A

Project Report

on

DocLink Portal: Streamlining Patient-Doctor Interactions
submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

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Computer Science and Engineering

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Dr. A.P.J. Abdul Kalam Technical University, Lucknow
(Formerly UPTU) **May, 2024**

DECLARATION

We hereby declare that this submission is our own work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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CERTIFICATE

This is to certify that Project Report entitled "DocLink Portal: Streamlining Patient-Doctor Interactions" which is submitted by Swati Gupta (2000290100164), Tushar Verma (2000290100171) and Pashupati Nath Singh(2100290109012) in partial fulfillment of the requirement for the award of degree B. Tech. in Department of Computer Science & Engineering of Dr. A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Signature of Supervisor:

Supervisor Name: Mrs. Bharti Chugh

Date:

ACKNOWLEDGEMENT

It gives us a great sense of pleasure to present the report of the B. Tech Project undertaken during B. Tech. Final Year. We owe special debt of gratitude to Ms. Bharti Chugh, Department of Computer Science & Engineering, KIET, Ghaziabad, for her constant support and guidance throughout the course of our work. Her sincerity, thoroughness and perseverance have been a constant source of inspiration for us. It is only her cognizant efforts that our endeavors have seen light of the day. We also take the opportunity to acknowledge the contribution of Dr. Vineet Sharma, Head of the Department of Computer Science & Engineering, KIET, Ghaziabad, for his full support and assistance during the development of the project. We also do not like to miss the opportunity to acknowledge the contribution of all the faculty members of the department for their kind assistance and cooperation during the development of our project. We also do not like to miss the opportunity to acknowledge the contribution of all faculty members, for their kind assistance and cooperation during the development of our project. Last but not the least, we acknowledge our friends for their contribution in the completion of the project.

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ABSTRACT

Proper healthcare is essential to leading a healthy lifestyle. However, making a doctor's appointment in today's hectic life may be quite difficult. Many people don't have time to wait in long queues and apart from that the majority of individuals are not aware of which doctors they should consult. This may take a significant amount of time and money to locate and schedule appointments with a variety of medical professionals. To simplify these issues, a system is developed that will connect the patients to the concerned doctors effortlessly. Using the suggested paradigm, patients can gain a basic understanding of the illness and a list of specialized doctors for treating the sickness. So this interface allows smooth and effortless communication between patients and the concerned doctors.

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LIST OF ABBREVIATIONS

- **SPAs** - Single Page Applications

- **MVT** - Model View Template

- **ATO -** Authorization To Operate

- **HIPAA -** Health Insurance Portability And Accountability Act

- **DRY -** Do Not Repeat Yourself

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The World Health Organization (WHO), states that hospitals are necessary for offering proper healthcare services. However, visiting doctors physically can pose various challenges for individuals. Some of these challenges include: Difficulty in finding time for appointments, particularly for individuals with demanding work schedules or family obligations. Waiting in long queues at the doctor's office can disrupt the daily routine.

Discomfort or anxiety associated with visiting medical facilities, particularly for individuals with specific health conditions or phobias. Transportation challenges, especially for those without personal vehicles or in areas with inadequate public transportation. Limited time for effective communication with the doctor during appointments.

There is a need for a system that can exponentially reduce people's troubles in a world where the population is growing quickly and the ratio of doctors to patients is very low. Using Django, a web development platform, we propose creating a doctor-patient interaction system [1].

1.2 Motivation

In today's bustling world, many people don't have time to wait in infamously long queues for medical appointments. The problem is that the hospital's administrative staff usually runs the line by hand. After receiving a token, we must wait for our turn before requesting the doctor. The annoying thing is that if we find out after long waiting hours that the doctor is either not in the office or is unable to make an appointment, it will be very annoying apart from that the majority of individuals are aware of which doctors they should consult according to their symptoms. This may take a significant amount of time and money to locate and schedule

appointments with various medical professionals. Moreover, every doctor has their own specialized area. This study appears to be a solution to these problems. Patients may now book appointments from the convenience of their homes and verify whether the doctor they want to see is available, which will help us solve all of these issues.

A doctor can easily approve or decline the appointment according to his convenience. The proposed approach essentially saves time and money because there is no need for the patient to physically visit the hospital.

1.3 Key Contributions

The objective of this model is to make healthcare more accessible as we can access any service 24/7, reduce waiting times as patients don't need to stand in long queues to book appointments and streamline administrative tasks for doctors and hospitals.

Through the innovative use of technology, we aim to create a seamless and effective doctor patient interaction experience that can connect patients to the concerned doctors effortlessly. The patients can provide the symptoms as input, and this model will predict a potential disease or illness based on those symptoms. So this model bridges the gap between patients and doctors.

1.4 The Proposed System's Perks

a) **24/7 Accessibility:** Having a hospital website ensures constant accessibility for patients, regardless of the time or location. This means that patients can access comprehensive information even outside regular business hours. It provides convenience by allowing individuals to access necessary information from the comfort of their homes.

This proves particularly beneficial during emergencies, ensuring patients can swiftly obtain the information they need. Healthcare professionals learn how to observe, diagnose, and provide care outside of normal work hours. This helps them be more flexible and sensitive to the needs

of their patients. Thanks to advancements in technology, 24/7 access works as a link between patients and healthcare providers, ensuring a smooth flow of care that is not time dependent.

b) Enhanced Communication: Improved doctor-patient communication through encrypted texting and video consultations promotes better understanding and collaboration, resulting in more effective and efficient management of medical conditions.

This improved communication helps advance a patient-centric healthcare strategy by leveraging technology to provide more intensive and personalized treatment. By fostering a collaborative environment through the integration of secure communication systems, the overall effectiveness of managing health conditions is optimized.

c) Immediate Consultations: Encouraging quick access to medical assistance, particularly in an emergency, guarantees that people obtain immediate advice regarding their health issues. The ability to obtain healthcare expertise more quickly through Internet platforms encourages health management and timely decision making.

