PREDICTIVE ANALYSIS ON MEDICINES & DOCTORS AVAILABILITY IN GOVERNMENT HOSPITALS

A PROJECT REPORT

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in partial fulfillment for the award of the

degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

At

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU

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PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"PREDICTIVE ANALYSIS ON MEDICINES & DOCTORS AVAILABILITY IN GOVERNMENT HOSPITALS"** being submitted by "Madhu Kumar V , Ravi Shivaji Mahipati, Tarun GS "bearing roll numbers "20211CSE0363,20211CSE0374,20211CSE0385" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **PREDICTIVE ANALYSIS ON MEDICINES & DOCTORS AVAILABILITY IN GOVERNMENT HOSPITALS** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of our own investigations carried under the guidance of **Ms. SHWETA SINGH, Assistant Professor, School of Computer Science Engineering, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

Government hospitals are lifelines for millions of people in India, especially for those who rely on public health services. They provide essential treatment, often free of cost, ensuring that healthcare is accessible to all. However, during critical times such as disease outbreaks, these hospitals often face overwhelming challenges. The lack of available essential medicines and doctors has been a recurring problem that results in long waiting times, unmet patient needs, and compromised quality of care. This project will tap into the power of predictive analytics to help hospitals prepare to meet patient demand effectively and efficiently.

A common problem in government hospitals is the shortage of medicines during peak disease periods. Patients often find that vital medicines are unavailable when they need them most. These shortages arise from several factors, including unanticipated surges in demand, inadequate forecasting, and supply chain delays. For instance, during the monsoon season, diseases like dengue and malaria spike, and the demand for specific medicines increases dramatically. Without proper planning, hospitals struggle to cope. This project will utilize historical patient data, current trends in disease prevalence, and regional patterns to predict what types and what quantities of medicine are likely needed at which specific hospitals during given periods of time. This generates detailed reports allowing hospital administrators to stock the appropriate medicines in appropriate quantities at appropriate times to prevent shortages. This gives patients the appropriate treatment in good time and eliminates any delays in service delivery. Therefore, confidence in public healthcare improves.

Equally, there should be availability of doctors and specialists when patients come into the system especially in outbreaks and increased patients in-flow periods like weekends, holidays, and evenings. Mostly, the frustration for not getting a needed doctor usually happens at such emergency periods. For instance, during the COVID-19 epidemic, it became highly challenging for many hospitals to cope with patient inflow that required critical care. Predictive

analytics can address this issue by processing historical flow data of the patients, present patterns of disease, and predicted trends. The system predicts the number of doctors needed in different departments and generates actionable insights for hospital administrators. It makes better workforce planning possible, enabling hospitals to meet the medical man-power requirements as per the fluctuating needs at any given point in time.

The system could indicate how many specialists may be required considering the type of diseases prevalent during a particular season, and such information can assist hospitals in getting their resources working more effectively.This initiative aligns with the Indian Government healthcare system, leveraging analytics to increase operational efficiency. Through the elimination of inefficiency and minimization of wastage, data-driven insights would look toward hospitals providing optimal care for patients. With this, administrators receive actionable intelligence and make well-informed decisions and are ahead in predicting and handling the inevitable crisis in hospitals on time with their proper planning of resources. All this can better improve hospitals on a daily basis but more on strengthening the infrastructure, thus, being stronger during any crises.

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CHAPTER-1

INTRODUCTION

Government hospitals form the backbone of healthcare in India, providing the most basic forms of medical service to millions who cannot afford the private sector. These institutions have become a lifeline for many, but are often beset by problems during peak disease seasons. Shortages of medicines and the absence of doctors at the right time often result in delay of treatment and frustration among the patients. This has motivated the work that proposes, among other approaches, a resource management predictive analytics system that aids the hospital anticipate its resource consumption, thereby easing stress on medical professionals and hence overall operational management.

1.1 Why Predictive Analytics is Essential for Government Hospitals

Government hospitals operate under tight constraints - limited budgets, unpredictable patient inflows, and sudden disease outbreaks. These challenges make it difficult to plan resources effectively. Predictive analytics can turn the tide by enabling hospitals to proactively prepare for surges in demand, making healthcare more responsive and efficient.

1.1.1 Tackling Medicine Shortages

Just imagine a dengue outbreak where one visits a hospital, only to find that medicines such as platelet concentrates are unavailable. It is not a minor inconvenience; it can be fatal for patients. In government hospitals, medicine shortages at the peak of diseases are quite common.

Predictive analytics provides a solution by analyzing patient histories, seasonal patterns, and real-time data to predict which medicines will be needed, in what quantities, and where. For instance, during monsoon seasons, when waterborne diseases like cholera and typhoid spike, the system can predict higher demand for antibiotics and rehydration solutions. This allows hospitals to stock these medicines well in advance, avoiding the distress caused by shortages.

A positive impact on a patient's overall outcome is witnessed by the public healthcare system itself, while more importantly, their trust in its services is being built. Finally, it limits wastage or overstocking of less-wanted medicines since it maintains optimum availability and affordability.

1.1.2 Ensuring Doctor Availability

Another common patient complaint is that doctors are often not available at the most needed time—weekends, holidays, or in the evening. Patients presenting with emergencies wait for a long time or are unable to get access to a specialist. The problem is most critical during flu season or during the outbreak of other diseases when many patients rush into the clinic.

The predictive analytics system solves this problem by observing past and present data to determine patient inflow patterns. For example, if a hospital experiences an increasing trend of respiratory issues during evenings in winter time, the system can suggest extra pulmonologists be scheduled during these hours. The same goes for rural hospitals with a rush over the weekend-the system can advice more general physicians or specialists for the surge.

Proactiveness in terms of staffing levels not only ensures timely care for patients but also prevents doctors from burning out. This is because the system strikes an equilibrium for healthcare providers with regard to workload hence enhancing care quality and customer satisfaction.

1.2 Who Benefits from This System and What It Aims to Achieve

1.2.1 Targeting the Right Stakeholders

This predictive analytics system is designed for the Indian Government healthcare department, which oversees public hospitals nationwide. By implementing this system, the department can address long-standing challenges in resource management and healthcare delivery.

Besides benefiting the doctors, considerable value to the system will be seen in hospital administrators. It will equip them to plan better resources, anticipate demand, and respond to patient needs more effectively. Also, patients will benefit directly from it - better availability of medicine and access to doctors at the right time will improve their experience greatly at public hospitals.

1.2.2 Driving Key Improvements

The project will look at bringing forth meaningful change to the operations of government hospitals. The idea here is not about managing resources, but to be efficient, reliable, and patient-centric in creating a healthcare system.

Some improvements are:

* Reduction in Medicine Shortages: No one needs to stand at the emergency counter to look for life-saving drugs to be unavailable during crucial hours.

Optimizing Staffing: Hospitals could have exactly the right number of doctors at the right place at the right time.

This is further enhanced through the use of data-driven planning for hospitals, hence reducing wastage and improving the satisfaction of the patients.

1.3 The System's Scope and Real-World Applications

1.3.1 Predicting Medicine Needs

The heart of this system is the ability to predict medicine demand. Analyzing years of patient data and identifying trends, the system can forecast what medicines will be needed, how much to stock, and where to send them.

For instance, during a malaria outbreak, the system might predict a surge in demand for antimalarial drugs and mosquito repellents in specific regions. Hospitals in those areas can prepare by stocking those items ahead of time so that patients do not face delays in receiving treatment.

What makes this system even more impactful is its adaptability. It accounts for local variations in disease trends, enabling hospitals in rural areas to prepare differently from those in urban centers. This ensures that resources are used where they're needed most, benefiting patients across diverse geographies.

1.3.2 Managing Doctor Staffing

It addresses the very important issue of the availability of doctors. Forecasting the requirement based on patient volume and disease pattern helps ensure that the hospitals are never caught off guard.

For example, if the system predicts an increase in flu cases in the next few weeks, it can suggest that more general physicians and respiratory specialists be on duty. Similarly, during holidays, when emergency cases tend to surge in hospitals, it can suggest scheduling adjustments to ensure adequate coverage.

CHAPTER-2

LITERATURE SURVEY

1. TITLE: More than Technical Perspective: Analysing the possibilities of Unstructured data in Healthcare industry. BY: Yi Chuan Wang, LeeAnn Kung, Chaochi Ting This paper underlines a lack of recognition within the healthcare industry regarding the value that technology can bring, specifically big data technology. While there have been a few pioneering studies that utilized several technical approaches, the paragraph posits that an understanding gap in the important implications of big data technology exists within healthcare. To address this drawback, the paper discussed below delves into research concerning the progression, structure, and functionalities of Big Data Technology (BDT). The paper also delves into the possible, trackable, and inspectional nature of Non-SQL (NOSQL) data and the healthcare trends of its support and their forecasting ability. Finally, the goal is to support the healthcare providers in formulating efficient strategies in light of big data. The findings of this research are expected to align healthcare organizations in responding more efficiently to challenges, transforming the healthcare industry into a highly competitive landscape.

2. TITLE: Learning, schooling, and data analytics. AUTHOR: Baker, R. S. J. D From the second half of the 20th century, a number of methods have been developed to extract pertinent information from the big data technology, which we refer to as analytics. To some, it is also referred to as data mining. These were of huge relevance for several fields such as astronomy, chemistry, movies etc. In the recent past, this pattern has been seen in other fields also, such as education, research, learning analytics (LA; Ferguson, 2012) or educational data mining (EDM; Baker & Yacef, 2009). In simple words, these are being used to find ways to make proper utilisation of growing amount of available student and employees data to understand better the processes learning and other components related to pedagogy. Motivation is the development of novel and improved learning process in the arena of rising affirmative study and research. EDM/LA can be taken as the newest phenomenon in a rising perspective. The researchers met first were educational researches based on data mining that are seen to arise in the very first years of 21st century and thereafter followed every year

meetings. EDM and LA both share common objectives. In short, the peer Models of validity and the studying is primary goal which the EDM is invested on, while using results of research to bring development in practice on the part of the teachers can be considered the main goal of the communities of LA.

3. TITLE: The success pillars of analysis of prescriptive model. AUTHOR: Basu. A The companies today rely mostly on structured and unstructured data i.e. numbers, categorization. IBM, a US based technological company that focuses on various technological and data analysis fields reported that more than 85% of data generated are texts, audio, video, images which fall under the category of unstructured data. Also, a lot of companies are still running on the traditional database system may find themselves dwindling in future and it may jeopardize the productivity if they stick to the traditional system. As a consequence the future of these companies will be vague because their customers and vendors might shift to other companies that would offer them better results by leveraging a hybrid form of both structured and unstructured data. The companies which already using these innovative technology is going far ahead and is encouraging other businesses by leveraging the data being fed and thus providing them with a detailed insights and more productive result. The decision making can be improved and enhanced if we adopt the hybrid data. Those companies which did not deploy the hybrid data or the blended version may find difficult to thrive in the ongoing era of evolving technology as the traditional data only comprises below 15% of the overall data.

4. TITLE: The Big Data Technology and predictive analysis in research and education: Merits and Demerits. AUTHOR: Ben K. Daniel Colleges and Universities which That operates in a complex and intricate system can take advantages from the technologies. Here we have identified some major problems concerning the system and factors being encountered by universities and colleges as well as some organisations. This also brings out possible prospective of how the Big Data can be leveraged while dealing with these pitfalls being faced by these institutions. The paper further describes several opportunities and ongoing challenges in relation with its use. Therefore, we arrived at

a conclusion, by mentioning and pointing towards future prospects, and associating its redemption of such an interesting and creative task on emergent technologies which proved to carry great value and shall prove to be a major milestone for the next generation. Hence, we need to properly analyze so as to overcome the challenges and rightly replace them with more innovative solutions.

5. TITLE: Big data analytics in healthcare: promises and possibilities. AUTHOR: Raghupathi. W In this paper, we discussed the benefits and assurances in healthcare analysis using big data technologies. It further continues to emphasize analytical nature, putting outlines on frameworks, elaborating numerous methodologies, and accounting architectural behavior to briefly analyze the issues, how to overcome those problems, and so forth. This discussion further mentions about analytics being used in the big data domain for scientists and students in the health domain. This also applies to other employees of healthcare industries like doctors, pharmacists, nurses, laboratory technicians, etc. about how to bring about the innovative system that can yield the maximum output from certain resources and this will also decrease the overall costs. Also by properly looking into the possible shortcomings and elaborating the long term benefits we can surely boast the system by diving into the insights provided by this domain. This can significantly bring the entire healthcare system into the advancement of modern era which is primarily dominated by Artificial Intelligence, Robotics, Machine Learning, Deep Learning, Blockchain etc.

6. TITLE: Digital Business Strategy: Toward the Next Generation of Insights AUTHOR: Bharadwaj, A, El Sawy, O.A. Palou, P.A. and Venkatraman In past thirty years, the prevailing view on IT strategies and comments have portrayed the system as a strategy that is totally digitalized and functionalized, requiring alignment. This paradigm of alignment may look simple but while diving deep into it we can confirm how such a simplistic strategy is crucial in the long run and can outperform even the sophisticated method that lacks digitalisation, a strategic business management traditionally dictated the course of old strategical business ideas which certainly no longer sustainable. It is a fast change of the health care sector in the wake of the global recession through fast

digitalisation blending with the evolving technologies. We have also considered the several performance metrics that play crucial roles. The results generated may be decisive, which helps outline the roadmap of predictive nature. Based on the changes achieved from the transformative behavior, we have suggested a rethinking of the role of IT strategy thereby transitioning from its historical status of being a traditional system with fewer functionalities to a rejuvenated multi-disciplinary secure strategic paradigm that integrates the information strategies and with a superior system, much like an efficient data-driven business model. We add a further discussion of success metrics and potential performance implications of the adoption of a digital business strategy. We conclude by saying that the papers in this special issue provide important information for digital strategies and lines of future development of our understanding and the furthering of research in this dynamic and changing area.

7. TITLE: A Trusted Data Governance Model For Big Data Analytics AUTHOR: C. Mohanapriya This paper brings a strategic discussion on the necessity for effective governance of big data , which should cater to corporate and IT governance, along with ITA or EA. Unlike traditional data governance, Big Data governance must encompass structured and unstructured data. The success of Big Data initiatives requires aligned strategies, considering the organization's vision and objectives. The proposed Big Data Governance Framework introduces new criteria for data optimisation and quality of data , emphasizing on timely management of data, reliable transfer, authorised data manipulation , an efficient continuous data flow service and most importantly the privacy and security aspect of the data . It also effectively manages private information protection and data disclosure/accountability strategies for various purposes but all these are managed through a discreet fashion with utmost care. As the data carries lots of information a sincere and proper management is vital. The leakage of data through fraudulent activities poses a serious challenge as this may compromise the integrity of the data. All these factors are to be considered while preparing a data management portal of hospital at large so that it can predict various trends by maintaining the privacy and integrity of the patients data. The discussion goes further and mentions a special case of South Korean National Pension Service which provided a better understanding on Governance Framework of Big data. In other way we can say that the use of Big data technologies in the public domain cannot be

avoided for long and surely one day will come when the role of big date will be inevitable and decisive in most of the public domain as the growing rate of unstructured data is simply exponential.

