



AUTOMATED SMART HEALTH SCHEDULER USING DESIGN THINKING

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ABSTRACT:- *Healthcare appointment scheduling can be a challenging and time-consuming task for patients and healthcare providers. The Automated Smart Health Scheduler is an intelligent appointment scheduling system designed to address these challenges. The proposed system utilizes machine learning prediction modal and optimization techniques to provide patients with personalized appointment scheduling and to optimize healthcare provider schedules. The system uses the medical data from health monitoring system that is incorporated in the patient's home, and availability to schedule appointments with the most appropriate healthcare provider. The system also considers the availability of the healthcare providers and their specialties to ensure that patients are matched with the best provider for their needs. The Smart Health Scheduler also optimizes healthcare provider schedules by identifying scheduling conflicts and suggesting alternative appointment times. This helps to reduce wait times for patients and increase the efficiency of healthcare providers. The proposed system has the potential to improve healthcare appointment scheduling by reducing wait times for patients and increasing the productivity of healthcare providers.*

Keywords: Machine Learning prediction modal, Time-Consuming, medical data, health monitoring system, reduce wait time.

1. INTRODUCTION:-

1.1. DOMAIN OVERVIEW

In recent years, the healthcare industry has experienced tremendous growth due to the increased demand for healthcare services. With the increasing demand for healthcare services, healthcare providers are finding it challenging to manage appointments efficiently. Patients often experience long waiting times and delays in getting appointments, which can negatively affect their health outcomes.

To address this challenge, the use of technology has become increasingly prevalent in the healthcare industry. The design and development of an automatic doctor appointment booking system using machine learning algorithms is an innovative solution to improve the efficiency of the healthcare system. The proposed system aims to provide a personalized approach to healthcare appointment scheduling and optimize healthcare provider schedules.

The Smart Health Scheduler is an automated system designed to streamline the process of booking doctor appointments. With the help of artificial intelligence and advanced scheduling algorithms, this system aims to optimize the scheduling process, reduce wait times, and improve patient satisfaction.

The proposed system utilizes machine learning algorithms to predict the optimal appointment time slots for each patient based on their medical history and the availability of doctors.

This approach ensures that patients are matched with the most appropriate healthcare provider and that the appointments are scheduled at a time that is convenient for the patient.

The Smart Health Scheduler aims to solve these problems by automating the scheduling process and freeing up staff time for other tasks. By gathering data on appointment scheduling patterns and integrating with electronic medical records (EMRs), this system can provide a seamless and efficient healthcare experience for patients and healthcare providers alike.

The machine learning algorithms used in the proposed system include decision trees, random forests, and support vector machines. These algorithms have been proven to be effective in predicting the best possible outcomes in various domains, including healthcare. Decision trees are used to predict the appointment slot that is most likely to be preferred by the patient based on their medical history. Random forests are used to generate a list of probable appointment slots for the patient. Finally, support vector machines are used to select the best appointment slot based on the availability of doctors.

The proposed system also includes features such as appointment rescheduling and reminders. Patients can reschedule their appointments based on their changing schedules, and the system will automatically adjust the appointment slots. The system also sends reminders to patients before their appointments to reduce the likelihood of missed appointments.

In traditional healthcare settings, scheduling appointments can often be a time-consuming and error-prone process. Patients may have to wait on hold for extended periods or navigate confusing online booking systems. These inefficiencies can lead to frustration for patients and staff, as well as lost productivity and revenue for healthcare providers.

The Smart Health Scheduler is an intelligent appointment scheduling system that is designed to optimize healthcare provider schedules. The system identifies scheduling conflicts and suggests alternative appointment times, reducing wait times for patients and increasing the productivity of healthcare providers.

The proposed system has the potential to revolutionize the healthcare industry by providing a personalized approach to healthcare appointment scheduling and optimizing healthcare provider schedules. The integration of machine learning algorithms has the potential to increase the efficiency of the healthcare system and improve patient outcomes. The proposed system is an innovative solution that could help to improve the quality of healthcare services and reduce the burden on healthcare providers.

