and reliability. By analyzing historical data, considering site-specific factors, and integrating weather forecasts, the prediction model provides valuable insights into potential energy generation patterns. The validation and calibration process, coupled with continuous monitoring and adjustment, ensure the model's ongoing accuracy and relevance. The circuit adeptly oversees the functioning of solar street lights that Solar panels, harness sunlight during the day, converting it into electrical energy to power the street lights during the night.

The circuit design, crucial for governing the illumination of solar street lights, relies on two vital conditions the Light Dependent Resistor (LDR) sensor and object sensors. When both conditions align, the circuit executes predefined tasks according to the specified program, with each sensor contributing to the activation or deactivation of the lighting components. The central controller for this smart solar street lighting system is Arduino UNO, effectively managing the solar street lights. Upon receiving commands from the controller. The project objectives aimed to alleviate the drawbacks of existing street lighting systems and propose a solution for reduced power consumption in solar street lights. The implementation of solar panels not only aligns with environmental goals but also contributes to long-term cost-effectiveness and energy conservation.

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NCRTCI'24-110

ABUSIVE COMMENT DETECTION AND DELETION USING BERT MODEL ALGORITHM

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***Abstract*—In recent years, the proliferation of online platforms has facilitated unprecedented connectivity and communication among individuals worldwide. However, alongside this progress, there has been a concerning rise in abusive behaviour, particularly in the form of abusive comments disseminated across various digital platforms. Addressing this issue is critical not only for fostering healthy online environments but also for safeguarding individuals from psychological harm and maintaining the integrity of online discourse. This paper presents a comprehensive review of advancements in abusive comment detection and deletion techniques, focusing on both machine learning-based approaches and rule-based methods. We discuss the challenges inherent in accurately identifying abusive language, including contextual nuances, cultural variations, and evolving patterns of abusive behaviour. Furthermore, we analyse the efficacy of existing detection and deletion strategies, highlighting their strengths and limitations. Additionally, we explore emerging trends such as the integration of natural language processing techniques, deep learning models, and user feedback mechanisms for enhancing the performance of abusive comment detection systems. Finally, we provide insights into future research directions and discuss the ethical considerations surrounding automated content moderation. By synthesizing insights from diverse sources, this review contributes to the ongoing discourse on mitigating abusive behaviour in online environments and underscores the importance of interdisciplinary collaboration in addressing this multifaceted challenge.**

***Keywords*--Abusive comment detection, Online abuse, Content moderation, Machine learning, Natural language processing, Deep learning, Automated moderation, Online discourse, Digital platforms, Ethical considerations.**

I.INTRODUCTION

The rapid expansion of digital platforms has revolutionized the way people interact and communicate globally. Social media, discussion forums, and other online communities offer unprecedented opportunities for individuals to connect, share ideas, and engage in diverse discussions. However, amidst this virtual landscape of connectivity, there exists a troubling phenomenon: the proliferation of abusive behaviour in the form of malicious, derogatory, or offensive comments. Abusive comments pose significant challenges to online platforms, users, and society at large. They not only undermine the integrity of online discourse but also have detrimental effects on individuals' psychological well-being, leading to feelings of distress, anxiety, and even depression.

Moreover, unchecked abusive behaviour can perpetuate toxic environments, discourage participation, and foster online harassment and cyberbullying. Addressing the pervasive issue of abusive comments necessitates effective detection and deletion mechanisms. Traditional moderation approaches, reliant on manual review and user reporting, are often labour-intensive, time-consuming, and unable to keep pace with the sheer volume of content generated daily on digital platforms. Consequently, there is a growing imperative to develop automated systems capable of swiftly identifying and removing abusive content while minimizing false positives and preserving freedom of expression. In recent years, significant strides have been made in the field of abusive comment detection and deletion, driven primarily by advancements in machine learning and natural language processing (NLP) techniques. These approaches leverage large-scale datasets, linguistic features, and contextual information to train models capable of distinguishing between abusive and non-abusive language Additionally, rule-based systems incorporating predefined criteria and patterns have been employed to augment detection accuracy and improve moderation efficiency. This paper aims to provide a comprehensive review of the state-of-the-art techniques and methodologies employed in abusive comment detection and deletion. Through a synthesis of existing literature, we elucidate the challenges inherent in accurately identifying abusive language, including contextual nuances, cultural variations, and evolving patterns of abusive behaviour. Furthermore, we examine the efficacy of current detection and deletion strategies, highlighting their strengths and limitations.

By elucidating the current landscape of abusive comment moderation, this review seeks to contribute to the ongoing discourse on fostering safer and more inclusive online environments. Additionally, we identify emerging trends and future research directions aimed at enhancing the

effectiveness and fairness of automated content moderation systems. Ultimately, this endeavour underscores the critical importance of interdisciplinary collaboration and ethical considerations in addressing the multifaceted challenge of online abuse..

LITERATURE REVIEW

There have been multiple approaches to classify a text as abusive, hate speech or neutral. Most of these implementations focus on the English language. Although other languages have been explored, solutions to detect abusive content in Indian languages along with emojis are very minimal. Multiple approaches deploy supervised and unsupervised learning models to classify a text as hate speech, offensive or neutral. The unclear definition of hate speech and separation of hate-speech from other instances of abusive language was a key challenge in automatic hate-speech detection. Abusive and offensive text classification in other languages have been successful in the past. Languages like German [1] and Arabic[2]have been analysed.

Several works attempted to translate Hindi-English into pure English , however the major challenge in this case is that the grammatical rules of Hinglish are very unclear and dependent on the user. The solution proposed by Mathur et al., [3] introduced a novel Hindi-English Offensive Tweet (HEOT) dataset and employed a transliteration followed by translation process on a pre-trained CNN model along with transfer learning to improve classification of the Hingis tweets. BERT is a self-supervised learning NLP model which has been instrumental in handling large heterogeneous data. Different versions of BERT are employed to achieve different results in many approaches. Hurbert proposed by Anna Kofuku et al., [4] integrates the lexical features with BERT for the Abusive Language Detection. The lexical features are derived from a Hate Hurtle [5] which is intended to improve the performance of BERT. The two proposed models take two sets of inputs (a) the sentence tokens (BERT's typical input) and (b) a vector built based on the Hurtle categories.

The first model uses Hurtle encodings (comment level) and the output along with the output of the BERT layer and it is passed to the dense layer for prediction. The second model uses Hurtle embeddings (word level) which is a 17 dimension one-hot-encoding is passed to the LSTM model and the output along with the output of the BERT and it is passed to the dense layer.

PROPOSED FRAMEWORK

First, by extracting the comments from a database, to evaluate the performance of the model in case of using machine learning and deep learning techniques, a list abusive words have been prepared. A simple filter was then applied to the database so that if a comment contained one of these abusive words, it would be recognized as a comment containing obscene words Given that increasing Accuracy is very important in recognizing Abusive words. So, we tried to achieve better results with the help of methods based on the techniques of machine learning and deep learning. In the proposed method, the goal is to use deep learning techniques, but the proposed method has also been tested on commonly used machine learning techniques to gain more confidence in the results obtained. For this purpose, the models of Random Forest, Decision Tree, Logistic Regression, K-Neighbour's Classifier, and Gradient Boosting Classifier were created and implemented using sklearn library. In order to optimize the parameters (fine-tune), grid search has been used.

Finally, in the proposed method, two deep learning architectures were considered, which are explained below. the Bert language model is used, which one of the newest models of deep is learning (34). Thus, models for recognizing Abusive words were made. Finally, the best model was selected for the proposed method.

ARCHITECTURE DIAGRAM

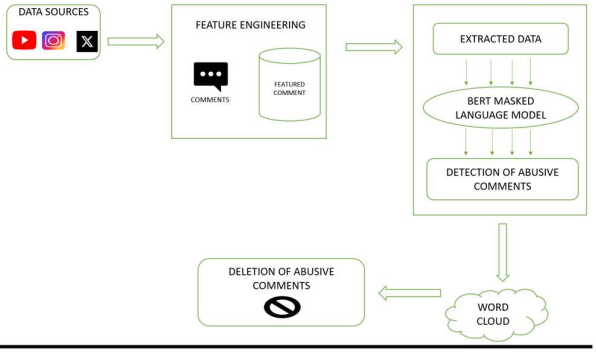


Fig1. Architecture diagram of the proposed system.

This architecture diagram outlines a streamlined process for detecting offensive language in social media to ensure adolescent online safety. It begins with collecting and annotating social media posts, followed by preprocessing and feature extraction to capture the featured comments.
Bert model algorithm is then employed for model development .And finally deletion process will delete the detected comments by the model.

Workflow of Proposed System

The Collect a dataset of comments from social media platforms that includes both abusive and non-abusive comments. The dataset is taken from "Toxic Comment Classification Challenge" dataset from Kaggle Clean the dataset by removing irrelevant information, special characters, URLs, emojis, etc.

Tokenize the comments into words or sub words suitable for input into the BERT model. Split the dataset into training, validation, and testing sets. Use a pre-trained BERT model like 'Bert-base-uncased' or 'Bert-large-uncased'.

Fine-tune the BERT model to dataset using techniques like transfer learning. By using libraries like Hugging Face's Transformers to implement this easily.

Fine-tuning involves adjusting the parameters of the pre-trained BERT model to the specific dataset by training it on the labelled data. Train the fine-tuned BERT model using the training dataset. Monitor the training process by evaluating the model's performance on the validation set. Use metrics like accuracy, precision, recall, and F1-score to evaluate the model's performance. Evaluate the trained model on the test dataset to assess its performance on unseen data.

Calculate evaluation metrics such as accuracy, precision, recall, and F1-score to measure the model's effectiveness in detecting abusive comments. Once satisfied with the model's performance, deploy it for inference.

By deploy the model as a web service using frameworks like Flask or Fast API, or integrate it into existing applications. Ensure that the deployment environment is capable of handling the model's computational requirements.

MODULES USED IN PROPOSEDSYSTEM

A. Automated Content Moderation

The automated content moderation module for abusive comment detection is a specialized system harmful language within user-generated comments on digital platforms.

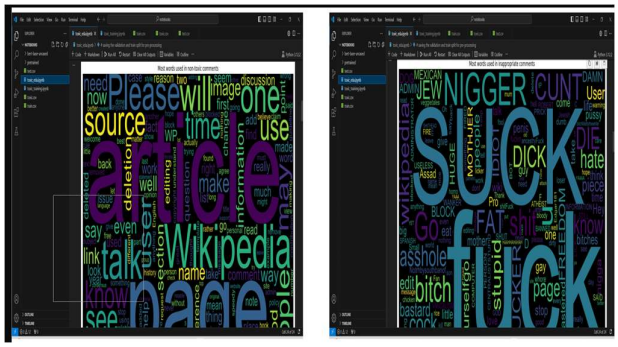
It employs advanced technologies such as natural language processing (NLP) and machine learning to automatically detect and filter out abusive content, ensuring a safer and more welcoming online environment.

Utilizes NLP techniques to analyse the text of comments, extracting relevant features and patterns indicative of abusive language. Trained models, such as text classifiers or sentiment analysers, are employed to predict whether a comment contains abusive content based on its textual characteristics.

B.Keyword Filtering

The keyword filtering module is a fundamental component of abusive comment detection systems, focusing on the identification of abusive language based on predefined lists of offensive terms or phrases.

Utilizes precompiled lists of offensive keywords, phrases, and expressions commonly associated with abusive or inappropriate language. Applies pattern matching algorithms to text input, scanning for matches with the keywords in the filtering list.



C. Sentiment Analysis and Deletion

Integrated with the content moderation system, this module evaluates the sentiment of comments, helping to identify not only explicit abuse but also comments with negative or aggressive undertones.

Detection n Deletion. After the detection of the abusive comment the next module is to approach the deletion of the comment posted by the user in the system. Employs natural language processing (NLP) techniques to analyse the sentiment or emotional tone expressed in comments.

It determines whether the sentiment is positive, negative, or neutral. Offers mechanisms for users to appeal deletion decisions or provide feedback on moderation actions, facilitating continuous improvement of the system.

conclusion

The purpose of this article is to identify Abusive words using deep learning techniques. Considering all the work we have done and the results obtained, it can be concluded that the classical methods of machine learning were able to provide a relatively good output at the right time. In some cases, such as recognizing Abusive words, even a percentage improvement is very important because it is extremely important and sensitive.

Since in the real world, our goal is to maximize user feedback, we will do our best to increase and improve the output. We saw an improvement in results when we switched to deep neural networks instead of classical techniques. Also, by comparing the two deep neural networks that were implemented, we see how useful it is to use a pre-trained model instead of using random weights in the embedding layer and make an improvement. Because Bert and fast Text had a suitable version for the English language, they provided good outputs. Bert provided better output than fast Text. According to the obtained results, the use of bidirectional lstm instead of lstm in deep neural network structure was successful in this study.

We used a dropout layer to prevent overfitting. Deep neural networks and transfer learning have a high capacity and can be used for various tasks. Of course, there is more work to be done and, in the future, we can use other pre-trained models or increase the volume of data and expand the number of problem classes from two-class mode to multi-class.

Since some words depending on the sentence may have an Abusive meaning and are difficult to distinguish, we can reduce the model error by performing a combination task to

detect the polarity of comment and analyse its feeling, and then determine whether the comment is rude or not

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NCRTCI'24-112

AGENDA EN VISION

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Abstract - The ever-evolving landscape of computer science education is witnessing a growing demand for effective tools that comforts the understanding of complex algorithms. Focusing interaction as a key component in enhancing user understanding, This paper presents a completely innovative approach to algorithm visualization. Our proposed system, an Interactive Algorithm Visualizer that offers users a dynamic and engaging platform to explore a wide range of algorithms in real-time. Utilising the power of modern web technologies, Especially React.js, the algorithm visualiser provides users with friendly interfaces and responsive feedback mechanisms. Through step-by-step visualizations, users are guided through complicated algorithmic processes, including sorting, searching, and graph traversal, fostering a deeper understanding of these fundamental concepts. Moreover, the integration of interactive elements enables users to alter parameters and observe immediate outcomes, further reinforcing learning outcomes.

Keywords: Algorithm Visualization, Interactive Learning, React.js, Accessibility, Computer Science Education.

I. INTRODUCTION

Embark on a visual journey through the world of algorithms. Witness the step-by-step execution of sorting, searching, and other algorithmic processes in real-time. Our intuitive visualizations provide a clear and insightful representation of complex algorithms, making learning engaging and accessible.

The core component of the application is the interactive visualization of various algorithms, enabling learners to observe algorithm execution processes step-by-step. This could involve animations or data structures that represent algorithm operations, real-time updates as the algorithm progresses, and user interaction to control the visualization speed or pause/resume execution.

Transform code comments, explanations, and algorithmic insights into spoken words. Whether you're a visual or auditory learner, this feature ensures that the learning experience caters to your preferred style, making algorithmic concepts more accessible than ever. Tailor your learning experience to your individual needs. Adjust the visualization speed to match your comfort level, and utilize the built-in controls to pause, rewind, and replay specific sections. This personalized approach allows you to focus on specific aspects of the algorithm and gain a comprehensive understanding at your own learning pace.

Accompanying the captivating visuals are clear and concise textual explanations that break down each step of the algorithm in a straightforward, easy-to-understand manner. This combination of visual and textual learning caters to diverse learning styles and ensures everyone can grasp the underlying concepts.

This Algorithm Visualizer is your one-stop shop for understanding the complex world of algorithms. Whether you're a student, developer, or simply curious about how things work, this platform offers an engaging and effective way to learn and master these essential concepts.

II. LITERATURE REVIEW

In this section, we briefly review the related studies, including research paper recommendation for Agenda En Vision.