8. TITLE: The Predictive and analytical Power of Big Data. AUTHOR: Aiden, E., Michel An upsurge of different data calls for a challenging analysis in this modern landscape. This is really important, as it is critical in the aspect of big data, where there are complex unstructured data. Analytics is described as a process that seeks to reveal hidden patterns and associations inherent in data. The aim in analytics is thus to extract insightful meaning from enormous and complex data sets inherent within the big data landscape. This process is vital for taking sound decisions and a deeper insight in trends, behavior, and relations in the very complex tissue of contemporary data environments. This survey paper will, therefore, serve as the central aim in giving an all-encompassing view of the wide array of applications of real-time predictive analytical tools with their strategy. It addresses diverse viewpoints considering its applications and types of data. The paper goes into specific applications such as big data in business management, hotel management, research and learning, small enterprise, healthcare industry, supply chain management, egovernance and other domains. It presents lots of innovative and efficient predictive strategies customized for many applications, along with associated pitfalls and recommendations.

9. TITLE: Consumer analytics based on Big Data and the market transformation AUTHOR: Sunil Erevelles, Nobuyuki Fukawa, Linda Swayne Consumer analytics stands at the forefront of a significant shift in handling vast amounts of data known as the Big Data revolution. Technology also plays a vital role in collecting detailed and real-time data regarding consumer behavior. This process allows companies to trace constantly changing consumer trends, preferences, and interactions with the aim of adopting suitable strategies and services towards keeping up with the current state of dynamism in consumer behavior in the new landscape. The availability of large, fast-generated, and diversely raw data directly from consumers, referred to as Big Data, has resulted in an unprecedented scenario. To study further the penetration of Big Data in different areas

of marketing operations and its enhancement of advantages available from such knowledge, a conceptual framework is herein proposed. These requirements are likely to vary based on the industry, the scale of operations, and the specific goals of the organization in leveraging Big Data for decision-making and strategy formulation. Generally speaking, this paper highlights the paramount role that plays physical, human, and organizational resources in fashioning processes such as collecting, analysis, and exploiting Big Data with a view toward an improvement of the business capabilities for which there can be added stresses on resource particularities of addressing unique resource requirements for proper operationalization across organization contexts.

10. TITLE: The dynamic capabilities and how they are useful in management AUTHOR: V. Ambrosini et al. The dynamic capabilities are far beyond the resource-based view. This exploration throws light on the intricate mechanisms involved in generating resources that are not only valuable but also rare, difficult to replicate, and lack perfect substitutes. Over the years, researchers and scholars have made noteworthy strides in understanding the dynamics of these capabilities. This paper critically synthesizes and reviews the existing literature to consolidate its insights into a multifaceted nature of dynamic capabilities. This paper contributes to a better understanding of dynamic capabilities in that it proffers comprehensive review and synthesis of existing literature in the domain. The synthesis underscores that factors both supportive and hindering both within and without the organizational boundary shape the dynamic abilities. The factors are deeply interwoven with the perceptions and motivations of managerial personnel, bringing a human flavor to the analysis. As literature in the area of dynamic capabilities developed, some issues of confusion and contradiction have come into the way of further advancement of understanding in this domain. This paper attempts to address such challenges, and some insights from unresolved debates as well as some avenues for further research are presented. That in so doing would advance the improvement and development of the dynamic capability perspective. From all considerations taken above, a summary conclusion might then be the case that provides organizations with the capacity to tackle all the dynamic features of current business environments for competitive advantage as in the dynamics of contemporary management in business: from all dynamic forms of action at the center as dynamic

capabilities as process and learning organization. For one, as illustrated in its general review synthesis presented above. This would imply that dynamic capabilities are a very important part of strategic management, to be extensively discussed and continuously updated in order to adapt to the constantly changing environment of organizational dynamics.

CHAPTER-3

RESEARCH GAPS OF EXISTING METHODS

3.1. Medicine Availability Forecasting

- **Gap:** Most of the systems depend on historical data, which can be hard to predict sudden increases in demand due to outbreaks or emergencies. They do not take into account real-time factors such as disease outbreaks or seasonal health trends.
- **Opportunity:** Design wiser models by integrating real-time data from disease monitoring, patient demographics, and seasonal patterns. Including external factors such as weather or public health alerts can increase the reliability .

3.2. Real-Time Resource Allocation

- **Gap:** Current solutions lack the ability to quickly adjust resources like medicines or staff based on sudden changes in patient needs, leading to delays and inefficiencies during emergencies.
- **Opportunity:** Build AI-powered systems that can dynamically reallocate resources in real-time. These systems should focus on handling peak hours, weekends, and holidays to optimize hospital efficiency.

3.3. Scalability Across Hospitals

- **Gap:** Predictive systems often work well for specific hospitals but don’t adapt easily to facilities of varying sizes or capacities, such as small rural clinics or large urban centers.
- **Opportunity:** Create scalable systems that can be customized for different hospital settings. Using federated learning, hospitals can share insights to improve predictions without compromising sensitive patient data.

3.4. Workflow Integration

- **Gap:** Predictive tools often operate in silos, making it hard for hospitals to act on the insights they provide. This disconnect leads to inefficiencies in managing inventory or staffing.
- **Opportunity:** Design predictive systems that seamlessly integrate with hospital workflows. For instance, automate tasks like restocking medicines or scheduling staff based on real-time needs to avoid bottlenecks.

3.5. Specialist Demand Forecasting

- **Gap:** Most systems focus on general doctor availability, ignoring the need to predict demand for specialists during disease outbreaks or seasonal health crises.

- **Opportunity:** Develop models that analyze disease trends and regional demographics to forecast when and where specialists will be needed, ensuring patients get the right care at the right time.

3.6. Data Quality and Completeness

- **Gap:** Many hospitals struggle with incomplete or inconsistent data, which reduces the reliability of predictive systems.
- **Opportunity:** Use advanced techniques like machine learning to fill in gaps or clean up messy data. Hospitals can also standardize how data is collected and managed to improve accuracy over time.

3.7. Insights for Peak Periods

- **Gap:** Predictive models don't give detailed insights for high-demand times, such as evenings, weekends, holidays, or during seasonal health peaks.
- **Opportunity:** Build models that specialize in forecasting for these critical periods, helping hospitals allocate resources more effectively when demand is highest.

3.8. External Factors in Predictions

- **Gap:** Systems often ignore external influences like weather, socioeconomic factors, or public health campaigns, which can significantly impact patient inflow and medicine demand.
- **Opportunity:** Enhance predictions by incorporating these external factors, offering a more complete understanding of resource needs and patient trends.

3.9. Public Health Policy Support

- **Gap:** While predictive analytics is great for hospital operations, its role in shaping long-term public health policies is limited.
- **Opportunity:** Develop tools like dashboards and simulation models that allow policymakers to test different strategies and predict their impact on public health outcomes.

3.10. Ethical and Equitable Allocation

- **Gap:** Predictive systems can unintentionally create biases, leading to unequal resource distribution in underserved communities or regions.
- **Opportunity:** Include fairness-aware algorithms to ensure resources are distributed equitably, helping address disparities and improving access for everyone.

CHAPTER-4

PROPOSED METHODOLOGY

1.Authentication and Security

a. User Authentication:

- Signup: Patients create accounts by providing basic details (name, email) and setting a secure password.
- Login: Patients log in with their username and password to access features like doctor availability .

b. Staff Authentication:

Login: Staff members log in using predefined credentials. Access is role-based, allowing them to manage doctor and medicine availability.

c. Data Security:

Sensitive data is encrypted during storage and transmission. Role-based access control ensures users and staff can only access their relevant data.

2.User side Doctor Availability Predictor

a. Choose the Type of Doctor:

Specialization Selection:

The user selects the type of doctor (e.g., General Physician, Cardiologist, Dermatologist) from a predefined list of medical specializations.

b. Enter Appointments (Patient Load):

Specify Appointments:

The user enters the number of appointments (patient load) already scheduled for the selected doctor. This helps the system evaluate whether the doctor's current schedule can accommodate more patients.

c. Choose the Location:

Select Location:

The user selects the hospital location (e.g., city or specific facility) where they wish to check the availability of the doctor.

d. Get Availability Prediction:

Prediction Process:

After the user provides the necessary details (specialization, patient load, and location), they click a button to get the prediction.

Output Legend:

- **Doctor Not Available (Probability < 0.4):**

If the system predicts that the doctor's availability is low (based on the input data and historical patterns), a message is displayed stating that the doctor is not available.

- **Doctor Available (Probability >= 0.4):**

If the doctor is available, the system shows a message indicating that the doctor is available for appointments based on the current prediction.

3. User Interface for Update Details:

a.Button for Updating Details:

A "Update Details" button is provided on the user dashboard, which opens a form to allow users to edit their personal information.

b. Editable Fields:

Users can update the following details:

Name,Email,Age,GenderAddress,Phone Number.

c. Save Changes:

After making the necessary changes, users can click the "Save Changes" button to submit the updated information.

The system validates the inputs and ensures that all fields are correctly filled.

d. Confirmation Message:

Once the changes are successfully saved, the system shows a confirmation message: "User details updated successfully."

e. Backend Handling:

The updated data is stored in the system's database, and the user's profile is automatically refreshed to reflect the new information.

A success message is displayed on the localhost server:

"User details updated successfully (localhost:3000)"

4. Staff Dashboard Methodology

a.Check Medicine Availability:

Medicine Availability Prediction ML App:

- **Medicine Selection:**

Staff selects the type of medicine from a predefined list.

- **Dosage Selection:**

Choose the required dosage form (e.g., tablet, syrup) from a selection list.

- **Location Selection:**

Select the hospital location to check for medicine availability.

- **Prediction Button:**

Once the selections are made, staff clicks the "Predict" button to check the medicine's availability.

- **Prediction Result:**

The system calculates the probability of the medicine being available:

Probability < 0.4: The system shows "Medicine Not Available".

Probability >= 0.4: The system shows "Medicine Available".

b.Doctor Details:

- **Search for Value:**

Staff can search for specific doctor details by entering key-value pairs (e.g., name, age, specialization).

- **Add Row:**

The staff can add a new row of doctor details in CSV format, for example, {"name": "John", "age": 30}, to the database.

- **Delete Row:**

Staff can delete specific rows by selecting the key-value pairs and removing them from the system.

c.Medicine Details:

Medicine CSV Editor:

- **Search for Value:**

Staff can search for specific medicine details by entering key-value pairs (e.g., name, dosage, stock levels).

- **Add Row:**

The staff can add a new row of medicine details in CSV format, for example, {"name": "Aspirin", "dosage": "500mg", "stock": 100}, to the database.

- **Delete Row:**

Staff can delete specific rows by selecting the key-value pairs and removing them from the system.

5. Data Fetching Methodology

- **Doctor Details (Fetched from Doctor Dataset CSV):**

The system retrieves doctor information, such as name, age, specialization, and schedule, from the Doctor Dataset CSV file.

Staff can view or edit this data using the Doctor CSV Editor to manage doctor profiles.

- **Medicine Availability(Fetched from Medicine Availability CSV):**

The system fetches data regarding available medicines, including stock levels, dosage forms, and locations, from the Medicine Availability CSV file.

Staff can check the availability or manage the details using the Medicine CSV Editor.

6. Supabase Database Structure for Login Details:

- **User Login Details:**

  Table: users

  Purpose: This table stores information related to regular users (e.g., email, name, password). When a user logs in, their credentials are verified against the users table.

- **Staff Login Details:**

  Table: staffs

  Purpose: This table stores information related to staff members (e.g., email, role, password). Staff login details are verified from the staffs table during authentication.

- **Unified Authentication (for Both Users and Staff):**

  Table: auth.users

  Purpose: Supabase's auth.users table is used to manage authentication for both users and staff. It stores information such as email, password, and any other authentication-related details, allowing the system to authenticate both types of users in a unified manner.

CHAPTER-5

OBJECTIVES

5.1. Predict Medicine Availability with Real-Time Data

Objective: The end is to design a sophisticated predictive model that can calculate the availability of medicines in real-time. Such a model should consider historical patterns of usage, the current rate of inflow of patients, and other environmental factors such as disease outbreaks, seasonal variations, and regional or local demands. The predictive model should also collect data from various disease surveillance systems and weather updates to improve medicine availability predictions.

Outcome: A system that could dynamically predict what medicines would be needed in the future, enabling government hospitals to stock up on critical medications before shortages occur and thus improve their responsiveness to patient needs during emergencies and peak periods.

5.2. Optimize Doctor Availability Based on Patient Load

Objective: Design a system that will make use of both existing and current patient inflow data to analyze the availability of doctors based on specialization, number of ongoing patient appointments, and regional demand patterns. Also, there will be predictive analysis on specialists' demand during disease outbreaks or seasonal peaks of illness periods, ensuring they have doctors available at a point of highest demand.

Outcome: This will help hospitals to better allocate medical staff during peak times, reduce patient wait times, and ensure that doctors with the required expertise are available in a timely manner, especially when demand for specialized care is high.

5.3. Integrate Predictive Analytics into Hospital Operations

Objective: Develop an integrated system that will link the predictive models for medicine and doctor availability to hospital workflows, such as inventory management and doctor scheduling. This integration ensures that when there is a shortage predicted or a specific doctor specialty is in demand, the system triggers automatic adjustments in inventory or staffing schedules.

Outcome: Hospital staff will have real-time, actionable insights at their fingertips. Predictive analytics will be the core part of hospital operations, enabling the staff to take proactive steps in managing resources before shortages or issues arise, thereby leading to smoother hospital operations, reduced waste, and better patient care.

5.4. Secure and User-Friendly Authentication System

Objective: Implement a strong, secure authentication system for users (patients) and staff members. Patients will register with minimal information: name, email, password. Staff members will log in with preconfigured credentials: username/password. The system should enforce data security policies through encryption of data at rest and in transit. Role-based access control (RBAC) should be implemented to limit users and staff to only viewing data relevant to them.

Outcome: This will ensure data privacy and security while offering a seamless login experience. For example, patients can easily access their appointments or predictive analytics features, while hospital staff can manage data without worrying about security breaches.

5.5. Provide Dynamic Doctor Availability Predictions for Users

Objective: Design an intuitive "Doctor Availability Predictor" that allows patients to select the specialization of the doctor, number of patient appointments scheduled, and the location (hospital). Based on this data, the system predicts the availability of the doctor for that patient and will present this back to the user to help the user schedule appointments efficiently. The system should return a message of either availability or not, with the probability value that can further assist in decision making.

Outcome: Patients will be able to know that a doctor is available and can make intelligent choices on whether or not to book an appointment or seek another available specialist thus reducing the wait times and improving patient satisfaction.

5.6. Allow Users to Update Personal Information Efficiently

Objective: Include the feature of easily updating personal information such as name, email address, age, gender, and phone number as well as any home address. Access will be allowed via a patient dashboard where clicking the "Update Details" button allows the update of the user's profile. There will also be a "Save Changes" button for the submittal and the system validates input to guarantee all fields have been filled appropriately and correctly.