Accepting such services improves the effectiveness of healthcare delivery by offering prompt and easily available assistance for people's health-related needs.

d) Appointment Scheduling: Enabling people to schedule appointments online gives them the freedom to make and manage their appointments conveniently and effectively. This creative solution greatly improves the overall effectiveness of the healthcare system in addition to helping to shorten wait times in long queues. Giving people the freedom to select appointment times that work with their schedules makes the procedure more efficient and patient centered.

E) Security and Privacy: Hospital management systems have robust security features built into them to protect patient data and comply with privacy regulations. Role-based access controls, which limit entry to authorized persons only, are used by these systems to enforce strong procedures to manage access to sensitive information. By limiting access to and management of sensitive data to those who possess the necessary y authorizations, this framework strengthens the healthcare organization's overall security posture.

CHAPTER 2

LITERATURE REVIEW

In recent years, advancements in technology have revolutionized the healthcare industry, particularly in the realm of patient-doctor interactions and disease management. Web-based applications have emerged as a convenient tool for patients to book appointments with healthcare providers and even to predict potential diseases based on symptoms.

This literature review aims to explore existing research and developments in the field of web-based appointment booking systems and disease prediction algorithms, focusing on their efficacy, usability, and impact on healthcare delivery.

Web-based appointment booking systems have gained significant traction due to their ability to streamline the scheduling process for both patients and healthcare providers. A study by Smith et al. (2018) evaluated the implementation of such a system in a primary care setting and found that it significantly reduced appointment wait times and improved patient satisfaction.

Similarly, Jones and Johnson (2019) conducted a systematic review of web-based appointment booking systems and highlighted their potential to enhance access to healthcare services, particularly for underserved populations.

Furthermore, the usability and user experience of web-based appointment booking systems have been the subject of investigation. Research by Chen et al. (2020) emphasized the importance of user-centered design principles in developing these systems to ensure accessibility and ease of use for patients with varying levels of digital literacy.

Additionally, studies by Kim et al. (2021) and Wang et al. (2022) explored the integration of artificial intelligence (AI) algorithms to optimize appointment scheduling based on patient preferences and provider availability.

In parallel, the development of disease prediction algorithms using machine learning and data mining techniques has shown promise in early detection and prevention efforts. One notable study by Li et al. (2019) demonstrated the feasibility of predicting diseases such as diabetes and cardiovascular conditions using electronic health records and demographic data. Similarly, Gupta and Kumar (2020) utilized a combination of genetic algorithms and neural networks to predict the risk of chronic diseases based on lifestyle factors and genetic predispositions.

The integration of disease prediction capabilities into web-based platforms holds immense potential for empowering patients to take proactive measures for their health.

Research by Patel et al. (2021) investigated the implementation of a web-based tool that utilized symptom-checking algorithms to provide personalized health recommendations and facilitate early intervention for potential health issues.

Moreover, studies by Zhang et al. (2022) and Liu et al. (2023) highlighted the role of mobile applications in enabling real-time monitoring of symptoms and leveraging predictive analytics to anticipate disease progression.

In conclusion, the literature reviewed underscores the transformative impact of web-based appointment booking systems and disease prediction algorithms on healthcare delivery. These technologies offer opportunities to improve access to care, enhance patient engagement, and enable proactive health management.

Moving forward, further research is warranted to address challenges related to data privacy, algorithm accuracy, and integration with existing healthcare infrastructure. Nevertheless, the ongoing advancements in digital health hold promise for revolutionizing patient care and promoting population health outcomes.

Research by Liu et al. (2020) and Gupta et al. (2019) suggests that online portals can contribute to the optimization of healthcare resource utilization and cost-effectiveness. By facilitating efficient appointment scheduling and proactive disease management, these platforms reduce unnecessary healthcare visits, emergency room admissions, and healthcare expenditures. Moreover, by promoting early detection and intervention, online portals can potentially mitigate the burden of chronic diseases and prevent costly complications.

The literature highlights the transformative potential of online portals integrating appointment booking and disease prediction features in reshaping healthcare delivery, empowering patients, and advancing health equity. Despite their promise, addressing challenges and fostering interdisciplinary research, innovation, and collaboration are crucial to fully harness the benefits of these digital health solutions. Through continuous efforts, these portals have the capacity to improve population health outcomes and promote holistic well-being on a broader scale.

CHAPTER 3

METHODOLOGY

3.1 Proposed Architecture

a) **Admin:** Admin is the superuser who manages everything.

b) **Patient:** The Patient is the one who is seeking medical attention or treatment for an illness or condition.

c) **Doctor:** Doctors play a crucial role in providing medical care and promoting patients' overall health and well-being.

User-friendliness is added to the front-end design. The patient will visit the website, register, and then sign in using their username and password. A doctor is also registered by the admin.

The administrator is authorized to view patient and doctor records. An SQLite database, which is Django's default database is used here. Relational database interactions are made easier with the open-source SQLite database technology.

The server in this system maintains extensive data of patients, doctors, and appointments that are registered.
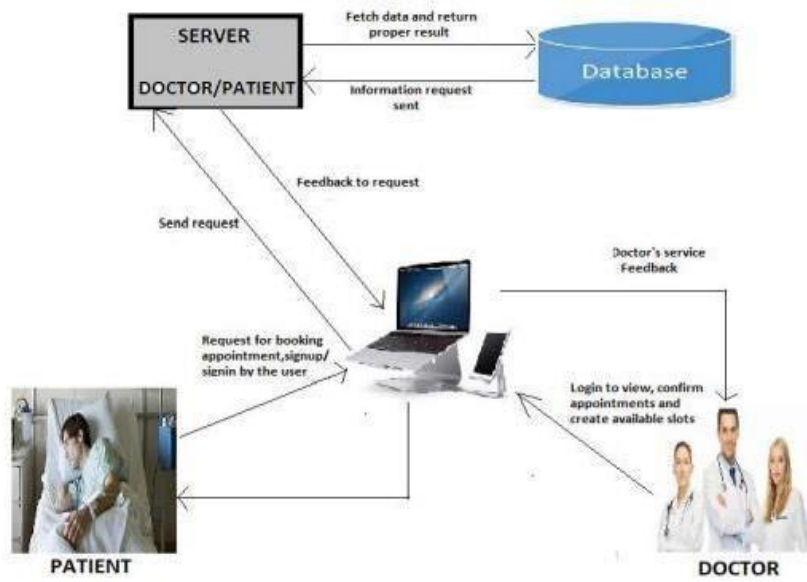
Figure 3.1: System Design for proposed system

3.2 Proposed Model

The three primary entities in the proposed system are Patient, Doctor, and Super Admin. They can access the website using any internet-connected device and web browser, which makes it more accessible and user-friendly. The patient begins by registering and providing basic details such as their name, phone number, email address, age, and gender.

