HOSPITAL MANAGEMENT SYSTEM USING DJANGO

A report on
Internet Technologies Lab Project
[CSE-3262]

Submitted By
NEHAL CHANDAN MURDESHWAR - 210962021
ABHIRAM REDDY KONDA - 210962003

MANIPAL
ACADEMY of HIGHER EDUCATION
(Institution of Eminence Deemed to be University)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
MANIPAL INSTITUTE OF TECHNOLOGY,
MANIPAL ACADEMY OF HIGHER EDUCATION

APRIL, 2024

Hospital Management System using Django

Nehal Chandan Murdeshwar[1], Abhiram Reddy Konda[2]

[1]MIT Manipal, India

[2] MIT Manipal, India

[1]nehalmurdeshwar@gmail.com; [2] abhiramrk123@gmail.com

Abstract*— The "Hospital Management System in Django" project aims to digitize the front office operations of a hospital by developing software that is user-friendly, efficient, and cost-effective. This project addresses the traditional manual processes involved in managing patient information, including identification and medical details. The core functionality of this system is the ability to register, store, and retrieve patient and doctor information on demand, enhancing the ability to manage this data effectively. Inputs to the system include comprehensive patient details and their diagnostic information. The outputs are designed to display these details readily on user screens. Access to the Hospital Management System is secured with usernames and passwords, ensuring that only authorized personnel such as administrators or secretaries can add and manage data within the system. This level of access helps maintain data integrity and privacy, ensures security, and enhances the speed of data processing within the hospital's management system.

I. INTRODUCTION

The Hospital Management System project is designed to streamline hospital operations by facilitating the registration of patients, storage of their medical and personal information, and automating billing processes in the pharmacy and laboratory departments. The system assigns a unique identification number to each patient and automatically records details for both patients and staff. Additionally, it features an advanced search functionality, allowing users to check the availability of doctors and access patient details via their unique ID.

Access to the system is secured with usernames and passwords, ensuring that only authorized personnel, such as administrators or secretaries, can input and manage data. This exclusivity helps maintain the integrity and confidentiality of the data. The user interface of the system is straightforward, designed for ease of use without sacrificing functionality. Data retrieval is quick and efficient, which significantly speeds up information processing and enhances productivity. Overall, the Hospital Management System is robust, adaptable, and crafted to provide tangible benefits to healthcare institutions, promoting efficiency and operational effectiveness.

II. MOTIVATION

The motivation behind developing the Hospital Management System stems from the need to enhance the quality and efficiency of healthcare services through technological innovation. Traditionally, hospital management has been bogged down by manual processes that are time-consuming and susceptible to errors. These inefficiencies can lead to delays in patient care, discrepancies in billing, and overall dissatisfaction among staff and patients. By integrating a digital system that automates key processes such as patient registration, data storage, and billing, hospitals can streamline their operations, minimize errors, and allocate resources more effectively. Moreover, ensuring data security and rapid accessibility not only complies with regulatory standards but also fosters trust among patients. The system is designed to meet the growing demands of modern healthcare environments, providing a scalable solution that enhances patient outcomes and operational efficiencies.

III. OBJECTIVES

- **Improve Operational Efficiency:** To enhance the efficiency of hospital operations by automating the registration, data storage, and billing processes. This includes the creation of a unified system that integrates

patient information with pharmacy and laboratory services, streamlining workflows and reducing manual data entry errors.

- **Enhance Data Security and Accessibility:** To ensure that all patient and staff data are securely stored and easily accessible only by authorized personnel. The objective is to implement robust authentication mechanisms to safeguard sensitive information, while also ensuring that data retrieval processes are fast and efficient to support timely decision-making and healthcare delivery.

IV. **TECHNOLOGIES USED**

A. HTML

HTML (HyperText Markup Language) serves as the foundational building block for creating web pages and web applications. In the context of the Hospital Management System, HTML is utilized to structure the front-end interface of the system, providing a framework that defines the layout and presentation of web pages. This includes the arrangement of text, images, and other elements that are essential for displaying information clearly and effectively to the users. By using HTML, developers can ensure that the content of the hospital management application is organized and accessible, facilitating a better user experience.