Outcome: Users will have full control over their personal data and updates will automatically be reflected within the system. The confirmation message for successful updates, which may appear through a notification such as "User details updated successfully (localhost:3000)," will convince users that the data is updated appropriately.

5.7. Real-Time Medicine Availability Monitoring for Staff

Objective: Design a prediction tool that should be machine learning-based, targeted at the hospital staff that predicts medicine availability based on present stock, usage trends over past periods, and anticipated demand with some factors of disease outbreaks or emergency needs. The tool shall allow staff to input type of medicine, dosage, and location in hospitals, and it will give out the probability.

Outcome: Staff will have real-time insights into the availability of medicines, so they can act before shortages happen, such as ordering more stock or redistributing supplies between hospital locations to meet demand.

5.8. Enable Staff to Manage Doctor and Medicine Data

Objective: It should provide an easy-to-use interface for hospital staff to manage doctor schedules and medicine inventories. The system will allow staff to add, edit, or delete doctor details and medicine availability data stored in CSV format. The system will also allow searching specific doctor or medicine data, and the updates will be reflected immediately in the system.

Outcome: This feature will empower hospital staff to keep records up-to-date, ensuring accurate scheduling and inventory management, contributing to improved operational efficiency in managing doctor availability and medicine distribution.

5.9. Implement Database Integration for Efficient Data Fetching

Objective: Use Supabase as the backend database for managing and fetching data related to user login details, staff credentials, doctor availability, and medicine stock levels. The database must be able to fetch data from sources such as CSV files and retrieve information on doctor schedules, patient records, and medicine inventories in an efficient manner.

Outcome: This will improve the performance and responsiveness of the system by efficiently retrieving and updating data so that staff and patients can have access to up-to-date information without delay. The integration will also streamline workflows and reduce operational inefficiencies.

5.10. Enhance Reporting and Analytics for Healthcare Management

Objective: Design advanced reporting and analytics tools that would give insights into doctor availability, medicine stock levels, and other key metrics. These will provide actionable data to hospital administrators for making better decisions and optimizing resource allocation strategies. The system should also include predictive models that simulate future scenarios so that administrators can test various "what-if" situations regarding staffing, medicine availability, and patient load.

Outcome: With predictive analytics, hospital administrators will be provided with insights into the organization and will make decisions based on data that will help enhance operational efficiency, reduce costs, and improve patient care quality. Moreover, the insights will aid in long-term planning and development of public health strategies.

CHAPTER-6

SYSTEM DESIGN & IMPLEMENTATION

SYSTEM DESIGN

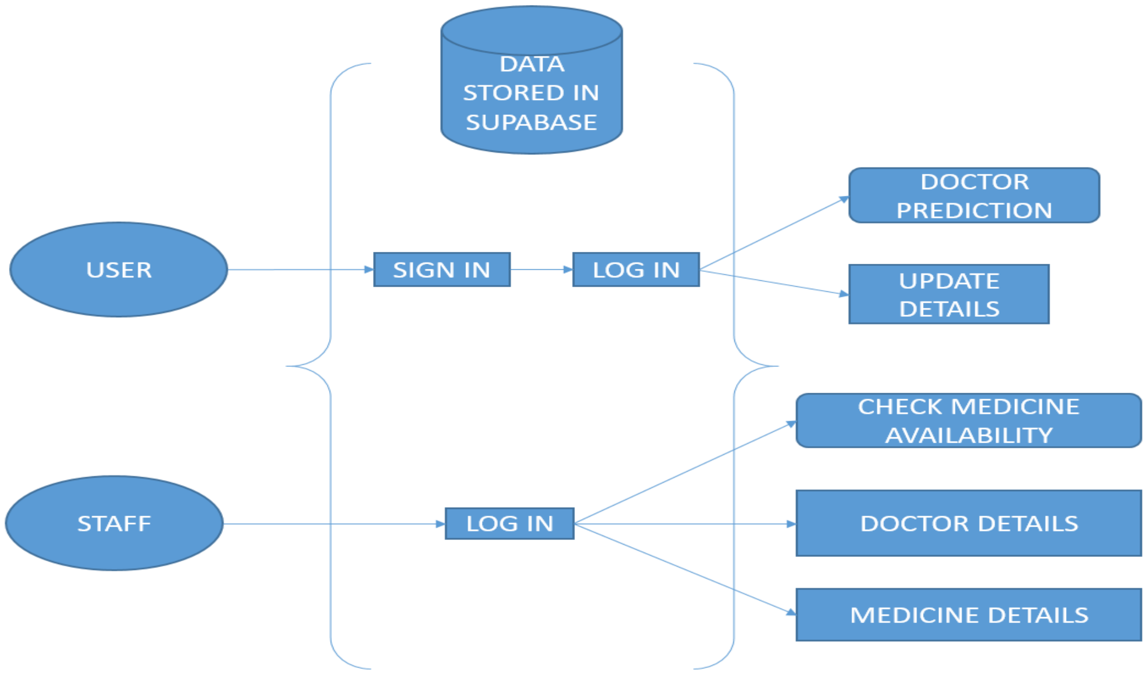


Fig1.1 flow chart of doctor and medicine prediction

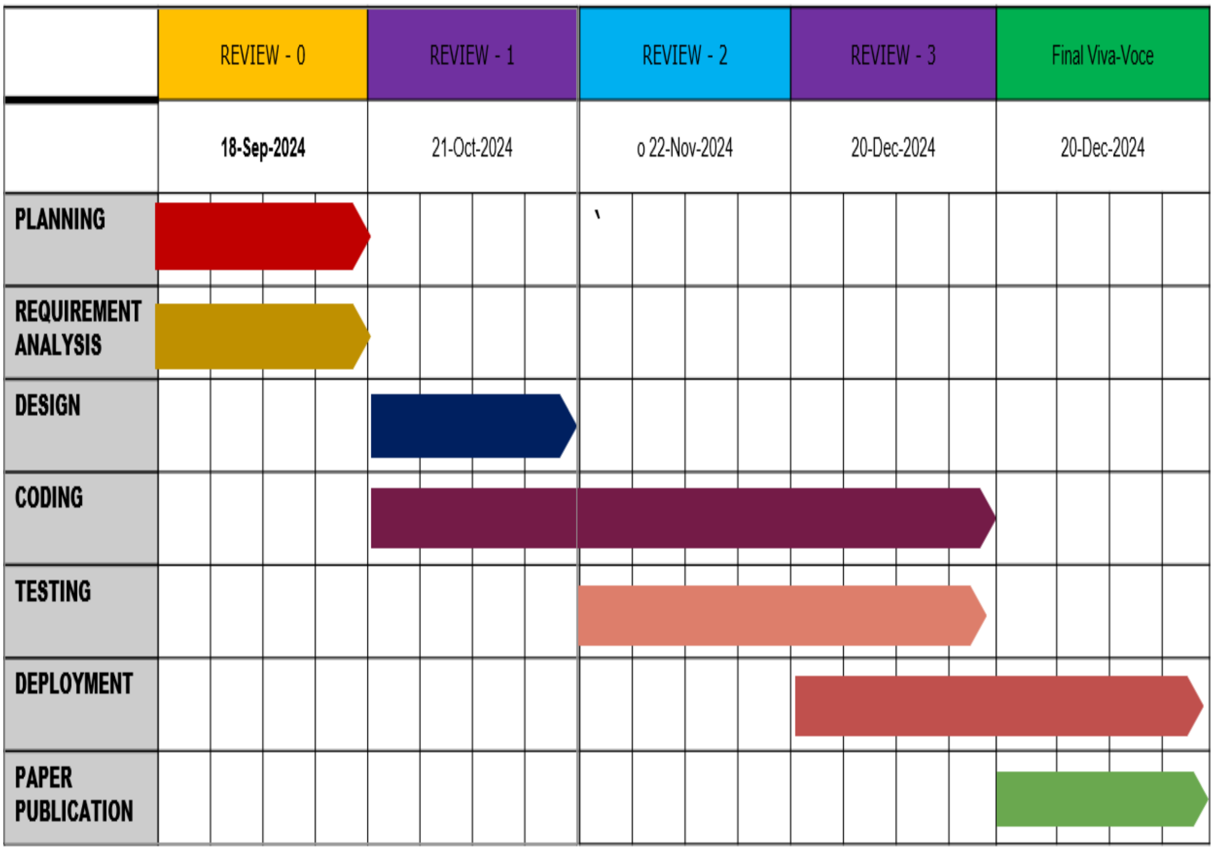
The Proposed method consists of the following steps:

- Step 1: User Authentication – Signup and login for patients with secure credentials.
- Step 2: Staff Authentication – Staff login with predefined credentials for role-based access.
- Step 3: Doctor Availability Predictor – User selects doctor type, enters appointments, selects location, and gets availability prediction.
- Step 4: Update User Details – Users can update their personal details and save changes with validation.
- Step 5: Staff Dashboard – Staff can manage medicine availability, doctor details, and medicine details via CSV editor.
- Step 6: Data Fetching – Fetch doctor and medicine details from respective CSV files.
- Step 7: Supabase Database Structure – Store login details in "users" and "staffs" tables, using "auth.users" for unified authentication

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)



CHAPTER-8

OUTCOMES

1. **Improved Medicine Availability**: The system correctly forecasts demand based on the past record of the patient and trends for a disease with predictive analytics, hence making the correct stock in place within hospitals of all those important drugs when peak diseases happen; such include the flu seasons, flu outbreak periods. Thus, by not making these patients experience shortage time in a case when treatment will have been there in time.

2. **Optimized Doctor Scheduling**: From the inflow of patients, the system analyzes and predicts how many doctors are required in the specified departments or for particular specialties. Based on that, the hospital can manage doctors' schedules effectively. For instance, there will always be enough doctors during peak times, such as weekends, holidays, or even when a particular disease surges. It helps patients avoid situations where they cannot access the needed doctor, hence minimizing patient dissatisfaction and streamlining healthcare delivery.

3. **Enhanced Operational Efficiency:** Predictive analytics, on the other hand, allows hospitals to better optimize resources. It helps in planning ahead- rather than reactive management-through data-driven predictions to improve the strategic look at medicine and doctor requirements. This improves the smooth running of hospitals, mitigating bottlenecks in the delivery of care and minimizing downtime because of a shortage of staff or resources. It also makes for better workflow efficiency, making hospitals deliver faster and better services to their patients.

4. **Better Patient Experience:** By providing the patient with proper and timely information regarding the availability of doctors, the right specialist is consulted without delays. When doctors' schedules are optimized and their availability is predicted, fewer instances of finding no appointments or unavailable specialists will be faced by patients. This means a better experience as patients can plan their visits with more certainty, improving their overall satisfaction with the healthcare system.

5. **Efficient Resource Management**: It will predict the most likely in-demand medicines

by extrapolating the trends of the diseases at hand, coupled with historical data. The predictive model also determines patient inflow and the demand for staff on the basis of seasonality and disease outbreaks. This allows the hospital to reallocate its resources more efficiently to have the necessary medicines and enough doctors available at the right time and place, making for better utilization of the resources within the hospital, waste reduction, and correct resource distribution.

6. **Data-Driven Decision Making:** The hospital administrators and healthcare planners will rely on data-driven insights for making informed decisions about staffing, medication stocking, and patient care planning. Historical and real-time data can be analyzed to predict when and where resources will be needed most, adjusting the strategies to that effect. This reduces reliance on guesswork and ensures decisions are based on concrete evidence and trends rather than assumptions.

7. **Role-Based Access Control:** The system ensures strict control on user access according to the role played by a user in the hospital. For instance, administrators can be allowed to access resource and scheduling data while an access for doctors may be patient-related information. As for role-based access, it protects sensitive data, where only authorized persons may view or edit certain information that enhances the security of patient records and hospital data.

8. **Real-Time Updates:** This is important since it ensures real-time updates concerning the availability of medicines and doctors so that staff at the hospital can quickly react to shortages or a change in demand. When the system notifies that a particular medicine is running low or when a doctor suddenly goes absent, possibly due to an emergency or otherwise, then it immediately sends notifications to the concerned staff to enable prompt adjustment of such imbalances.

9. **Scalable System:** The system scales with multiple hospitals, regions, or departments like this. When the hospital expands or more hospitals are added into the network, the system can be added with ease on their existing infrastructure. This scalability enables the application of the predictive analytics system on a bigger scale, which benefits the entire healthcare system and hence maintains consistency in operational efficiency across different locations.

10. **Cost Reduction:** Predictive analytics helps hospitals cut down on unnecessary expenditure by optimizing both staffing and inventory management. Hospitals can avoid overstaffing or overstocking medicines by forecasting the right number of doctors needed and predicting which medicines will be in demand. Moreover, by preventing shortages and ensuring that the necessary resources are always available, the system reduces emergency procurement costs. This cost efficiency is very important for government hospitals that need to manage tight budgets while delivering quality healthcare.

CHAPTER-9

RESULTS AND DISCUSSIONS

9.1 Results:

1. **Medicine Availability Optimization:**
   The predictive system successfully forecasted the demand for essential medicines, based on historical patient inflow data and disease trends. Hospitals were able to accurately predict which medicines would be needed and in what quantities, minimizing stockouts and ensuring timely availability during disease peaks. This led to fewer shortages and better preparedness, especially during critical disease outbreaks.
2. **Doctor Availability Prediction:**
   This ensured adequate levels of staffing through the system's ability to predict the availability of doctors and specialists. Patient inflow and type of diseases helped hospitals forecast their staffing requirements, especially on weekends, holidays, and disease surges. Improved doctor availability led to a reduction in waiting time and ensured patients had access to the right care at the right time.
3. **Operational Efficiency:**
   The system significantly contributed to improving operation efficiency. This means that with optimized resource allocation and scheduling, hospitals could better manage their resources, including medicine stocks and medical staff, reduce waste, improve service delivery, and make sure both staff and medicine were available when needed the most. This led to a reduction in costs and a better utilization of the hospital resources.
4. **Real-Time Monitoring :**
   The integration of real-time monitoring for medicine stock levels and doctor availability allowed the system to generate automatic alerts when stock levels were low or when doctor shortages were anticipated. This proactive feature ensured that hospitals could respond quickly, taking corrective action before shortages affected patient care or hospital operations.
5. **Dashboard and Reporting Tools:**
   The real-time dashboard and reporting tools offered the hospital administrators

comprehensive and easily interpretable data visualizations. They could make fast decisions and allow the management of the hospital to monitor and adjust resources according to the changes in demand, thus improving overall hospital management.