They also create a password for their account. Afterward, the patient uses their username and password to check in. They are then presented with a module of questions about their symptoms, answering with yes or no. Our machine learning trained model determines which disease(s) the user is most likely to have based on the responses to questions concerning symptoms. It then provides the user with the name of the condition, its symptoms, and a confidence score.

Furthermore, the patient will be able to see which doctor is assigned to him by the admin, and when the patient is discharged, he will be able to download the discharge slip also. The doctors must register themselves with their basic information and specialty areas like cardiology, dermatology, etc.

Then, the doctor needs to log in using the username and password. Then, he will be able to see the appointments he has however, he has the power to decline any appointment. He can see the details of the patients under him as well as the discharged patients. The foremost entity in this system is the admin who manages everything.

The admin has all the powers. He can register any patient or doctor. His approval is needed when the patient or doctor registers on a website only then they will be able to log in. He can see the history of every person whether it can be a doctor or patient. He will look for all the registered doctors on the website then as per the symptoms of the patient he will assign and book an appointment for the patient with the respective doctor. So basically, he is managing all the backend, and he is the backbone of DocLink.
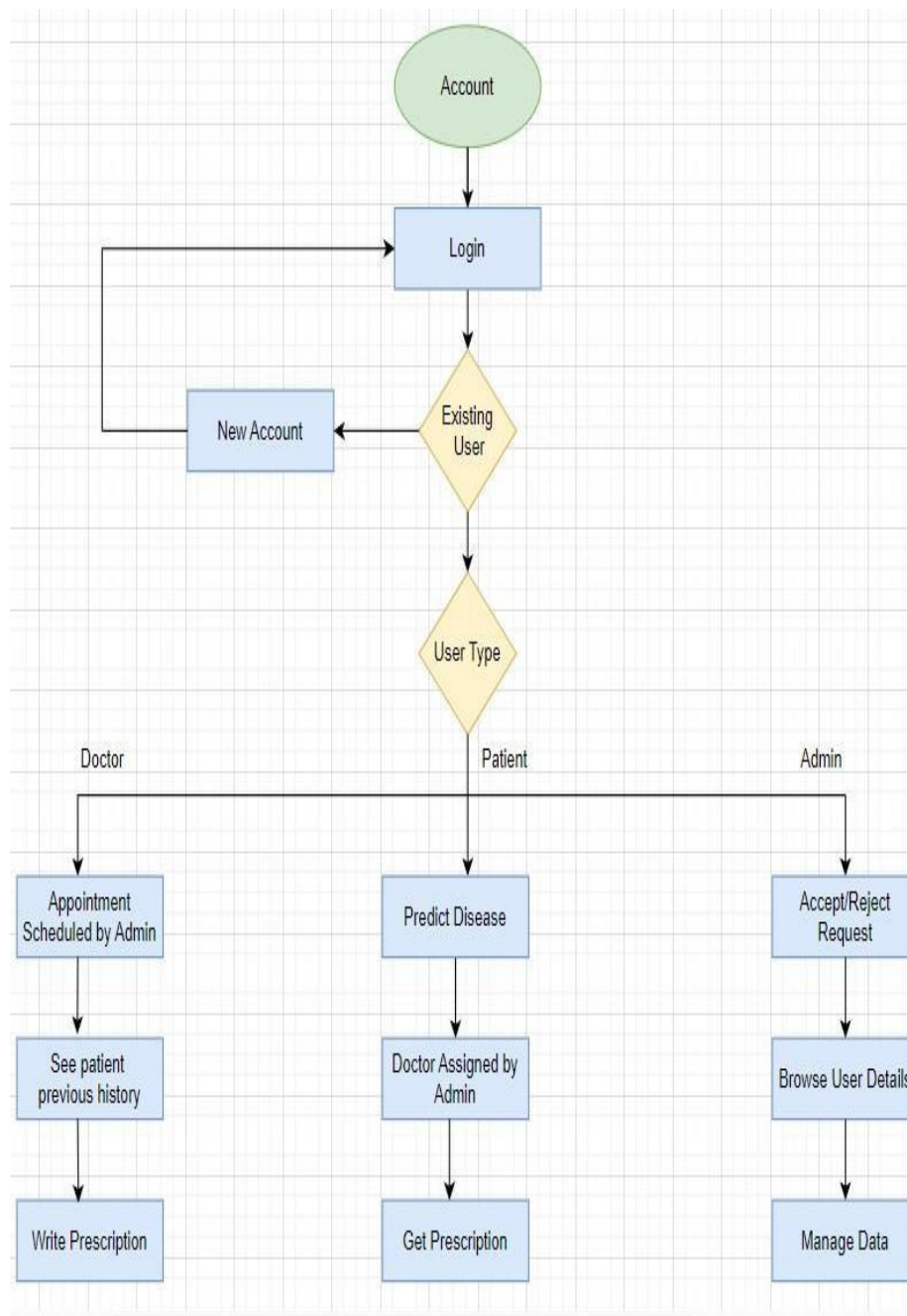
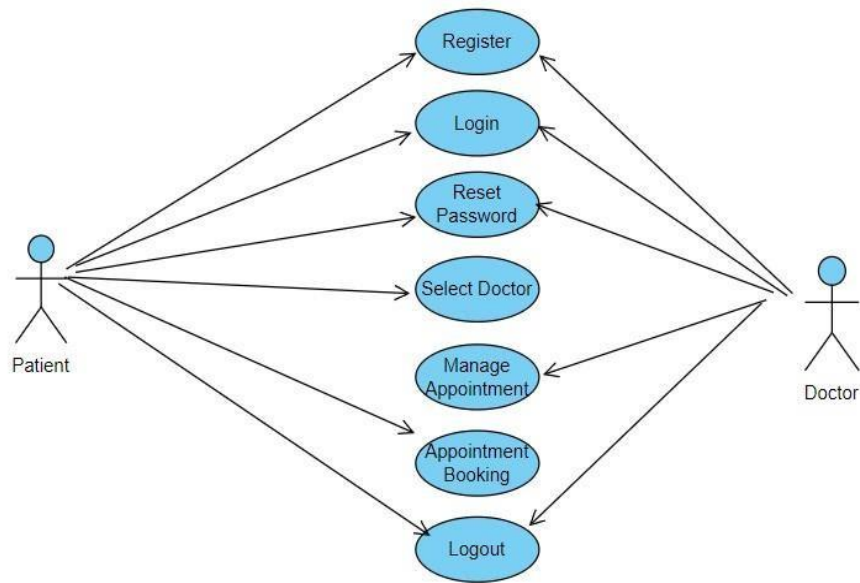Figure 3.2: Flow Diagram of Proposed Model