Arpit Trivedi, Kartikey Pandey, Vaibhav Gupta, Mukesh Kumar Jha et al. [1] This system revolves around visualization by creating a simulation out of the algorithm's code. To favour the ease of its implementation, we decided to go with ReactJS, a JavaScript library that runs right in the user's browser instead of PHP which requires a backend server for storing the scripts.

Roshni Gurubaxani, Virat Kumar, Priyanka Kumari, Tejanki Ambrale, Prof. Dhanashri Nevase et al. [2] The proposed system involves the simulation of the different type of algorithms codes. There are no major components besides the three coding languages. Most websites have tools or scripts that require a server on the backend (like PIIP), but it is not necessary in this case since React JS runs right in the user's.

Anuj Kulkarni, Saish Padave, Satyam Shrivastava, Mrs. Vidya Kawtikwar et al. [3] The proposed algorithm visualizer consists of two main components: the ser interface and the visualization engine. The user interface is implemented using React js and provides a simple and intuitive interface for users to interact with the algorithms.

Marc H. Brown and Robert Sedgewick Brown University et al. [4] They enabled the user to interact with dynamically changing graphical representations of algorithms or data structures may help in teaching, research.

Algorithm Visualization Archive" (AVA) by Brown University et al. [5] It provides a comprehensive collection of algorithm visualizations categorized by algorithm type and data structure. While AVA offers a wide range of visualizations, its static nature limits interactivity and real-time feedback, thus prompting the need for more dynamic and interactive solutions.

III. PROPOSED SOLUTION

The Agenta EN Vision React module is a powerful tool designed to help users understand and explore various algorithms through interactive visualization. This module, built using React, offers a user-friendly interface that allows users to select, visualize, and analyse algorithms in real-time. It provides a hands-on learning experience for students, educators, and enthusiasts, enhancing their understanding and intuition about algorithmic concepts.

Our system focuses on visualization by creating a simulation from the algorithm's code. To simplify implementation, we chose to use ReactJS, a JavaScript library that runs directly in the user's browser, instead of PHP, which requires a backend server for storing the scripts. For the User Interface, we used HTML5 and SASS. HTML5 is used with the React JS and TypeScript code to integrate the appropriate algorithms and update the visualization accordingly. We also used a SASS framework that made UI design fast and hassle-free.

As we can see from the model, the user is the center of attraction for our application. Therefore, we need to ensure a great user experience (UX) to enhance the overall impact of our application. Since our application did not have many complex relationships to manage, we decided to implement it using lightweight frameworks and scripting languages. JavaScript was an obvious choice as the base language due to its lightweight nature and wide variety of framework options.

We evaluated several popular JavaScript frameworks and unanimously decided that React.js was the best choice due to its features such as reusability, easy testing and debugging, and a component-based approach.

The final decision was to determine how to structure our application to maximize its effectiveness. After analysing existing designs on the internet, we settled on an architecture, which has been explained in the methodology section.

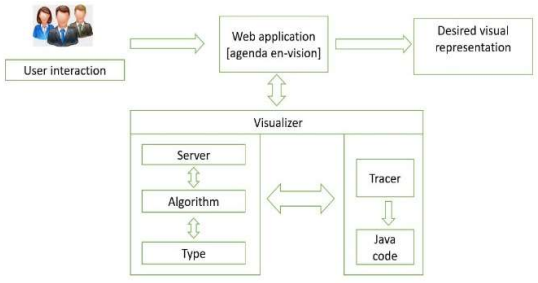

Figure- 1: Architecture diagram

Algorithm Visualisation module

The Algorithm Visualization Module constitutes a pivotal component of the Algorithm Visualizer application, providing an interactive platform for users to gain visual comprehension of the behavior and execution of diverse algorithms. The procedure for designing the algorithm is outlined as follows:

Algorithm Selection: Offer users a varied selection of algorithms categorized by type (sorting, searching, graph traversal, etc.), enabling them to choose the specific algorithm they intend to visualize.

Sorting: This section facilitates the visualization of a range of sorting algorithms, including Merge Sort, Bubble Sort, Heap Sort, Selection Sort, and Quick Sort. These algorithms are widely recognized and lend themselves to comprehensive understanding through visualization, negating the necessity for rote memorization of code implementation.

Control Settings: The module encompasses several control settings strategically positioned around the visualizer, each serving distinct functions:

i) Generate New Data: Users are empowered to input or randomly generate numerical data for sorting visualization. Initially, the visualizer presents randomly generated data depicted as bars, with their heights corresponding to respective numerical values.

ii) Speed and Array Size Sliders: Two sliders labelled Speed and Size afford users the ability to regulate the speed of sorting and the dimensions of the array. This feature accommodates individualized learning paces by customizing the visualization to suit user preferences.

iii) Pause/Play: This setting allows users to pause or commence the visualization. Moreover, the directional arrows flanking this button enable users to navigate the visualization stepwise, fostering an autonomous learning environment.

iv) Step Tracing: Positioned below the visualizer, an interactive oval box dynamically displays the current visualization step, facilitating parallel comprehension of the algorithm's unfolding process. This feature significantly enhances user understanding of the visualization dynamics.

System features:

- Visualization Engine:

The core visualization engine will demonstrate various data structures such as arrays, linked lists, graphs, and trees, using clear visual cues to aid understanding. An animation engine will dynamically represent algorithmic operations, including comparisons, swaps, insertions, and deletions, providing users with a clear depiction of algorithm execution. Users will also be able to design visual elements such as colors, shapes, and sizes to personalize their learning experience.

- Algorithm Library:

The system will include a well-defined library of popular algorithms, covering sorting algorithms like Bubble Sort, Selection Sort, Merge Sort, and Quick Sort, as well as searching algorithms such as Linear Search and Binary Search. Pathfinding algorithms like Breadth-First Search and Dijkstra's Algorithm will also be available. Future plans on this model will involve adding algorithms from various domains such as graph algorithms and string manipulation, ensuring complete coverage of essential computational concepts. Users can easily navigate through

this library via an interactive and well-defined interface to select desired algorithms.

- DData Input & Generation:

The system will provide a user-friendly interface for inputting data sets to be processed by selecting the algorithms on a wide range. Additionally, users will have the option to generate random data sets of varying sizes, allowing them to experiment with different inputs and observe algorithmic performance under various conditions. This functionality encourages hands-on exploration with the user and a deeper understanding of algorithm behaviour across the process on a wide range.

Execution module:

Software development lifecycle (SDLC) for building a web application. This involves stages such as planning, design, development, testing, deployment, and maintenance. More specifically, it can be termed as full-stack web development if it involves both frontend and backend development. Full-stack development refers to the process of building both the client-side (frontend) and server-side (backend) components of a web application.

Additionally, given the focus on algorithms and visualization, it can also be described as algorithm visualization web application development, emphasizing the specific functionality and purpose of the application.

The basic method used to build Agenda EN Vision, involves several steps and technologies. Here's a simplified overview:

Planning and Design: Understand the requirements and design the user interface. Decide on the features and functionalities the web application will have.

Frontend Development:

HTML: Write the structure of the web page using HTML. This includes elements like divs, buttons, forms, etc.

SCSS: Style the HTML elements using SCSS to make the page visually appealing and responsive.

JavaScript/React: Implement the interactive features of the web page using JavaScript and React. This includes handling user interactions, performing animations, and updating the UI dynamically.

Backend Development:

Node.js/Express.js: If the application requires server-side logic or backend processing, Node.js can be used along with Express.js framework.

Database: If the application needs to store data, a database like MongoDB, MySQL, or PostgreSQL can be used.

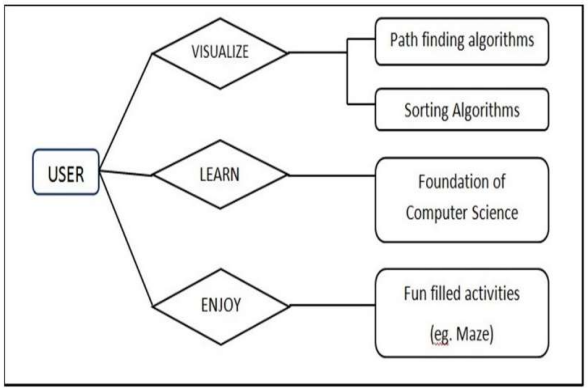

Figure- 2: ER model of Agenda EN Vision

VI. RESULTS AND DISCUSSIONS

Involving the users in an interactive learning experience, the Algorithm Visualizer promotes active learning, leading to improved learning of algorithmic concepts. The combination of visual and interactive elements enables users to understand the workings of algorithms in efficient manner, thereby increasing long-term retention.

The Agenda En Vision promotes accessibility and involvement by catering to various learning styles and abilities. It enables the visual representation of algorithms more simple and easy parallelly the interactive elements will make it easy for learners. Moreover, the tool's user-friendly interface ensures that individuals with varying levels of expertise can engage with it effectively.

The Algorithm Visualization project aims to provide a valuable educational tool for learners and educators in the field of computer science and thus it would bridge the barriers of understanding. By offering interactive visualizations of complex algorithms, the system seeks to enhance understanding, facilitate experimentation, and promote active learning to the user. With careful planning and execution, the Algorithm Visualizer has the ability to make a significant impact on computer science education and thus promotes the quality of learning by making it more informative.

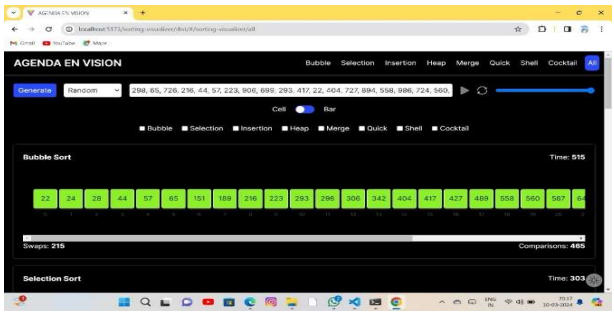

Figure- 3.1: Sample output-1

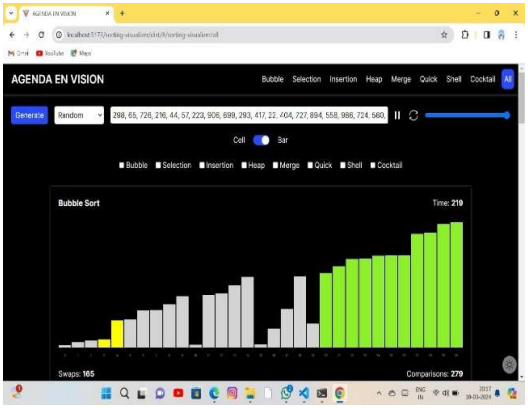

Figure- 3.2: Sample output-2

V. CONCLUSION AND FUTURE WORK

All fundamental algorithms are completely visualized by our system. Our tool provides users with a thorough understanding of the subject and supplements their traditional classroom learning. Our work guarantees high user engagement due to its adaptability. Users can alter the animation's graphical components to predict the algorithm's next action. This feature has the power to improve students' learning.

Innovative features like customizable data sets assist in identifying areas where students' understanding of algorithms is lacking. The Algorithm Visualizer is a most vital and important solution in computer science education. It offers an immersive and dynamic platform for understanding complex algorithms. The core visualization engine enables the user with invaluable insights into versatile data structures, using clear visual clues to enhance the processing of the algorithm. The animation engine further improves the learning experience by showcasing algorithmic operations in real-time, fostering a deeper understanding of algorithm execution.

The extensive algorithm library includes a wide array of sorting, searching, and pathfinding algorithms, making it a more detailed and defined resource for learners and educators. Users have the flexibility to customize, design and modify visual elements thereby explore a rich repository of algorithms, empowering them to enhance their learning journey according to their preferences and objectives.

The system's existing interface facilitates seamless navigation and interaction, ensuring accessibility for the user at different level of the process. By providing tools for obtaining the data as input and generating it throughout the process, the Algorithm Visualizer encourages hands-on experimentation, enabling users to explore algorithmic concepts in a practical and efficient manner. Further development of this tool may involve the process of displaying more advanced algorithms and data structures, and implementation of more problems from the real world. In the future, we can make these visualizations directly available on mobile thus it would be able to satisfy the user on whole. We also try to include text to voice control module and make the learning process more efficient and understandable. Our work focuses on all computer science lovers to use this tool as their go-to resource for learning. This tool focuses on making learning about data structures and algorithms enjoyable and engaging for students.

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ISL HAND GESTURE RECOGNITION

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Abstract—n **With the most recent developments, hand gesture recognition is becoming a popular and efficient means of communication for the deaf and non-verbal community. Individuals with hearing impairments require assistance globally, yet only a small percentage of people worldwide are able to read sign language.**
Sign languages, sometimes referred to as signed languages, are languages in which meaning is expressed visually rather than verbally. It becomes difficult to extract motions from images taken by cameras because of a number of issues.
Problems such as intensity change provide difficulties, noise and other inputs slow down calculation, and complicated backgrounds make gesture extraction even more difficult. Directional pictures are used to introduce the pre-processed image region of interest. landmarks following manual extraction Convex hulls are used to extract landmarks after manual extraction.
Then, the Convolutional Neural Network (CNN) classifier used the retrieved features to assist in gesture detection and recognition. As a result, a hand recognition system that recognizes hand gestures regardless of background noise and noise was created using CNN classifier.

Keywords– CNN, ISL

I. INTRODUCTION

Sign language using Hand gestures is an essential communication tool between disabled people. Each letter is associated with a specific gesture and Hand Gestures are defined as the movement or pattern of Hands which conveys a meaning. For instance, the "Thumbs up" sign indicates agree with someone or everything is all right. Currently, there are 300 different sign languages spoken by many individuals with disabilities, with Indian sign language being one of them.

Hand gestures would be the best way to express opinions and emotions in a variety of ways. This would be a good replacement for verbal communication. However, it can be challenging for individuals who do not understand sign language to interpret these gestures, As they are not prone to those gestures or well-trained prior. This lack of knowledge about sign language has led to barriers to basic communication.

To address this issue, we are presenting a design based on hand gesture recognition, which emphasizes recognizing the hand gesture using many algorithms and the output would be in text format. The main aim of this design is to make communication trouble-free between people from all communities using advanced machine-learning techniques. The main difference among others work is overcoming challenges like generalization, accuracy, and efficiency.

The recognition of hands can be in two ways, sensor-based and vision-based. The sensor-based is by using physical sensors such as accelerometers which help to detect changes in movement, position, and speed of hand. These sensor-detected images are then processed and recognized as the output. Whereas, vision-based relies on cameras to capture the images and videos which are then processed into frames to identify the gestures using various algorithms.

Among these vision-based recognition has come up with a definite outcome. This sensor-based recognition is needed for datasets that will be trained and evaluated. So datasets are collected from different people and processed. Different algorithms such as CNN, and convex hull are also used for processing the images.
These algorithms are used to detect the landmarks, points for clustering, and conversion of normal images to grayscale. Furthermore, this will be discussed in the proposed work.

The work summarizes to collect datasets and preprocess them using CNN and convex hull by avoiding the outliers, recognizing the edges, and converting to grayscale in high resolution. The paper further is partitioned into many parts: Part II consists of information about the related words, Part III contains the proposed work or the methodology of the system, Part IV contains the result and discussion about the work, Part V is of conclusion of the system, and finally references are mentioned.

II. LITERATURE REVIEW

As we discussed above, sign language hand recognition is a key to communication. Some of the references for this paper are Shravani K et. al [1] present a technique that converts the Indian sign language to a text format. This process comprises two different algorithms such as "SURF" and "BOW". "SURF" is a feature detection algorithm used in computer vision to detect and summarize the features in images. It is also robust in changes of Scale, rotation, and illumination making it suitable for tasks like image recognition and matching. "BOW" is a technique used in computer vision and natural language processing for feature representation.