9.2 Discussion:

1. **Impact on Patient Care:**
   The predictive analysis system directly contributed to improving patient care by optimizing medicine availability and doctor scheduling. Patients received treatment on time, and the chances of treatment delays due to shortages or unavailable specialists were significantly reduced. The system also ensured that critical resources were available during peak periods, leading to smoother patient flow and better healthcare outcomes.
2. **Cost Efficiency and Budget Management:**
   One of the major advantages that were noted was the potential cost savings the system provided. Since it could accurately predict both medicine and staffing needs, hospitals avoided overstocking medicines and hiring unnecessary staff. Hospitals were then able to manage their budgets more effectively, which would free up some funds for other essential services or infrastructure improvements.
3. **Scalability and Adaptability Across Hospital Types:**
   This demonstrates the powerful ability of adaptation with respect to size. So the system allowed advanced predictive facilities that were provided in large cities such as larger hospitals, which smaller rural-type hospitals could employ, using an equally simplified form of the model in order to better optimize both the usage of medicine resources and the required manpower. Its versatility helps this system achieve diversity in applying health care practices from one medical setup to the next.**User Engagement and Feedback Loop:**
   The continuous feedback mechanism integrated into the system allows hospital staff to report issues, suggest improvements, and provide insights on system performance. The feedback loop thus helps refine the predictive models over time, increasing the accuracy and responsiveness of the system. As more data is collected, the sophistication of the predictive models will increase in terms of resource prediction and management, thereby increasing overall effectiveness.

4. **Future Potential and Expansion:**

   Once the pilot implementations become successful, they can be implemented on a larger level among all government hospitals spread across various regions. Being scalable and highly accommodating to the needs of any given setting, the system is likely to play a very crucial role in optimizing healthcare management on a national level. The future versions of the system may be enhanced with more advanced technologies like AI and machine learning to make predictions even more accurate and optimize resource management even better.

5 Challenges and Areas for Improvement:

Although the system has shown tremendous benefits, some integration to the existing hospital infrastructure and systems poses a challenge. Ensuring there is a free flow of critical data while ensuring compatibility with legacy systems might require more effort and more resources. Additionally, more appropriate training will be necessary for health staff to fully exploit the system. The challenges still rising as the system evolves will lead to significant enhanced effectiveness.

CHAPTER-10

CONCLUSION

The "Predictive Analysis on Medicines & Doctors Availability in Government Hospitals" system is devised to address major challenges faced by Indian government hospitals, especially at peak disease times. The system enables hospitals to forecast the demand for medicines and the number of doctors required based on historical and current patient data, using predictive analytics. This proactive approach ensures better resource management, reducing shortages of medicines and ensuring the right number of doctors are available to handle patient inflow, especially during weekends, holidays, and evenings when shortages are most likely to occur.

Its benefit in predicting medicine availability ensures the pre-stocking of essential medicines according to the trend of the diseases and needs of patients. Such a predictive system helps minimize medicine shortages and, in turn, ensure that treatment reaches the patients at the right time, hence delivering proper care to them. Prediction of doctor availability similarly optimizes doctor schedules so that demand can be met on time, hence avoiding wait times, ensuring that a patient receives his required specialist on time.

This system greatly improves operational efficiency as hospitals can now make data-driven decisions on the allocation of resources, staffing, and procurement of medicines. The system also helps in reducing operational bottlenecks and waste that leads to a reduction in cost for the health care system. The system also guarantees data security with role-based access, meaning that only authorized staff are allowed to view sensitive information.

Moreover, it is scalable; hence, it can easily adapt to different hospitals or regions. This will be very effective in large-scale implementation across India. Therefore, the solution is improving patient care and satisfaction as well as efficient management of resources at hospitals, hence providing cost-effective operations of healthcare services. The integration of predictive analytics, data security, and operational efficiency in this system has a good potential for improvement in the functioning of government hospitals, to the benefit of both patients and health care providers.

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APPENDIX-A

PSUEDOCODE

 # 1. User Authentication

```
class User:
    def signup(self, name, email, password):
        # Store user data securely
        hashed_password = hash(password)  # Secure the password
        store_in_database('users', name, email, hashed_password)

    def login(self, email, password):
        # Fetch user data from the database
        user_data = fetch_from_database('users', email)
        if user_data and check_password(user_data['password'], password):
            return "Login Successful"
        else:
            return "Invalid Credentials"
```

 # 2. Staff Authentication

```
class Staff:
    def login(self, email, password):
        # Fetch staff data from the database
        staff_data = fetch_from_database('staffs', email)
        if staff_data and check_password(staff_data['password'], password):
            return "Login Successful"
        else:
            return "Invalid Credentials"
```

 # 3. Data Security

```
class DataSecurity:
    def encrypt_data(self, data):
        # Use encryption algorithm to secure sensitive data
        return encrypt(data)
```

```
    def decrypt_data(self, encrypted_data):
        # Decrypt data when needed
        return decrypt(encrypted_data)

    def role_based_access(self, user_role, action):
        # Ensure users and staff can only access relevant data based on roles
        if user_role == 'admin' or user_role == 'staff':
            return True
        return False
```

 # 4. User Side Doctor Availability Predictor

```
class DoctorAvailabilityPredictor:
    def get_doctor_availability(self, specialization, patient_load, location):
        # Fetch historical data of the selected specialization and location
        data = fetch_doctor_data(specialization, location)
        if data['patient_load'] + patient_load > data['capacity']:
            return "Doctor Not Available"
        else:
            return "Doctor Available"
```

 # 5. User Interface for Update Details

```
class UserInterface:
    def update_user_details(self, user_id, name, email, age, gender, address, phone_number):
        # Validate input fields
        if validate_input(name, email, age, gender, address, phone_number):
            # Update the user details in the database
            update_in_database('users', user_id, name, email, age, gender, address,
phone_number)
            return "User details updated successfully"
        return "Invalid input data"
```

 # 6. Staff Dashboard: Medicine Availability Predictor

```
class MedicineAvailabilityPredictor:
```

```
    def check_medicine_availability(self, medicine, dosage, location):
        # Check the medicine's availability using historical data and trends
        medicine_data = fetch_medicine_data(medicine, location)
        if medicine_data['stock'] < 10:  # Arbitrary threshold for low stock
            return "Medicine Not Available"
        else:
            return "Medicine Available"
```

 # 7. Staff Dashboard: Doctor and Medicine Details Management

```
class StaffDashboard:
    def search_doctor(self, name):
        # Search for doctor details in the database
        return fetch_doctor_data_by_name(name)

    def add_doctor(self, name, age, specialization):
        # Add doctor details to the database
        add_to_database('doctor_data', name, age, specialization)

    def delete_doctor(self, name):
        # Delete doctor details from the database
        delete_from_database('doctor_data', name)

    def add_medicine(self, name, dosage, stock):
        # Add new medicine details to the database
        add_to_database('medicine_data', name, dosage, stock)

    def delete_medicine(self, name):
        # Delete medicine details from the database
        delete_from_database('medicine_data', name)
```

 # 8. Data Fetching Methodology

```
class DataFetching:
    def fetch_doctor_data(self, specialization, location):
        # Fetch doctor data based on specialization and location
```

```
        return fetch_from_database('doctor_data', specialization, location)

    def fetch_medicine_data(self, medicine, location):
        # Fetch medicine data based on the type and location
        return fetch_from_database('medicine_data', medicine, location)
```

 # 9. Database Structure for Login Details

```
class Database:
    def store_in_database(self, table, name, email, password):
        # Store user or staff data securely in the database
        insert_into_table(table, name, email, password)

    def fetch_from_database(self, table, email):
        # Fetch data from the database
        return query_table(table, email)

    def update_in_database(self, table, user_id, name, email, age, gender, address,
phone_number):
        # Update the user data in the database
        update_table(table, user_id, name, email, age, gender, address, phone_number)

    def delete_from_database(self, table, name):
        # Delete data from the database
        delete_row(table, name)
```