B. Bootstrap

Bootstrap is a powerful front-end framework used to create responsive and mobile-first web pages. In the Hospital Management System, Bootstrap is employed to design a visually appealing and highly functional interface that adapts seamlessly to different screen sizes and resolutions. This responsiveness is crucial in a hospital setting where users may access the system from various devices such as tablets, smartphones, and desktop computers. Bootstrap's comprehensive library of pre-designed components like forms, buttons, and navigation bars significantly speeds up the development process and ensures design consistency across the application.

C. jQuery

jQuery is a fast, small, and feature-rich JavaScript library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development. In the Hospital Management System, jQuery is used to enhance the front-end user interactions by providing a smooth and interactive experience. It allows for the creation of dynamic, user-friendly, and responsive elements, such as modal windows, form validations, and other interactive components. jQuery's ability to facilitate easier and quicker manipulation of the DOM (Document Object Model) makes it invaluable for implementing complex features in a more manageable way.

D. Django

Django is a high-level Python web framework that encourages rapid development and clean, pragmatic design. For the Hospital Management System, Django serves as the backbone, providing a robust and scalable platform to manage backend processes such as data storage, retrieval, and security. Django's built-in features support the development of secure websites by helping manage user accounts and passwords, preventing common security errors like cross-site scripting, and safeguarding user data. Furthermore, Django's ORM (Object-Relational Mapping) simplifies database transactions and data management, making it easier to work with complex data structures.

E. SQLite3

SQLite3 is a compact, self-contained SQL database engine that provides a lightweight disk-based database, which doesn't require a separate server process and allows access to the database using a non-server based SQL database management system. In the Hospital Management System, SQLite3 is used for storing and managing all the application data, from patient records to billing information. Its simplicity and efficiency make it an ideal

choice for applications that require a database with a small footprint, without the need for the full server-side database system. SQLite3 enhances the system's performance and reliability, ensuring that data retrieval and storage are executed swiftly and securely.