1.2. APPOINTMENT BOOKING SYSTEM

An appointment booking system is a digital tool that enables individuals or organizations to schedule appointments with clients or customers in an efficient and organized manner. The system can be used for a wide range of purposes, from healthcare services to salon appointments to business meetings.

Traditionally, appointments have been scheduled through phone calls or in-person visits, which can be time-consuming and often result in scheduling conflicts or missed appointments. The advent of digital technologies has enabled businesses and service providers to streamline their appointment booking processes and improve their overall efficiency.

Appointment booking systems typically allow customers to book appointments online, through a mobile app, or by phone. The system provides real-time availability information, allowing customers to choose an available time slot that is convenient for them. Once the appointment is booked, the system sends a confirmation to the customer and the service provider, reducing the likelihood of missed appointments or scheduling conflicts.

In addition to improving efficiency and reducing scheduling conflicts, appointment booking systems can also provide a better customer experience. Customers appreciate the convenience of being able to book appointments online or through a mobile app, and the ability to see real-time availability information can help them make more informed decisions.

Appointment booking systems can also provide valuable data and analytics for businesses and service providers. The system can track appointment history, customer preferences, and other relevant data, allowing businesses to improve their services and better understand their customers' needs.

Overall, appointment booking systems have become an essential tool for businesses and service providers looking to improve their efficiency, reduce scheduling conflicts, and provide a better customer experience. With the continued advancement of digital technologies, it is likely that appointment booking systems will become even more sophisticated and valuable in the years to come.

2. EXISTING TECHNIQUE: -

The existing technique is of two: Online Medical Appointment Manager and Doctor Appointment Booking App.

An online medical appointment manager is a web-based platform that allows healthcare providers to manage appointments and schedules electronically. These systems can be customized to fit the specific needs of the practice, and typically include features such as appointment scheduling, automated reminders and notifications, patient

data management, and reporting. From the patient perspective, an online medical appointment manager can offer several advantages. Patients can schedule appointments at any time, from anywhere, as long as they have internet access. This eliminates the need for patients to call the office during business hours or wait on hold to speak with a receptionist. Additionally, online medical appointment managers can reduce the risk of double-booking or overbooking, as patients can only select available appointment times.

A doctor appointment booking app is a mobile application that allows patients to schedule appointments with healthcare providers using their smartphone or tablet. These apps can be downloaded for free from the app store or downloaded directly from the provider's website. Doctor appointment booking apps typically offer features such as appointment scheduling, provider profiles, reviews and ratings, and appointment reminders. Some apps may also include telemedicine features, allowing patients to have virtual appointments with providers.

3. SYSTEM HARDWARE:-

3.1. RASPBERRY PI

Raspberry Pi is a small, credit card-sized computer that was first developed in the United Kingdom by the Raspberry Pi Foundation in 2012. It is a low-cost, high-performance computer that is designed to promote the teaching of basic computer science in schools and developing countries. Since its release, Raspberry Pi has become a popular choice for hobbyists, educators, and developers who want to create innovative projects.

Raspberry Pi is built on a Broadcom system on a chip (SoC) that includes a processor, memory, and other components necessary for computing. It has a wide range of inputs and outputs that allow it to interact with the physical world, including GPIO (General Purpose Input/Output) pins, HDMI (High-Definition Multimedia Interface) ports, USB (Universal Serial Bus) ports, and Ethernet ports. It also has built-in Wi-Fi and Bluetooth capabilities, making it easy to connect to other devices and networks.

One of the key features of Raspberry Pi is its flexibility. It can run a variety of operating systems, including Linux, Windows 10 IoT, and even Android. It also supports a range of programming languages, including Python, C++, and Java, making it easy for developers to create applications and projects.