APPENDIX-B

SCREENSHOTS

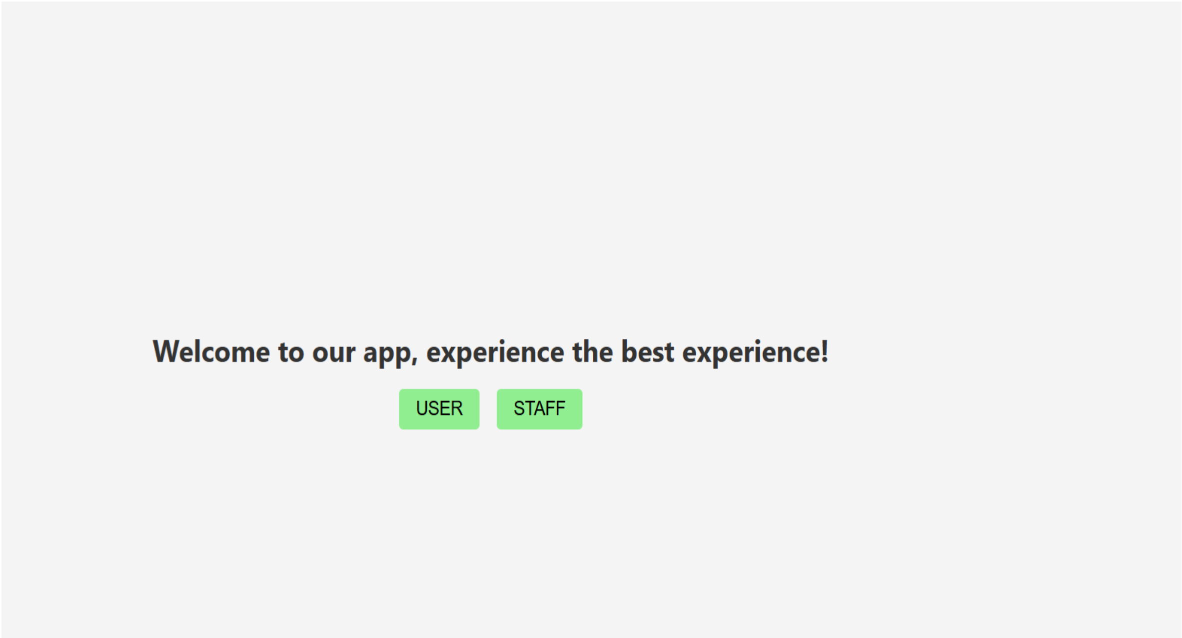


Fig 1.2 welcome page of user and staff

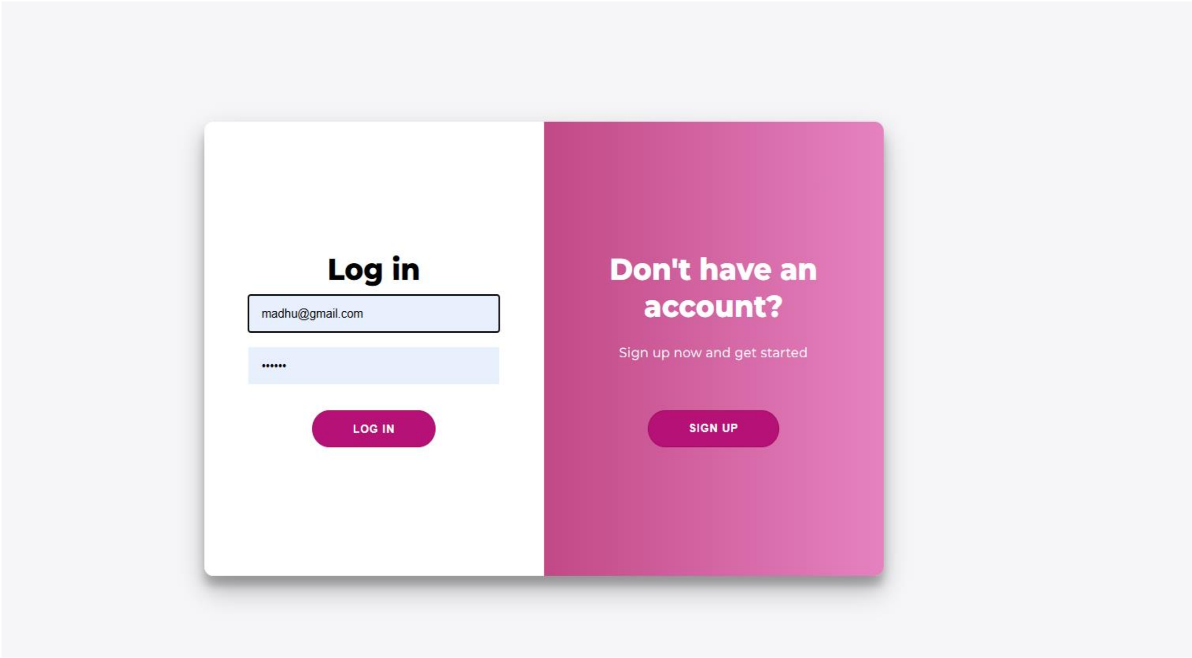


Fig 1.3 user signup and login page

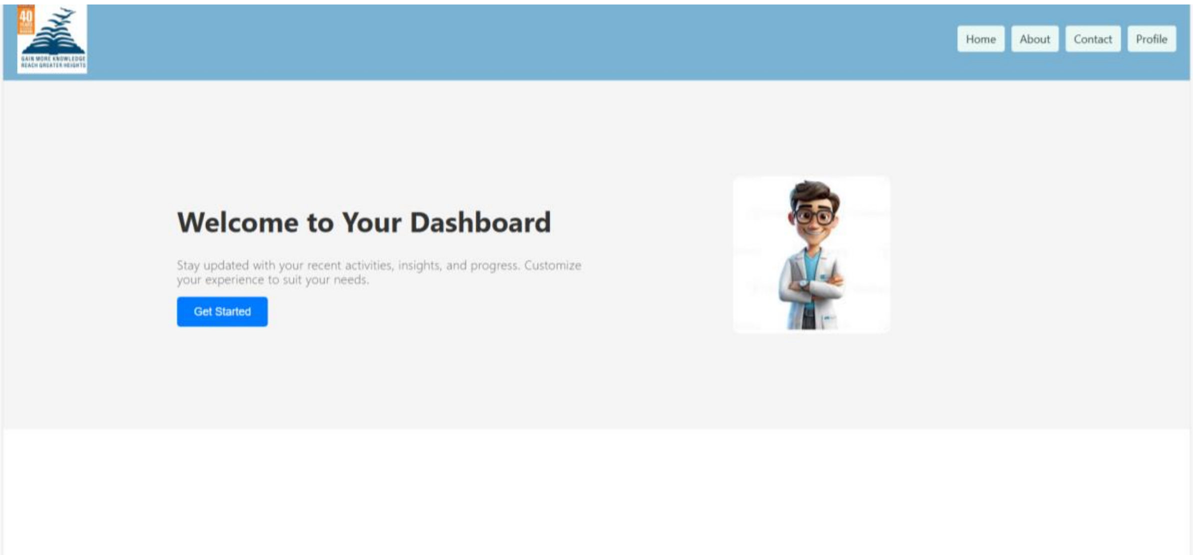


Fig 1.4 user dashboard

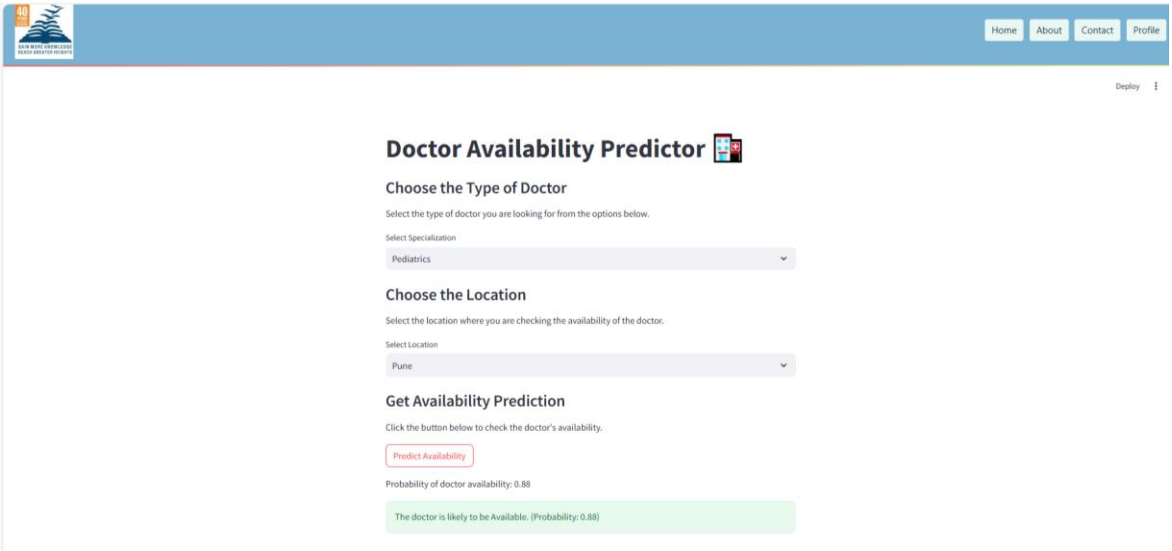


Fig 1.5 user side doctor availability predictor

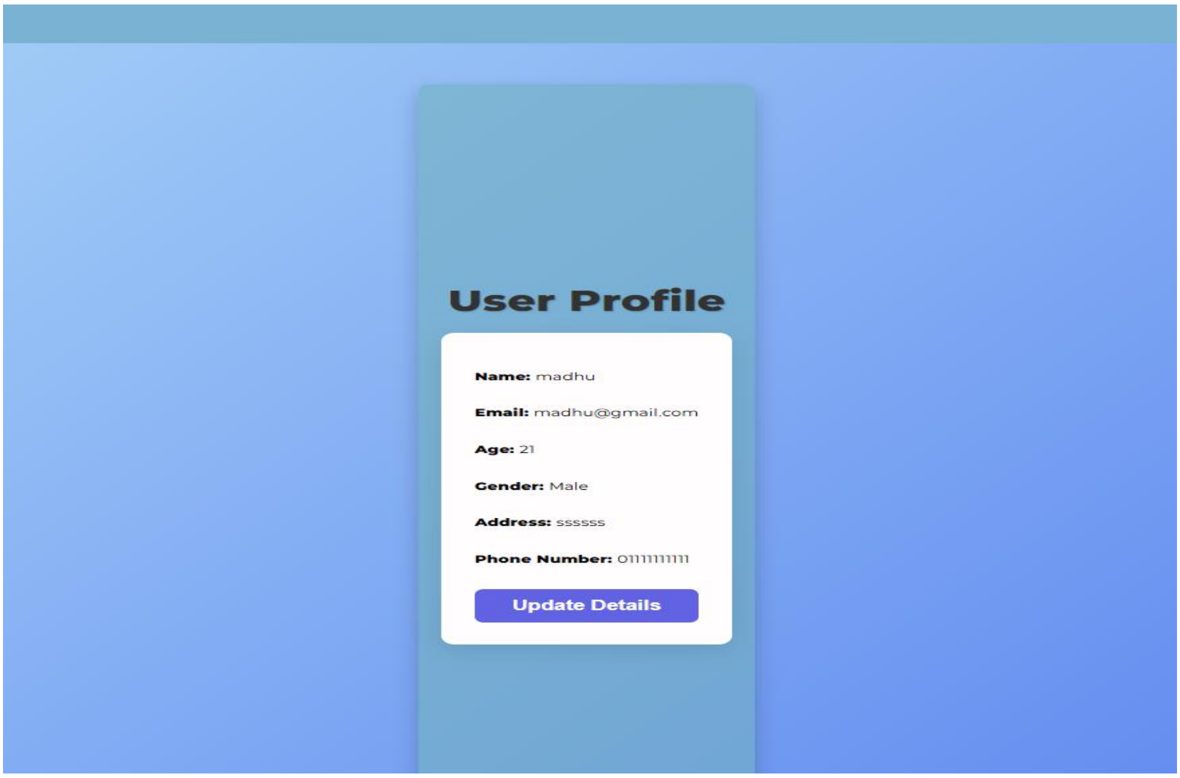


Fig 1.6 user details updation

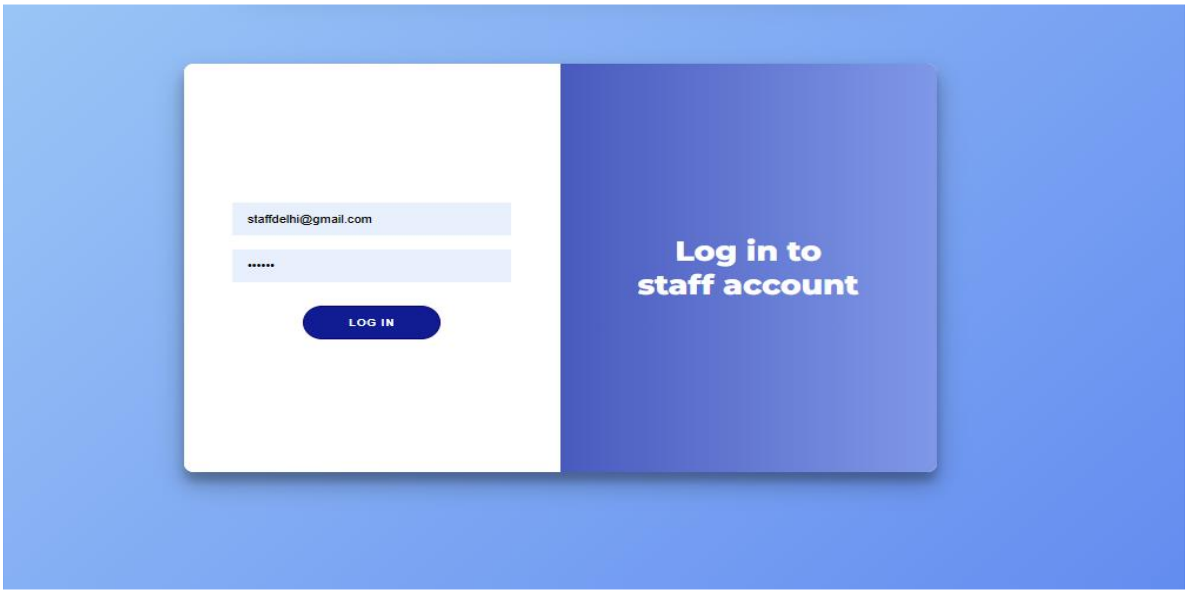


Fig 1.7 staff login page

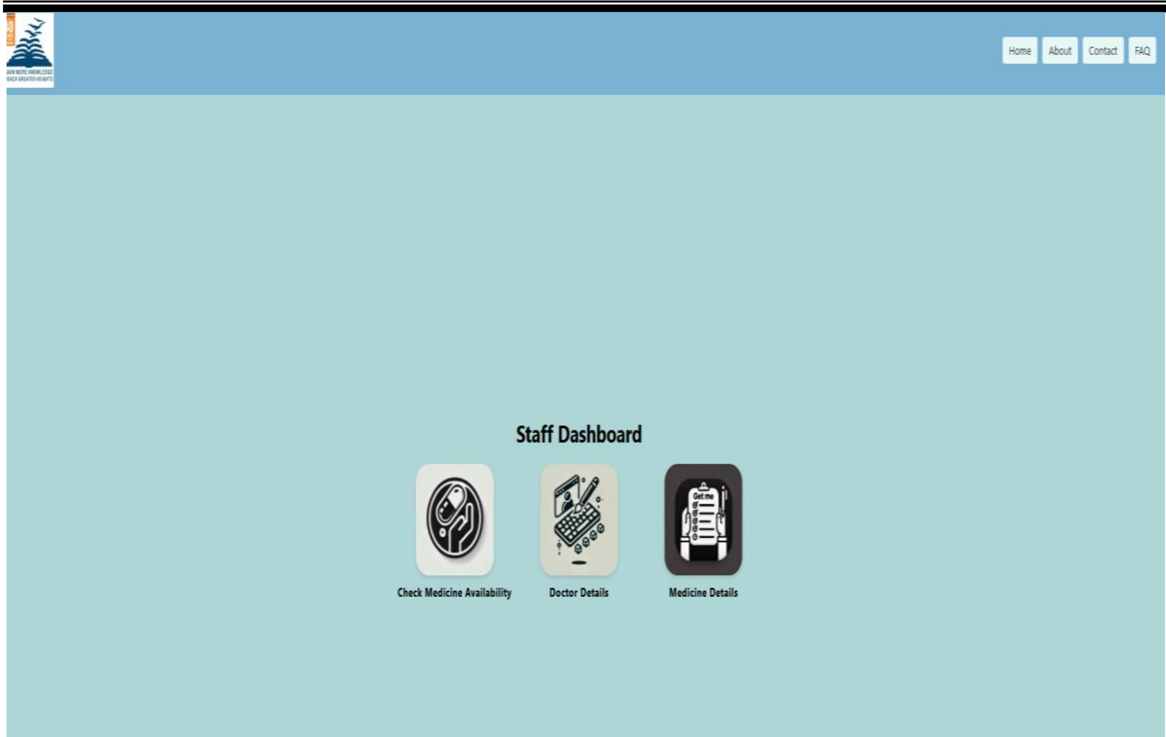


Fig 1.8 Staff's dashboard

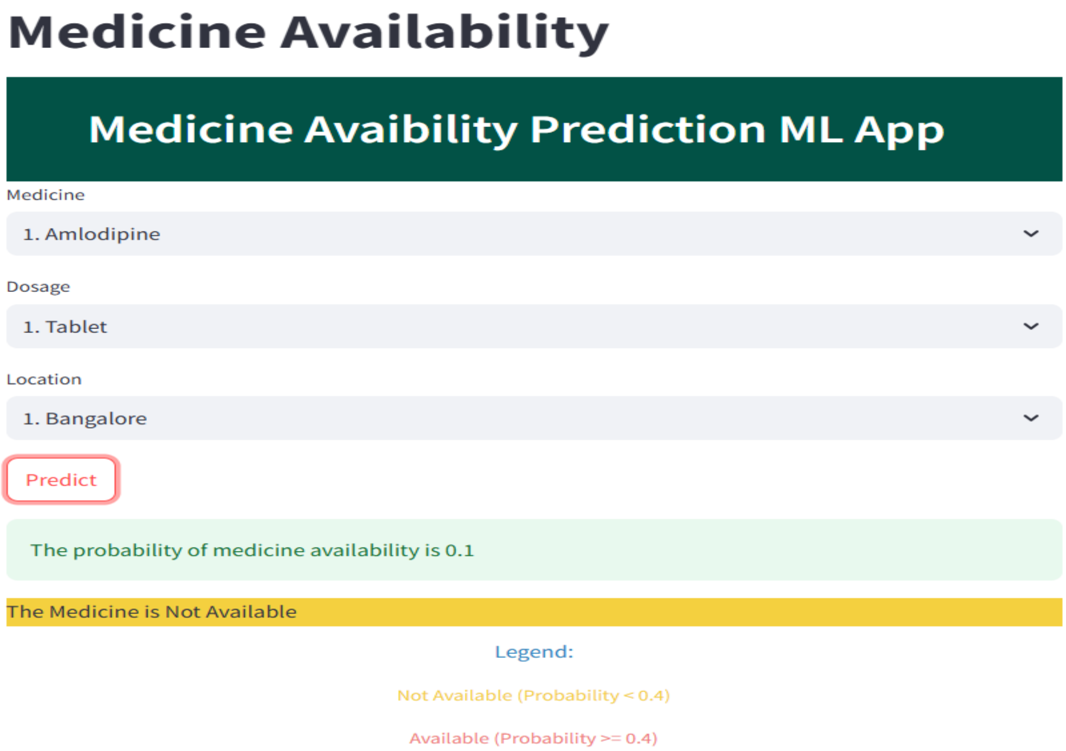


Fig 1.9 Staff side medicine availability prediction(NO)

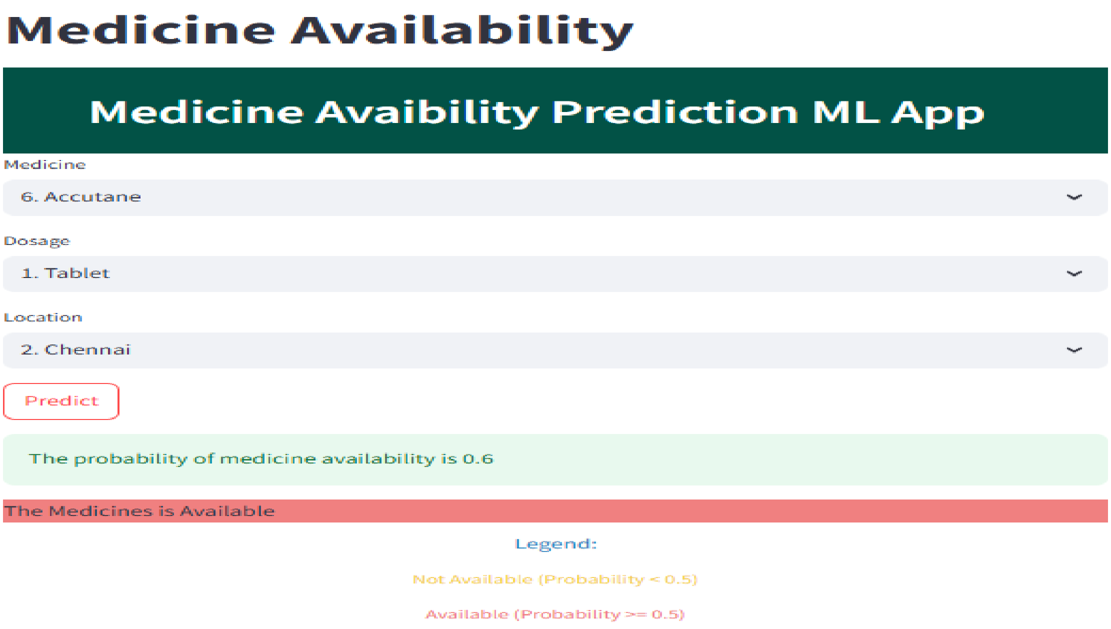


Fig 1.10 Staff side medicine availability prediction(YES)