V. **DESIGN**

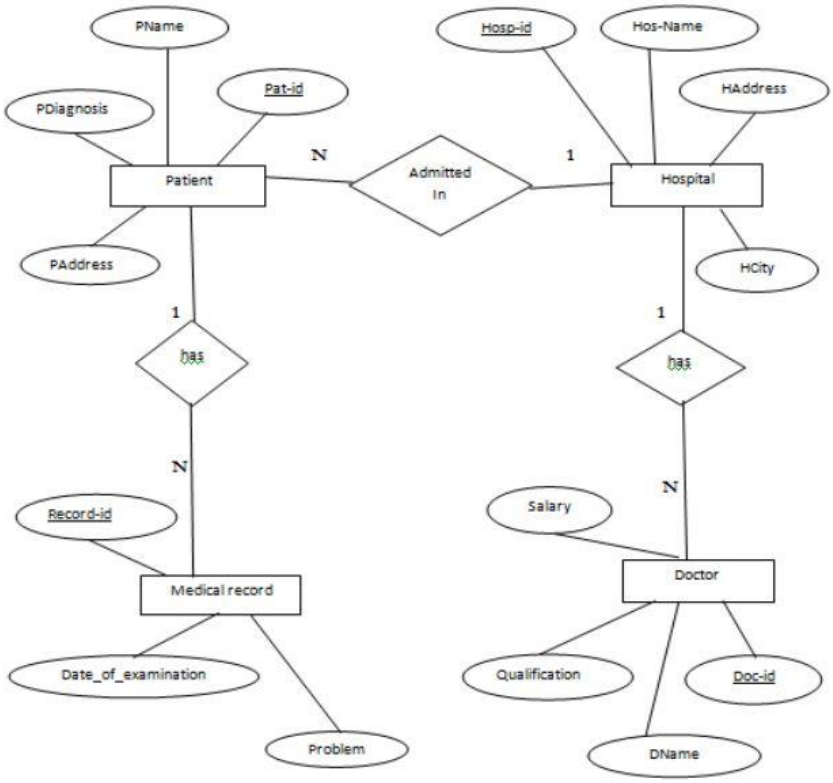

Figure A. Entity Relationship Design

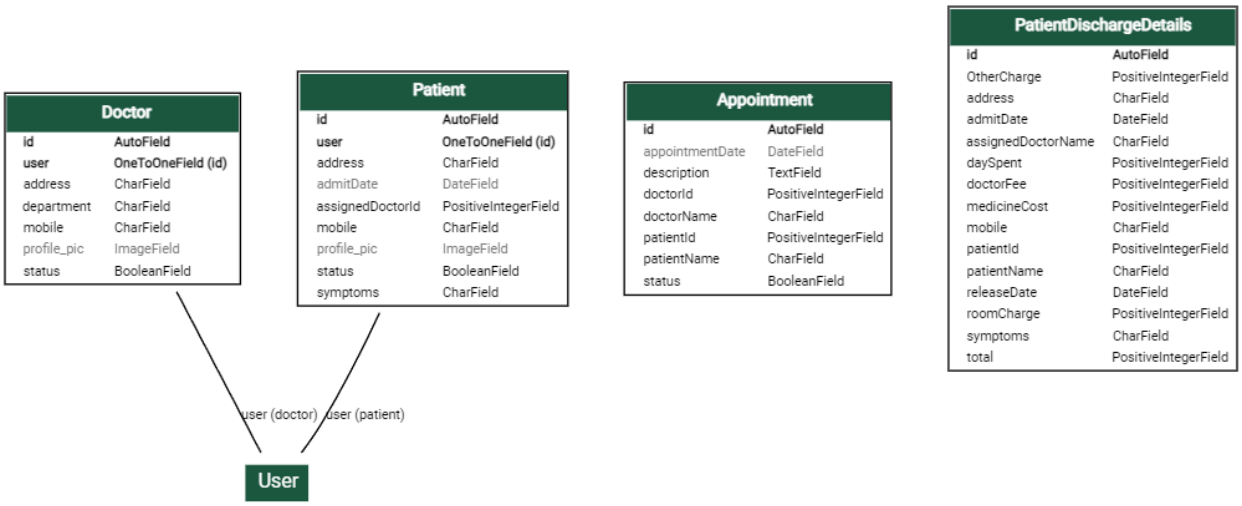

Figure B. Detailed Django Generated ER Diagram

The Entity-Relationship (ER) design of the Hospital Management System is meticulously crafted to accommodate various user roles and their interactions with the system, specifically tailored for three levels of access: admin, doctor, and patient. This design includes distinct entities such as Patients, Doctors, Admins,

Appointments, Medical Records, and Billing, each connected through well-defined relationships that facilitate efficient data management and integrity. Admins possess the highest level of access, enabling them to manage system settings, user accounts, and comprehensive data across all modules. Doctors have access tailored to their needs, allowing them to view and manage patient medical records, schedule appointments, and update treatment plans. Patients, on the other hand, have access to their personal medical records, appointment scheduling, and billing information. The ER model ensures that each entity and its corresponding data are securely managed and accessible according to the user's authorization level, maintaining privacy and data security while supporting the system's multifunctional requirements. This structured approach not only supports robust data processing and storage but also enhances the system's usability and accessibility across different user groups.

Creating an ER diagram for our Hospital Management System involves depicting the relationships and entities in a structured format. Here's how we can visualize the ER diagram.

1. Entities:

- Patient: Contains details like PatientID, Name, Address, Phone, Email.
- Doctor: Includes DoctorID, Name, Specialty, Contact Information.
- Admin: Holds AdminID, Name, and Contact Information.
- Appointment: Captures details such as AppointmentID, Date, Time, DoctorID (linked to Doctor), PatientID (linked to Patient).
- Medical Record: Stores RecordID, PatientID (linked to Patient), Diagnosis, Treatment Plan.
- Billing: Consists of BillingID, PatientID (linked to Patient), Amount, Date.

2. Relationships:

- Patients are linked to Appointments, Medical Records and Billing (indicating that each patient has zero or more appointments, medical records, and bills).
- Doctors are linked to Appointments (showing that each doctor can have one or more appointments).