Raspberry Pi has a wide range of applications, from creating DIY home automation systems to building robots and drones. It is also used in education and research, as well as in industrial and commercial settings. Its low cost and versatility make it a popular choice for anyone looking to experiment with technology or create new and innovative projects.

Overall, Raspberry Pi is a powerful, flexible, and affordable computer that has revolutionized the world of

computing and has opened up new possibilities for innovation and creativity.



Fig.1 Raspberry Pi

3.2. TFT Display

A TFT (Thin Film Transistor) display is a type of LCD (Liquid Crystal Display) that uses thin-film transistor technology to improve image quality and increase the response time of the display. TFT displays are commonly used in a variety of electronic devices, including smartphones, tablets, laptops, and TVs.

TFT displays work by using a matrix of thin-film transistors (TFTs) to control the flow of electric current through the display. Each pixel on the display is controlled by a single TFT, which allows for precise control of the pixel's brightness and color. This results in high image quality and fast response times, making TFT displays suitable for displaying fast-moving video and other dynamic content.

TFT displays are available in a range of sizes and resolutions, and can be used in both monochrome and color configurations. They are also available in different orientations, including portrait and landscape. TFT displays can be connected to a microcontroller, such as an Arduino, using a variety of interfaces, including SPI (Serial Peripheral Interface), I2C (Inter-Integrated Circuit), and parallel.

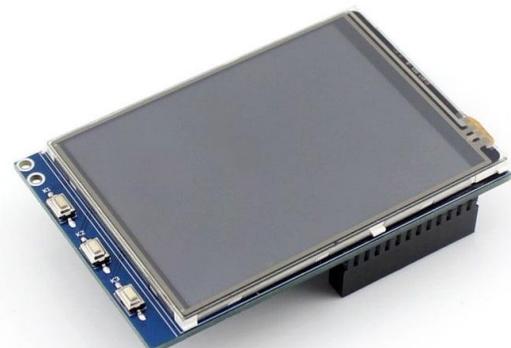


Fig.2 TFT Display for Raspberry Pi

4. SYSTEM SOFTWARE:-

4.1. REACT JS

ReactJS is a popular JavaScript library for building user interfaces. It was developed by Facebook and is now widely used by developers around the world. ReactJS allows developers to create complex UI components and reusable code, making it an ideal choice for developing large and complex web applications.

At its core, ReactJS is all about creating and manipulating components. A component is a self-contained unit of UI, which can be combined with other components to create larger, more complex UIs. Each component can be thought of as a function that takes in data (known as "props") and returns a description of what the UI should look like (known as "rendering").

ReactJS uses a technique called "virtual DOM" to efficiently update the UI in response to changes in data. When a component's state or props change, ReactJS creates a new virtual DOM tree and compares it to the previous one to determine what has changed. Only the parts of the UI that need to be updated are changed in the actual DOM, making ReactJS very efficient.

ReactJS is also very flexible, and can be used in a variety of ways. It can be used on its own to build complex UIs, or it can be combined with other libraries and frameworks to create full-stack web applications. ReactJS is often used together with Redux, a popular state management library, to manage the state of an application in a predictable way.

4.2. STRAPI CMS

Strapi is a headless CMS (Content Management System) that allows developers to build and manage API-driven digital content. Strapi is an open-source platform that supports multiple databases, including MongoDB, PostgreSQL, SQLite, and MySQL. It is built on top of Node.js and offers a user-friendly interface that enables developers to easily create and manage content.

Strapi has a plugin-based architecture that allows developers to easily extend its functionality. It provides a RESTful API out of the box, making it easy to integrate with any front-end framework. Strapi also has a powerful admin panel that allows users to manage content, configure settings, and view analytics.

One of the key advantages of Strapi is its flexibility. It allows developers to create custom content types, define relationships between them, and build custom API endpoints. Strapi also supports role-based access control, which enables developers to manage user permissions and access to specific content types.