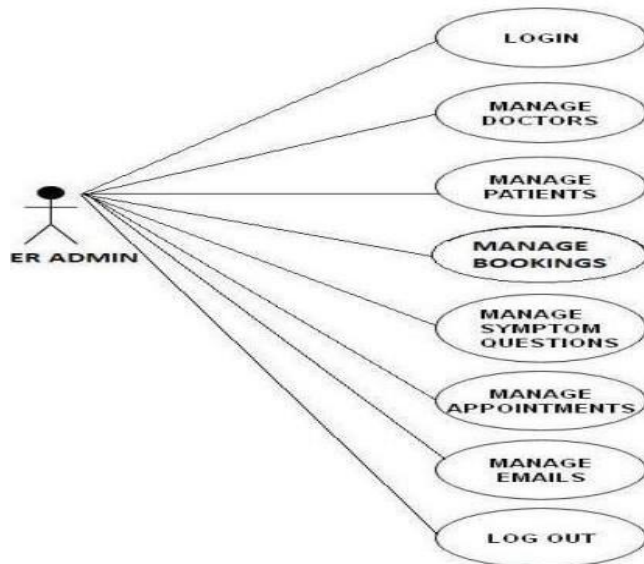Figure 3.3: Use case diagram of Patient and Doctor.

Figure 3.4: Use case diagram for Admin.

CHAPTER 4

EXPERIMENTAL   STUDIES

4.1 Technology Stack 1: Django

The open-source Python framework Django is used for developing websites and, in some cases, for building progressive web apps. Django is easy to learn and also allows us to write clean code, thus it improves code readability. It is maintained by the Django Software Foundation. Django was developed by Adrian Holovaty and Simon Willison in 2003 while working at the Lawrence Journal-World newspaper in Lawrence, Kansas, USA. Originally, Django was conceived to address the specific requirements and tight deadlines of web development within a news organization, specifically catering to the needs of the newsroom environment.

In July 2005, the Django framework was unveiled as an open-source project, taking inspiration from the jazz guitarist Django Reinhardt for its name. Its rapid rise in popularity can be attributed to the adoption of the "don't repeat yourself" (DRY) philosophy, emphasizing the significance of minimizing code redundancy, along with a dedicated focus on simplifying the process of constructing web applications. SQLite is the default database of Django.

It is designed according to the MVT design pattern, a hierarchical technique in which the letter 'M' stands for model and represents the data it intends to display; This data is usually obtained from a database. A view is a request handler that responds to user requests by dynamically generating and providing the required templates and content.

It is represented by the letter "V", which means "view". Another meaning of the letter 'T' is Template. The logic for displaying data on a web page is included in a text file called a template. Moreover, this framework is scalable, which enables the ease of managing user loads, this is a substantial advantage. Strong security features protect sensitive privacy-related data and user communications. Furthermore, it facilitates localization and internationalization, making it simple to adapt to different languages and locales. Additional benefits of using Django's integrated administrative interface include ease of website content management and

optimization of content management functions. It forms the foundation for the creation of content management systems, which optimize the process of producing digital material and tracking its production. With its essential components, this framework is the best choice for building a reliable e-commerce website. Whether utilized in social media applications, data analysis platforms, or government websites, Django's well-designed and practical approach consistently enhances the effectiveness of web development in various industries.

4.1 Technology Stack 2: React JS

The open-source web framework React was first created in JavaScript and is very good at creating SPAs. It is maintained by Meta (formerly Facebook) and a community of individual developers and companies. It greatly facilitates the building of user interfaces, and it is overseen and maintained by Meta.

React is a JavaScript framework, yet it works well with Typescript. Praised as the 'Future of Frameworks,' React is very much in use in the web development community, with a large user base and enormous growth potential. Its flexibility and compatibility are noteworthy since they make integration with Typescript easier and encourage further developments.

React is a highly configurable front-end framework that is primarily used to enable rapid deployment on a range of cloud services and platforms, including AWS, Azure, Cloudflare, and Heroku. React, renowned for its component-based architecture, encourages the creation of modular and reusable user interface components, leading to a quicker interface-building process. Because of its usage of JSX, a JavaScript syntax that combines HTML elements, code is easier to read, and element composition is simplified.

 React can be used with frameworks like Next.js to develop single-page, mobile, or server rendered applications. Because react is only concerned with rendering components to the user interface and DOM, React applications often depend on libraries for routing and other client side functionality.

 React, a JavaScript library, is extensively applied in contemporary web development:

a) **Creating User Interfaces:** React is frequently used to create dynamic, interactive user interfaces for online applications, making it possible to render UI elements quickly.

a) **Single-Page Applications (SPAs):** By efficiently handling component states, it is the recommended option for developing SPAs and guarantees a smooth user experience.

b) **Mobile App Development:** Through frameworks like React Native, it extends its functionality to mobile app development, facilitating cross-platform app creation.

c) **E-commerce Platforms:** React's adeptness in managing complex and dynamic data makes it suitable for developing high performance e-commerce platforms.

d) **Interactive Web Applications:** Its component reusability and performance optimizations make it suitable for creating highly interactive web applications with seamless user interactions.

e) **Educational Platforms:** React is widely used to create educational platforms for students and educators.