3. Access Levels:

- Admin: Full access to all entities and their management.
- Doctor: Access primarily to Appointments, and Medical Records relevant to their patients.
- Patient: Access limited to their Appointments, Medical Records, and Billing.

This structure helps ensure that each type of user interacts with the system in a manner appropriate to their role, maintaining security and confidentiality while providing necessary services efficiently.

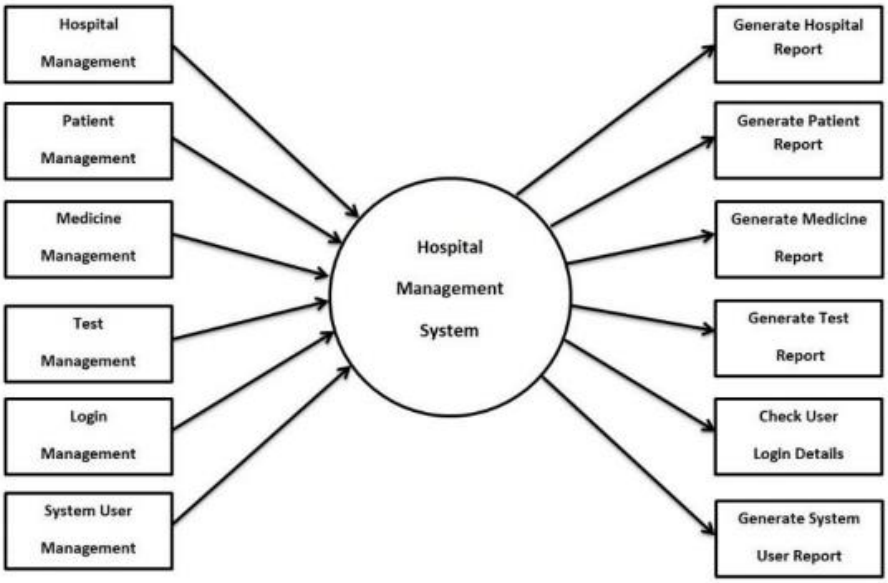

Figure C. General Design

VI. **FUNCTIONALITY**

A. Home Page

The homepage of the Hospital Management System, as depicted in the provided image, serves as the central hub for user interaction and navigation. Elegantly organized with a clear, intuitive interface, the homepage facilitates immediate access to the system's key areas through a top navigation bar that delineates the portals for Admin, Doctor, and Patient—each integral to the system's multi-tiered access framework. The ethos of the system, “Streamlining Care, Supporting Health,” is prominently displayed, encapsulating the system's core objective of operational efficiency and enhanced healthcare support.

Below the central message, a conspicuous call-to-action beckons users to "Book an Appointment," effectively reducing the complexity of scheduling visits and promoting a user-centric approach to healthcare management. The lower segment of the homepage is methodically divided into sections for each type of user, with each segment marked by universally recognizable icons that lead to tailored interfaces for Administrators, Doctors, and Patients. Each section is anchored with a 'View' prompt, signifying a straightforward pathway to the respective functional dashboards. This layout is designed not only for aesthetic appeal but also for its functional simplicity, ensuring that users of all technical proficiencies can navigate the system with ease and confidence. The homepage design thus reflects a commitment to accessibility and efficiency, critical attributes for a system tasked with managing the complexities of modern healthcare information systems.