Strapi is a popular choice for building scalable, API-driven applications. Its open-source nature and strong

community support make it a reliable option for developers looking to build content-driven applications. With its ease of use, flexibility, and powerful features, Strapi is a valuable tool for developers building modern web applications.

4.3. PYTHON

Python is a high-level, object-oriented, general-purpose, interactive, and interpreted programming language. Between 1985 and 1990, Guido van Rossum designed it. Python source code is also accessible under the General Public license, just like Perl.

Python is a powerful, interactive, object-oriented, and interpreted scripting language. Python has been created to be very readable. It has fewer syntactic structures than other languages and typically employs English keywords rather than punctuation.

Python is an absolute must for students and working professionals who want to excel as software engineers, especially if they work in the web development field.

Python is Interpreted - The interpreter processes Python at runtime. Python software does not need to be compiled before running. This is comparable to PHP and PERL.

Python is Interactive — To write programs, Python can actually sit at a Python prompt and communicate with the interpreter directly.

Python supports the Object-Oriented style or technique of programming, which encapsulates code within objects.

Python is a wonderful language for beginning programmers since it facilitates the creation of a wide variety of programs, from simple text processing to web browsers to games.

Python third-party modules can be found in their hundreds on the Python Package Index (PyPI). There are countless options with Python thanks to both the standard library and the community-contributed modules.

Python's most fundamental application is as a language for automation and scripting.

Python is used for system provisioning and configuration in tools like Ansible and Salt, as well as to automate interactions with web browsers and application GUIs. It is not merely used to replace shell scripts and batch files.

It can be created by both command-line and cross-platform GUI applications with Python and deployed as self-contained executables. Python doesn't have the native ability to generate a standalone binary from a script, but third-party packages like cx_Freeze and PyInstaller can be used to accomplish that

Python is a general-purpose programming language that may be used to build cross-platform Graphical User Interface (GUI) programmers as well as command-line applications. Although it is not native to Python, third-party tools like cx_Freeze and PyInstaller can be used to create standalone binary files from scripts.

4. WORKING OF PROPOSED METHOD:-

The Automated Smart Health Scheduler system works by using a database of healthcare providers, appointment schedules. The system uses machine learning algorithms and artificial intelligence techniques to predict the problems of the users and provide help for them accordingly. The proposed system works on the basis of a triggering function. A mini-device will be available at the user end. When the user needs help i.e., he/she wants to book an appointment to the doctor for medical attention, they will use the device to trigger the process. When the device is triggered, it takes inputs such as name, age, location, etc. and the health data of the users from an existing health monitoring system. The health data input is then given into a prediction modal algorithm which is developed using machine learning for processing. The prediction modal gathers the current data and process it and then predict the problem of the user by using a set of historical data. The prediction modal is based on logistic regression which uses categorical data. Once the prediction is done, based on the predicted problem, a document in the form of a report will be generated. The report will be send to the nearest hospital server and the medical team in the hospital will attend the request and the respond to it. Accordingly, the reply with information such as appointment time, slot etc. will be sent to the user as message or email. In case of emergency need, the prediction modal will also predict the emergency situation and it will send an alert along with the report.

5. RESULT:-

The predicted results by the modal using the patient's health data are displayed in the TFT Display.



Fig.3 Booking UI (Just for display instead of the triggering device)