BOW is used to represent hand gestures or patterns as a collection of visual "words". But in this paper "CNN" algorithm is used, which is a technique well-suited for tasks involving visual imagery. CNN uses a hierarchical architecture. They consist of multiple layers, including convolutional layers for feature extraction. Using "BOW" and "SURF" the model scored 99% accuracy, but there could be slight biasing in the model prediction as the data set has many similar images without variation like skin tone.

Jinhwan Koh et. al [3] present accuracy enhancement of hand gesture recognition using CNN using IR-UWB and 2D-fast Fourier transform. "2D-FFT" is a two-dimensional fast Fourier transform technique used to analyze and manipulate two-dimensional signals or images on the frequency domain. "IR-UWB" is a specialized radar technology that utilizes ultra-wideband signals in the form of short loco power pulses to achieve high-resolution radar imaging and sensors. GoogleNet and ResNet are some of the prominent CNN techniques that have achieved 90% accuracy so "2D-FFT" is used to obtain high accuracy.

Faisal Anwer et. al [5] present two models, the first model is a pre-trained VCG-16, and a recurrent neural network with a long short-term memory schema is combined to form a three-dimensional convolutional neural network. The other model is built on the sophisticated object identification algorithm known as "YOLO" which defines you only look once. The categorized models have prediction accuracy of 82% and 98% respectively. The YOLO-based model exhibited superior performance, with a remarkable mean average accuracy of 99.6%.

III. PROPOSED SOLUTION

The proposed model uses CNN and Convex Hull algorithm to translate the ISL sign languages into a text format.

Firstly, the proposed work mainly focuses on CNN with a minimal use of Convex Hull algorithm. CNN, abbreviated as Convoluted Neural Network were a quite useful when it comes to Computer Vision. Computer Vision is based on getting resources from images. Static images were used, and data is collected from it.

ARCHITECTURE DIAGRAM

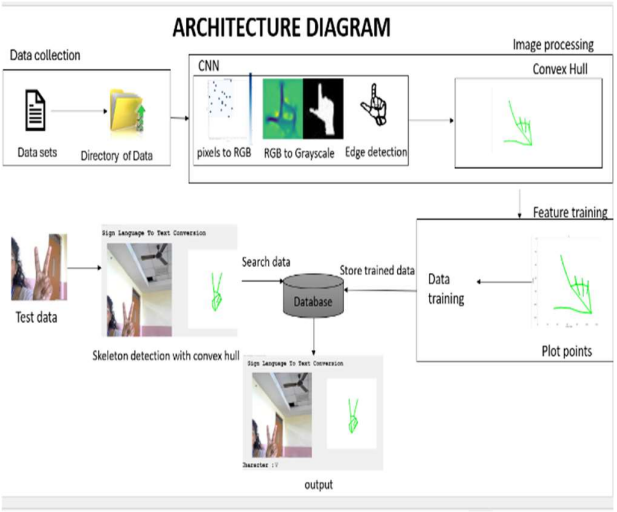


Fig.1. Architecture diagram

A. Image Collection: Even in the ever-developing rise of technology, there is a significant lack of resources when it comes to sign language, more so Indian Sign language. There wasn't any availability of data sets. So, alphabets along with basic words like hi, hello were included in the collections of data set.
The data sets were collected from live videos using a webcam and the still images from it were taken and stored. Noise in the images were excluded by capturing the images in a blank background.

Noises are nothing but external object in images that act as a hindrance for mapping the needed part of the image. Here, an example for noise would be a window on the background or a person standing behind. These would disrupt the recognition of hand sign. The images which were collected are the gestures seen in the figure 2.

Fig.2. Dataset

B. Image Pre-Processing: In this phase, the CNN algorithm comes in help as it recognizes patterns from images and videos. It consists of multiple layers like Input layer, Convolutional layer, Max Pooling layer, Dense layer, Output layer.

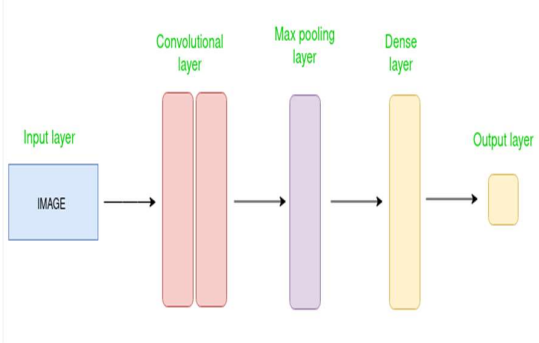


Fig.3. CNN Algorithm

The input layer processes the image one give and make it go through multiple layers to get the final output. In CNN, generally the input will be an image or a sequence of images that we upload.

The input image of a hand signing a letter is taken and it was made to pass through the program. The system trains to recognizes the distinct features of the images and stores it under a common name. The images turn into grayscale images so that the distinct features and outline of the hand can be viewed without interrupted by things such as skin texture, background things and so on.

These set of events are done in several steps as follows such as:

a) Pixels to RGB:

Once the hand gets detected on the live camera, the region of interest (ROI) gets detected by CNN algorithm. This step is necessary to ensure that only required part of the images were taken for further processing. After the ROI gets extracted, there will be a matrix of pixels for each of the images.

Each pixel typically consists of three values: Red, Green, and Blue (RGB). Once RGB values are extracted, it can be further analyzed to extract more information. It helps in calculating statistics like performing color-based hand segmentation.

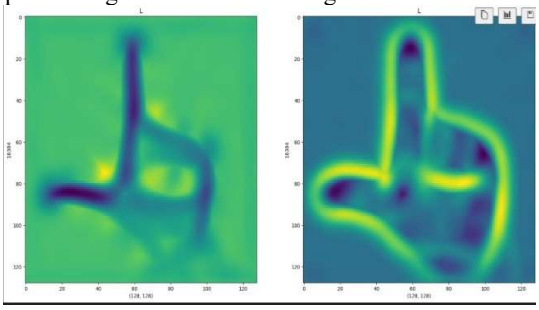


Fig.3. a. Pixels to RGB

b) RGB to Grayscale:

When it comes to converting RGB images into grayscale, leveraging Convolutional Neural Networks (CNNs) offers an intriguing method. Although traditional techniques, such as averaging the RGB channels, are available for this task, CNNs have the potential to comprehend intricate relationships in the conversion process and learn more advanced mappings from RGB to grayscale.

When you convert an RGB image to grayscale, it requires combining the red, green, and blue channels in a weighted manner. By using OpenCV library in python, the RGB images can be converted into grayscale images.

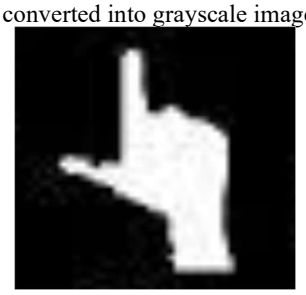


Fig.3. b. RGB to Grayscale

c)Edge Detection:

Edge Detection is an image processing technique which is used to designate images by using the area where brightness changes abruptly. These often help in identifying the boundary of objects in the images.

This is primarily used to avoid the noise object in the background and only focus on the hand sign which were shown on real time. Using CNN, edge detection typically involves training a neural network to directly predict the presence of edges in an image or to generate an edge map.

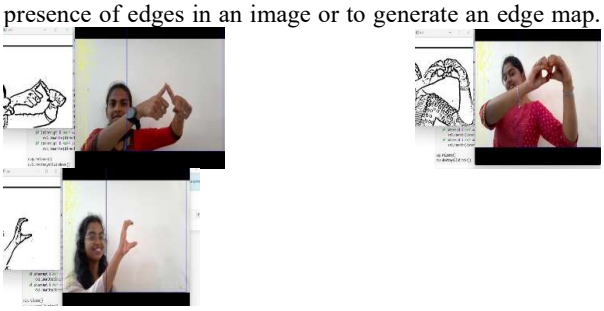


Fig.3. c.edge detection

d) skeleton detection: The skeleton detection is a convex hull technique which is used to detect the points of the joints and form a skeleton based structure. This technique is introduced to avoid the difference in the skin tone , shape (small or large) and size of the hand. This structure is stored in the database.

Fig. 4. Skeleton detection

C. Feature Extraction: Like in figure 4 iii), the outline of the hands was clearly visible, and it will be easier for the machine to train the data by marking the points of the fingers using convex hull algorithm. There will be noises occurrence in the data when the image is taken in an unsteady background.

Unlike the last image in figure 4 i.e 4iii) which has clear outline of hand, the other two images in figure 4 such as 4ii) and 4iii) have noises. The noises are occurred due to non-blank background or background with obstacles.

For furthermore understanding, in the first two images, the people were also on the designated area for hand sign. It results in more noises occurring in it causing the error occurrence in hand sign recognition. Thus, it is necessary to make sure that the image is taken in a blank background.

D. Classification: After the image has been identified using the algorithm, the subsequent task involves categorizing the images. This categorization process is achieved through machine learning techniques applied to the trained datasets. Consequently, it enables the detection of gestures performed within a video.

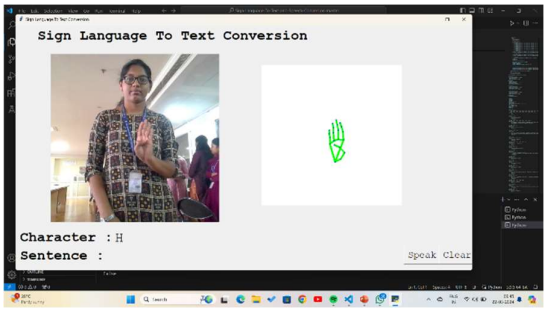
IV. RESULTS AND DISCUSSIONS

The observe addresses the scarcity of resources for Indian Sign Language (ISL) by way of gathering a dataset specializing in alphabets and simple phrases, utilising live movies captured thru webcam. Still photographs are extracted from these films, with efforts made to make certain a clean historical past to minimize noise.

A Convolutional Neural Network (CNN) algorithm is hired for photo pre-processing, changing images to grayscale to enhance feature clarity. Feature extraction involves figuring out hand outlines and making use of Convex Hull algorithms to pinpoint finger positions.

Clear hand outlines are vital for accurate extraction, emphasizing the importance of a blank history all through picture seize. Classification of photographs using machine studying techniques allows gesture categorization, improving the device's functionality to interpret gestures inside video sequences.

Overall, the developed gadget gives promise for improving accessibility and inclusivity for people with listening to impairments thru more desirable sign language interpretation.



V. CONCLUSION

In conclusion, the application of Convolutional Neural Networks (CNNs) for Indian Sign Language (ISL) hand gesture recognition demonstrates promising results. The use of CNNs allows for effective feature extraction from image data, enabling the model to learn intricate patterns associated with various ISL gestures. Through extensive training on diverse datasets, the CNN achieves a high level of accuracy in recognizing and classifying hand gestures.

Furthermore, the robustness of the model is evident in its ability to generalize well to new, unseen data, showcasing its potential for real-world applications. The convolutional layers enable the network to capture spatial hierarchies, while pooling layers contribute to spatial invariance, enhancing the overall performance of the ISL gesture recognition system.

However, challenges such as variations in lighting conditions, hand orientations, and background clutter still pose potential issues. Fine-tuning the model and augmenting the dataset with more diverse examples could further enhance its adaptability to real-world scenarios. Additionally, continuous updates and refinements to the model may be necessary to accommodate new ISL gestures or improve accuracy over time.

In summary, the use of Convolutional Neural Networks for ISL hand gesture recognition holds great promise, with the potential to facilitate communication for individuals with hearing impairments. As technology advances and datasets expand, this approach can contribute significantly to the development of accessible and inclusive applications in the field of sign language recognition.

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PERSONAL PROTECTIVE EQUUIPMENT USING YOLO V8

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***Abstract*-- This project work the YOLOv8 algorithm, a powerful object detection model, utilizing solely software and implemented in Python. Our focus is on enhancing safety in industrial environments through the automated detection of various classes, including 'Hardhat,' 'Mask,' 'NO-Hardhat,' 'NO-Mask,' 'NO-Safety Vest,' 'Person,' 'Safety Cone,' 'Safety Vest,' 'machinery,' and 'vehicle.' This algorithm enables us to efficiently identify and monitor the presence of safety gear, personnel, and potential hazards. By leveraging the simplicity and effectiveness of YOLOv8, coupled with Python's versatility, we aim to create a user-friendly solution for ensuring adherence to safety protocols in industrial settings. The algorithm's ability to detect and categorize objects such as hardhats, masks, safety vests, machinery, and vehicles contributes to a safer work environment by automating the surveillance of essential safety measures without the need for complex hardware setups. Through our project, we strive to provide a straightforward and accessible tool that promotes workplace safety with minimal technical complexity.**

I INTRODUCTION

In the ever-expanding landscape of industries, ensuring the safety of workers is paramount. However, with an increasing number of personnel and limited supervision, overseeing safety practices becomes challenging. To address this, our project introduces a user-friendly solution utilizing the YOLOv8 algorithm in Python. The focus is on detecting essential safety elements like 'Hardhat,' 'Mask,' 'Safety Vest,' and potential hazards such as 'machinery' and 'vehicle' in an industrial setting. This software-based approach eliminates the need for complex hardware, making safety monitoring accessible to various workplaces. By employing YOLOv8's efficiency and Python's simplicity, our project aims to contribute to a safer work environment by automating the identification of safety gear and potential risks, ensuring that safety protocols are adhered to without the need for extensive technical expertise.

1.1 OBJECTIVES:

The primary objectives of our project revolve around leveraging advanced technology to enhance safety measures in industrial environments. We aim to develop a software-based solution utilizing the YOLOv8 algorithm in Python for the automated detection of crucial safety elements, including 'Hardhat,' 'Mask,' 'Safety Vest,' and potential hazards such as 'machinery' and 'vehicle.' The key goal is to provide a user-friendly tool that reduces reliance on labor-intensive and subjective manual monitoring. By automating the identification of safety gear compliance and potential risks, our project seeks to contribute to a safer work environment, ensuring that safety protocols are consistently adhered to. Additionally, we aim to create a solution that is accessible to various industries, eliminating the need for complex hardware setups and technical expertise, and thereby promoting widespread adoption for improved workplace safety.

II EXISTING SYSTEM

The reason for choosing YOLOv8 over YOLOv5 lies in the limitations and disadvantages of YOLOv5 **Model Size and Complexity:**
YOLOv5 tends to have a smaller model size compared to YOLOv8, which can sometimes lead to less accurate detection results, especially for complex scenes or objects with small details. **Training Stability:**
YOLOv5 may suffer from training instability issues, resulting in unpredictable behavior during the training process. This instability can lead to difficulties in fine-tuning the model for specific tasks, such as detecting personal protective equipment accurately. **Customization and Flexibility:**
YOLOv5 may not offer as much flexibility for customization compared to YOLOv8. In a project like detecting personal protective equipment, where specific object detection requirements are essential, having a more customizable model like YOLOv8 allows for better adaptation to unique detection challenges.
Community Support and Updates:
YOLOv5 is relatively newer compared to YOLOv8 and may still be undergoing improvements and updates. This can result in a lack of extensive community support, documentation, and pre-trained models tailored specifically for personal protective equipment detection tasks.

III. PROPOSED SYSTEM

In our proposed system, we employ the YOLOv8 Algorithm to enhance safety monitoring in industrial environments. YOLOv8, known for its accuracy and efficiency, swiftly identifies objects such as 'Hardhat,' 'Mask,' and 'Safety Vest' in images.