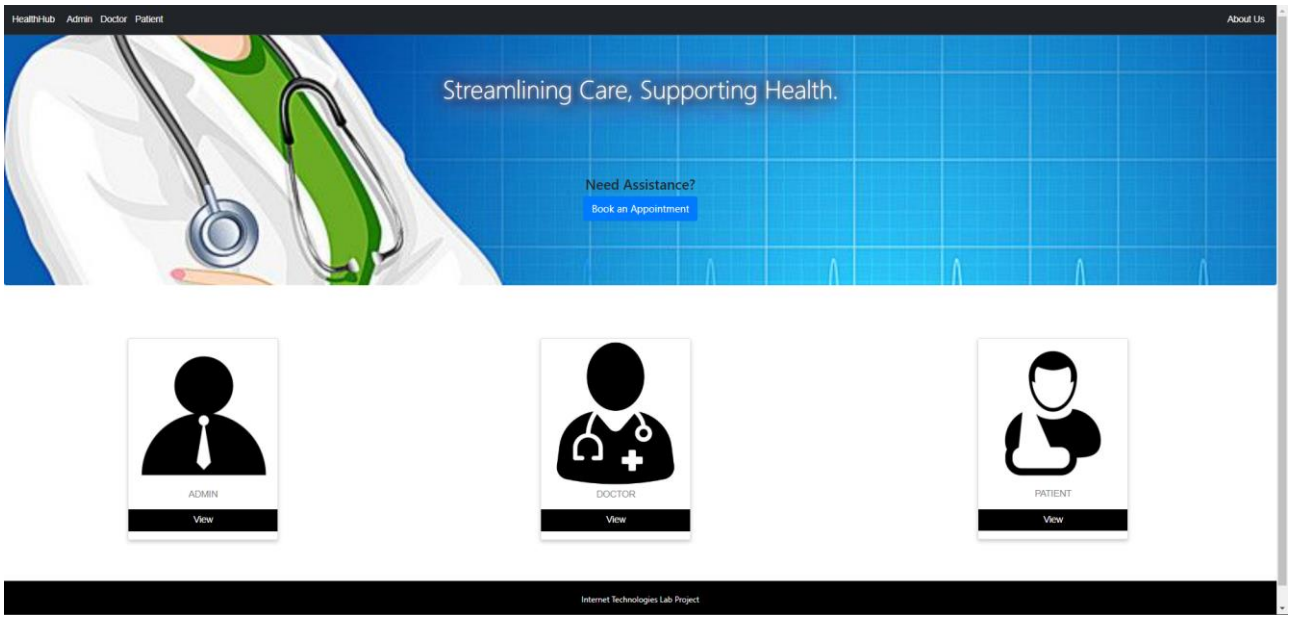

Figure D. Home Page

The "Add New Admin To Hospital" page, as illustrated in the below image, is a streamlined administrative interface designed for the seamless onboarding of new administrators into the Hospital Management System. It presents a straightforward form that requests essential details such as the first name, last name, username, and password—information critical for establishing secure admin accounts. The page is marked by its minimalistic aesthetic, devoid of unnecessary elements, which aligns with the system’s overarching philosophy of clarity and functionality. A notable feature is the direct link to the login page for existing administrators, optimizing the experience for returning users. This interface embodies the system's dedication to secure, efficient, and user-friendly administrative operations, which are pivotal for maintaining the integrity and smooth functioning of the hospital’s digital management ecosystem.

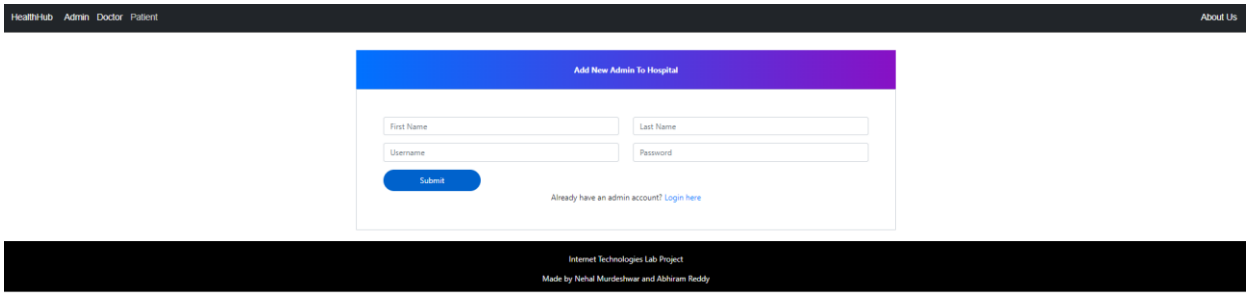

Figure E. Admin Sign-Up Page

The registration interface for medical professionals, showcased in the image below, represents a crucial component of the Hospital Management System. It is designed to onboard new healthcare providers into the hospital network. The form is straightforward, requesting essential information such as name, username, specialty—which in this case includes a drop-down menu for selection of medical fields like cardiology—contact details, and address. The process is also made efficient by providing the option to upload necessary credentials or certifications. This page epitomizes the system's dedication to creating a user-friendly digital environment, which simplifies the process of integrating new doctors into the hospital's ecosystem. Additionally, the provision of a direct link to the login page for existing users exemplifies the system's thoughtful consideration for user convenience and efficient navigation.