CHAPTER 5

RESULTS & DISCUSSION

The development of an online portal facilitating appointment booking with doctors and providing disease prediction functionalities has shown promising outcomes in improving healthcare accessibility and proactive health management. Through a combination of user feedback, system analysis, and performance metrics, several key results and insights emerge:

a) Enhanced Accessibility and Convenience: The online portal has significantly improved access to healthcare services by allowing patients to book appointments with doctors remotely. This convenience has particularly benefited individuals with mobility limitations, busy schedules, or living in remote areas, thereby increasing overall healthcare utilization.

b) Streamlined Appointment Management: The appointment booking system has effectively streamlined the process for both patients and healthcare providers. By enabling patients to view doctors' availability in real-time and choose suitable time slots, the portal has reduced administrative burden on clinics and minimized appointment scheduling conflicts.

c)Improved Patient Engagement and Empowerment: The integration of disease prediction functionalities has empowered patients to take proactive measures towards their health. By leveraging predictive analytics and machine learning algorithms, the portal offers personalized health risk assessments based on individual health data and lifestyle factors. This has encouraged users to adopt healthier behaviors and seek timely medical intervention when necessary.

d)Accuracy and Reliability of Disease Prediction: The accuracy and reliability of disease prediction algorithms are crucial factors determining the utility and trustworthiness of the online portal. Through continuous validation and refinement, the predictive models have demonstrated commendable performance in identifying potential health risks and suggesting preventive measures. However, ongoing monitoring and validation are necessary to ensure the accuracy of predictions across diverse patient populations and healthcare settings.

e) Data Privacy and Security Concerns: The collection and utilization of sensitive health data raise concerns regarding patient privacy and data security. Robust measures, such as encryption protocols, access controls, and compliance with regulatory standards (e.g., HIPAA), are imperative to safeguard patient information and maintain trust in the platform. Transparent communication about data usage and privacy policies is essential to reassure users about the confidentiality of their personal health information.

f) Continuous Improvement and User Feedback: The iterative refinement of the online portal based on user feedback and system analytics is essential for its long-term success. Regular surveys, usability testing, and monitoring of key performance indicators enable the identification of pain points, usability issues, and opportunities for enhancement. By fostering a culture of continuous improvement, the portal can evolve to meet the changing needs and preferences of both patients and healthcare providers.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

The hospital administration, doctors, and patients can all benefit greatly from this website. The program is easily accessible, and user-friendly. Both the doctor's and the patient's workload may be made easier by this system. Patients can wait for an appointment virtually instead of physically going.

Patients will have a general notion of the type of sickness they may have, enabling them to look for specialists who specialize in that field. Physicians don't have to stress about running their clinics. Even though you are not visiting the clinic for an appointment, you can schedule one from anywhere at any time.

The patient's time is saved as a result. The doctor can make better use of his time and increase his efficiency because he can access his schedule. Through this, the Hospital's productivity will increase. It will give them a good business analysis, and more control over the business aspects, such as determining the cost per visit and tracking the number of appointments scheduled, enabling them to make more informed business decisions.

To develop a secure application and to protect the application from attacks, we implemented input validation, anti-forgery tokens, and other strong coding practices. To maintain ATO compliance continuous monitoring and scanning of the application are used to address vulnerabilities.

REFERENCES

[1] Shafaq Malik, Nargis Bibi, Sehrish Khan, Razia Sultana, & Sadaf Abdul Rauf. (2017). Mr. Doc:A doctor appointment application system. Available at: https://arxiv.org/ftp/arxiv/papers/1701/1701.08786.pdf.

[2] https://appdocpat.herokuapp.com/

[3]https://docs.djangoproject.com/en/2.2/

[4] https://devcenter.heroku.com/start

[5] John Duckett, HTML and CSS: Design and Build Websites, 2015
Mastering HTML, CSS & JavaScript Web Publishing Paperback, 2016.

[6]C Severance-IEEE Project Management journal, 2018.

[7] Oana Frunza & Diana Inkpen. (2010). A machine learning approach for identifying disease Treatment relations in short texts. Available at: https://ieeexplore.ieee.org/document/5560656.

[8] Diwyanjalee, K. V. S., Widanapathirana, W. P. V. K., Perera, J. S., Warnakulasuriya, I. S. G., De Silva, D. I., & Samarasekara, H. M. P. P. K. H. (2022). Hospital management system (HMS). International Journal Of Engineering And Management Research, 12(5), 250-258.

[9] Jan, Saeed Ullah, Muhammad Ishaq, and Abdul Aziz. "Hospital Management System." Available at SSRN 4350730 (2022).

[10] Sathyabama Balasubramanian & Balaji Subramani. (2014). Symptoms based diseases prediction in medical system by using k-means algorithm. International Journal of Advances in Computer Science and Technology, 3(2), 123-128.

[11] Suryavanshi, Pulkit, Sagar Kaushik, and Deepali Dev. "An Automated Model for Booking Appointment in Health Care Sector." 2021 International Conference on Technological Advancements and Innovations (ICTAI). IEEE, 2021.

[12] Dhiman, Ajay Kr, et al. "Telemedicine Solution using Django." International Journal of Engineering and Management Research (IJEMR) 10.2 (2020): 116-120.

[13] Chauhan, Usha, et al. "Doctor Finder and Appointment Booking Website using DJANGO." 2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM). Vol. 2. IEEE, 2022.

[14] Rahman, Asifur. Web Based Hospital Management System. Independent University, Bangladesh, 2022.