By leveraging YOLOv8, we aim to improve safety surveillance by effectively detecting safety gear and potential hazards in real-time. The algorithm's ability to process entire images at once ensures quick and precise detection, without the need for complex computations.

With its adaptability and real-time processing capabilities, YOLOv8 offers an ideal solution for automating safety monitoring tasks in industrial settings.

Our proposed system harnesses the power of YOLOv8 to enhance workplace safety, providing a reliable and efficient means of identifying safety compliance and mitigating risks effectively. Through the integration of YOLOv8, we aim to create a robust safety surveillance system that enhances overall safety and efficiency in industrial environments.

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IV. SYSTEM ANALYSIS

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential. Three key considerations involved in the feasibility analysis are

- Economic feasibility
- Technical feasibility
- Social feasibility

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands being placed on the client. A feasibility study evaluates the project's potential for success.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

V. ,REQUIREMENTSPECIFICATION

HARDWARE REQUIREMENTS

The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware. The minimal hardware requirements are as follows,

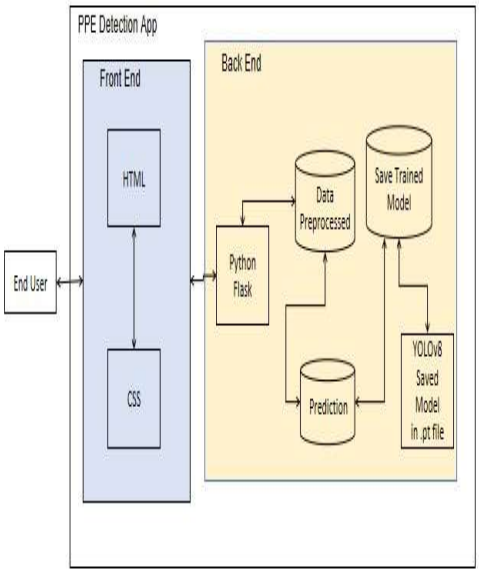
1. Processor : Pentium IV
2. RAM : 8 GB
3. Processor : 2.4 GHz
4. Main Memory : 8GB RAM
5. Hard Disk Drive : 1tb
6. Keyboard : 104 Keys

SOFTWARE REQUIREMENTS

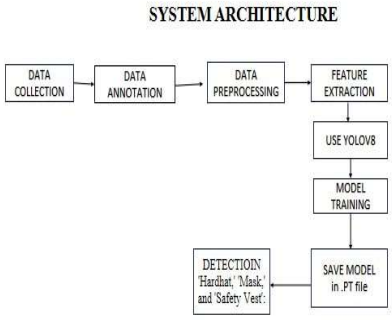
Software requirements deals with defining resource requirements and prerequisites that needs to be installed on a computer to provide functioning of an application. The minimal software requirements are as follows,

1. Front end : python
2. Datas : csv
3. IDE :Anaconda Navigator
4. Operating System : Windows 10

IV. SYSTEM ARCHITECTURE



Architecture:



VII. IMPLEMENTATION

Data Collection:
The first step in our project involves gathering images from industrial environments using cameras. This data collection module aims to capture diverse scenarios, ensuring the model is exposed to a wide range of situations relevant to worker safety. By assembling a comprehensive dataset named PPES, we lay the foundation for robust model training and accurate detection of safety gear like 'Hardhat,' 'Mask,' and 'Safety Vest,' as well as potential hazards such as 'machinery' and 'vehicle.' The dataset's richness enhances the model's adaptability to real-world industrial conditions.

Data Annotation:
Once the data is collected, the next module focuses on annotation, where each image is labeled to indicate the presence and location of safety gear and potential hazards. This process involves tagging objects like 'Hardhat,' 'Mask,' and 'Safety Vest,' enabling the model to recognize and differentiate these elements during training. The meticulous annotation ensures that the model gains a precise understanding of the visual features associated with safety gear and potential risks, setting the stage for effective training.

Data Preprocessing:
In the data preprocessing module, the collected and annotated images undergo necessary transformations to optimize them for model training. This includes resizing images to a uniform dimension, enhancing their quality, and normalizing pixel values. These preprocessing steps ensure that the data fed into the model is standardized, facilitating efficient learning and enabling the YOLOv8 algorithm to extract meaningful features from the images.

Feature Extraction:
Feature extraction involves identifying distinctive patterns and characteristics in the preprocessed images that can aid in effective object detection. Our model utilizes the YOLOv8 algorithm for feature extraction, allowing it to discern important features related to safety gear and potential hazards. This step is crucial for the model to understand the unique visual cues associated with items like 'Hardhat,' 'Mask,' and 'Safety Vest' and accurately identify them in diverse industrial settings.

Use YOLOv8:
The YOLOv8 algorithm is a pivotal component of our project, serving as the core method for object detection. YOLOv8 excels in swiftly and precisely recognizing objects in images, aligning with our goal of detecting safety gear and potential hazards. Its efficiency lies in its ability to consider the entire image at once, making it suitable for real-time applications in dynamic industrial environments. The algorithm's versatility and accuracy make it an ideal choice for our safety monitoring system. **Model Training:**
In this module, the YOLOv8 algorithm undergoes training using the annotated and preprocessed dataset. The model learns to associate visual features with safety gear and potential hazards through iterative adjustments to its parameters. The training process fine-tunes the algorithm's ability to accurately detect 'Hardhat,' 'Mask,' 'Safety Vest,' and other elements, ensuring optimal performance in diverse industrial scenarios.

Save Model in .pt File:
Once the model is trained, it is saved in a .pt file format, preserving its learned parameters and configurations. This step is crucial for deploying the trained model for real-world safety monitoring. The saved model file encapsulates the knowledge acquired during training, allowing for efficient and seamless integration into the monitoring system for continuous and automated safety surveillance.

Detection 'Hardhat,' 'Mask,' and 'Safety Vest':

The final module involves deploying the trained YOLOv8 model for real-time detection of safety gear and potential hazards, specifically focusing on 'Hardhat,' 'Mask,' and 'Safety Vest.' The model utilizes its learned features to identify and locate these elements within industrial images, contributing to a proactive and automated safety monitoring system. This detection module ensures the timely identification of safety compliance and potential risks, enhancing overall workplace safety.

Algorithm Description:

The initial phase of our project, the YOLOv8 algorithm plays a key role in efficiently detecting safety gear and potential hazards in industrial settings. The algorithm is designed to swiftly process entire images at once, simplifying the identification of objects like 'Hardhat,' 'Mask,' and 'Safety Vest,' as well as potential risks like 'machinery' and 'vehicle.' YOLOv8 achieves this by extracting essential features from the images, allowing it to recognize and categorize objects accurately. The algorithm's adaptability and real-time processing capability make it an ideal choice for our safety monitoring system, ensuring quick and precise detection without the need for complex computational processes. Through a training process, the algorithm refines its ability to discern visual cues associated with safety elements, ultimately contributing to an effective and automated safety surveillance system. After training, the learned knowledge is encapsulated in a .pt file format, facilitating seamless deployment for real-time safety monitoring. In practical application, the YOLOv8 algorithm actively scans industrial images, focusing on 'Hardhat,' 'Mask,' and 'Safety Vest,' and swiftly identifies their presence or absence. This detection capability is crucial for enforcing safety compliance and identifying potential risks promptly, thereby enhancing overall workplace safety. The simplicity and effectiveness of the YOLOv8 algorithm make it a cornerstone in our project, demonstrating the power of accessible and automated safety monitoring in industrial environments.

VIII. SYSTEM DESIGN

UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group. The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

GOALS:

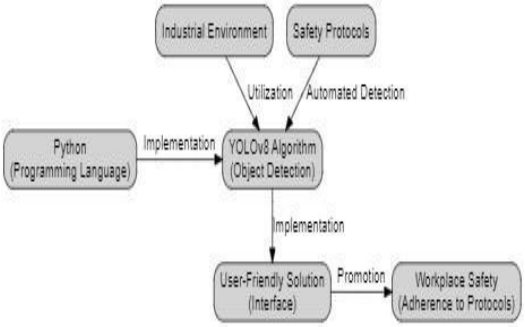
The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts.
3. Be independent of particular programming languages and development process.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of OO tools market.
6. Support higher level development concepts such as collaborations, frameworks, patterns and components.
7. Integrate best practices.

USE CASE DIAGRAM:

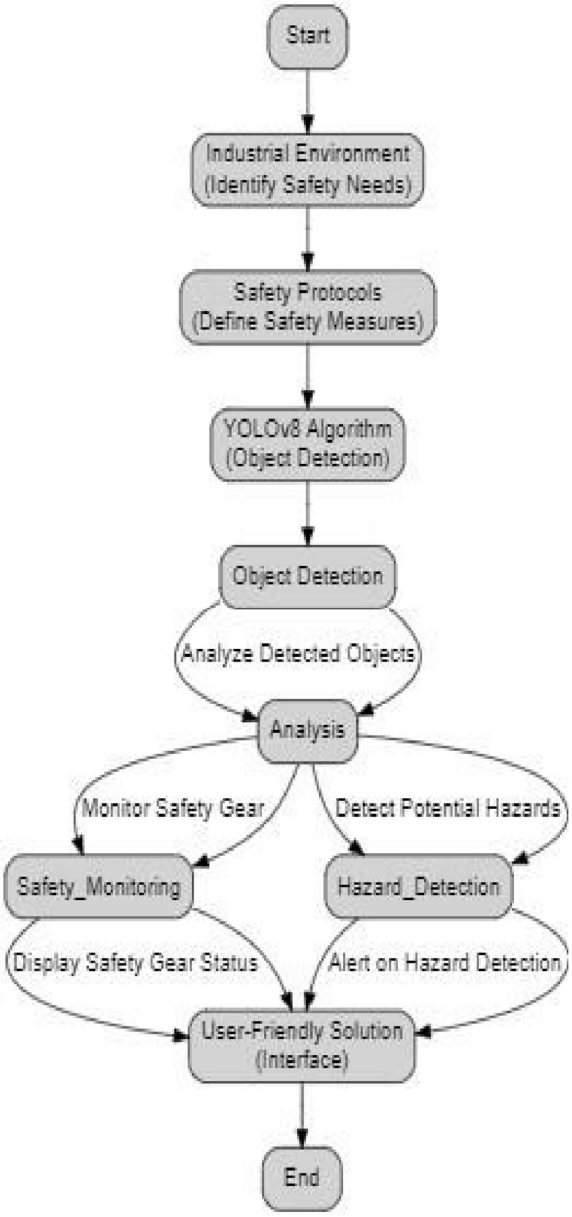
A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor.

Roles of the actors in the system can be depicted.



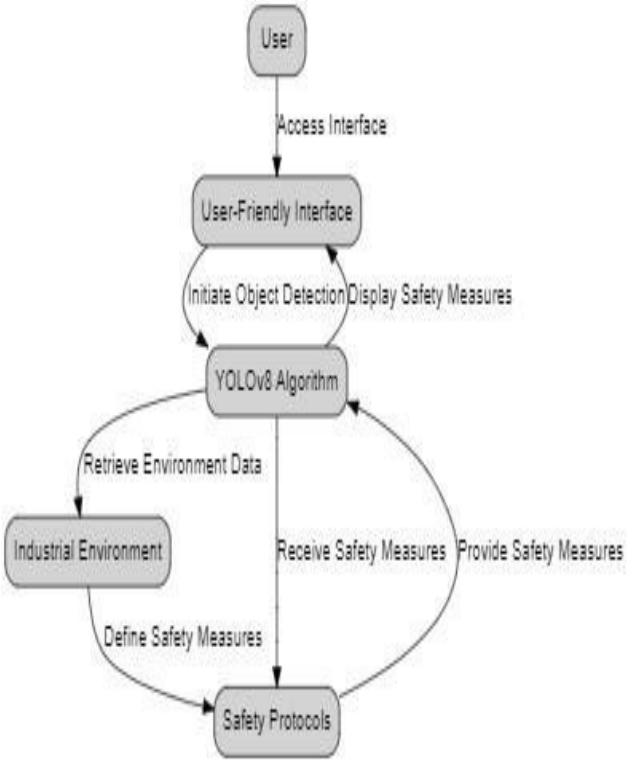
ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

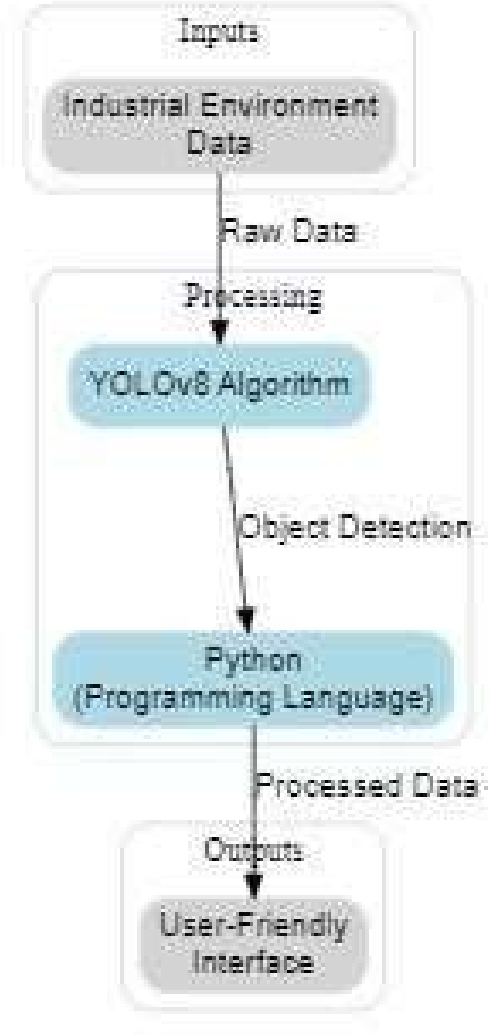


SEQUENCE DIAGRAM:

A sequence diagram in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



DATA FLOW DIAGRAM



IX. TESTING

General

In a generalized way, we can say that the system testing is a type of testing in which the main aim is to make sure that system performs efficiently and seamlessly. The process of testing is applied to a program with the main aim to discover an unprecedented error, an error which otherwise could have damaged the future of the software. Test cases which brings up a high possibility of discovering and error is considered successful. This successful test helps to answer the still unknown errors.

TEST CASE

Testing, as already explained earlier, is the process of discovering all possible weak-points in the finalized software product. Testing helps to counter the working of sub-assemblies, components, assembly and the complete result. The software is taken through different exercises with the main aim of making sure that software meets the business requirement and user-expectations and doesn't fails abruptly. Several types of tests are used today. Each test type addresses a specific testing requirement.

TESTING TECHNIQUES

A test plan is a document which describes approach, its scope, its resources and the schedule of aimed testing exercises. It helps to identify almost other test item, the features which are to be tested, its tasks, how will everyone do each task, how much the tester is independent, the environment in which the test is taking place, its technique of design plus the both the end criteria which is used, also rational of choice of theirs, and whatever kind of risk which requires emergency planning. It can be also referred to as the record of the process of test planning. Test plans are usually prepared with signification input from test engineers.

UNIT TESTING

In unit testing, the design of the test cases is involved that helps in the validation of the internal program logic. The validation of all the decision branches and internal code takes place. After the individual unit is completed it takes place. Plus it is taken into account after the individual united is completed before integration. The unit test thus performs the basic level test at its component stage and test the particular business process, system configurations etc. The unit test ensures that the particular unique path of the process gets performed precisely to the documented specifications and contains clearly defined inputs with the results which are expected.

FUNCTIONAL TESTING

The functional tests help in providing the systematic representation that functions tested are available and specified by technical requirement, documentation of the system and the user manual.