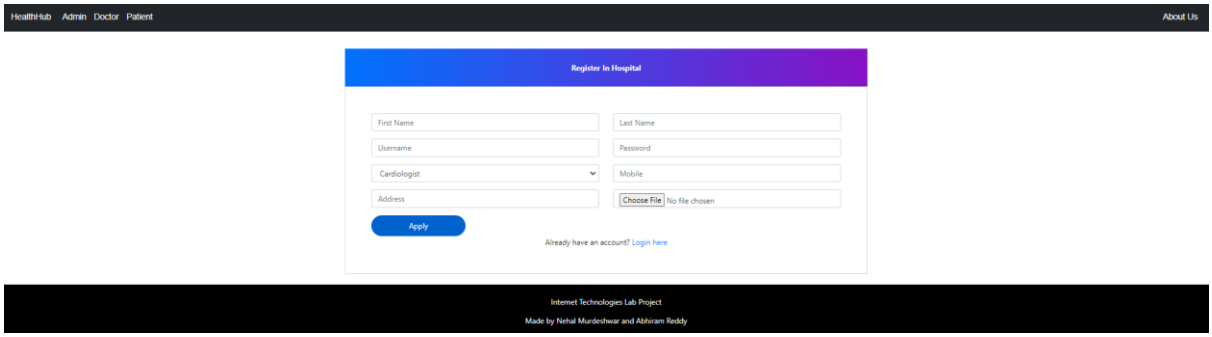

Figure F. Doctor Sign Up Page

The patient registration portal, as showcased in the provided image, exemplifies a patient-centric approach in the Hospital Management System's design. This interface is carefully crafted to gather vital patient information through a clean, straightforward form, which includes fields for personal details, contact information, and medical data such as symptoms. Notably, the interface incorporates a feature to upload documents, which can streamline the process of sharing medical history or referral details. The choice to allow patients to select a department ensures that their registration is routed efficiently to the appropriate medical team, expediting the subsequent steps of care. An option to login for returning patients underscores the system's focus on creating a continuous, engaging user journey.

