3.1 Scope & Relevance of Various Types of AI in Healthcare

Artificial Intelligence (AI) has the potential to revolutionize healthcare across various domains. Here's a breakdown of different types of AI and their scope and relevance in healthcare:

1. **Machine Learning (ML)**:

- Scope: ML algorithms analyze large datasets to identify patterns and make predictions or decisions without explicit programming.

- Relevance: ML is extensively used in healthcare for tasks such as disease prediction, diagnosis, treatment optimization, patient monitoring, and personalized medicine. For example, ML algorithms can analyze medical images (like X-rays, MRIs) to detect abnormalities or assist in drug discovery by analyzing genomic data.

2. **Natural Language Processing (NLP)**:

- Scope: NLP focuses on the interaction between computers and human language. It helps computers understand, interpret, and generate human language.

- Relevance: NLP is crucial in healthcare for tasks such as electronic health record (EHR) documentation, medical transcription, clinical decision support systems, and extracting valuable information from medical literature or patient notes. NLP can aid in automating administrative tasks, extracting insights from unstructured clinical data, and improving communication between healthcare providers.

3. **Computer Vision**:

- Scope: Computer vision involves algorithms that enable computers to interpret and analyze visual information from the real world.

- Relevance: In healthcare, computer vision is used for medical image analysis (e.g., detecting tumors in radiology images), surgical robotics, monitoring patient vital signs through cameras, and analyzing patient behavior for early disease detection or assessing mental health conditions.

4. **Robotics and Automation**:

- Scope: Robotics and automation involve the use of robots and automated systems to perform tasks traditionally carried out by humans.

- Relevance: In healthcare, robotics and automation are applied in surgical procedures (e.g., robot-assisted surgery), medication dispensing, physical assistance for patients with disabilities, and repetitive tasks in laboratories or pharmacies. These technologies enhance precision, reduce human error, and improve patient outcomes.

5. **Predictive Analytics**:

- Scope: Predictive analytics involves using statistical algorithms and machine learning techniques to forecast future events based on historical data.

- Relevance: In healthcare, predictive analytics is used for patient risk stratification (identifying patients at risk of developing certain conditions), forecasting disease outbreaks, optimizing hospital resource allocation, and predicting patient outcomes. It helps healthcare providers intervene proactively, improve resource efficiency, and deliver personalized care.

6. **Genomics and Personalized Medicine**:

- Scope: Genomics involves studying an organism's entire DNA sequence, while personalized medicine tailors medical treatment to individual characteristics of each patient.

- Relevance: AI is employed in genomics to analyze vast genomic datasets, identify genetic variations associated with diseases, and develop personalized treatment plans based on individual genetic profiles. It enables precision medicine by matching patients with the most effective therapies, reducing adverse reactions, and improving treatment outcomes.

7. Virtual Health Assistants:

- Scope: Virtual health assistants and chatbots are AI-powered systems designed to interact with users, provide information, answer questions, and offer support.

- Relevance: These technologies are used in healthcare for patient education, symptom checking, medication reminders, appointment scheduling, and triaging patients to appropriate levels of care. Virtual health assistants improve access to healthcare services, enhance patient engagement, and alleviate the burden on healthcare providers by handling routine inquiries.

Overall, AI has the potential to enhance various aspects of healthcare by improving diagnostic accuracy, treatment efficacy, operational efficiency, and patient experience. However, challenges such as data privacy concerns, algorithm bias, regulatory compliance, and integration with existing healthcare systems need to be addressed to realize the full benefits of AI in healthcare.

3.2 AI’s Timeline in Healthcare

The timeline of AI's integration into healthcare is dynamic and continuously evolving. Here's a brief overview:

1. **Early 2000s**: AI applications in healthcare were primarily focused on decision support systems, such as helping with diagnostics and treatment recommendations. However, these systems were limited in scope and effectiveness due to the constraints of technology and data availability.

2. **2010s**: The availability of large-scale datasets (big data) and advancements in machine learning algorithms, particularly deep learning, revolutionized AI's role in healthcare. This led to significant progress in medical image analysis, natural language processing for electronic health record (EHR) interpretation, and predictive analytics for patient outcomes.

3. **2016-2018**: Breakthroughs in AI-powered diagnostic tools emerged, particularly in radiology and pathology. For instance, algorithms were developed to analyze medical images like X-rays, MRIs, and CT scans with high accuracy, aiding in the detection of various diseases and conditions.