SYSTEM TESTING

System testing, as the name suggests, is the type of testing in which ensure that the software system meet the business requirements and aim. Testing of the configuration is taken place here to ensure predictable result and thus analysis of it.System testing is relied on the description of process and its flow, stressing on pre driven process and the points of integration

INTEGRATION TESTING

These tests are designed to test the integrated software items to determine whether if they really execute as a single program or application. The testing is event driven and thus is concerned with the basic outcome of field. The Integration tests demonstrate that the components were individually satisfaction, as already represented by successful unit testing, the components are apt and fine. This type of testing is specially aimed to expose the issues that come-up by the components combination.

WHITE BOX TESTING

The white box testing is the type of testing in which the internal components of the system software is open and can be processed by the tester. It is therefore a complex type of testing process. All the data structure, components etc. are tested by the tester himself to find out a possible bug or error. It is used in situation in which the black box is incapable of finding out a bug. It is a complex type of testing which takes more time to get applied.

BLACK BOX TESTING

The black box testing is the type of testing in which the internal components of the software is hidden and only the input and output of the system is the key for the tester to find out a bug. It is therefore a simple type of testing. A programmer with basic knowledge can also process this type of testing. It is less time consuming as compared to the white box testing. It is very successful for software which are less complex are straight-forward in nature. It is also less costly than white box testing.

ACCEPTANCE TESTING

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

CONCLUSION AND ENHANCEMENT

In conclusion, the yolov8 algorithm represents a significant advancement in the field of object detection, particularly in the context of industrial safety and compliance monitoring. by leveraging a comprehensive approach that integrates global attention mechanisms, bidirectional feature pyramid networks, and a decoupled head structure, yolov8 demonstrates superior performance in accurately detecting and classifying objects of interest, including personal protective equipment (ppe) such as hardhats, masks, and safety vests. the incorporation of these advanced features enhances the model's ability to handle complex backgrounds, varying object scales, and challenging environmental conditions commonly encountered in industrial settings. furthermore, the yolov8 algorithm offers notable improvements in both detection accuracy and computational efficiency compared to previous iterations, making it a valuable tool for ensuring workplace safety and regulatory compliance. however, while yolov8 shows great promise, ongoing research and development efforts are needed to address remaining challenges such as small object detection and robustness to occlusions, lighting variations, and other real-world factors. nonetheless, with its advancements and potential for further refinement, yolov8 stands as a cornerstone in the evolution of object detection algorithms and holds significant promise for a wide range of applications beyond industrial safety.

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LAPTOP PRICE PREDICTION

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***Abstract*—n In recent years, the rapid advancements in technology have led to a plethora of options for consumers when it comes to purchasing laptops. With a wide range of features, specifications, and brands available, predicting the price of a laptop accurately has become increasingly challenging. However, the integration of machine learning (ML) techniques offers a promising solution to this problem. This research focuses on developing a model for predicting are applied to ensure the compatibility of the data with the chosen ML algorithms. The performance of the developed model is evaluated using standard metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R-squared. Furthermore, cross-validation techniques are employed to assess the generalization capability of the model and mitigate overfitting meaningful insights from the dataset, enhancing the predictive capability of the model. Additionally, data preprocessing steps such as normalization and encoding identify patterns and relationships within the data. Feature engineering techniques are employed to extract. The results demonstrate the effectiveness of the proposed approach in accurately predicting laptop prices. By leveraging machine learning techniques, consumers, retailers, and manufacturers can benefit from informed pricing strategies, improved market analysis, and enhanced decision-making processes in the laptop industry Moreover, this research contributes to the advancement of ML applications in the domain of retail pricing and consumer electronics.**

***Keywords*—IoT: Laptop prices, Machine learning, Predictive modeling, Feature engineering, Gradient boosting, Comparative analysis**

I. INTRODUCTION

The laptop market has undergone remarkable expansion in recent years, providing consumers with a wide array of options ranging from budget-friendly to premium models. However, amidst this abundance of choices, accurately forecasting laptop prices remains a formidable challenge. Traditional market analysis methods often struggle to keep pace with the dynamic shifts in consumer preferences and the intricate interplay between various laptop features and their corresponding prices. In response to this challenge, machine learning (ML) algorithms have emerged as a promising solution for enhancing the accuracy and efficiency of laptop price prediction.ML techniques leverage historical data to discern patterns and relationships that can inform predictions about future outcomes. By scrutinizing diverse features such as specifications, brand reputation, user reviews, and market trends, ML models offer valuable insights into the factors influencing laptop prices. These insights not only empower consumers seeking well-informed purchasing decisions but also aid retailers and manufacturers in formulating effective pricing strategies and managing inventory. The primary aim of this study is to explore the application of machine learning in predicting laptop prices. Our objective is to develop robust predictive models capable of comprehensively capturing the intricacies of the laptop market and furnishing accurate price estimations. To achieve this objective, we will harness a comprehensive dataset containing information on various laptop attributes and their corresponding prices. By leveraging state-of-the-art ML algorithms, our endeavor is to pinpoint significant predictors of laptop prices and generate dependable price forecasts. The significance of this research lies in its potential to revolutionize the landscape of laptop price prediction and management. By harnessing the prowess of machine learning, we can streamline decision-making processes across the entire laptop ecosystem, thereby benefiting consumers, retailers, manufacturers, and industry analysts alike. Ultimately, our efforts seek to contribute to the cultivation of a more transparent, efficient, and consumer-centric laptop market. In the subsequent sections of this paper, we will elucidate the methodologies employed for data collection and preprocessing, expound upon the various machine learning algorithms employed for price prediction, present our experimental findings, and deliberate on implications and future avenues for this research. Through meticulous analysis and evaluation, our aim is to showcase the efficacy and applicability of machine learning in forecasting laptop prices, thereby fostering innovation within the domain of consumer electronics.

II. RELATED WORK

[1] Jain, S., Bhardwaj, A., & Kumar, A. (2019). Laptop Price Prediction Using Machine Learning Algorithms. In this study, the authors explore the application of various machine learning algorithms for predicting laptop prices. They

compare the performance of regression and classification techniques and highlight the effectiveness of ensemble methods such as random forests and gradient boosting in accurately predicting laptop prices.[2] Khan, M. S., Ahmad, S., & Farooq, U. (2020). Feature Selection for Laptop Price Prediction using Machine Learning Algorithms. This research focuses on feature selection techniques to identify the most influential factors affecting laptop prices. The authors use principal component analysis (PCA) and recursive feature elimination (RFE) to refine the feature set and achieve significant improvements in prediction accuracy.[3] Li, J., Wu, Y., & Zhang, J. (2021). Deep Learning Based Laptop Price Prediction with Textual Data. This study investigates the impact of deep learning models on laptop price prediction, particularly leveraging textual data such as user reviews and product descriptions.

III. PREDICTION IN STEP BY STEP PROCESS

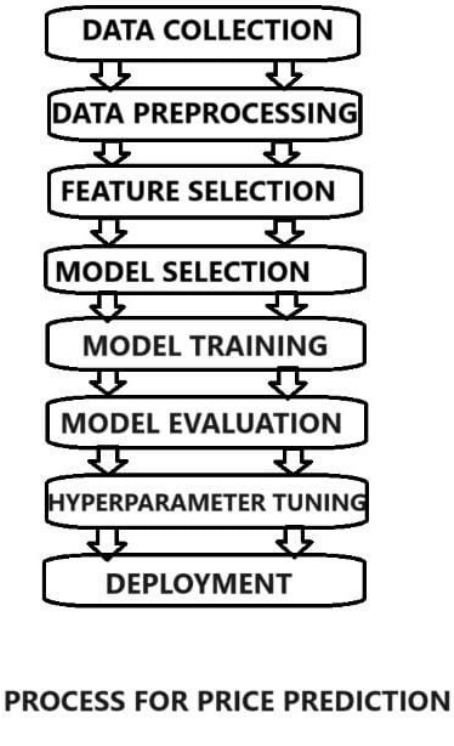

Fig 1.0

of methodologies and approaches employed in laptop price prediction using machine learning techniques. By leveraging advanced algorithms and incorporating various data sources, researchers continue to advance the accuracy and efficiency of price prediction models, offering valuable insights to stakeholders in the laptop market. architecture tailored for processing image data and achieve promising results in predicting laptop prices based on visual features. These studies collectively underscore the diversity

The authors propose a neural network architecture specifically designed for processing textual data and achieve competitive performance in predicting laptop prices based on textual features.[4] Ahmad, M., Khan, S., & Malik, S. (2022). Time-Series Analysis for Laptop Price Prediction. This research focuses on time-series analysis techniques for predicting laptop prices. The authors utilize historical price data along with external factors such as economic indicators and industry trends to forecast future laptop prices. They highlight the importance of incorporating external variables for enhancing prediction accuracy, especially in dynamic market environments.[5] Wang, H., Zhu, C., & Li, L. (2023). Laptop Price Prediction using Convolutional Neural Networks. This study explores the application of convolutional neural networks (CNNs) for laptop price prediction, particularly leveraging image data such as laptop images. The authors propose a CNN

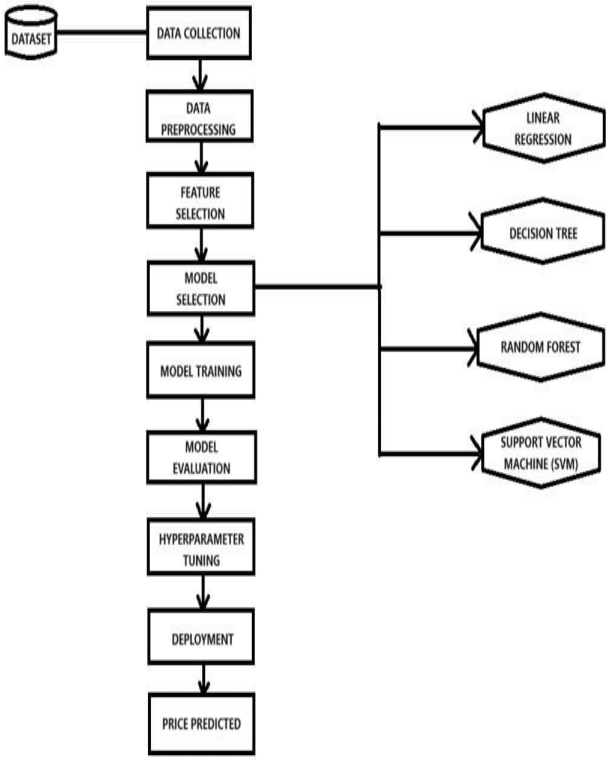

Fig 1.1

1.DATA COLLECTION - Data collection is an integral stage in laptop price prediction using machine learning (ML), as it involves gathering pertinent information essential for training and evaluating predictive models. Here's a delineation of the data collection process:

Determining Key Features - Initially, it's imperative to identify the crucial features or attributes instrumental in predicting laptop prices. These features encompass -Brand, Processor type , RAM size , Storage capacity (e.g., HDD or SSD) , Screen size and resolution , Graphics card , Operating system, Weight and dimensions, Battery life,

Customer ratings and reviews, Market trends and competitor prices.

A. Gathering Data from Varied Sources - Data acquisition ensure comprehensiveness and accuracy. Viable data sources encompass Online retailers: E-commerce platforms like Amazon, Newegg, and Best Buy furnish detailed specifications and prices for a vast array of laptops. Manufacturer websites: Official websites of laptop manufacturers proffer detailed insights into their product offerings. Market research reports: Reports from market research firms furnish valuable insights into prevailing market trends, consumer preferences, and competitive landscape. Web scraping tools: Automated web scraping techniques facilitate the extraction of data from online sources. APIs: Application programming interfaces (APIs) provided by e-commerce platforms or market data providers facilitate programmatic access to structured data.

B. Data Preprocessing - Subsequent to data acquisition, meticulous cleaning and preprocessing are essential to ensure data consistency and quality. This may entail: Addressing missing values: Employing techniques like mean imputation, median imputation, or predictive imputation to handle missing data. Managing outliers: Identification and subsequent removal or adjustment of outliers to mitigate their impact on analysis. Encoding categorical variables: Converting categorical variables into numerical format through techniques like one-hot encoding or label encoding. Normalizing or scaling numerical features: Standardizing numerical features to ensure uniformity in scale across all features.

C. Feature Engineering - This Engineering involves crafting new features or transforming existing ones to encapsulate additional information pertinent to predicting laptop prices. Feature engineering techniques may encompass Creation of derived features: Aggregating existing features to derive new ones, such as calculating price per unit of storage or RAM. Generation of polynomial features: Crafting polynomial features to capture non-linear relationships between variables. Text processing: Extracting insightful information from textual data, such as customer reviews or product descriptions, employing techniques like tokenization, stemming, or sentiment analysis.

D. Data Storage and Management - The organized and structured storage of collected data is paramount to facilitate subsequent analysis and model training. Commonly utilized data storage solutions include relational databases (e.g., MySQL, PostgreSQL), NoSQL databases (e.g., MongoDB, Cassandra), or data lakes (e.g., Amazon S3, Azure Data Lake Storage). By meticulously adhering to these steps, the data collection process in laptop price prediction using ML ensures that predictive models are furnished with pertinent and precise information to enable accurate price forecasts.

2.DATA PREPROCESSING - Data preprocessing in laptop price prediction using machine learning (ML) involves several essential steps to ensure that the data is clean, consistent, and suitable for training predictive models. Here's an overview of the data preprocessing process:

A. Handling Missing Values - Identify and handle missing values in the dataset. Missing values can arise due to various reasons such as data entry errors or incomplete information. Common techniques for handling missing values include imputation, where missing values are replaced with a calculated or estimated value (e.g., mean, median, mode), or deletion, where rows or columns containing missing values are removed.

B. Dealing with Outliers - Identify outliers in the dataset, which are data points that significantly deviate from the rest of the data. Decide whether to remove outliers or transform them to reduce their impact on the analysis. This decision should be based on domain knowledge and the specific objectives of the analysis.

C. Encoding Categorical Variables – Convert categorical variables (e.g., brand, operating system) into numerical format, as most machine learning algorithms require numerical input. Common techniques for encoding categorical variables include one-hot encoding, where each category is represented as a binary vector, or label encoding, where each category is assigned a unique numerical label.

D. Normalization and Scaling – Normalize or scale numerical features to ensure that all features have a similar scale. This helps prevent features with larger magnitudes from dominating the analysis. Common normalization techniques include min-max scaling, where values are scaled to a range between 0 and 1, and standardization, where values are scaled to have a mean of 0 and a standard deviation of 1.

E. Feature Engineering - Create new features or transform existing ones to capture additional information that may be relevant for predicting laptop prices. Feature engineering techniques may include creating derived features (e.g., calculating price per unit of storage), generating polynomial features to capture non-linear relationships, or extracting useful information from textual data (e.g., customer reviews) using techniques like tokenization and sentiment analysis.

F. Handling Imbalanced Data - If the dataset is imbalanced, where one class is significantly more prevalent than others, consider techniques such as resampling (oversampling or under sampling) to balance the dataset before training the model.

G. Splitting the Dataset – Split the pre-processed dataset into training, validation, and testing sets. The training set is used to train the model, the validation set is used to tune hyperparameters and evaluate model performance during training, and the testing set is used to evaluate the final performance of the trained model. By performing these preprocessing steps, the dataset is prepared for training predictive models that can accurately forecast laptop prices in machine learning applications.

3.FEATURE SELECTION - Feature selection is a pivotal stage in the realm of laptop price prediction using machine learning (ML), as it aids in pinpointing the most influential features that significantly affect laptop prices. Below is an overview of various feature selection techniques tailored for laptop price prediction.