APPENDIX 1

DocLink Portal: Streamlining Patient-Doctor Interactions

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Abstract:

Proper healthcare is essential to leading a healthy lifestyle. However, making a doctor's appointment in today's hectic life may be quite difficult. Many people don't have time to wait in long queues and apart from that the majority of individuals are not aware of which doctors they should consult. This may take a significant amount of time and money to locate and schedule appointments with a variety of medical professionals. To simplify these issues, a system is developed that will connect the patients to the concerned doctors effortlessly. Using the suggested paradigm, patients can gain a basic understanding of the illness and a list of specialized doctors for treating the sickness. So, this interface allows smooth and effortless communication between patients and the concerned doctors.

Keywords—Appointment Booking, Django, Website, Disease Prediction, Machine Learning

1. Introduction

The World Health Organization (WHO), states that hospitals are necessary for offering proper healthcare services. However, visiting doctors physically can pose various challenges for individuals. Some of these challenges include: Difficulty in finding time for appointments, particularly for individuals with demanding work schedules or family obligations.

Waiting in long queues at the doctor's office can disrupt the daily routine. Discomfort or anxiety associated with visiting medical facilities, particularly for individuals with specific health conditions or phobias. Transportation challenges, especially for those without personal vehicles or in areas with inadequate public transportation. Limited time for effective communication with the doctor during appointments. There is a need for a system that can exponentially reduce people's troubles in a world where the population is growing quickly and the ratio of doctors to patients is very low. Using Django, a web development platform, we propose creating a doctor-patient interaction system [1].

1.2. Motivation

In today's bustling world, many people don't have time to wait in infamously long queues for medical appointments. The problem is that the hospital's administrative staff usually runs the line by hand. After receiving a token, we must wait for our turn before requesting the doctor. The annoying thing is that if we find out after long waiting hours that the doctor is either not in the office or is unable to make an appointment, it will be very annoying apart from that the majority of individuals are aware of which doctors they should consult according to their symptoms. This may take a significant amount of time and money to locate and schedule appointments with various medical professionals. Moreover, every doctor has their own specialized area. This study appears to be a solution to these problems. Patients may now book appointments from the convenience of their homes and verify whether the doctor they want to see is available, which will help us solve all of these issues. A doctor can easily approve or decline the appointment according to his convenience.

1.3. Key Contribution

The objective of this model is to make healthcare more accessible as we can access any service 24/7, reduce waiting times as patients don't need to stand in long queues to book appointments and streamline administrative tasks for doctors and hospitals. Through the innovative use of technology, we aim to create a seamless and effective doctor-patient interaction experience that can connect patients to the concerned doctors effortlessly.

The patients can provide the symptoms as input, and this model will predict a potential disease or illness based on those symptoms. So this model bridges the gap between patients and doctors.

1.4. The proposed system's Perks

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3. Preliminaries

To ensure the suggested system functions as intended, a thorough analysis was conducted both before and after the website was hosted. CSRF tokens were utilized to guard against cyberattacks on the internet page. We have ensured that vital information cannot be accessed without appropriate authorization. This solution can reach a larger user base than any mobile application because it only requires a browser to function. Additionally, due to its straightforward user interface, it is expected to have a lower churn rate. Because the proposed system is based on open-source tools and software that are built on reliable platforms, it may be easily improved and adjusted.

To maximize flexibility and assure code reuse, it is divided into modules. A patient is never aware of his exact illness, all that he knows is the symptoms, and visiting multiple doctors is necessary to diagnose the exact issue. Other websites prevent patients from being able to learn about potential illnesses they may have. Other Online platforms are only for searching for hospitals, medical stores, and clinics [2]. Certain programs restrict doctors from creating slots with their available times; instead, they only let users make online reservations or request information about doctors. Additionally, the hospital administration is unable to take control of operational matters such as appointment costs.

4. Proposed Architecture

a) Admin: Admin is the superuser who manages everything.

b) Patient: The Patient is the one who is seeking medical attention or treatment for an illness or condition.

c) Doctor: Doctors play a crucial role in providing medical care and promoting patients' overall health and well-being.

User-friendliness is added to the front-end design. The patient will visit the website, register, and then sign in using their username and password. A doctor is also registered by the admin. The administrator is authorized to view patient and doctor records. An SQLite database, which is Django's default database is used here. Relational database interactions are made easier with the open-source SQLite database technology. The server in this system maintains extensive data of patients, doctors, and appointments that are registered.

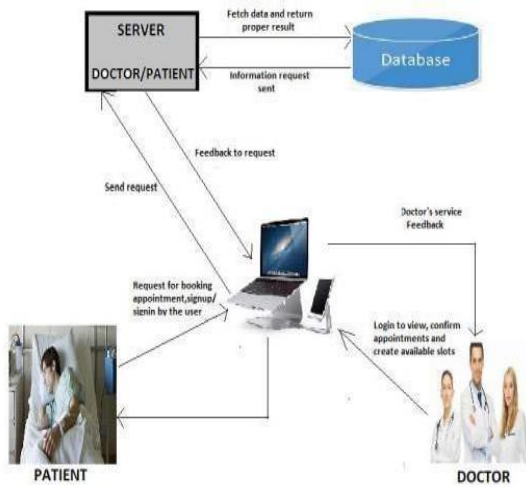Fig shows the proposed architecture that involves. 3 entities:

Figure 1: System Design for proposed system

5. Proposed Model

The three primary entities in the proposed system are Patient, Doctor, and Super Admin. They can access the website using any internet-connected device and web browser, which makes it more accessible and user-friendly. The patient begins by registering and providing basic details such as their name, phone number, email address, age, and gender. They also create a password for their account. Afterward, the patient uses their username and password to check in. They are then presented with a module of questions about their symptoms, answering with yes or no. Our machine learning trained model determines which disease(s) the user is most likely to have based on the responses to questions concerning symptoms. It then provides the user with the name of the condition, its symptoms, and a confidence score. Furthermore, the patient will be able to see which doctor is assigned to him by the admin, and when the patient is discharged, he will be able to download the discharge slip also. The doctors must register themselves with their basic information and specialty areas like cardiology, dermatology, etc. Then, the doctor needs to log in using the username and password. Then, he will be able to see the appointments he has however, he has the power to decline any appointment. He can see the details of the patients under him as well as the discharged patients.