4. **2018-2020**: AI applications expanded beyond diagnostics to include personalized medicine, drug discovery, genomics, and remote patient monitoring. Pharmaceutical companies started leveraging AI to streamline drug development processes, identify potential drug candidates, and predict drug responses based on patient-specific factors.

5. **2020-Present**: The COVID-19 pandemic accelerated the adoption of AI in healthcare. AI-powered tools were deployed for rapid diagnosis, tracking the spread of the virus, and developing vaccines. Telehealth platforms integrated AI-driven features for remote consultations, triaging patients, and monitoring individuals' health remotely.

6. **Future (Beyond 2020)**: AI's role in healthcare is expected to continue growing. Anticipated advancements include enhanced clinical decision support systems, more accurate predictive analytics for disease prevention and management, improved patient outcomes through personalized treatment plans, and the integration of AI into wearable devices for continuous health monitoring.

Throughout this timeline, challenges such as data privacy concerns, regulatory compliance, algorithm bias, and ethical considerations remain pertinent. However, ongoing research and collaboration between healthcare professionals, data scientists, and technologists aim to address these challenges and harness the full potential of AI to improve healthcare delivery and patient outcomes.

3.3 Implementation of AI Concepts in the Medical World

AI concepts have been increasingly integrated into various aspects of the medical world, revolutionizing healthcare delivery, diagnosis, treatment, and patient care. Here are some key implementations of AI concepts in medicine:

1. **Diagnostic Imaging**: AI algorithms are used to interpret medical images such as X-rays, MRIs, CT scans, and mammograms. These algorithms can assist radiologists in detecting abnormalities, improving accuracy, and speeding up the diagnosis process.

2. **Predictive Analytics**: AI-powered predictive analytics models can analyze patient data to predict disease onset, progression, and treatment outcomes. This helps in personalized treatment planning and preventive care.

3. **Drug Discovery and Development**: AI is used to expedite drug discovery by analyzing vast datasets to identify potential drug candidates, predict their efficacy and side effects, and optimize drug formulations.

4. **Virtual Health Assistants**: Chatbots and virtual health assistants powered by AI provide patients with personalized medical advice, appointment scheduling, medication reminders, and symptom tracking, enhancing patient engagement and adherence to treatment plans.

5. **Genomics and Precision Medicine**: AI algorithms analyze genomic data to identify genetic predispositions to diseases, predict responses to treatments, and tailor personalized treatment plans based on individual genetic profiles.

6. **Robotic Surgery**: AI-enabled surgical robots assist surgeons in performing minimally invasive procedures with greater precision, control, and dexterity, leading to improved surgical outcomes and faster recovery times for patients.

7. **Natural Language Processing (NLP)**: NLP algorithms analyze unstructured clinical text data from electronic health records (EHRs), medical literature, and patient notes to extract valuable insights for clinical decision-making, research, and healthcare administration.

8. **Remote Patient Monitoring**: AI-powered wearable devices and remote monitoring systems collect and analyze real-time patient data, enabling early detection of health problems, proactive interventions, and remote patient management, particularly for chronic conditions.

9. **Clinical Decision Support Systems (CDSS)**: AI-based CDSS provide healthcare providers with evidence-based recommendations, treatment guidelines, and alerts for potential adverse drug interactions or diagnostic errors, improving clinical decision-making and patient safety.

10. **Healthcare Operations and Resource Management**: AI algorithms optimize hospital workflows, resource allocation, staff scheduling, and inventory management, leading to cost savings, improved efficiency, and better patient outcomes.

These implementations demonstrate how AI concepts are transforming the medical world by enhancing the accuracy, efficiency, accessibility, and personalized nature of healthcare delivery while also addressing some of the longstanding challenges in the field. However, it's essential to ensure the ethical use of AI in medicine, including data privacy, transparency, and accountability, to maximize its benefits while minimizing potential risks.

Implementation of AI Concepts in the Medical World

AI concepts have been revolutionizing healthcare delivery, diagnosis, treatment, and patient care. Here are some key implementations of AI concepts in medicine:

1. **Diagnostic Imaging**

2. **Predictive Analytics**

3. **Drug Discovery and Development**

4. **Virtual Health Assistants**

5. **Genomics and Precision Medicine**

6. **Robotic Surgery**

7. **Natural Language Processing (NLP)**

8. **Remote Patient Monitoring**

9. **Clinical Decision Support Systems (CDSS)**

10. **Healthcare Operations and Resource Management**

As of my last update in January 2022, there were numerous ongoing research efforts contributing to the advancement of AI. While I can't provide the very latest developments beyond that point, I can highlight some areas of research that were prominent and likely continued to advance.