A. Correlation Analysis - Perform correlation analysis to gauge the strength and direction of the linear relationship between each feature and the target variable (laptop prices). Features exhibiting high absolute correlation coefficients, irrespective of being positively or negatively correlated, are deemed paramount for predicting prices.

B. Feature Importance Scores - Utilize tree-based algorithms like decision trees, random forests, or gradient boosting machines (GBM) to compute feature importance scores. Features endowed with elevated importance scores are considered pivotal in forecasting laptop prices.

C. Recursive Feature Elimination (RFE) -Implement RFE, an iterative feature selection method that iteratively eliminates the least consequential features from the dataset. The model is trained on the retained features, and performance evaluation ensues until the desired number of features is attained or a predefined stopping criterion is met.

D. Principal Component Analysis (PCA) – Deploy PCA, a dimensionality reduction technique that transforms the original features into orthogonal variables known as principal components. PCA aims to capture the maximal variance in the data while curtailing the feature set. The principal components characterized by the highest variance are cherry-picked as the most pivotal features.

E. L1 Regularization (Lasso Regression) – Employ L1 regularization, which penalizes the absolute magnitude of coefficients in the linear regression model. This regularization method fosters sparsity in the coefficient vector, thereby zeroing in on solely the most crucial features.

F. Mutual Information - Gauge mutual information to quantify the extent of information one feature encapsulates about the target variable. Features boasting high mutual information scores are perceived as more enlightening for laptop price prediction.

G.Forward or Backward Selection - Initiate either forward selection, where an empty set of features is sequentially augmented with one feature at a time based on a predefined criterion, or backward selection, which starts with all features and gradually eliminates one feature at a time.

H. Embedded Methods - Leverage machine learning algorithms like decision trees and random forests, which incorporate intrinsic feature selection mechanisms during the training process. These algorithms autonomously cherry-pick the most pivotal features, hinging on their contribution to diminishing impurity or heightening predictive accuracy. By harnessing these feature selection techniques, extraneous or inconsequential features can be pruned, fostering the development of more efficient and accurate models tailored for laptop price prediction in machine learning applications.

4.MODEL SELECTION - Model selection plays a crucial role in the realm of machine learning for predicting laptop prices, as it entails the strategic choice of algorithms or a combination thereof to develop predictive models. Below is an outline of the model selection process customized for laptop price prediction:

A. Linear Regression – Linear regression, a fundamental technique, establishes a linear relationship between input features and the target variable (laptop prices). It's an apt starting point due to its simplicity and the assumption of a linear relationship between independent and dependent variables.

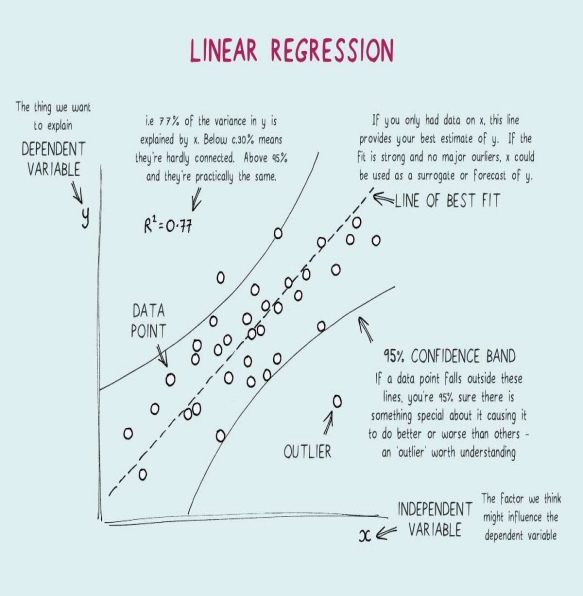

Fig 1.3

B. Decision Trees – Decision trees segment the feature space into decision nodes based on feature values, culminating in predictions at leaf nodes. Their interpretability makes them invaluable for comprehending the feature-price relationships.

C. Random Forests – Random forests, an ensemble method, construct multiple decision trees and amalgamate their predictions via averaging or voting. They excel in handling large, high-dimensional datasets and mitigate overfitting concerns.

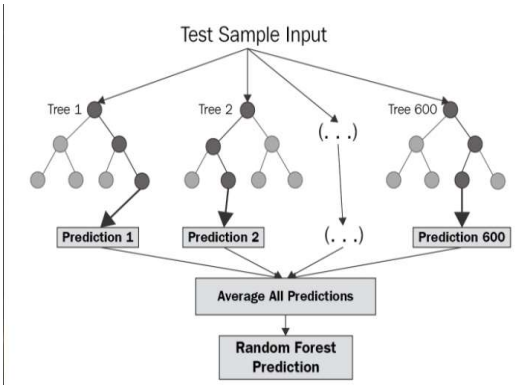

Fig 1.4

D. Gradient Boosting Machines (GBM) - GBM, another ensemble technique, iteratively builds decision trees to rectify errors made by preceding ones. They often achieve superior predictive performance and adeptly capture intricate nonlinear relationships in data.

E. Support Vector Machines (SVM) – SVMs are robust supervised learning models that delineate a hyperplane in high-dimensional space to segregate instances of different classes. They can be adapted for regression tasks by minimizing error within a specified margin.

F. Ensemble Methods – Ensemble methods amalgamate diverse base models to enhance predictive accuracy. These include bagging, boosting, and stacking. Leveraging the diversity of constituent models, ensemble methods bolster model robustness and generalization.

G. Hybrid Models - Hybrid models integrate different algorithms or techniques to harness their synergistic strengths. For instance, a hybrid model may fuse linear regression with a neural network to capture both linear and nonlinear feature-price relationships. By rigorously evaluating model performance using appropriate metrics (e.g., mean squared error, root mean squared error, R-squared), practitioners can discern the optimal model or ensemble thereof for effectively predicting laptop prices in machine learning applications.

5.MODEL TRAINING - Training a model for laptop price prediction using machine learning involves several crucial steps to ensure accurate predictions and effective deployment. Here's an overview of the model training process tailored specifically for laptop price prediction:

A. Data Preparation – Initially, the dataset containing historical information about laptops is divided into two subsets: training data and testing data. Typically, around 70-80% of the data is allocated for training, while the rest is reserved for testing. It's essential to split the data carefully to ensure that both subsets represent the overall dataset's characteristics accurately.

B. Model Initialization - The chosen machine learning algorithm is initialized with default parameters or manually specified initial parameters. For example, when using a neural network, parameters such as the architecture, number of layers, activation functions, and learning rate are defined.

C. Model Training – The initialized model is trained using the training dataset. During training, the model learns patterns and relationships between input features (e.g., laptop specifications) and the target variable (laptop prices) by adjusting its internal parameters (weights and biases). This process involves iteratively presenting batches of data to the model, calculating prediction errors (loss or cost), and updating the model parameters using optimization algorithms like gradient descent or its variants (e.g., stochastic gradient descent, mini-batch gradient descent). The goal is to minimize prediction errors and enhance the model's ability to generalize to unseen data.

D. Model Evaluation – Following model training, its performance is evaluated using the testing dataset. Evaluation metrics such as mean squared error (MSE), root mean squared error (RMSE), mean absolute error (MAE), or R-squared (R^2) score are computed to assess the model's accuracy and predictive power. Evaluating how well the model generalizes to new, unseen data is crucial for determining its effectiveness in real-world scenarios.

E. Hyperparameter Tuning - The model's hyperparameters are fine-tuned to optimize its performance further. Hyperparameters, such as the learning rate, regularization strength, number of hidden layers, and neurons per layer, significantly impact the learning process. Techniques like grid search, random search, or Bayesian optimization are employed to search for the best hyperparameter values efficiently.

F. Cross-Validation – Cross-validation techniques, like k-fold cross-validation, may be employed to assess the model's performance robustly. Cross-validation helps validate the model's performance across multiple data subsets, mitigating issues related to dataset partitioning.

G. Model Deployment - Once the model's performance meets the desired criteria, it is deployed into production to make real-time predictions on new or unseen data. The deployed model can be integrated into various applications, including web platforms, mobile apps, or other software systems, facilitating informed decision-making in the laptop market. By adhering to these steps, practitioners can effectively train machine learning models for laptop price prediction, contributing to better decision-making and market understanding.

6.MODEL EVALUATION - Model evaluation is a critical step in laptop price prediction using machine learning (ML) as it assesses the performance of trained models and ensures their effectiveness in making accurate predictions. Here's an overview of the model evaluation process tailored for laptop price prediction:

A. Testing Dataset - Before evaluating the model, a separate testing dataset is held out from the training process. This dataset contains unseen instances of laptop data that the model has not been exposed to during training.

B. Prediction Generation - Utilize the trained model to generate predictions for laptop prices using the features from the testing dataset.
C. Evaluation Metrics - Compute various evaluation metrics to quantify the performance of the model. Common metrics for regression tasks in laptop price prediction include: Mean Squared Error (MSE): Computes the average squared difference between the actual and predicted prices. Root Mean Squared Error (RMSE): Calculates the square root of the MSE, providing an interpretable measure in the same unit as the target variable. Mean Absolute Error (MAE): Measures the average absolute difference between the actual and predicted prices. R-squared (R^2) Score: Represents the proportion of the variance in the target variable that is explained by the model. Higher values indicate better model fit.
D. Interpretation and Analysis - Analyse the evaluation metrics to gain insights into the model's performance. A lower MSE, RMSE, and MAE indicate better predictive accuracy, while a higher R-squared score indicates better model fit. b. Examine any discrepancies between actual and predicted prices to identify potential areas for improvement or model refinement.
E. Comparison with Baselines – Compare the performance of the trained model against baseline models or heuristic approaches. This comparison provides context and helps assess the added value of using ML techniques for laptop price prediction.
F. Visualization - Visualize the actual versus predicted prices using scatter plots or other graphical representations. Visualization can offer intuitive insights into the model's predictive capabilities and identify any patterns or outliers in the predictions.
G. Cross-Validation - Employ cross-validation techniques, such as k-fold cross-validation, to validate the model's performance across multiple subsets of the data. Cross-validation provides a more robust estimate of the model's generalization performance and helps mitigate issues related to dataset partitioning.
H. Iterative Improvement – Based on the evaluation results, iterate on the model design, hyperparameters, or feature engineering techniques to improve predictive performance further. This iterative process helps refine the model and enhance its accuracy over time. By rigorously evaluating the trained models using appropriate metrics and techniques, practitioners can assess their performance accurately and make informed decisions regarding model deployment and refinement in laptop price prediction tasks.

7.HYPERPARAMETER TUNING - Hyperparameter tuning is a crucial aspect of building effective machine learning models for laptop price prediction. It involves optimizing the hyperparameters of the chosen algorithm to enhance the model's performance. Here's an overview of the hyperparameter tuning process tailored for laptop price prediction using ML:
A. Identify Hyperparameters - Identify the hyperparameters of the chosen machine learning algorithm(s) that significantly impact the model's performance. These may include parameters such as learning rate, regularization strength, number of hidden layers (for neural networks), maximum depth (for decision trees), and so on.
B. Define Search Space - Define the range or possible values for each hyperparameter that you want to explore during the tuning process. The search space should encompass a wide enough range to allow for sufficient exploration of hyperparameter combinations.
C. Choose Tuning Method - Select a method for tuning the hyperparameters, such as - Grid Search: Exhaustively search through all possible combinations of hyperparameter values within the defined search space. Random Search: Randomly sample hyperparameter values from the search space, which can be more efficient than grid search for high-dimensional spaces. Bayesian Optimization: Utilize probabilistic models to intelligently select hyperparameter values based on past evaluations of the model's performance.
D. Validation Strategy - Determine the validation strategy to evaluate the performance of different hyperparameter configurations. Common validation strategies include: Holdout Validation: Split the training dataset into training and validation subsets. Train each model configuration on the training subset and evaluate its performance on the validation subset. Cross-Validation: Perform k-fold cross-validation, where the training dataset is divided into k subsets (folds), and each configuration is evaluated k times on different combinations of training and validation sets.
E. Evaluation Metric - Choose an appropriate evaluation metric to assess the performance of each hyperparameter configuration. For laptop price prediction, metrics like mean squared error (MSE), root mean squared error (RMSE), or mean absolute error (MAE) are commonly used to quantify prediction accuracy.
F. Perform Hyperparameter Search - Execute the chosen hyperparameter tuning method (e.g., grid search, random search) using the defined search space and validation strategy. Train and evaluate the model for each hyperparameter configuration and record the performance metrics.
G. Select Best Configuration - Identify the hyperparameter configuration that yields the best performance on the validation set based on the chosen evaluation metric. This configuration is considered the optimal set of hyperparameters for the model.
H. Final Model Training - Train the final model using the entire training dataset and the selected optimal hyperparameters. This ensures that the model is trained on the maximum amount of data and can potentially generalize better to unseen instances.
I. Model Evaluation - Evaluate the final trained model on the testing dataset to assess its performance and validate its effectiveness in predicting laptop prices accurately. By systematically tuning the hyperparameters of the machine learning model(s), practitioners can optimize their

performance and improve the accuracy of laptop price predictions in real-world applications.

8.DEPLOYMENT - Deployment in the context of laptop price prediction using machine learning (ML) involves preparing and operationalizing trained models to make real-time predictions. Here's a comprehensive overview of the deployment process:

A. Exporting the Model - After satisfactory training and evaluation, the machine learning model must be exported or serialized into a format suitable for deployment. Popular formats include pickle (for Python-based models) or PMML (Predictive Model Markup Language).

B. Integration with Applications – Integrate the exported model into the target application or system requiring price prediction functionality, whether it's a web app, mobile app, or enterprise software. Clear documentation and guidelines should accompany this integration to facilitate seamless incorporation into the application codebase.

C. API Development - Develop an API (Application Programming Interface) to expose the model's functionality as a service accessible over the network. This allows external applications or systems to request predictions by sending requests to the API endpoint, necessitating clear definition of API endpoints, request parameters, and response formats.

D. Scalability and Performance Optimization – Design the deployment architecture to scale efficiently and perform well under varying workloads. Considerations such as load balancing, horizontal scaling, and caching mechanisms are essential to ensure optimal performance.

E. Containerization – Containerize the deployed model using technologies like Docker or Kubernetes for consistent deployment across diverse environments and simplified management of dependencies and configurations.

F. Monitoring and Logging Implementation - Implement monitoring and logging mechanisms to monitor the model's performance and health in real-time. Key metrics such as prediction latency, throughput, error rates, and resource utilization should be tracked to promptly identify and address any issues.

G. Security Measures Implementation - Implement security measures to safeguard the deployed model and the data it handles from unauthorized access, tampering, or exploitation. This involves measures like authentication, authorization, encryption, and compliance with data privacy regulations.

H. Continuous Integration/Continuous Deployment (CI/CD) - Establish CI/CD pipelines to automate the deployment process and ensure seamless integration of updates or improvements to the model. Automation of testing, validation, and deployment stages minimizes downtime and streamlines the release cycle.

I. User Training and Support- Offer training and support to end-users, developers, and stakeholders on interacting with the deployed model, interpreting its predictions, and troubleshooting any issues that arise.

J. Feedback Loop and Model Maintenance - Establish a feedback loop to collect user feedback and monitor the model's performance in production. Use this feedback to iteratively enhance the model through retraining, updating hyperparameters, or incorporating new features. By adhering to these deployment best practices, practitioners can effectively deploy machine learning models for laptop price prediction, delivering value to end-users in real-world scenarios.