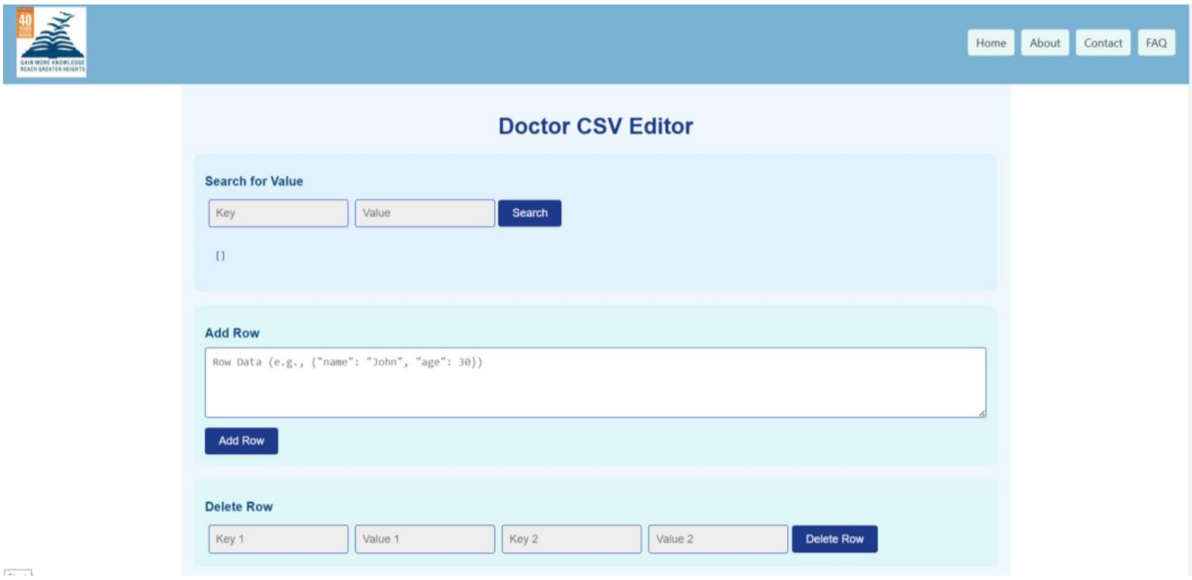


Fig 1.11 doctor csv editor

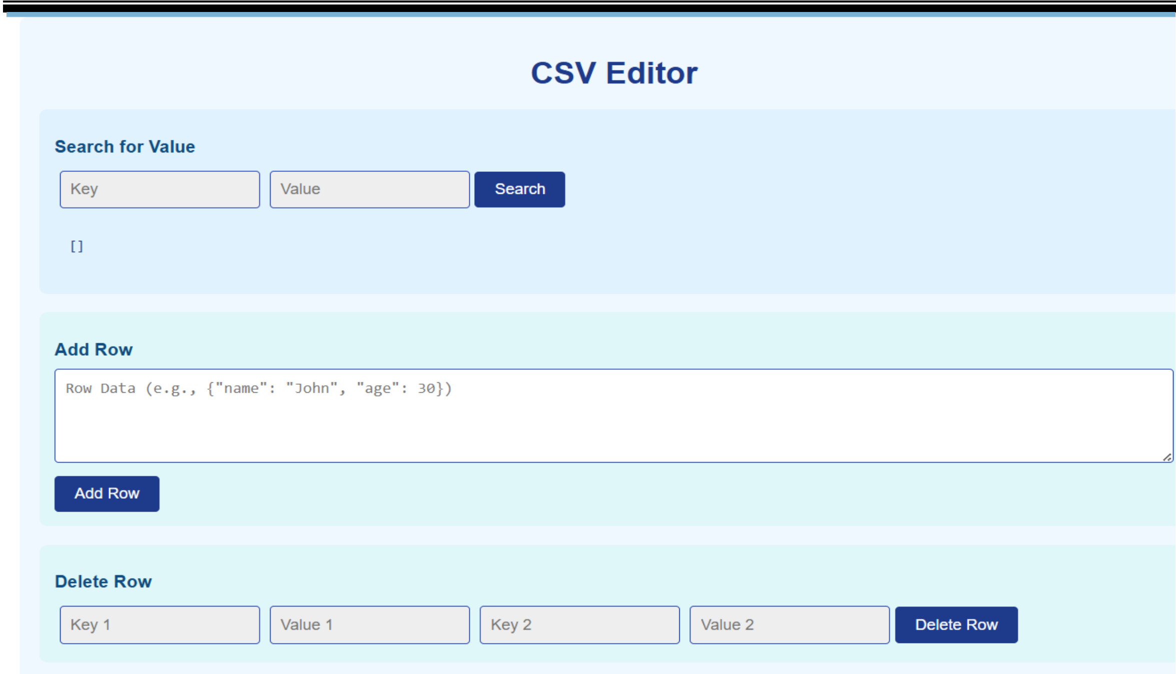


Fig 1.12 Medicine csv editor

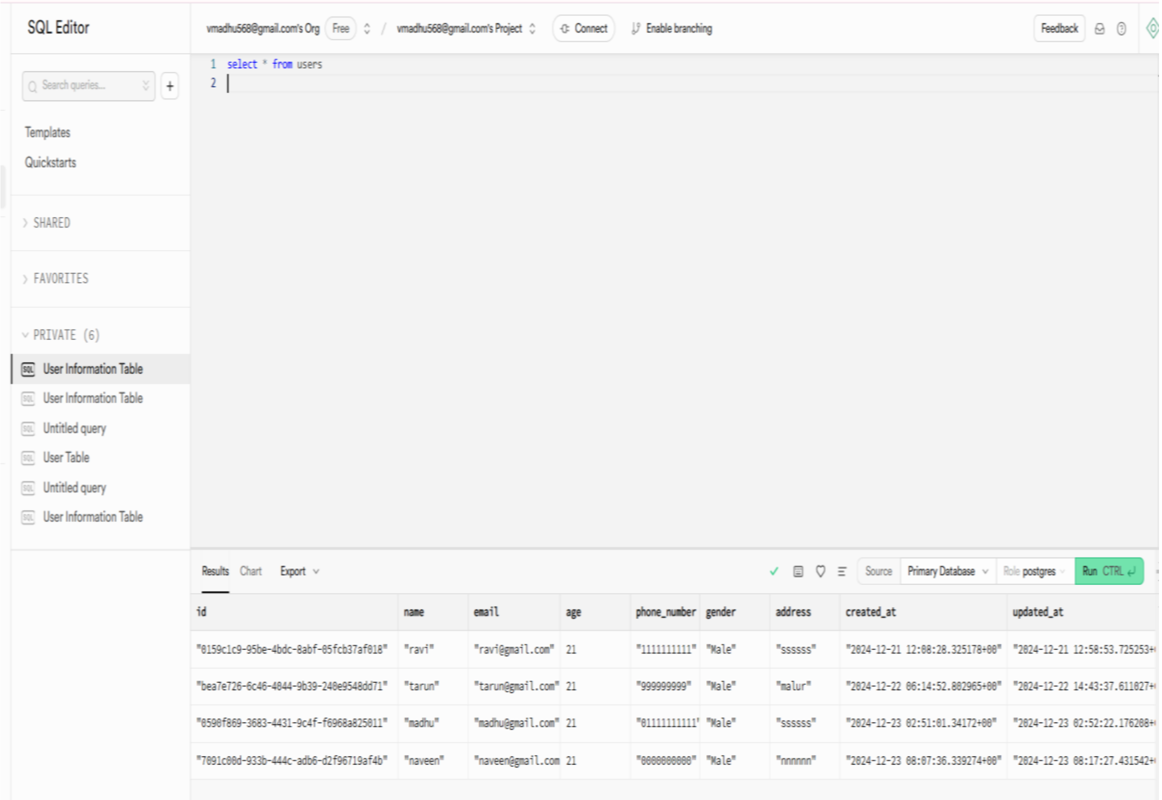
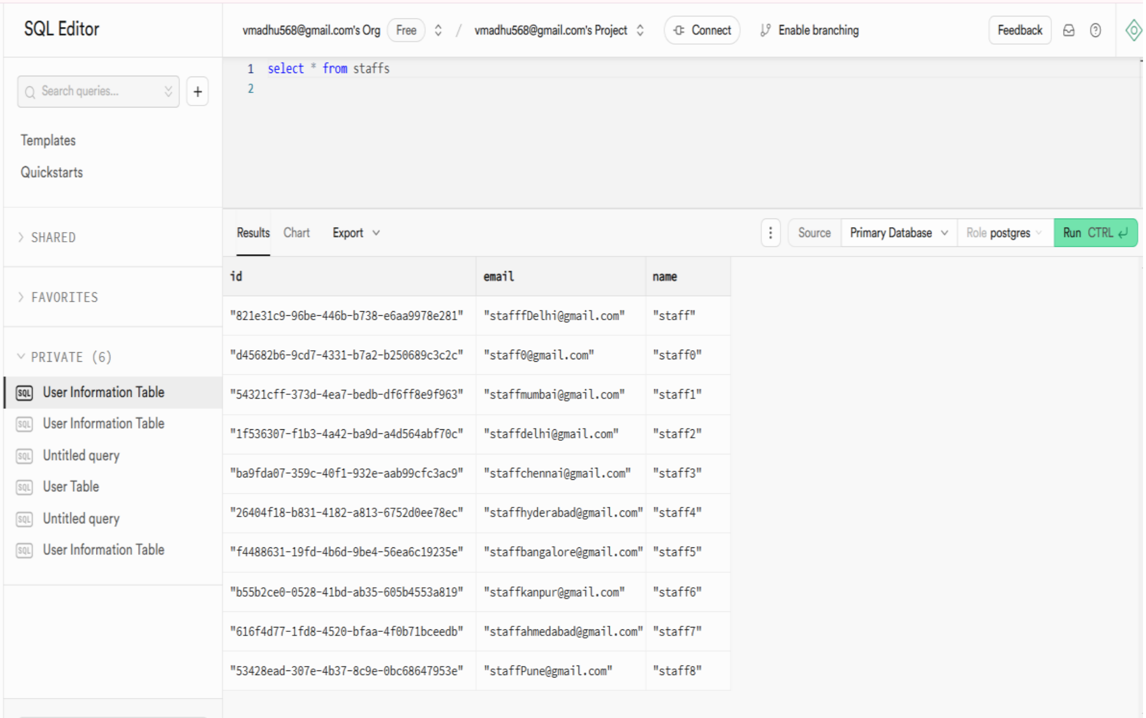


Fig 1.13 users database stored in supabase



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"54321cff-373d-4ea7-bedb-df6ff8e9f963"	"staffmumbai@gmail.com"	"staff1"
"1f536307-f1b3-4a42-ba9d-a4d564abf70c"	"staffdelhi@gmail.com"	"staff2"
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"26404f18-b831-4182-a813-6752d0ee78ec"	"staffhyderabad@gmail.com"	"staff4"
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Fig 1.14 Staff's database stored in supabase

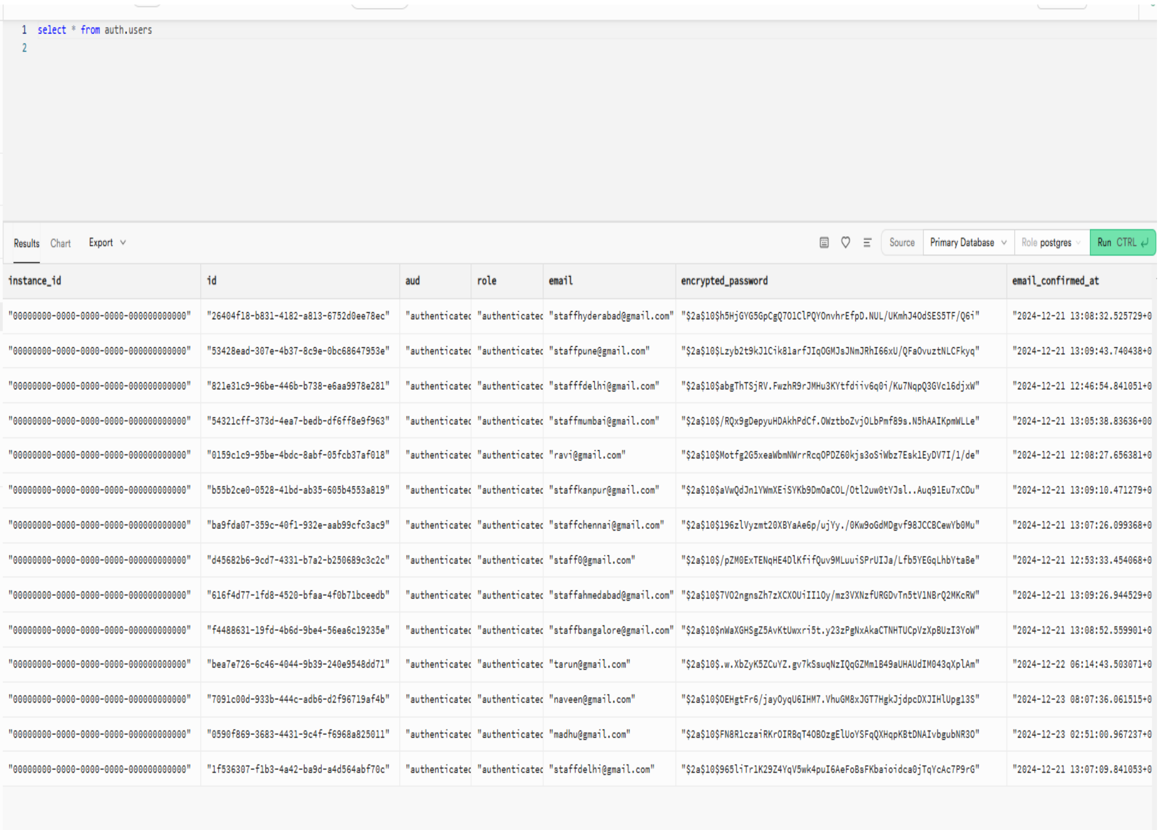

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Fig 1.15 Staffs and users database stored in supabase

APPENDIX-C

ENCLOSURES

1. Journal publication/Conference Paper Presented Certificates of all students.

INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT - (IJNRD)
International Peer Reviewed & Refereed Journals, Open Access Journal
ISSN: 2456-4184 | Impact factor: 8.76 | ESTD Year: 2016
Scholarly open access journals, Peer-reviewed, and Refereed Journals, Impact factor 8.76 (Calculate by google scholar and Semantic Scholar | AI-Powered Research Tool) , Multidisciplinary, Monthly, Indexing in all major database & Metadata, Citation Generator, Digital Object Identifier(DOI)

Dear Author, Congratulation!!!
Your manuscript with Registration/Paper ID: 303280 has been Accepted for publication in the INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG | ISSN: 2456-4184 | International Peer Reviewed & Refereed Journals, Open Access Online and Print Journal.