3.4 Current Research that Contribute to the Advancement of AI

1. **Deep Learning Architectures**: Researchers were exploring novel deep learning architectures to improve the efficiency, scalability, and interpretability of neural networks. This includes techniques such as attention mechanisms, transformers, graph neural networks, and capsule networks.

2. **Reinforcement Learning**: Advancements in reinforcement learning (RL) were ongoing, with research focusing on improving sample efficiency, generalization, and stability of RL algorithms. Meta-learning, hierarchical RL, and curriculum learning were among the areas of active investigation.

3. **Explainable AI (XAI)**: As AI systems are increasingly deployed in critical applications, there was a growing emphasis on making AI systems more transparent and interpretable. Research in XAI aimed to develop techniques that provide insights into the decision-making processes of AI models.

4. **AI Ethics and Fairness**: Addressing biases and ethical considerations in AI systems remained a crucial area of research. Efforts were directed towards developing fair and unbiased algorithms, ensuring privacy and data security, and exploring the societal impacts of AI technologies.

5. **Neurosymbolic AI**: Combining symbolic reasoning with neural networks, neurosymbolic AI aimed to integrate the strengths of both approaches to enable more robust and interpretable AI systems. Research in this area explored methods for integrating logic-based reasoning with deep learning.

6. **AI for Healthcare**: AI continued to make significant contributions to healthcare, with research focusing on applications such as medical image analysis, drug discovery, personalized medicine, and health monitoring. AI techniques were being developed to assist healthcare professionals in diagnosis, treatment planning, and patient care.

7. **Natural Language Processing (NLP)**: NLP research was advancing rapidly, with breakthroughs in areas such as language modeling, text generation, sentiment analysis, and machine translation. Pre-trained language models like BERT, GPT, and T5 were being fine-tuned for various downstream tasks.

8. **AI and Robotics**: Research at the intersection of AI and robotics aimed to develop intelligent robots capable of performing complex tasks in unstructured environments. Topics of interest included robot learning, perception, manipulation, navigation, and human-robot interaction.

9. **AI and Climate Change**: AI was being leveraged to address environmental challenges, including climate modeling, renewable energy optimization, carbon footprint reduction, and natural disaster prediction. Researchers were exploring how AI techniques could be applied to mitigate the impacts of climate change.

10. **AI and Creativity**: Exploring the creative potential of AI, researchers were developing algorithms for generative art, music composition, storytelling, and other creative domains. AI systems were being used to assist artists, designers, and musicians in their creative endeavors.

These are just a few areas of research contributing to the advancement of AI. The field is vast and interdisciplinary, with researchers from various domains working together to push the boundaries of what AI can achieve.

3.5 Key Issues & Challenges Ahead in AI

Several key issues and challenges remain prevalent in the field of AI. These issues not only pose technical challenges but also raise ethical, societal, and economic concerns.

Here are some of the key issues and challenges ahead in AI:

1. **Ethical considerations**: Ethical concerns surrounding AI include issues like bias in AI systems, fairness and transparency, accountability, and the potential impact on privacy and security. Addressing these concerns is crucial to ensure that AI technologies are developed and deployed responsibly.

2. **Bias and fairness**: AI systems can inherit biases from the data they are trained on, leading to unfair or discriminatory outcomes, particularly in areas such as hiring, lending, and criminal justice. Mitigating bias and ensuring fairness in AI algorithms is an ongoing challenge.

3. **Explainability and interpretability**: Many AI algorithms, particularly those based on deep learning, are often seen as "black boxes" whose decision-making processes are not easily understandable by humans. Improving the explainability and interpretability of AI systems is essential for building trust and understanding in their use.

4. **Data privacy and security**: AI systems often rely on vast amounts of data, raising concerns about data privacy and security. Ensuring that AI technologies protect individuals' privacy and sensitive information is critical, particularly in light of increasing data breaches and privacy regulations.

5. **Regulatory challenges**: As AI technologies continue to advance and become more pervasive, there is a growing need for regulatory frameworks to govern their development and deployment. However, creating effective regulations that balance innovation with ethical considerations can be challenging and requires collaboration between policymakers, industry stakeholders, and researchers.

6. **Workforce displacement**: The increasing automation enabled by AI has the potential to disrupt labor markets and lead to job displacement in certain industries. Helping workers transition to new roles and acquiring skills that complement AI technologies is essential for mitigating the negative impact on employment.

7. **AI governance and international cooperation**: As AI technologies transcend national boundaries, there is a need for international cooperation and governance frameworks to address global challenges such as AI arms race, misuse of AI for malicious purposes, and ensuring equitable access to AI benefits.