IV.RESULT OF THE PREDICTION:

Laptop price prediction using machine learning (ML) involves leveraging algorithms and statistical models to forecast the prices of laptops based on various factors such as specifications, brand, market trends, and economic indicators. The process typically begins with data collection, where historical pricing data along with features of laptops are gathered from diverse sources. These features may include processor type, RAM capacity, storage, screen size, brand reputation, and even user reviews. Once the data is collected, it undergoes preprocessing, which involves cleaning, normalization, and feature engineering to ensure that it is suitable for analysis. Feature engineering may include techniques such as one-hot encoding for categorical variables and scaling for numerical variables. Next, a suitable machine learning model is selected and trained using the pre-processed data. Popular algorithms for price prediction tasks include linear regression, decision trees, random forests, support vector machines, and neural networks. The model is trained to learn the relationship between the features and the target variable (price) from the historical data. After training, the model is evaluated using metrics such as mean absolute error, mean squared error, or R-squared to assess its performance. If the model performs well on the evaluation metrics, it can be deployed for making predictions on new, unseen data. In practice, the model's predictions can be influenced by various factors such as the quality and quantity of the data, the choice of features, and the complexity of the model. Continuous monitoring and periodic retraining of the model may be necessary to maintain its accuracy, especially in dynamic markets where factors affecting laptop prices can change rapidly. Overall, laptop price prediction using ML offers businesses valuable insights for pricing strategies, inventory management, and market positioning, enabling them to make data-driven decisions in a competitive landscape.

V.CONCLUSION:

In summary, incorporating machine learning (ML) techniques for laptop price prediction offers substantial benefits and opportunities within the consumer electronics sector. By leveraging historical data, advanced algorithms, and predictive modeling methodologies, ML empowers stakeholders to navigate the intricacies of the laptop market with enhanced precision and insight. This study comprehensively explored various aspects of ML-driven

laptop price prediction, covering data collection, preprocessing, feature selection, model selection, training, evaluation, hyperparameter tuning, and deployment. Each phase of the process contributes to the development of resilient predictive models that augment decision-making for consumers, retailers, and manufacturers.ML algorithms such as linear regression, decision trees, random forests, gradient boosting, and neural networks play a pivotal role in capturing the nuanced relationships between laptop attributes and prices, thereby enabling more accurate forecasting. Through adept feature engineering and rigorous model selection, models are tailored to generalize effectively to new data and adapt to evolving market dynamics. Furthermore, the deployment of ML models into production environments facilitates real-time price predictions, enabling stakeholders to respond promptly to market shifts and consumer preferences. Ongoing monitoring, feedback integration, and model maintenance ensure the sustained relevance and efficacy of predictive models amidst the ever-changing laptop market landscape. In essence, ML-driven laptop price prediction serves as a valuable tool for fostering transparency, efficiency, and competitiveness in the consumer electronics industry. By leveraging data-driven insights and predictive analytics, stakeholders can refine pricing strategies, optimize inventory management practices, and ultimately deliver enhanced value to consumers. As technology progresses, the integration of ML into pricing methodologies will remain indispensable for driving innovation and maintaining a competitive advantage in the dynamic laptop market.

VI.FUTURE WORKS:

Looking ahead, there are several promising avenues for future research and development in the realm of laptop price prediction using machine learning (ML). Here are some potential areas of focus:

A. Advanced Feature Engineering: Exploring more sophisticated feature engineering techniques, including natural language processing (NLP) for analyzing textual data such as user reviews and product descriptions. Additionally, incorporating image processing techniques for extracting information from product images could further enrich the feature set and improve prediction accuracy.

B. Ensemble Learning: Investigating the efficacy of ensemble learning techniques such as stacking, where multiple diverse models are combined to achieve superior performance. Ensemble methods can enhance model robustness and generalization capabilities, particularly in complex and dynamic market environments.

C. Deep Learning Architectures: Delving deeper into the application of deep learning architectures, such as recurrent neural networks (RNNs) or transformers, for capturing temporal dependencies and sequential patterns in the data. These architectures may offer improved performance in handling sequential data and time-series features relevant to laptop prices.

D. Transfer Learning*: Exploring transfer learning approaches to leverage pre-trained models on large datasets from related domains (e.g., electronics pricing in general) and fine-tuning them for laptop price prediction tasks. Transfer learning can help overcome data scarcity issues and accelerate model training with limited labeled data.

E. Dynamic Pricing Strategies: Investigating dynamic pricing strategies based on ML models' predictions to optimize pricing decisions in real-time. Adaptive pricing strategies could be developed to respond to changing market conditions, competitor prices, and consumer preferences, thereby maximizing revenue and profitability for retailers and manufacturers.

F. Explainable AI: Enhancing model interpretability and explainability to provide transparent insights into how pricing decisions are made. Developing interpretable ML models can foster trust among stakeholders and facilitate better decision-making by understanding the factors driving price predictions.

G. Domain-Specific Models: Tailoring ML models specifically for different laptop market segments (e.g., gaming laptops, ultrabooks) or target customer demographics. Domain-specific models can capture unique features and preferences relevant to each segment, leading to more accurate and personalized price predictions.

H. Real-Time Market Data Integration: Integrating real-time market data streams, social media sentiment analysis, and economic indicators into ML models to capture the latest trends and dynamics influencing laptop prices. Continuous data integration can enhance model adaptability and responsiveness to market changes.

I. Ethical and Fair Pricing Practices: Addressing ethical considerations and biases in pricing models to ensure fair and equitable pricing practices. Developing ML models that mitigate biases based on factors such as demographics, location, or socioeconomic status can promote fairness and inclusivity in pricing decisions.

J. Industry Collaboration and Benchmarking: Collaborating with industry partners and sharing benchmark datasets and evaluation metrics to foster innovation and standardization in laptop price prediction research. Establishing common evaluation benchmarks can facilitate comparisons between different models and drive advancements in the field. By exploring these future directions, researchers and practitioners can further enhance the accuracy, efficiency, and fairness of laptop price prediction using ML, ultimately benefiting consumers, retailers, manufacturers, and the broader consumer electronics industry.

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EFFICIENT CNN-BASED FRAMEWORK FOR FRUITS & VEGETABLES RECOGNITION

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***Abstract*— The recognition and classification of fruits and vegetables are essential tasks in various domains such as agriculture, food processing, and retail. Convolutional Neural Networks (CNNs) have demonstrated remarkable success in image recognition tasks, including those involving fruits and vegetables. The framework employs a combination of techniques aimed at optimizing both accuracy and efficiency. Firstly, a lightweight CNN architecture is designed to ensure rapid inference without compromising recognition performance. Secondly, data augmentation techniques are employed to enrich the training dataset, thereby enhancing the model's generalization capabilities. Thirdly, transfer learning is utilized to leverage pre-trained models and adapt them to the specific task of fruit and vegetable recognition, reducing the need for extensive training on limited datasets.That datasets comprising various types of fruits and vegetables. Results demonstrate that the proposed framework achieves competitive accuracy levels while significantly reducing computational requirements and inference time compared to existing approaches. Overall, the proposed CNN-based framework offers a promising solution for efficient and accurate fruits and vegetables recognition, with potential applications in agriculture automation, food quality assessment, and retail inventory management.**

Keywords*— *Machine learning; Convolutional Neural Network (CNN); Recognition; Object detection; Fruits and Vegetable detection; Voice generation.

INTRODUCTION

Efficient Convolutional Neural Network (CNN)-based frameworks have revolutionized the field of computer vision, particularly in tasks such as object recognition and classification. In recent years, there has been a growing interest in applying CNNs to specific domains, such as recognizing and classifying fruits and vegetables.It is a challenging task due to the variability in appearance, shape, size, and texture among different types of fruits and vegetables. By employing techniques such as transfer learning, data augmentation, and optimization algorithms, this framework aims to achieve high accuracy and efficiency in identifying and categorizing various fruits and vegetables.Key components of this framework include a carefully designed CNN architecture optimized for the task of fruit and vegetable recognition, along with a comprehensive dataset containing diverse examples of fruits and vegetables. The CNN model is trained on this dataset using supervised learning techniques, where it learns to extract relevant features from input images and classify them into different fruit and vegetable categories, to achieve accurate recognition results making it suitable for real-time applications and resource-constrained environments.

LITERATURE REVIEW

A literature survey for an efficient CNN-based framework for fruits and vegetables recognition involves reviewing existing research papers, articles, and publications related to similar topics. In [1] Li, Z.et.al (2019).The proposes a fruit and vegetable recognition method based on a CNN with improved performance.[2] Nascimento,et.al(2020).To deep learning techniques for fruit and vegetable classification, including CNN-based approaches.[3] Koirala, A,et.al (2020).It covers deep learning techniques, including CNNs, for various agricultural tasks, including fruit and vegetable recognition.[4] Ma, J., et.al (2020).A fruit and vegetable recognition method based on CNNs with data augmentation techniques.[5] Hu,H.,et.al (2020).An automated fruit and vegetable recognition system utilizing CNNs and data augmentation methods.[6] He,Z.,et.al (2020).

A fast and accurate CNN model for fruit and vegetable classification, emphasizing efficiency.[7] Baheti,A.,et.al (2020).Fruit and vegetable recognition system based on CNNs, focusing on consumer electronics applications. [8] Tan, M.,et.al (2019). EfficientNet: Rethinking model scaling for convolutional neural networks. [9] Wen, W.,et.al(2019). Embedded food quality inspection system with efficient convolutional neural network design.[10] Yu, Y.,et.al (2019). Fruit detection for strawberry harvesting robot in non-clustered environments based on mask-RCNN.

III.METHODOLOGY

The proposed methodology for the Efficient CNN-Based Framework for Fruits and Vegetables Recognition involves

several key steps aimed at achieving high accuracy and efficiency in dentifying and classifying different types of fruits and vegetables. Here's an outline of the methodology:

Figure 1: Step by step process

Hashed values are generated only if the signature is genuine; they are not generated if the signature is fraudulent. Time stamps, hash values, and the previous hash value are all included in a block containing all of the data. A safe chain of records is ensured as each file's authenticity is based on the hash value of the one before it. Administrators are in charge of overseeing and controlling the functionality and security of the system by adding station logins and checking FIRs. This arrangement guarantees the security and integrity.

A. DEFINING THE SCOPE AND DATA COLLECTION:

The framework for fruits and vegetables recognition, gathering data involves several steps to ensure a diverse and comprehensive dataset.

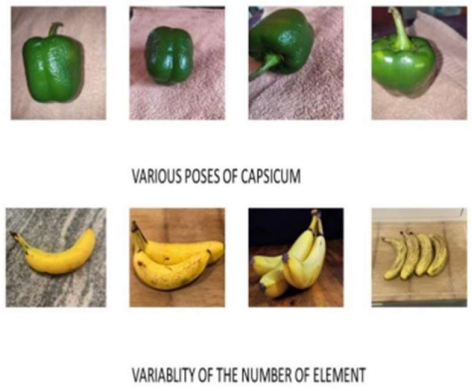

Figure 2: Different poses

Figure 3: Fruits and vegetables

Define Data Requirements: Clearly outline the types of fruits and vegetables that need to be recognized. Consider including a broad selection to ensure model robustness across different produce types.

Quality Assurance: Perform quality checks on the dataset to identify and rectify anomalies like mislabeled images or poor quality photos. Remove duplicates and ensure balanced representation across different categories to prevent bias during training.

Privacy and Ethics: Adhere to privacy and ethical guidelines when collecting and using image data, especially if it involves human subjects or sensitive information. Obtain necessary permissions and consent for data collection, respecting individuals' rights and privacy.

B.DATA PREPROCESSING:

In recognizing fruits and vegetables, the preprocessing of data is essential to ensure that the dataset is well-prepared for model training. Here's a breakdown of how data preprocessing can be carried out:

Uniform Image Resizing: Resize all images to a consistent size to ensure uniformity in input dimensions. This aids in reducing computational complexity during both training and inference stages. Opt for an appropriate image size based on

the input requirements of the chosen CNN architecture within the framework.

Normalization of Pixel Values: Normalize pixel values to a standardized scale, typically ranging between 0 and 1.Standardize the mean and variance of pixel values across the dataset to enhance the stability and acceleration of the training process.

Strategic Data Splitting: Divide the preprocessed dataset into distinct training, validation, and test sets. The training set is utilized for model training, while the validation set aids in hyperparameter tuning and assessing model performance during training. The test set is then used for final model evaluation. Ensure equitable distribution of images across all subsets, preventing biased performance evaluations.

Optional Data Balancing Technique: Address dataset imbalance, if present, through techniques such as oversampling, undersampling, or class weighting. These methods help in balancing the distribution of samples across different categories, mitigating biases toward majority classes.

Serialization of Data: Serialize the preprocessed dataset into a suitable format for efficient storage and retrieval during model training. Common formats include HDF5, TFRecord, or NumPy arrays. Additionally, serialize metadata such as class labels and dataset statistics to facilitate reference during model evaluation and deployment.

Efficient Data Augmentation Pipeline: Implement a streamlined data augmentation pipeline leveraging libraries like TensorFlow Data Augmentation (tf.image) or OpenCV. Such pipelines allow for on-the-fly augmentation during model training, thereby reducing memory overhead and expediting data loading.

C. MODEL SELECTION AND ARCHITECTURE DESIGN:

To selecting an appropriate model architecture is crucial for achieving high accuracy while maintaining computational efficiency. Here's how model selection and architecture design can be approached.

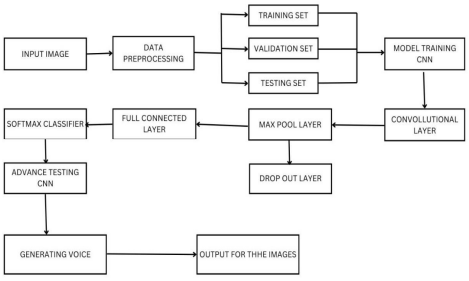

Figure 4: Architecture diagram

Research Existing Architectures: Explore existing CNN architectures that are known for their efficiency and effectiveness in image classification tasks. Architectures like MobileNet, EfficientNet, and SqueezeNet are popular choices due to their lightweight design and computational efficiency.

Consider Model Size and Complexity: Assess the trade-off between model size, computational requirements, and accuracy. In an efficient framework, prioritize models that strike a balance between these factors, favoring architectures with fewer parameters and lower computational complexity.

Regularization and Optimization: Incorporate regularization techniques such as dropout or L2 regularization to prevent overfitting and improve generalization. Optimize hyperparameters such as learning rate, batch size, and optimizer choice to fine-tune model performance and convergence speed.

Evaluate Performance Metrics :Assess the performance of different architectures using metrics such as accuracy, computational efficiency, and inference speed. Conduct experiments to compare the trade-offs between different models and select the one that best meets the requirements of the framework.

Transfer Learning and Fine-tuning: Leverage transfer learning by initializing the model with weights pre-trained on a large-scale dataset such as ImageNet. Fine-tune the model on the fruit and vegetable dataset to adapt it to the specific characteristics of the task.

D. TRANSFER LEARNING AND FINE-TUNING

Transfer learning and fine-tuning are crucial techniques for leveraging pre-trained models and adapting them to the specific task at hand. Here's how these techniques can be applied

Transfer Learning: Start by selecting a pre-trained CNN model that has been trained on a large-scale dataset such as ImageNet. Models like VGG, ResNet, Inception, MobileNet, or EfficientNet are commonly used for transfer learning. Transfer learning involves using the pre-trained model as a feature extractor, where the learned representations of the model's earlier layers are preserved, and only the final layers are replaced or retrained for the target task. By leveraging the feature representations learned from a diverse dataset like ImageNet, the model can capture generic features such as edges, textures, and patterns, which are beneficial for recognizing fruits and vegetables.