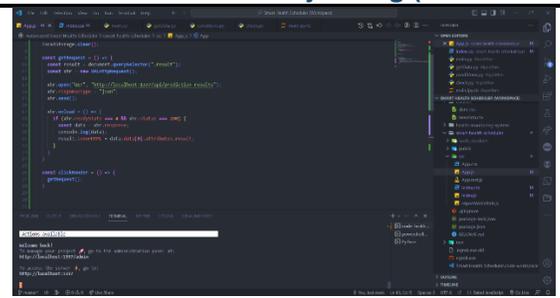


Fig.4 React Development Server

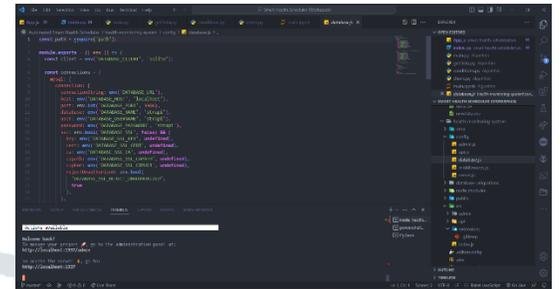


Fig.5 Strapi (for heath monitoring system database where the health data will be collected)

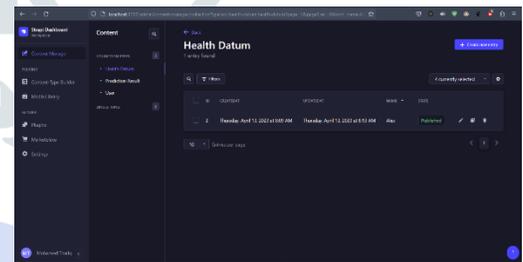


Fig.6 Health data of the user

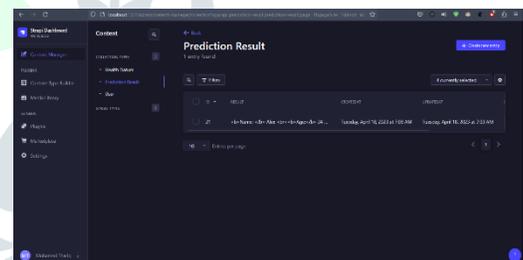


Fig.7 Predicted Result (uploaded to the hospital's database)

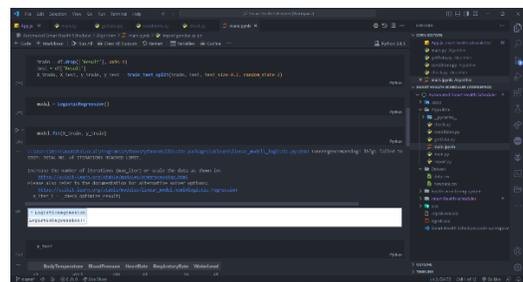


Fig.8 Logistic Regression Modal

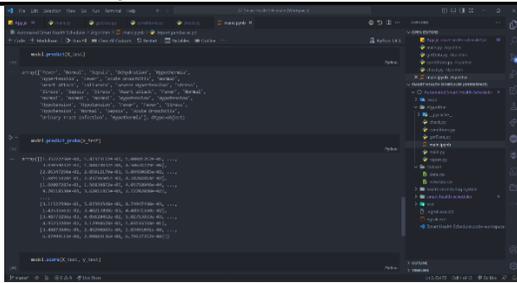


Fig.9 Predicted result with accuracy of the modal

6. CONCLUSION:-

The Automatic Doctor Appointment Booking System is an innovative solution that uses Raspberry Pi to automate the appointment booking process. The system is designed to be efficient, accurate, and user-friendly, providing patients with a convenient way to book appointments with doctors. With this system, doctors can manage their appointments more efficiently, and patients can book appointments without having to physically visit the doctor's office. Overall, the Automatic Doctor Appointment Booking System has the potential to transform the way we book appointments with doctors, making the process more efficient and convenient for everyone involved.

7. Future Work:-

In future, as health care technologies rises the modal can be used to predict various need of the user so that the user gets benefit. For E.g. If the health care system manages to get the psychological data of the user like mental stress, happiness, sad, etc. the modal can be used to predict that and can give therapy needs for the users. In future, the modal can also be used to give medication according to the need of the user. Also, it can be automated to use as for monitoring and predicting the need of patients in hospitals. As health monitoring system only monitors a patient and displays the output, this modal can predict their need in case of emergency and alerts the doctor. This modal can also be implemented to give medication for them.

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