8. **Environmental impact**: The computational demands of training and running AI models can have significant environmental consequences, contributing to carbon emissions and energy consumption. Developing more energy-efficient AI algorithms and infrastructure is crucial for mitigating the environmental impact of AI technologies.

9. **Misinformation and misuse**: AI technologies can be exploited to generate and spread misinformation, manipulate public opinion, and facilitate malicious activities such as cyberattacks.

Addressing these challenges requires efforts to develop AI systems that are resilient to misuse and to promote digital literacy among users.

10. **Safety and reliability**: Ensuring the safety and reliability of AI systems, particularly in critical domains such as healthcare, autonomous vehicles, and finance, is paramount. Robust testing, validation, and verification methods are needed to minimize the risk of AI failures and accidents.

Addressing these key issues and challenges will require concerted efforts from policymakers, researchers, industry stakeholders, and civil society to ensure that AI technologies are developed and deployed in a way that maximizes their benefits while minimizing potential risks and harms.

Inception of COVID-19 disease is a happening curse caused by the outbreak of Coronavirus covering almost the entire world. This pandemic condition has eaten up many lives, and still people are struggling between life and death every day.
The early signs of disease were first noticed in Wuhan of China in December 2019, which, being highly contagious, spread across the globe. As a rescue strategy, many countries have made different policies against this disease for reducing the severity.

Artificial intelligence (AI) is one such efficient policy, which can handle the situation better than any other aids. AI-powered drones have been used in surveillance and disinfectant activity.
Moreover, the technology helps in predicting the disease state in early stages using imaging data like X-rays and CT (computed tomography) scan. These techniques are components of AI, which has been running successfully in various fields.
The current advancement in AI is leading humans to upgrade their lives, which can be used in a significant way to reduce the pandemic impact. Through this manuscript, the readers will be able to understand different strategies based on AI that are applied in various healthcare sectors to fight effectively against COVID-19.

INCEPTION OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE
AI in healthcare utilizes certain complex algorithms and software, which imitate the human intelligence in processing (Clancey & Shortliffe, 1984). During the 1960s and 1970s, researchers have worked on AI and produced an expert system, which was the first problem-solving program named Dendral. MYCIN was another system subsequent to Dendral. It was mainly applied in organic chemistry (Swartout, 1985).
The extensive use of microcomputers with a unique network had started in the years of the 1980s and 1990s. In this era, researchers and developers recognized that AI in the healthcare promotes quality in visualizing data and helps in the expertise of physicians (Duda & Shortliffe, 1983)

Applications of AI in Detection and Treatment of COVID-19:

Radiology: Stanford created an algorithm that detects pneumonia at a specific site with a better average F1 metric than radiologists. Thus, the ability to interpret imaging results helps clinicians in the detection of minute changes in an image, which can be overlooked by the clinician accidentally (Rajpurkar et al., 2017).

Imaging: Recently, the advances in AI have eased the work to describe and evaluate the outcome of maxillofacial surgery or assess the cleft palate therapy regarding facial attractiveness (Patcas, Bernini et al., 2019; Patcas, Timofte et al., 2019).

In 2018, an article in Annals of Oncology journal had stated that AI could more accurately detect skin cancer, which refines the existing medication (Presse, 2018).

Disease Diagnosis: There are several AI techniques that are used for the diagnosis of a variety of diseases. Few are support vector machines, decision trees, neural networks etc. (Jiang et al., 2017). Demonstration of some specific functions in disease diagnosis is done by two different techniques, namely, artificial neural networks (ANN) (Bhargava, Banga, & Singh, 2016) and Bayesian networks (BN).

Thus, early classification and diagnosis of severe diseases like diabetes and cardiovascular diseases can be achieved by the development of machine learning models such as ANN and BN. Further, it is stated that ANN could more accurately classify these diseases as compared to BN (Alić, Gurbeta, & Badnjević, 2017).

Telehealth: Proliferation of Telemedicine has raised enormous applications of AI. Through AI, patients can be monitored easily with ease in communication between patients and physician that helps patients explain the symptoms better and makes the physician understand the case and diagnose it well. With AI, a patient can be monitored and assisted very well as compared to humans (Pacis, Subido Jr, & Bugtai,2018).

Electronic Health Records (EHRs): These records are very helpful in digitalization and also in the spread of information in the healthcare industries. EHRs can be efficiently utilized only when AI tool is used, which can scan EHRs easily and predict the course of diseased person accurately (Häyrinen, Saranto, & Nykänen, 2008).