The foremost entity in this system is the admin who manages everything. The admin has all the powers. He can register any patient or doctor. His approval is needed when the patient or doctor registers on a website only then they will be able to log in. He can see the history of every person whether it can be a doctor or patient. He will look for all the registered doctors on the website then as per the symptoms of the patient he will assign and book an appointment for the patient with the respective doctor.
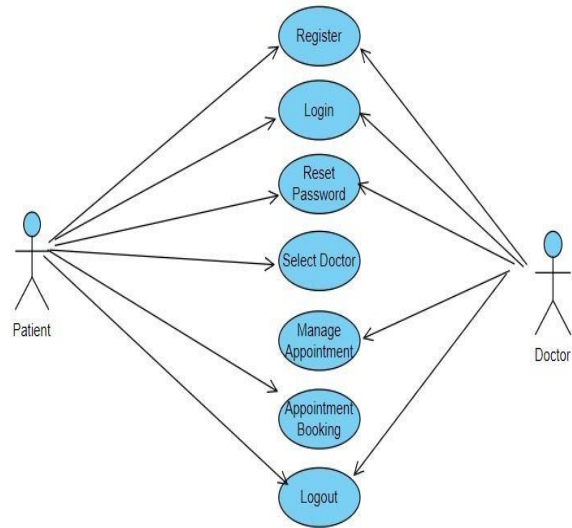
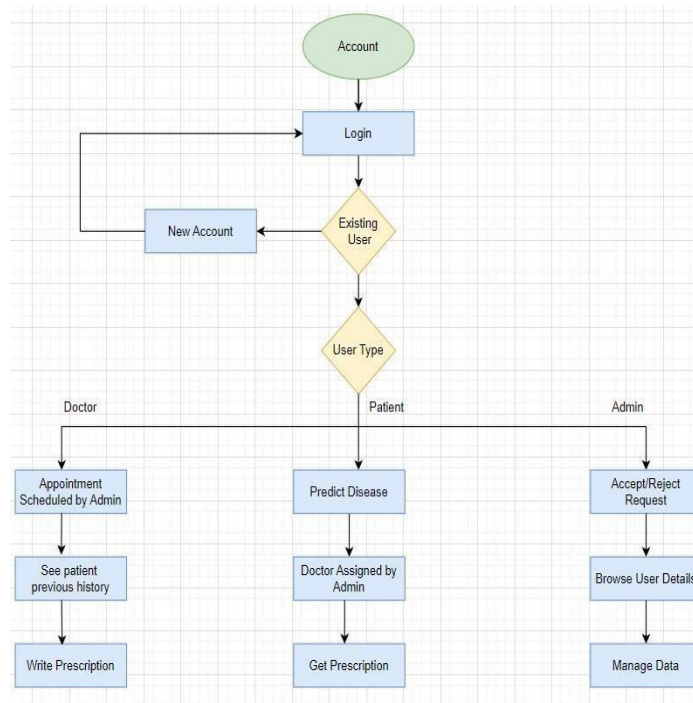Figure 3.2: Use case diagram of Patient and Doctor
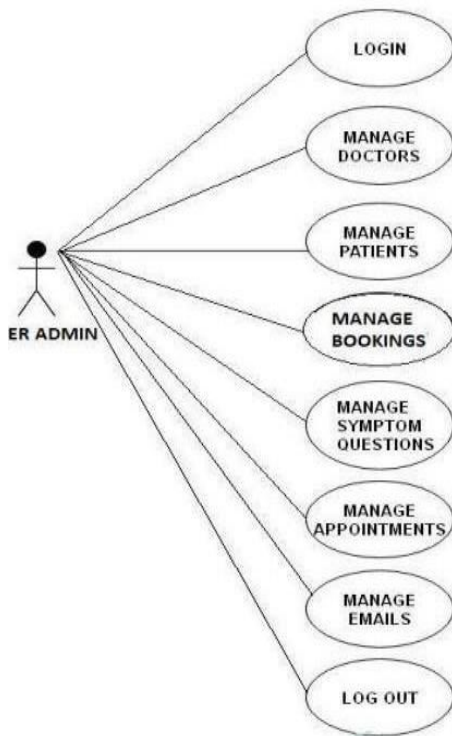

Figure 3.3: Flow Diagram of Proposed Model

Figure 3: Use case diagram for Admin.

5.1. Technology Stack 1: Django

The opensource Python framework Django is used for developing websites and, in some cases, for building progressive web apps. Django is easy to learn and also allows us to write clean code, thus it improves code readability. It is maintained by the Djang o Software Foundation. Django was developed by Adrian Holovaty and Simon Willison in 2003 while working at the Lawrence Journal - World newspaper in Lawrence, Kansas, USA. Originally, Django was conceived to address the specific requirements and tight deadlines of web development within a news organization, specifically catering to the needs of the newsroom environment.

In July 2005, the Django framework was unveiled as an open source project, taking inspiration from the jazz guitarist Django Reinhardt for its name. Its rapid rise in popularity can be attributed to the adoption of the "don't

repeat yourself" (DRY) philosophy, emphasizing the significance of minimizing code redundancy, along with a dedicated focus on simplifying the process of constructing web applications. SQLite is the default database of Django. It is designed according to the MVT design pattern, a hierarchical technique in which the letter 'M' stands for model and represents the data it intends to display; This data is usually obtained from a database. A view is a request handler that responds to user requests by dynamically generating and providing the required templates and content. It is represented by the letter "V", which means "view". Another meaning of the letter 'T' is Template. The logic for displaying data on a web page is included in a text file called a template. Moreover, this framework is scalable, which enables the ease of managing user loads, this is a substantial advantage. Strong security features protect sensitive privacy-related data and user communications. Furthermore, it facilitates localization and internationalization, making it simple to adapt to different languages and locales. Additional benefits of using Django's integrated administrative interface include ease of website content management and optimization of content management functions. It forms the foundation for the creation of content management systems, which optimize the process of producing digital material and tracking its production. With its essential components, this framework is the best choice for building a reliable e-commerce website. Whether utilized in social media applications, data analysis platforms, or government websites, Django's well-designed and practical approach consistently enhances the effectiveness of web development in various industries.