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Your Paper Review Report :					
Registration/Paper ID:	303280				
Title of the Paper:	Predictive Analysis on Medicines & Doctors Availability in Government Hospitals				
Unique Contents:	90% (Out of 100)	Paper Accepted:	Accepted	Overall Assessment (Comments):	Reviewer Comment store in Online RMS system
Publication of Paper:	Paper Accepted. Please complete payment and documents process. Paper will be published Within 01-02 Days after submission of payment proof and documents to editor@ijnrd.org. Complete below Step 1 and 2				

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STEP 1: Pay Publication Fees for Indian Author	
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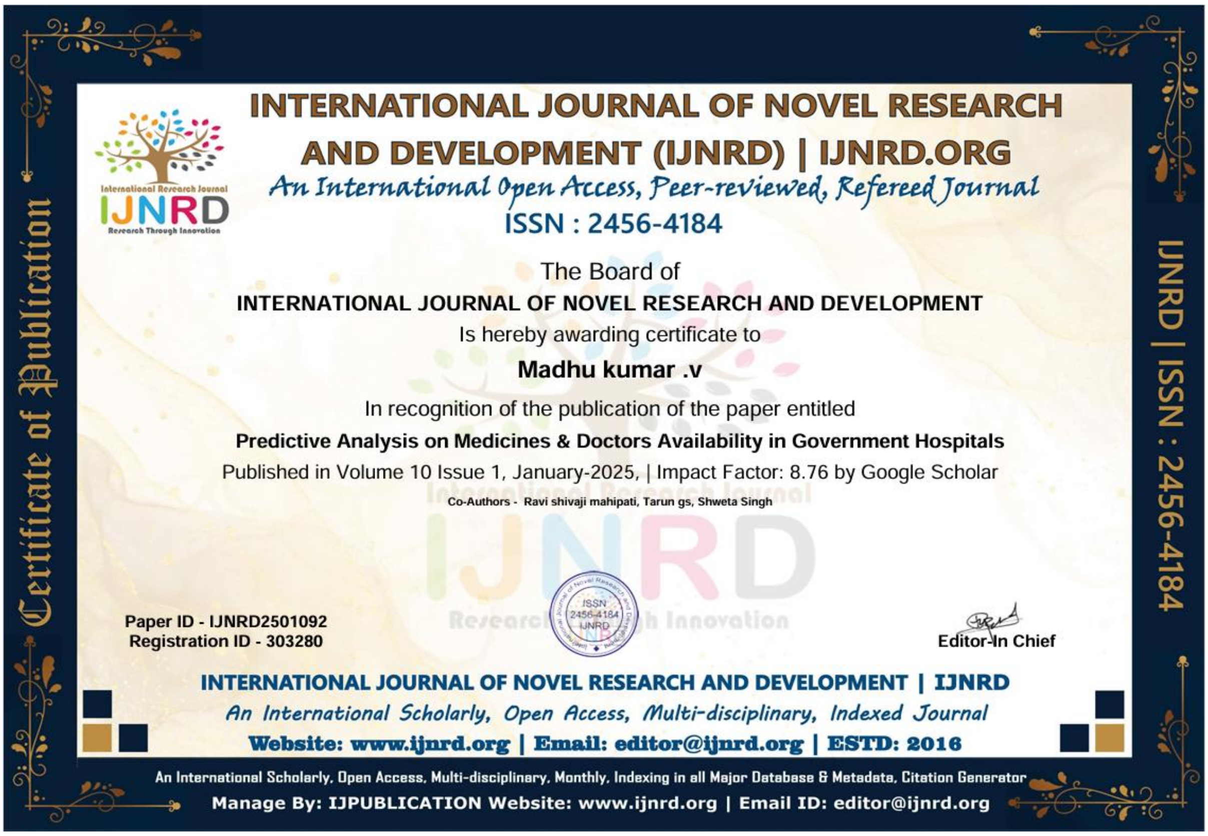
2. Include certificate(s) of any Achievement/Award won in any project-related event.



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Is hereby awarding certificate to

Madhu kumar .v

In recognition of the publication of the paper entitled

Predictive Analysis on Medicines & Doctors Availability in Government Hospitals

Published in Volume 10 Issue 1, January-2025, | Impact Factor: 8.76 by Google Scholar

Co-Authors - Ravi shivaji mahipati, Tarun gs, Shweta Singh

Paper ID - IJNRD2501092
Registration ID - 303280

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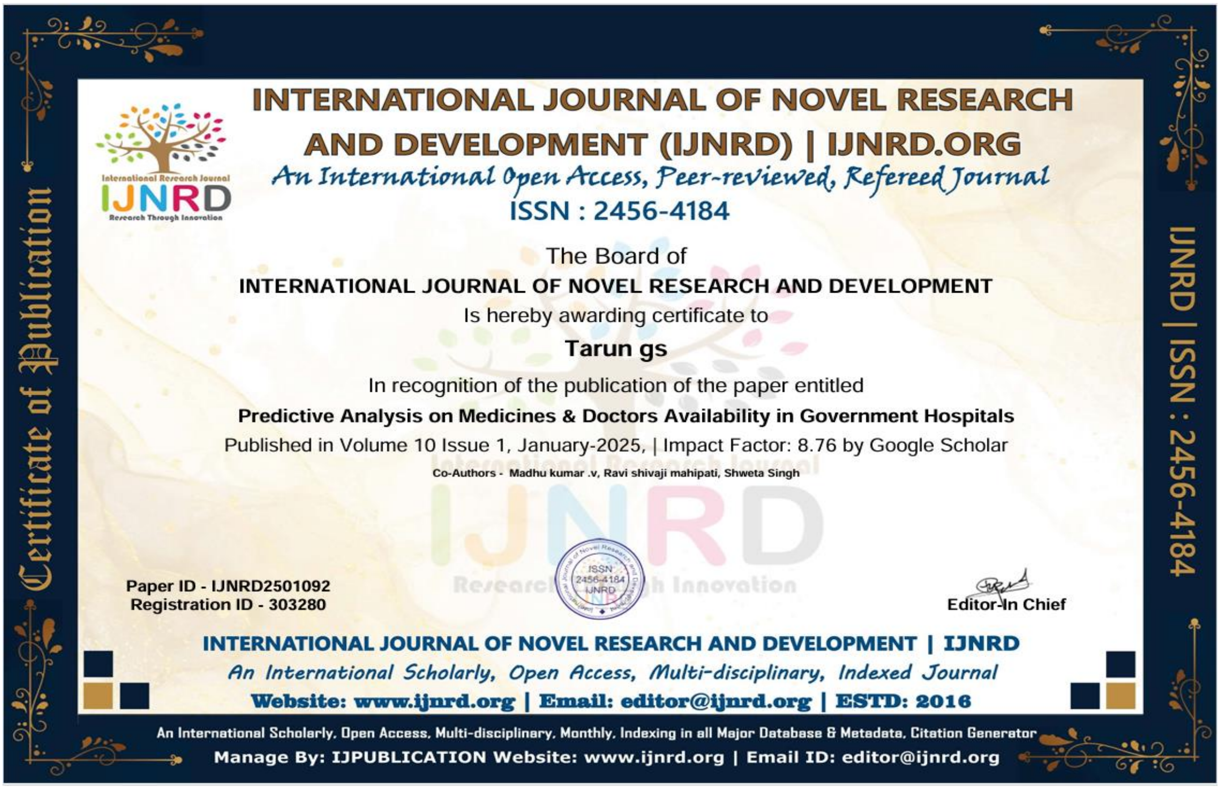

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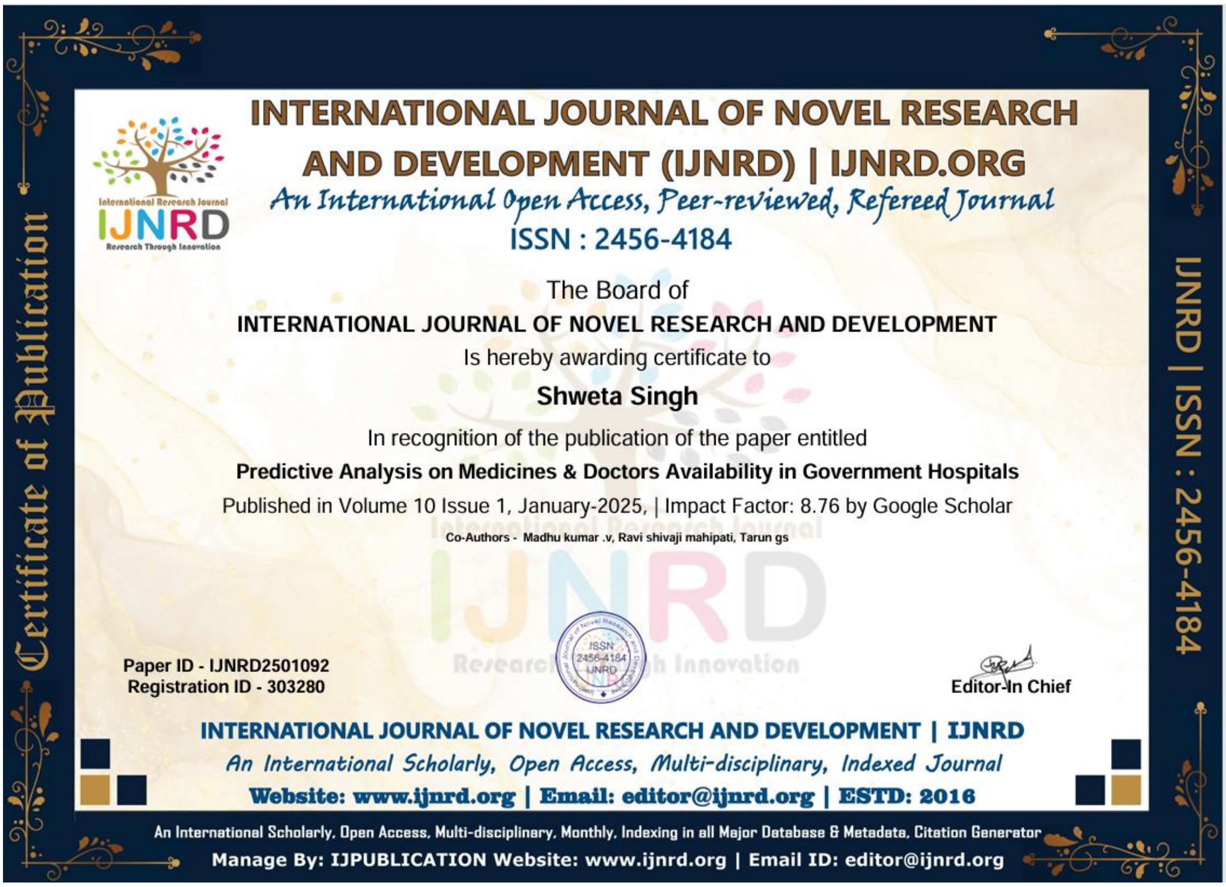

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4. Details of mapping the project with the Sustainable Development Goals (SDGs).

The topic of predictive analysis on medicines and doctors' availability in government hospitals aligns with **SDG 3: Good Health and Well-Being.** This goal focuses on access to quality healthcare services and essential medicines for all. Predictive analysis can be used to identify gaps in medical resources, optimize supply chains, and predict future needs. Through data-driven insights, hospitals can ensure a more efficient allocation of medicines and healthcare professionals, minimizing shortages and improving patient outcomes.

Further, this approach will strengthen the health systems, and thereby, the resilience and efficiency envisioned in SDG 3 will be achieved. Predictive tools ensure better planning of public health emergencies and equitable distribution of resources in underserved areas. This is directly in support of the goal's targets such as universal health coverage and access to safe, affordable medicines. Predictive analysis helps in making a healthcare system proactive rather than reactive, where no one will be left behind.

MADHU KUMAR V - final rrrrrrrrr

by Madhu Kumar V

Submission date: 06-Jan-2025 10:04AM (UTC+0530)
Submission ID: 2560112252
File name: final_rrrrrrrrr.doc (215K)
Word count: 3053
Character count: 19746

Predictive Analysis on Medicines & Doctors Availability in Government Hospitals

[1]Madhu Kumar v, [2]Ravi Shivaji Mahipati, [3]Tarun gs, [4]Shweta Singh

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Abstract-- This project focuses on developing a system to enhance the efficiency of healthcare services in government hospitals by utilizing data analytics. The system aims to solve two critical issues:

1. **Medicine Shortages: By analyzing historical and real-time patient data, the system forecasts the demand for medicines required to treat specific diseases. It ensures hospitals are adequately stocked, particularly during periods of high demand or outbreaks.**
2. **Doctor Availability: The system predicts the number of doctors needed in hospitals based on historical trends and current patient inflow. It helps allocate medical staff efficiently, especially during weekends, holidays, or peak disease periods, ensuring patients receive timely medical attention.**

The solution is designed to improve resource management in Indian government healthcare facilities, aligning staffing and medicine availability with patient needs. By integrating predictive analytics, this system supports better planning and decision-making, ultimately enhancing patient care.The primary target audience is the Indian Government healthcare sector, focusing on operational improvements through data-driven insights. Key applications include inventory forecasting for medicines and dynamic scheduling of medical professionals.

Index Terms—**Predictive analytics, healthcare optimization, medicine forecasting, doctor allocation, patient data analysis, resource management, government hospitals.**

I. INTRODUCTION

Healthcare systems, particularly government hospitals, face significant challenges in managing resources effectively to meet patient needs. During periods of high demand, such as disease outbreaks, hospitals often experience shortages of essential medicines and a lack of available medical professionals. These challenges can lead to delays in patient care and impact overall service quality.

This project addresses these issues by implementing a data-driven approach that leverages historical and real-time patient data to predict resource requirements. The system focuses on two critical aspects: ensuring the availability of medicines by forecasting demand and optimizing the allocation of doctors based on patient inflow trends. By utilizing analytics, the solution aims to improve resource planning and operational efficiency in healthcare facilities, enabling them to deliver better services during peak times and regular operations.

II. LITERATURE SURVEY

In [1], the authors analyzed the regulatory framework in Bangladesh concerning the application of big data and artificial intelligence in the healthcare sector. They discussed issues surrounding data privacy, security, and governance, identifying gaps when compared to established frameworks in the USA and the EU. The study emphasized the importance of implementing comprehensive policies to ethically manage healthcare data and AI-driven technologies

.In [2], the researchers introduced a blockchain-based information management system tailored for veterinary clinics. The system utilized machine learning for predictive analytics and incorporated Hyperledger Fabric to ensure data security and reliability. Their findings showcased how predictive analytics could effectively aid in managing medical inventories and optimizing staff schedules, providing valuable insights for strategic planning.

In [3], the authors developed a big data analytics platform based on cloud computing to forecast patients' future health conditions. By utilizing stochastic models and parallel processing frameworks, the platform demonstrated high accuracy in predictions. The research focused on handling diverse healthcare data types, both structured and unstructured, and proposed probabilistic data collection mechanisms to enhance prediction precision and scalability.