Drug Interactions: Natural language processing improvement such as algorithm development has enabled the identification of drug–drug interactions. Drug interactions, sometimes, are life-threatening to patients consuming multiple medications at a time (Cai et al., 2017). The role of AI in drug–drug interactions in tracking and generating an exact information of possible adverse effects has been highly appreciated (Christopoulou, Tran, Sahu, Miwa, & Ananiadou, 2020). Thus, it eases the work of doctors for the submission of reports on possible adverse reactions of medications to the organizations such as FDA Adverse Event Reporting System and WHO's VigiBase (Zhou, Miao, & He, 2018).

Creation of New Drugs: A drug molecule for the treatment of obsessive–compulsive disorder known as DSP-1181 was invented through AI and was accepted for the human trial. This was invented by the joint efforts of Exscientia and Sumitomo Dainippon Pharma, and the drug development has taken only 1 year, which, in general, takes 5 years.

Industry: Greater health data can be obtained when big companies merge with other companies, thus allowing an increment in the implementation of AI algorithms (Bhargava et al., 2020). Large companies are providing AI algorithms for aiming to process the data by finding a better clue (Panesar, 2019).
For example: IBM: Watson Oncology is a technical approach at Memorial Sloan Kettering Cancer Center and Cleveland Clinic, which relies on AI applications for chronic disease treatments with CVS Health (USA).

ARTIFICIAL INTELLIGENCE IN THE MANAGEMENT OF COVID-19

AI techniques have been involved in various areas related to Coronavirus pandemic, which include:

- AI in early detection and alert systems
- AI in tracking the patients along with predictions
- AI in diagnosis, treatment, and cure of the disease
- AI in obtaining the status and numbers related to disease using dashboards
- AI in social safety, surveillance, and prevention

AI in early detection and alert systems

BlueDot: A cluster of pneumonia patients was emerging around the fish market in Wuhan, China, as spotted by BlueDot (an AI system) on December 30, 2019 (Inn,2020). After approximately 9 days, the condition was recognized, and the WHO declared warning statements (Inn, 2020). The attack was accredited as COVID-19 and later was declared as a pandemic outbreak by WHO, considering the spread and severity of the cases across the globe (Allam & Dhunny, 2019).

BlueDot is an organization that was launched in 2014 at Toronto, Canada, which involves a panel of highly qualified personnel like physicians, epidemiologists, veterinarians, software developers, and the data analysts along with scientists from different fields (Allam & Jones, 2020). The personnel utilized the natural language processing as a tool to generate artificial responses and further optimized to process Big Data in a limited time. This technology can grab information from various possible sources like digital media, global airline tickets, population demography, livestock health reports etc., and apply them while processing (Castro, McLaughlin, & Chivot, 2019).

Working of BlueDot: It has an extensive software, which gives service to locate, predict, and trace the spread of virus. BlueDot engine accumulates the data of over 150 diseases, and syndromes, which are registered throughout the world.

Besides providing official data, it can also extract the information of billions of the passengers traveling through various routes; human–animal population data; and information from the journalists, media, and healthcare workers.

It processes the information by classifying the data manually and creates a taxonomy for further learning activity. By giving a proper input, it provides a handy data on a specific topic or a case, and is also able to produce suitable traces for the needed investigations. It can also present recent or live updates to give an alert for the troublesome circumstances, thereby looking for a preventive action.

With respect to the COVID-19 attack, the BlueDot system has sensed and flagged Wuhan city rightly as the hub of the virus outbreak. It even anticipated the list of places like Bangkok, Tokyo, Phuket, Seoul, Taipei, and Singapore, as areas prone to develop infected conditions. This is not the first time; the involvement of this technology was evident; even in the previous years during Zika virus outbreak, this was involved therein.

Chatbot: In recent times, WhatsApp has emerged as a routine in everyone’s life so WHO has selected WhatsApp and launched a chatbot, which gives a prior information regarding COVID-19. There are frequent updates in the tool that provides the latest news via audio or text method

regarding the COVID-19. The users have options to share the views or opinions at any point of time regarding COVID-19 pandemic (Inn, 2020).
This approach developed easiness by maintaining transparency among billions of people all over the world to have a uniform relevant information on the disease.
This chatbot includes the most advanced information related to symptoms, preventive measures, and the difference between the symptoms of regular flu and COVID-19. Additionally, it provides the live updates on the count of Coronavirus sufferers to help the government, health workers, caretakers, and decision-makers, which helps in an efficient policymaking (Fadhil & Schiavo, 2019), (Klein, Kulp, & Sarcevic, 2018).