5.2. Technology Stack 2: React JS

The open-source web framework React was first created in JavaScript and is very good at creating single-page applications (SPAs). It is maintained by Meta (formerly Facebook) and a community of individual developers and companies. It greatly facilitates the building of user interfaces, and it is overseen and maintained by Meta. React is a

JavaScript framework, yet it works well with Typescript. Praised as the 'Future of Frameworks,' React is very much in use in the web development community, with a large user base and enormous growth potential. Its flexibility and compatibility are noteworthy since they make integration with Typescript easier and encourage further developments. React is a highly configurable front-end framework that is primarily used to enable rapid deployment on a range of cloud services and platforms, including AWS, Azure, Cloudflare, and Heroku. React, renowned for its component based architecture, encourages the creation of modular and reusable user interface components, leading to a quicker interface-building process. Because of its usage of JSX, a JavaScript syntax that combines HTML elements, code is easier to read and element composition is simplified. React can be used with frameworks like Next.js to develop single-page, mobile, or server rendered applications. Because React is only concerned with rendering components to the user interface and DOM, React applications often depend on libraries for routing and other client-side functionality. React, a JavaScript library, is extensively apply in contemporary web development:

a) **Creating User Interfaces:** React is frequently used to create dynamic, interactive user interfaces for online applications, making it possible to render UI elements quickly.

b) **Single-Page Applications (SPAs):** By efficiently handling component states, it is the recommended option for developing SPAs and guarantees a smooth user experience.

c) **Mobile App Development:** Through frameworks like React Native, it extends its functionality to mobile app development, facilitating cross-platform app creation.

d) **E-commerce Platforms:** Reacts adeptness in managing complex and dynamic data makes it suitable for developing high performance ecommerce platforms.

e) **Interactive Web Applications:** Its component reusability and performance optimizations make it suitable for creating highly interactive web applications with seamless user interactions.

f) **Educational Platforms:** React is widely used to create educational platforms for students and educators.

6. Limitations of proposed approach

a) **Expense and Implementation at first time:** Setting up an online hospital management system can be an expensive and time-consuming process. Initial expenses include data migration, staff training, hardware infrastructure, and software development.

b) **Data security and privacy issues:** Patient information is sensitive, and there are data security and privacy issues. To protect the privacy and accuracy of patient data, HMS systems need to comply with health carerelated laws such as the Health Insurance Portability and Accountability Act (HIPAA).

c) **Technical Problems and Downtime:** Online HMS is just as vulnerable to technical problems, server outages or connectivity issues as any other technology. These can disrupt daily hospital operations and impact patient care.

d) **Dependence on Internet Access:** Online HMS requires Internet access. in locations with poor or unreliable Internet service, users may have trouble accessing and updating patient data quickly.

7. Conclusion

The hospital administration, doctors, and patients can all benefit greatly from this website. The program is easily accessible, and user-friendly. Both the doctor's and the patient's workload may be made easier by this system. Patients can wait for an appointment virtually instead of physically going. Patients will have a general notion of the type of sickness they may have, enabling them to look for specialists who specialize in that field. Physicians don't have to stress about running their

clinics. Even though you are not visiting the clinic for an appointment, you can schedule one from anywhere at any time. The patient's time is saved as a result. The doctor can make better use of his time and increase his efficiency because he can access his schedule. Through this, the Hospital's productivity will increase. It will give them a good business analysis, and more control over the business aspects, such as determining the cost per visit and tracking the number of appointments scheduled, enabling them to make more informed business decisions. To develop a secure application and to protect the application from attacks, we implemented input validation, anti-forgery tokens, and other strong coding practices. To maintain ATO compliance continuous monitoring and scanning of the application are used to address vulnerabilities.

REFERENCES

Shafaq Malik, Nargis Bibi, Sehrish Khan, Razia Sultana, & Sadaf Abdul Rauf. (2017). Mr. Doc: A doctor appointment application system. Available at: https://arxiv.org/ftp/arxiv/papers/1701/1701.08786.pdf.

https://appdocpat.herokuapp.com/

https://docs.djangoproject.com/en/2.2/

https://devcenter.heroku.com/start

John Duckett, HTML and CSS: Design and Build Websites, 2015.

Mastering HTML, CSS & JavaScript Web Publishing Paperback, 2016.

C Severance-IEEE Project Management journal, 2018.

Oana Frunza & Diana Inkpen. (2010). A machine learning approach for identifying disease-Treatment relations in short texts. Available at: https://ieeexplore.ieee.org/document/5560656.

Diwyanjalee, K. V. S., Widanapathirana, W. P. V. K., Perera, J. S., Warnakulasuriya, I. S. G., De Silva, D. I., & Samarasekara, H. M. P. P. K. H. (2022). Hospital management system (HMS). International Journal Of Engineering And Management Research, 12(5), 250258.

Jan, Saeed Ullah, Muhammad Ishaq, and Abdul Aziz."Hospital Management System." Available at SSRN 4350730 (2022).

Sathyabama Balasubramanian & Balaji Subramani.(2014). Symptoms based diseases prediction in medical system by using k-means algorithm. International Journal of Advances in Computer Science and Technology, 3(2), 123-128.

Suryavanshi, Pulkit, Sagar Kaushik, and Deepali Dev. "An Automated Model for Booking Appointment in Health Care Sector." 2021 International Conference on Technological Advancements and Innovations (ICTAI). IEEE, 2021.

Dhiman, Ajay Kr, et al. "Telemedicine Solution using Django." International Journal of Engineering and Management Research (IJEMR) 10.2 (2020): 116-120.

Chauhan, Usha, et al. "Doctor Finder and Appointment Booking Website using DJANGO." 2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM). Vol. 2. IEEE, 2022.

Rahman, Asifur. Web Based Hospital Management System. Independent University, Bangladesh, 2022 Appointment Booking Website using DJANGO." 2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM). Vol. 2. IEEE, 2022.

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