Fine-Tuning: After initializing the pre-trained model, fine-tuning involves further training the model on the target dataset of fruits and vegetables to adapt its learned representations to the specific characteristics of the task. Fine-tuning typically involves unfreezing some of the earlier layers of the pre-trained model while keeping the later layers frozen. This allows the model to learn task-specific features while retaining the previously learned generic features. Gradually unfreeze additional layers as needed and continue training until convergence. Monitor the model's performance on a validation set and adjust hyperparameters such as learning rate and regularization to optimize performance.

Evaluation and Monitoring:Evaluate the fine-tuned model on a separate validation set to assess its performance and generalization ability. Monitor key performance metrics such as accuracy, precision, recall, and F1-score during

training and validation to track the model's progress and identify potential issues.

E. TRAINING STRATEGY:

E.1.OPTIMIZING TRAINING FOR FRUIT &VEGETABLE RECOGNITION CNNs:

This section details a comprehensive training strategy specifically designed for Convolutional Neural Network (CNN) models tasked with fruit and vegetable recognition. This strategy prioritizes achieving optimal performance and strong generalization capabilities while maintaining efficiency.

Strategic Data Splitting :Divide the preprocessed dataset into training, validation, and test sets. The training set fuels the model's learning, the validation set guides hyperparameter tuning, and the test set provides a final, unbiased evaluation. Ensure all sets represent a balanced distribution of fruit and vegetable classes.

Leveraging Pre-trained Knowledge: Initialize the CNN with weights pre-trained on a large dataset like ImageNet. These weights capture features relevant to object recognition, including those potentially useful for fruits and vegetables. Initially freeze the weights in early layers to prevent drastic changes during training.

Iterative Training and Validation :Train the CNN on the training set using batches of preprocessed images. Monitor training progress by tracking metrics like loss and accuracy on both the training and validation sets. Regularly validate the model on the validation set (e.g., after each epoch) to identify overfitting and adjust hyperparameters as needed. Continue training until the model converges or validation set performance plateaus.

Optional Fine-tuning for Refinement: After initial training, consider fine-tuning the entire model. This involves unfreezing some or all layers and retraining them with a lower learning rate. Fine-tuning allows the model to further adapt its learned representations to the specific characteristics of the target fruit and vegetable dataset.

F. MODEL EVALUATION & VALIDATION:

Absolutely, model evaluation and validation are crucial steps in any machine learning framework, including those based on Convolutional Neural Networks (CNNs) for tasks like fruits and vegetables recognition. Here's a breakdown of the process:

Training Data : The first step is to collect and preprocess a diverse dataset of fruits and vegetables images. This dataset should cover a wide range of variations in terms of shapes, sizes, colors, lighting conditions, backgrounds, and occlusions.

Splitting Data : Divide the dataset into three subsets: training set, validation set, and test set. The training set is used to train the model, the validation set is used to tune hyperparameters and monitor the model's performance during training, and the test set is used to evaluate the final performance of the trained model.

Model Architecture: Choose an appropriate CNN architecture for the recognition task. Common architectures for image recognition tasks include AlexNet, VGG, ResNet, and Inception.

Validation: Evaluate the performance of the trained model on the validation set. This step helps in tuning hyperparameters and detecting issues such as overfitting.

Testing: Once the model is trained and fine-tuned, evaluate its performance on the test set. This step provides an unbiased estimate of the model's performance on unseen data.

Deployment: Once satisfied with the model's performance, deploy it in a real-world application for fruits and vegetables recognition.

G.DEPLOYMENT & OPTIMIZATION:

Through model evaluation is pivotal in an efficient CNN-based framework for recognizing fruits and vegetables. Here's a detailed approach

Validation Set Evaluation: Assess the trained model on a distinct validation set to spot any potential issues like overfitting or underfitting. Compute key evaluation metrics including accuracy, precision, recall, F1-score, and confusion matrix to gauge performance across various classes. Visualize model predictions to discern patterns of success and areas of difficulty.

Cross-Validation (Optional): If dataset size allows, consider cross-validation for more robust performance estimates. This entails splitting the dataset into folds, training the model on subsets, and assessing performance on remaining folds. Compute average evaluation metrics across all folds to evaluate generalization ability.

Test Set Evaluation: Once model hyper parameters are finalized, assess performance on an independent test set not used for training or validation. This ensures an unbiased estimate of real-world performance. Compute evaluation metrics, mirroring those from the validation set, such as accuracy, precision, recall, and F1-score. Compare performance on the test set with that on the validation set to ensure consistency and reliability.

Error Analysis: Analyze misclassifications to discern common error patterns and areas of model struggle. This analysis provides insights for future enhancements. Identify frequently misclassified patterns or classes and consider collecting additional training data or adjusting model architecture to address these challenges.

IV.RESULTS & DISCUSSION

You would typically aim for the following results.

High Accuracy : The model should achieve high accuracy in classifying fruits and vegetables correctly. This accuracy should be consistently high across different subsets of the dataset, indicating robust generalization.

Generalization : The model should generalize well to unseen fruits and vegetables, meaning it can accurately classify images it hasn't been trained on. This ensures that the model can perform effectively in real-world scenarios where it encounters novel examples.

Low Overfitting : Overfitting occurs when the model performs well on the training data but poorly on unseen data.

An efficient framework should mitigate overfitting by using techniques like dropout, data augmentation, and regularization to ensure the model learns meaningful features rather than memorizing the training data.

Fast Inference Time : The inference time, i.e., the time taken by the model to process an input image and produce a classification output, should be fast enough to be practical for real-time applications. Efficient CNN architectures and optimization techniques can help reduce inference time without sacrificing accuracy significantly.

Interpretability : While not strictly necessary for performance, interpretability can be beneficial for understanding why the model makes certain predictions. Techniques like visualization of activation maps and feature attribution methods can help provide insights into the model's decision-making process.

Scalability: The framework should be scalable to handle large datasets and accommodate future expansions or improvements. This includes efficient data loading, training, and inference pipelines, as well as compatibility with distributed computing frameworks for training on large clusters.

V. CONCLUSION

In proposes an efficient convolutional neural network (CNN) framework for the recognition of fruits and vegetables, the concluding section typically encapsulates the following crucial elements: A succinct recapitulation of the proposed CNN model's architecture, delineating the number of layers, their types (convolutional, pooling, fully connected), and any specific modifications or enhancements incorporated. An evaluation of the CNN model's performance, summarizing the achieved results in terms of accuracy, precision, recall, or other relevant metrics. A highlight of the key advantages and strengths of the proposed CNN framework, such as improved recognition accuracy, faster inference time, better generalization to diverse datasets, or robustness to variations in illumination, scale, or viewpoint.A discussion of the potential applications of the developed CNN-based recognition system in various domains, including agriculture, food industry, retail, or any other relevant areas where accurate fruit and vegetable recognition can be beneficial.An acknowledgment of any limitations or challenges encountered during the development or evaluation of the CNN model, along with suggestions for potential ways to address them in future work.A CNN-based framework for fruits and vegetables recognition, emphasizing its potential impact and importance in the field of computer vision and agricultural applications. The conclusion should be clear, concise, and provide a comprehensive overview of the proposed approach, its advantages, and its potential impact, while also acknowledging any limitations and suggesting future research directions.

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AIR QUALITY PREDICTION USING AI AND ML

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***Abstract*—Air quality prediction is a method employed to find out the quality of air in the surrounding atmosphere. Air pollution and its harm to human health has become a serious problem in many cities around the world.in recent years, research interests in measuring and predicting the quality of air around people has spiked. As the quality of air is degrading day by day due to rapid urbanization and industrialization drastically, a method for predicting the air quality is needed. So, an air quality predicting application can be used to find our requirements. This app makes use of a high quality temperature and pressure sensor and an high quality hd camera to detect the quality of air in a place at the same instant. Traditional way of using fixed sensors cannot effectively provide a comprehensive view of air pollution in peoples immediate surroundings, since the closest sensors can be possibly miles away. With a new approach ,a full spectrum of how air quality varies in nearby regions can be analyzed. After the detection of the surrounding atmosphere, the obtained values of pollutants will be compared with the standard acceptable values of pollutants given by the various meterological departments. Finally,a detailed prediction is made to find whether a particular area or region is safe from pollution or the region has higher risk of pollution hazards.**

Keywords—real-time tracking, mobile application, sensor.

I. INTRODUCTION:

The escalating levels of air pollution in urban areas worldwide have emerged as a critical environmental and public health concern. Rapid industrialization, coupled with urbanization, has exacerbated this issue, prompting the urgent need for innovative approaches to monitor and predict air quality in real-time. Traditional methods relying on fixed sensors often fail to provide accurate assessments of localized air pollution variations. In response, this study proposes a novel methodology that integrates high-precision temperature, pressure sensors, and an HD camera to offer immediate and comprehensive air quality evaluations. By leveraging advanced data analysis techniques and a user-friendly mobile application interface, our approach surpasses the limitations of conventional monitoring systems, providing users with actionable insights into their immediate surroundings. This introduction sets the stage for our research, which aims to address the pressing challenge of urban air pollution by offering a proactive solution that empowers individuals to make informed decisions for safeguarding their health and well-being**.**

II. SYSTEM ARCHITECTURE

A. Selecting Sensors and Deployment Research and identify the types of sensors suitable for measuring air pollutants of interest. Common sensors include particulate matter sensors, gas sensors (for NO2, SO2, CO, etc.), temperature sensors, humidity sensors, and pressure sensors.Consider factors such as sensor accuracy, precision, sensitivity, response time, and power consumption based on project requirements and environmental conditions.
Install the sensors in strategic locations within the target environment, such as urban areas, industrial zones, residential neighborhoods, or indoor spaces.
Position the sensors to capture representative data that accurately reflects the air quality conditions of the area.

B.Data Preprocessing:
In the air quality prediction project, the Data Preprocessing Layer refines raw sensor data to enhance its quality and usability for analysis. This involves cleaning the data to remove errors and inconsistencies, normalizing it to a standardized scale, and selecting relevant features. Additionally, the layer addresses missing values through imputation techniques. By ensuring the cleanliness, consistency, and suitability of the data, the preprocessing layer facilitates accurate modeling and prediction of air quality conditions, thereby improving the reliability of the overall system.

C.Machine Learning Model:
In the air quality prediction project, the Machine Learning Model Layer constructs models using preprocessed sensor data to forecast air quality. Regression models like linear regression and decision trees predict continuous pollutant concentrations by analyzing features such as temperature and humidity. Additionally, classification models like logistic regression categorize air quality into levels (e.g., good, moderate, unhealthy) based on preset thresholds.

By utilizing machine learning algorithms, this layer enables accurate predictions, facilitating informed decisions and interventions to mitigate air pollution's adverse effects on public health and the environment.

D.Prediction and Decision:
In the air quality prediction project, the Prediction and Decision Layer employs trained machine learning models to generate real-time forecasts of air quality conditions based on sensor data. It assesses potential risks associated with predicted pollutant levels and provides decision support by informing stakeholders of the current and future air quality status. This layer aids in proactive decision-making, enabling interventions to mitigate adverse effects on public health and the environment.

E.Visualization:
In the air quality prediction project, the Visualization and Reporting Layer presents insights derived from predictive models in a userfriendly manner. It employs graphical representations such as charts, maps, and dashboards to convey air quality predictions and trends effectively. Users can visualize current air quality conditions, track historical data, and receive alerts or notifications. This layer enables stakeholders to make informed decisions and take proactive measures to mitigate air pollution's adverse effects on public health and the environment.

F.Integration and Deployment:
In the air quality prediction project, the Integration and Deployment Layer ensures seamless communication between system components and deploys the predictive models and visualization tools on appropriate platforms. It manages data flow, facilitates real-time updates, and ensures scalability and accessibility of the system. This layer plays a crucial role in integrating the various elements of the project and making the air quality prediction system operational.

G.User Interface:
In the air quality prediction project, the User Interface Layer develops intuitive interfaces, such as web or mobile applications, to interact with the prediction system. It provides users with easy access to air quality information, allowing them to view predictions, track trends, and receive alerts.
This layer enhances user experience and facilitates informed decision-making regarding environmental health and safety.

III. RESULTS AND BENEFITS:

Through timely alerts and informed decisionmaking, it enhances public health, environmental protection, and resource optimization. Overall, it fosters resilience to pollution hazards, promoting healthier, safer communities and sustainable development.

A.Accurate Predictions:
The air quality prediction project delivers precise forecasts of air quality, allowing stakeholders to proactively manage environmental health risks. By anticipating pollution levels, stakeholders can implement timely interventions, minimizing exposure to harmful pollutants and safeguarding public health and well-being.

B.Informed Decision:
Informed decision-making facilitated by the air quality prediction project empowers stakeholders to make choices based on reliable data. This includes policymakers implementing effective regulations, citizens adjusting behaviors to minimize exposure, and urban planners guiding development strategies, all contributing to healthier environments and improved public health outcomes.

C. Improved Public Health:
Improved public health resulting from the air quality prediction project stems from reduced exposure to harmful pollutants. Accurate predictions enable timely interventions, minimizing health risks associated with air pollution. By promoting cleaner air and healthier environments, the project contributes to mitigating respiratory diseases and enhancing overall wellbeing within communities.

D.Environmental Protection:
Environmental protection facilitated by the air quality prediction project involves identifying pollution sources and implementing measures to mitigate their impact. By guiding sustainable practices and regulatory actions, the project helps preserve ecosystems, safeguard biodiversity, and mitigate climate change, fostering a healthier and more resilient environment for current and future generations.

E.Resource Optimization:
Resource optimization driven by the air quality prediction project involves directing interventions and mitigation efforts efficiently. By targeting areas with the greatest need, stakeholders can maximize the effectiveness of pollution control measures, allocate resources judiciously, and minimize environmental impact, contributing to sustainable development and improved air quality management..

F.Timely Alerts:
Timely alerts provided by the air quality prediction project notify stakeholders of changing air quality conditions promptly. By delivering real-time information, these alerts enable individuals and authorities to take immediate action, such as adjusting outdoor activities or implementing pollution control measures, to mitigate health risks associated with poor air quality..

G. Future Scalability:
Enhanced resilience fostered by the air quality prediction project equips communities to withstand and adapt to environmental challenges. By providing insights into air

quality trends and hazards, the project enables proactive responses, strengthens preparedness measures, and fosters community cohesion, ultimately enhancing resilience to air pollution and its associated impacts.

H. Social Impact:
The air quality prediction project has a profound social impact by empowering individuals with knowledge to protect their health from air pollution risks. It fosters community awareness, engagement, and advocacy for cleaner air, promoting collective action towards environmental sustainability and improved public well-being.. **I.Environmental Benefits:**
The air quality prediction project delivers environmental benefits by guiding targeted interventions to reduce pollution, preserve ecosystems, and mitigate climate change. By promoting sustainable practices and informing policy decisions, it fosters a healthier environment and contributes to the conservation of natural resources for future generations.

IV. CONCLUSION:

In conclusion, the air quality prediction project represents a vital tool for safeguarding public health, enhancing environmental protection, and promoting sustainable development. By providing accurate forecasts, timely alerts, and actionable insights, the project empowers stakeholders to make informed decisions, mitigate health risks, and minimize environmental impacts. Through collaboration, innovation, and community engagement, this project contributes to building healthier, safer, and more resilient communities, paving the way for a brighter and cleaner future for all.

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- B.E.: Electronics and Instrumentation Engineering
- B.E.: Mechanical Engineering
- B.E.: Medical Electronics

PG Courses

- M.E.: Industrial Safety Engineering (DISH Approved)
- M.E.: Power Systems Engineering
- M.E.: Control & Instrumentation Engineering
- M.E.: Communication Systems
- M.E.: Computer Science and Engineering
- M.E.: Structural Engineering
- M.Tech: Data Science
- MBA: Master of Business Administration
- MCA: Master of Computer Applications*

* Subject to Approval

Research Centres

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