Aarogya Setu App: Ministry of Electronics and IT of Indian Government has developed an app, for making the citizens aware of the pandemic situation. The app includes the risk factors and preventive steps to avoid the infection. It helps users to undergo a self-assessment to know their own health status. This app is available on Google play and app store for android and iOS, respectively.
How the App Works: Aarogya Setu adopts Bluetooth-enabled tracking to keep the user informed with enough information, just in a case, if he/she comes closer to someone who is tested positive for COVID-19. The Bluetooth and live location features enable tracking of an individual location and generate a social graph, which shows the interaction with several people.
After the installation process is done, the user has to allow its Bluetooth and location sensors to activate and set the permissions on for continuous tracking. The app also conducts a survey regarding the COVID-19 and asks the various questions related to the personal symptoms. The report is forwarded to the government to keep them updated. While collecting data, the app also senses the infected person moving around and immediately warns the user to get isolated and safe. The data remains confidential with an access to the government and user himself.

ROLE OF AI IN TRACKING AND PREDICTION OF COVID-19

The pandemic circumstances of COVID-19 have reached to a critical level till date,which needs intellectual aids to answer the situation. After reaching the warning stages, different nations in collaboration with WHO decided to execute different strategies striving to rescue their position. To have these measures under control, the scientists utilized AI, which aided in the clear findings of the virus pathway.

Several countries across the globe have implemented these in response to the disastrous pandemic situation (Long & Ehrenfeld, 2020).

Machine Learning:
The machine learning is one such strategy, which brings out the artificial intellect to solve the issue. This machine learning is something related to the data, which might be collected from various sources using different means. It is extended to a deep learning process where the system can think itself by grabbing the data from multiple networks. The primary objective of machine learning is to utilize the data in identifying the primary source of spread and for breaking the possible connections to terminate the chain. The process involves different algorithms, which respond based on the previous data saved in the library (Raj, Dewar, Palacios, Rabadan, & Wiggins, 2011).

Bluedot Technology:
The Canadian government, as the earliest step, have introduced a Blue Dot technology, which is a machine learning approach, where the growing symptomatic cases of COVID-19 are compared with the existing data, to find the relative pattern. This technology employs the past data records and analyzes the similarity factors between them. This model demonstrates the extent of development, and the areas that are more affected. As an extension, comprehensive precognition can be carried out for visualizing the hotspots prone to Coronavirus, through which a considerable level of alertness can be created (Long & Ehrenfeld, 2020).

Spatial Analysis:
By sourcing geographic information, the spread pattern of the virus can be easily hunted. This spatial analysis focuses on humans confined to a particular location. The inference of the Bayesian method facilitates the determination of infected ratio concerning time and space (Weblink1, 2020)
John Hopkins model is a platform, which presents live updates on the various epidemic scenarios in different countries (Weblink2, 2019).

National language processing is an AI tool, which uses different languages to encode the data and process them for output in the natural language. It converts the text into a structured format for further analyzing and displaying the results (Friedman, Rindflesch, & Corn, 2013).

Travel Data Collection is another vital tool to be considered as the cause of the spread that comes through migration. It is the ideal way to figure out the possible cases and help in early

measurement of risks. This kind of analysis is represented in the form of a Sankey diagram designed by WHO, which plots the chain flow in multidimensional visions at various stages. For a better knowledge of the virus spread pattern, a graph analysis using historical data is employed, which recognizes the extent of the outbreak and notices where it is happening more. A network map has been developed by Singapore's coding academy to envision the outbreak influence in various parts of country. A screening system is implemented in the airports while exiting, where smart sensors are introduced. These sensors check for unusual body conditions to detect any positive signs of COVID-19 (Quilty, Clifford, Flasche, & Eggo, 2020).

Enter Teclco Analytics

Involvement of electronic gadgets is a smart idea for individual tracking. The "Enter Telco Analytics" is a novel technology, which can collect the informationof almost all the categories of people. Every electronic device is programmed tosave few details of users, which will be tracked to monitor one's movement, action, and social behavior to check for abnormality. It utilizes different electronic gadgets like tablets, smartwatch, fit-band, smartphones, and other commonly accessible devices. Moreover, it is evident that on an average, each individual of this world carries at least one device with him/her. The smartphone is an elegant tool, as the software supports locating sensors, and fortunately, it is there in almost every pocket. It is not less than a library, which includes several pieces of information. So, tracking of one's smartphone may count the details from his name, location, contacts, and browsing history, and can even assess the behavior of a person. There
is a process called sniffing, which can track the private information like browsing history, chats, and calls of an individual in emergency times. Usually, a regulatory body governs this, which is known as the General Data Protection Regulation, which is present in almost all the countries (Stopczynski et al., 2014; Valentino- DeVries, Singer, Keller, & Krolik, 2018).