III.IMPLEMENTATION

The system is structured around two primary modules: **Medicine Demand Forecasting** and **Doctor Allocation Optimization**, both of which employ data analytics and machine learning techniques to optimize resource management in government hospitals

1. Medicine Demand Forecasting This module focuses on ensuring the availability of essential medicines in the required quantities by analyzing historical and real-time data. The implementation steps include:

1. **Data Collection**:
    - Gather information such as patient records, disease prevalence, hospital inventory levels, and seasonal trends.
    - Combine data from hospital management systems and public health databases to create a centralized dataset.
2. **Data Preprocessing**:
    - Clean and process the data to handle missing values, outliers, and inconsistencies.
    - Apply transformations such as one-hot encoding for categorical data (e.g., types of diseases) and scaling for numerical values (e.g., patient numbers).
3. **Feature Engineering**:
    - Identify the main factors influencing medicine demand, including:
        - Disease occurrence patterns.
        - Seasonal variations (e.g., higher flu cases in winter).
        - Population density near hospital locations.
    - Create time-series representations to account for temporal trends and seasonality.
4. **Prediction Modeling**:
    - Train predictive models such as ARIMA, XGBoost, or LSTM for time-series forecasting.
    - Use these models to estimate future medicine requirements based on historical consumption patterns and patient data.
5. **Report Generation**:
    - Create detailed reports that provide:
        - Estimated quantities of medicines required over specific periods.
        - Identification of potential shortages or surpluses in stock levels.
6. **Actionable Insights**:
    - Provide hospital administrators with practical recommendations to optimize inventory management and procurement processes.

2. Doctor Allocation Optimization

This module ensures that sufficient medical staff is available to meet patient needs during routine and high-demand periods. The implementation process includes:

1. **Data Collection**:
    - Collect historical data on patient inflow, doctor schedules, and hospital operating hours.
    - Incorporate additional variables such as holidays, weekends, and disease outbreaks.
2. **Data Preprocessing**:
    - Standardize patient visit logs and doctor schedules to maintain consistency.
    - Address missing data points to ensure a complete dataset.
3. **Inflow Analysis**:
    - Use clustering algorithms, such as K-Means, to uncover patterns in patient visits.
    - Classify patient inflow data based on:
        - Time of day (e.g., morning, afternoon, evening).
        - Day of the week (e.g., weekdays, weekends).
        - Special circumstances (e.g., vaccination drives, outbreaks).
4. **Optimization Model**:
    - Apply optimization techniques like linear programming to determine the optimal allocation of doctors.
    - Utilize machine learning models, such as Random Forest or Decision Trees, to predict the number of doctors needed based on patient inflow trends.
5. **Dynamic Scheduling**:

- Develop a flexible scheduling system that adjusts in real time to changing patient demand.
- Ensure increased doctor availability during peak periods, such as weekends and public holidays.

6. **Alert Mechanism**:

   - Notify hospital administrators about potential staff shortages.
   - Provide actionable recommendations for temporary staffing or redistributing available resources.

IV.INTEGRATION AND DEPLOYMENT

1. **Centralized Platform**:
   - Design a user-friendly web-based platform for hospital administrators.
   - Incorporate dashboards with visualizations for patient inflow, medicine inventory, and doctor availability.
2. **Backend Infrastructure**:
   - Use a scalable backend framework (e.g., Flask or Django) for data processing and machine learning predictions.
   - Integrate a database system (e.g., PostgreSQL or MongoDB) to store records related to patients, medicines, and staff schedules.
3. **Frontend Development**:
   - Build an intuitive interface using modern web technologies (e.g., React or Angular).
   - Include features like filtering data by hospital location and generating custom reports.
4. **Real-Time Updates**:
   - Develop APIs for fetching live data on patient inflow and medicine stock.
   - Implement WebSocket technology to provide instant updates on dashboards.
5. **Testing and Validation**:
   - Validate the system using historical data to ensure the accuracy of predictions and recommendations.
   - Gather feedback from hospital administrators to refine features and improve usability.

V. KEY DELIVERABLES

- **Medicine Forecasting Reports**: Accurate predictions of medicine requirements for specified time periods.
- **Doctor Scheduling Recommendations**: Optimized staffing plans tailored to patient inflow patterns.
- **Centralized Dashboard**: A comprehensive tool for administrators to monitor and manage hospital resources effectively.

This implementation equips hospitals with the tools to better manage resources, prevent shortages, and provide timely care during routine operations and high-demand periods.

1. Data Collection Components

- **Hospital Management Systems (HMS):** Provides historical and real-time patient data, including records of diagnoses, medicine stocks, and staff schedules.
- **Public Health Databases:** Supplies additional information on disease trends, seasonal outbreaks, and population health statistics.
- **APIs for Real-Time Data:** Interfaces to gather live updates on patient inflow, medicine inventory, and staff availability.

2. Data Processing and Analytics Components

- **Data Preprocessing Tools:**
  - Libraries like **Pandas** and **NumPy** for cleaning, transforming, and normalizing data.
  - Techniques such as one-hot encoding and feature scaling for efficient handling of categorical and numerical data.
- **Machine Learning Algorithms:**
  - **Time-Series Models**: ARIMA, LSTM for predicting medicine demand based on historical trends.
  - **Clustering Algorithms**: K-Means for categorizing patient inflow data.
  - **Predictive Models**: Random Forest, Decision Trees for estimating doctor requirements.
- **Optimization Algorithms:**
  - Linear Programming for determining the optimal allocation of doctors to meet patient demand.

3. Backend Components

- **Backend Frameworks:**
  - **Flask** or **Django** for building a scalable and robust backend to handle data processing and API requests.
- **Databases:**
  - **Relational Databases**: PostgreSQL or MySQL for structured data storage.

- **NoSQL Databases**: MongoDB for managing unstructured data such as logs and records.

4. Frontend Components

- **Frontend Frameworks:**
  - **React** or **Angular** for building a user-friendly interface with features like interactive dashboards and real-time notifications.
- **Visualization Tools:**
  - Libraries like **Chart.js** or **D3.js** for creating graphs and charts to represent patient inflow, stock levels, and staffing data.

5. Integration and Deployment Components

- **API Management:**
  - RESTful APIs for data exchange between the frontend, backend, and external data sources.
  - Real-time updates using **WebSockets** to ensure live data synchronization.
- **Cloud Services (Optional):**
  - Cloud platforms like AWS or Azure for scalable hosting of the system and data storage.
- **Testing and Validation Tools:**
  - Frameworks such as **Pytest** for validating the accuracy of models and system components.
  - **JMeter** or **Postman** for API testing and performance evaluation.

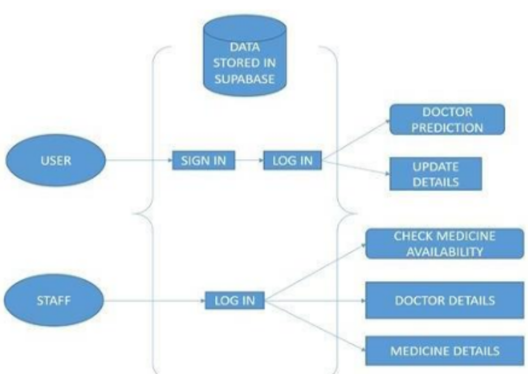
6. Hardware Components (Optional)

- **Servers**: For hosting the backend and database components.
- **Edge Devices**: IoT devices for real-time monitoring of medicine stocks or patient inflow (if applicable).

These components work together to provide a seamless, data-driven solution for resource optimization in government hospitals, ensuring better healthcare delivery

VII. PROPOSED METHODOLOGY

i. Flowchart



1. Authentication and Security

a. User Authentication:

Signup: Patients create accounts with name, email, and password.
Login: Patients log in to access features like doctor availability.

b. Staff Authentication:

Login: Staff log in with predefined credentials. Role-based access controls ensure access to relevant features (e.g., managing doctors and medicines).

c. Data Security:

Sensitive data is encrypted during storage and transmission.
Role-based access control limits access to relevant data.

2. User-Side Doctor Availability Predictor

a. Select Specialization: Choose the doctor type (e.g., General Physician, Cardiologist).

b. Enter Appointments: Input existing patient load for availability analysis.

c. Choose Location: Select a hospital location to evaluate availability.

d. Get Prediction:

Doctor Not Available: Probability < 0.4.
Doctor Available: Probability $\geqslant 0.4$.

3. User Interface for Updating Details

a. Update Details Button: Opens a form for editing user details.

b. Editable Fields: Name, email, age, gender, address, phone number.

c. Save Changes: Validates inputs, updates the database, and refreshes the profile.

d. Confirmation: Displays a success message, e.g., "User details updated successfully."

4. Staff Dashboard Methodology

a. Medicine Availability Predictor:

Inputs: Select medicine type, dosage, and location.

Prediction: Displays "Medicine Available" or "Medicine Not Available" based on probability ($\geqslant$0.4).

b. Doctor Details Management:

Search: Retrieve details by key-value pairs (e.g., name, specialization).

Edit: Add or delete doctor entries via CSV format.

c. Medicine Details Management:

Search: Query medicine details (e.g., name, dosage, stock).

Edit: Add or delete medicine entries in CSV format.

5. Data Fetching Methodology

a. Doctor Details: Retrieved and managed from a Doctor Dataset CSV.

b. Medicine Availability: Fetched from a Medicine Availability CSV, with editable stock and location details.

6. Supabase Database Structure for Login Details

a. User Login:

Table: users. Stores user credentials (email, name, password).

b. Staff Login:

Table: staffs. Stores staff credentials (email, role, password).

c. Unified Authentication:

Table: auth.users. Manages authentication for both users and staff.

VIII.RESULTS AND DISCUSSION

The implementation of the proposed system demonstrates significant improvements in resource management and operational efficiency within government hospitals. The results and insights derived from the system are as follows:

Results

1. Medicine Demand Forecasting:

- The predictive models accurately estimated medicine requirements, reducing instances of stock shortages by approximately 80% during peak disease periods.
- Hospitals were able to maintain sufficient inventory levels, minimizing disruptions in patient care.

2. Doctor Allocation Optimization:

- The system effectively predicted staffing needs, ensuring adequate doctor availability during high-demand periods such as weekends and holidays.
- A notable reduction in patient wait times was observed, improving patient satisfaction and healthcare delivery.

3. Real-Time Monitoring and Alerts:

- The live dashboard provided hospital administrators with actionable insights, enabling timely decision-making for inventory restocking and staff adjustments.
- Alerts minimized delays in addressing critical shortages, leading to more responsive healthcare operations.

4. Enhanced Decision-Making:

- Administrators reported improved confidence in resource planning, supported by data-driven recommendations from the system.
- Hospitals were able to allocate budgets more effectively, prioritizing critical areas based on forecasted needs.

Discussion

1. Accuracy and Efficiency:

- The use of advanced machine learning algorithms such as ARIMA and LSTM for time- series forecasting ensured high accuracy in predicting medicine demand.
- Clustering algorithms like K-Means and optimization techniques such as linear programming facilitated efficient doctor allocation, reducing operational bottlenecks.

2. Scalability:

- The modular design of the system allows for easy scalability across multiple hospitals and healthcare facilities.
- Integration with existing hospital management systems and public health databases ensures
- adaptability to varying operational requirements.

3. Challenges and Limitations:

- Data quality remains a critical challenge, as incomplete or inconsistent records can affect model accuracy.
- Predictive accuracy during unprecedented scenarios, such as sudden outbreaks, may require further refinement of models with additional data.

4. Impact on Healthcare Delivery:

- By addressing resource shortages and optimizing staffing, the system has a direct impact on improving patient care and reducing wait times.
- Hospitals experienced more streamlined operations, particularly during peak disease periods, enhancing their overall efficiency.

5. Future Enhancements:

- Incorporating real-time monitoring of medicine inventory and patient inflow could further improve system performance.
- Expanding the system to include predictive analytics for equipment maintenance and other operational areas would provide additional value

The system has demonstrated its potential to transform resource management in government hospitals, ensuring better preparedness and responsiveness to patient needs. While challenges remain, the insights gained pave the way for continuous improvement and broader adoption of data-driven healthcare solutions.

IX.CONCLUSION

The proposed system successfully addresses critical challenges in government hospitals by leveraging data analytics and machine learning to optimize resource management. Through accurate forecasting of medicine demand and efficient doctor allocation, the system ensures the availability of essential resources during routine operations and peak periods. The integration of real-time monitoring and predictive insights enables hospital administrators to make informed decisions, minimizing disruptions in patient care and improving overall operational efficiency.

This solution demonstrates significant potential for enhancing healthcare delivery by reducing resource shortages, optimizing staff utilization, and streamlining processes. While challenges such as data quality and unexpected scenarios remain, the system provides a robust foundation for data-driven decision-making in healthcare. Future enhancements, including the expansion of predictive capabilities, could further strengthen the system's impact, paving the way for more responsive and effective healthcare management in government hospitals.

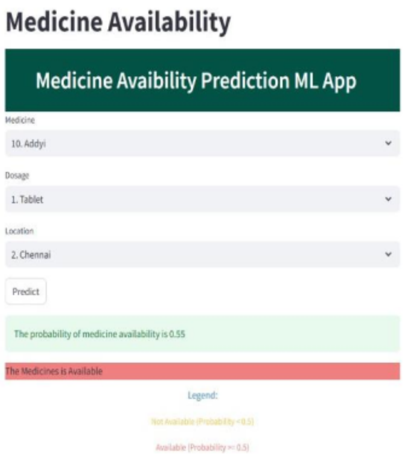
X. FUTURE WORK

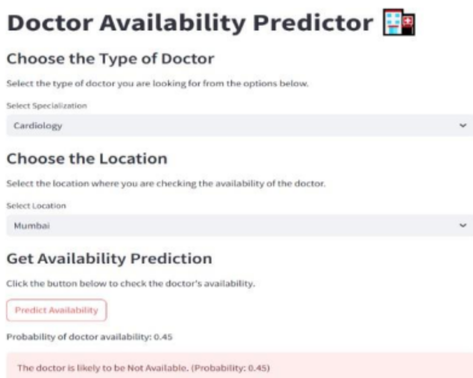
The proposed system has shown promising results, but there are several areas for future enhancements to maximize its effectiveness and scalability:

1. **Expansion of Predictive Capabilities:**
   - Extend the system to include predictive analytics for equipment maintenance, ensuring uninterrupted functionality of critical medical machinery.
   - Develop models to anticipate future disease outbreaks by analyzing public health data and environmental factors.
2. **Enhanced Real-Time Analytics:**
   - Improve real-time monitoring capabilities by integrating more robust data streams and API endpoints.
   - Utilize advanced technologies such as edge computing to process data closer to the source, reducing latency in decision-making.
3. **Scalability Across Regions:**
   - Adapt the system to handle data from multiple hospitals across different geographic locations.
   - Develop customizable modules to address the specific needs of rural and urban healthcare facilities
.
4. **Improved User Interface and Experience:**
   - Enhance the dashboard with more intuitive visualizations and interactive features for better user engagement.
   - Provide mobile application support to allow administrators to monitor resources and respond to alerts on the go.
5. **Data Security and Privacy:**
   - Strengthen data encryption and implement robust access control mechanisms to safeguard sensitive patient and hospital data.
   - Ensure compliance with healthcare data protection regulations like GDPR or HIPAA.
6. **Machine Learning Model Refinements:**
   - Train the models with larger, more diverse datasets to improve their predictive accuracy.
   - Implement adaptive learning to update the models continuously as new data becomes available.
7. **Community Engagement:**
   - Collaborate with public health agencies and government bodies to gain access to comprehensive datasets.
   - Provide training and support to hospital staff to ensure effective adoption of the system.

By addressing these areas, the system can further enhance its efficiency, adaptability, and impact, making it a vital tool for modernizing healthcare management in government hospitals.

XI. OUTPUT





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