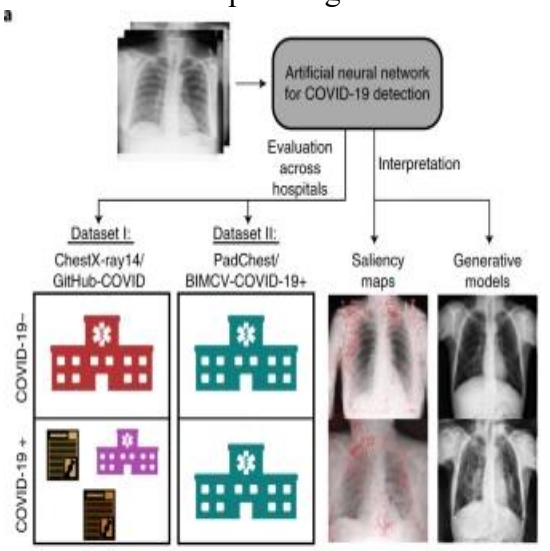
Social Media:

The advent of social media like Facebook, YouTube, WhatsApp, Instagram, and Twitter may serve in communicating the severity of the circumstances and bring consciousness among the viewers. Many programmers are developing trendy applications to detect the clues of infected people. Aarogya Setu is one of such trending apps in India, which does recognize the activity. Many more such applications are being developed, to strengthen the accessibility of needs and serviceto the public. The CCTV surveillance is probably a compelling idea to investigate the mode of transmission. Through it, the epidemic alerts are monitored, and an immediate preventive action can be scaled. The continuous enquiry of medical data may picturize the plot of epidemic projections (Grind, McMillan, & Wilde Mathews, 2020). In contrast to the above-mentioned authentic applications, there are also a few false claims on AI being spread in the media. Through social media, people are posting their opinions as inference without placing proper evidence, which mislead the people and even create overexcitement and panic. Recently, a propaganda became viral on the internet that claimed the development of a biochip to track the Corona by Microsoft as reported by Reuters. Despite many beneficial aspects, still a lot has to put forward in the utilization of AI to regulate the severity of the condition, instead of compromising the condition.

AI in COVID-19 Diagnosis:

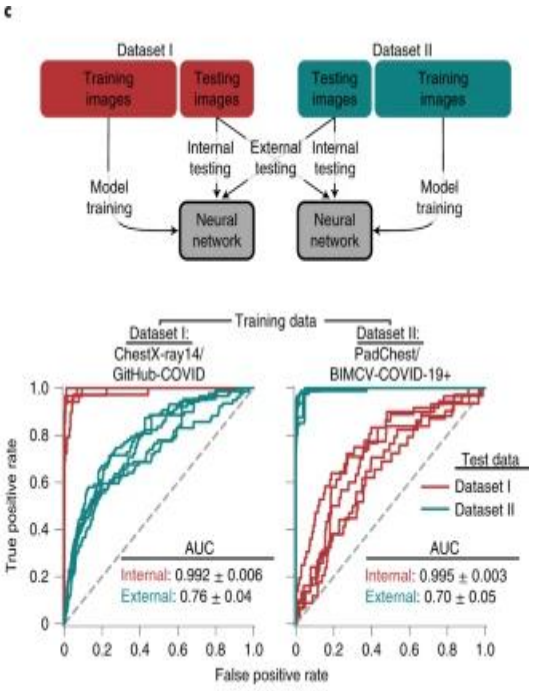
AI has played a significant role in COVID-19 diagnosis and management. Simplified block diagrams illustrating the application of AI in COVID-19 diagnosis

1. **Medical Imaging Analysis:**
    a) **Data Collection**: Chest X-rays or CT scans of patients with suspected COVID-19 are collected.
    b) **Preprocessing**: Images are preprocessed to enhance quality and standardize formats.
    c) **Feature Extraction**: AI algorithms extract relevant features from the images, such as lung texture and abnormalities.
    d) **Classification**: Machine learning models classify images into COVID-19 positive or negative cases based on extracted features.
    e) **Diagnosis**: Results are presented to healthcare professionals for diagnosis and treatment planning.



b

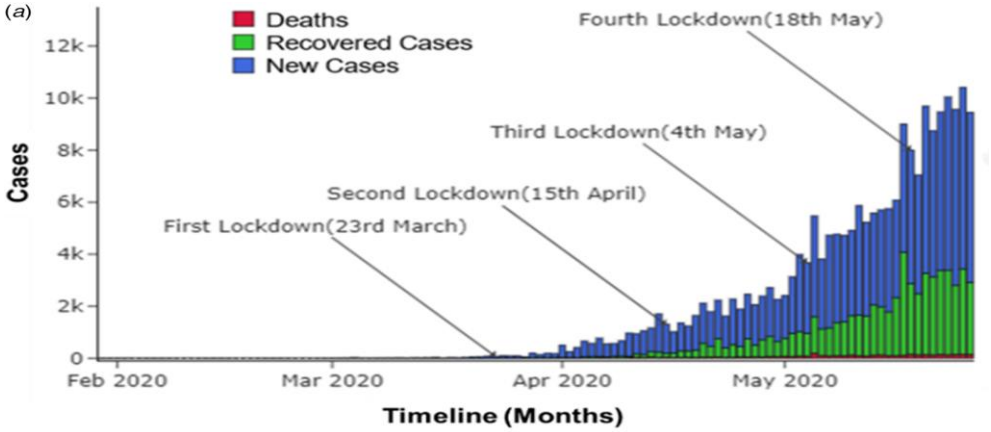
	Dataset I			Dataset II		
	Combined	Chest-X-ray14	GitHub-COVID	Combined	PadChest	BIMCV-COVID-19+
No. radiographs	112,528	112,120	408	97,866	96,270	1,596
No. patients	31,067	30,805	262	64,954	63,939	1,105
% COVID-19+	0.2	0	76.5	1.6	0	100
% AP images	39.9	40	26	5.6	4.7	58.1

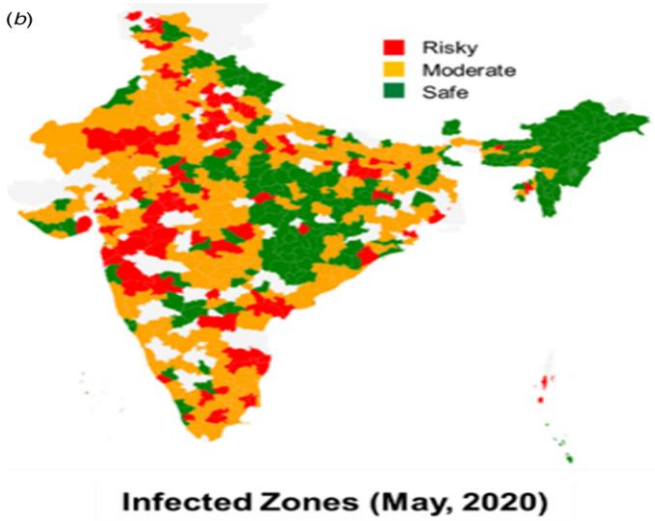


2. Symptom and Epidemiological Data Analysis:
medicine. data relating to the occurrence, transmission, and
control of epidemic diseases. ---- clinical findings and pathology

a) ***Data Collection:*** Symptom reports, epidemiological data, and other relevant information are collected from various sources.
b) ***Data Preprocessing:*** Raw data undergoes preprocessing to remove noise and inconsistencies.
c) ***Feature Extraction:*** AI algorithms extract key features and patterns from the data.
d) ***Model Training:*** Machine learning models are trained using historical data to predict disease spread, identify high-risk areas, and assess the effectiveness of interventions.

e) ***Prediction and Monitoring:*** Predictions and insights derived from the models are used for proactive decision-making, monitoring, and resource allocation.





3. Contact Tracing and Risk Assessment:

a) **Data Collection:** Contact tracing data, location information, and individual health records are collected.
b) **Data Processing:** Raw data is processed to identify potential contacts and assess individual risk factors.
c) **Model Integration:** AI algorithms integrate contact tracing data with epidemiological models to predict transmission dynamics and assess population-level risk.
d) **Alert Generation:** Based on risk assessment, alerts are generated for individuals or communities at increased risk of COVID-19 transmission.
e) **Response Planning:** Authorities use generated alerts to implement targeted interventions, such as quarantine measures or testing campaigns.

These block diagrams provide a simplified overview of how AI is applied in different aspects of COVID-19 diagnosis and management. Actual implementations may vary in complexity and may involve additional steps, such as model validation and regulatory compliance.