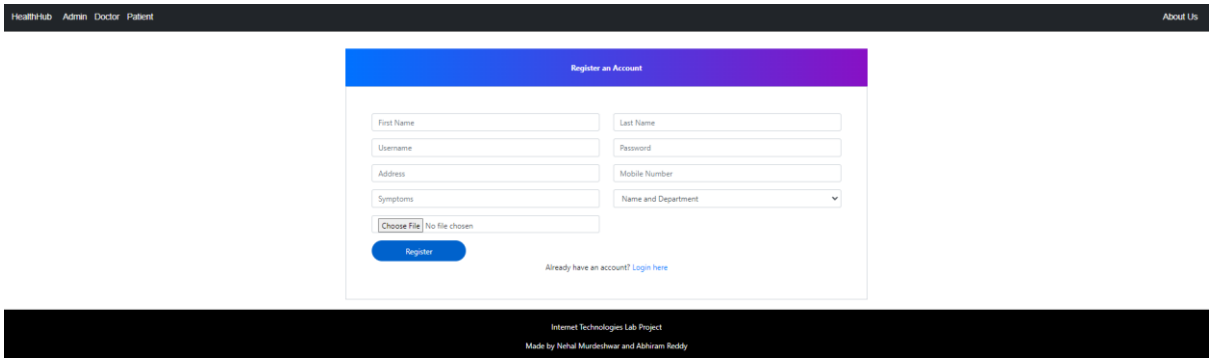

Figure G. Patient Sign Up Page

B. Admin, Doctor and Patient Dashboard

The admin dashboard interface, as presented in the image, stands as a testament to the comprehensive oversight provided within the Hospital Management System. It is a nexus of real-time data and analytics, efficiently organized to present a snapshot of the hospital's operational status. Key metrics such as the total number of doctors, patients, and appointments are displayed prominently in a color-coded panel, allowing for quick assessment and action. Below this summary, the interface is divided into sections showing recent doctor and patient additions, complete with relevant details like department, contact information, symptoms, and status. This at-a-glance accessibility to current hospital activity empowers administrators with the necessary tools to manage resources effectively, track ongoing processes, and make informed decisions promptly. The interface is designed not just for functionality but also for ease of navigation, with a clear, logical layout that ensures all pertinent information is readily available to the system administrators.

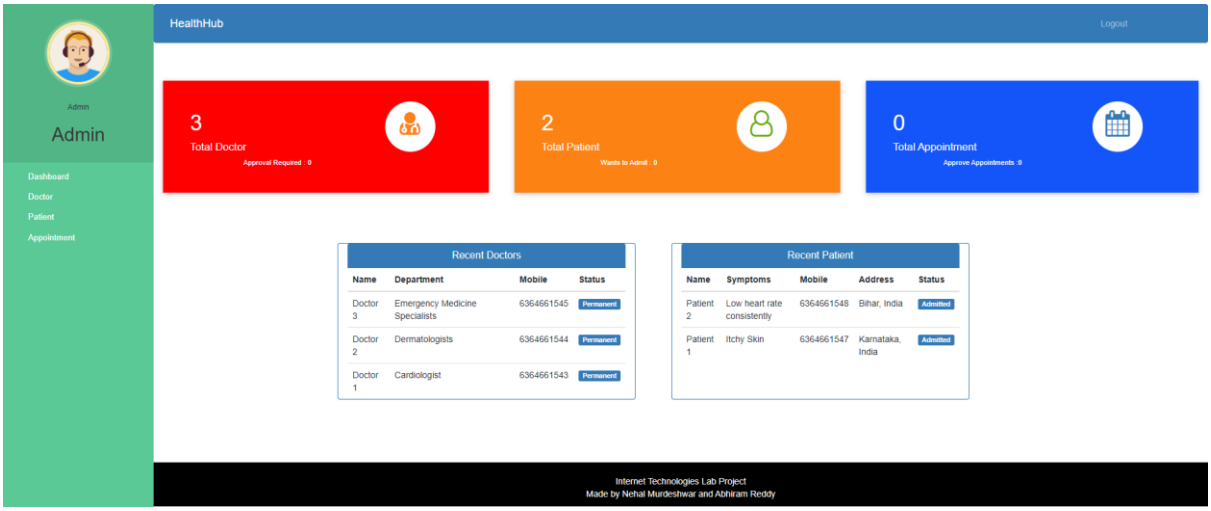

Figure H. Admin Dashboard

In the Hospital Management System, the administrator holds a pivotal role with comprehensive control and oversight capabilities. Upon self-registration, an administrator can directly log in to the system without the need for external approval, ensuring uninterrupted access to their dashboard. Within their purview lies the responsibility to manage the doctor's profiles by registering new doctors, reviewing their applications, and making decisions on their approval or rejection based on employment needs of the hospital. Furthermore, the admin has the authority to remove a doctor’s access to the system if necessary.

Administrators are also tasked with patient management; they oversee the admission process, monitor the status of inpatients, and have the authority to approve or reject admission requests. When a patient’s treatment concludes, the admin is responsible for facilitating their discharge from the hospital. An essential function of the admin role is the generation and downloading of invoices. They compile costs incurred from medical care, including medicine, room charges, doctor's fees, and any additional services rendered, to produce detailed and accurate billing documents in PDF format for patients.

Additionally, the administrator plays a key role in the appointment scheduling process. They view and manage booking requests and possess the discretion to approve appointments sought by patients, ensuring the appointment schedules align with the hospital's operational flow and doctor availability. This suite of functionalities underscores the administrator's crucial role in maintaining the hospital's efficiency and service quality.

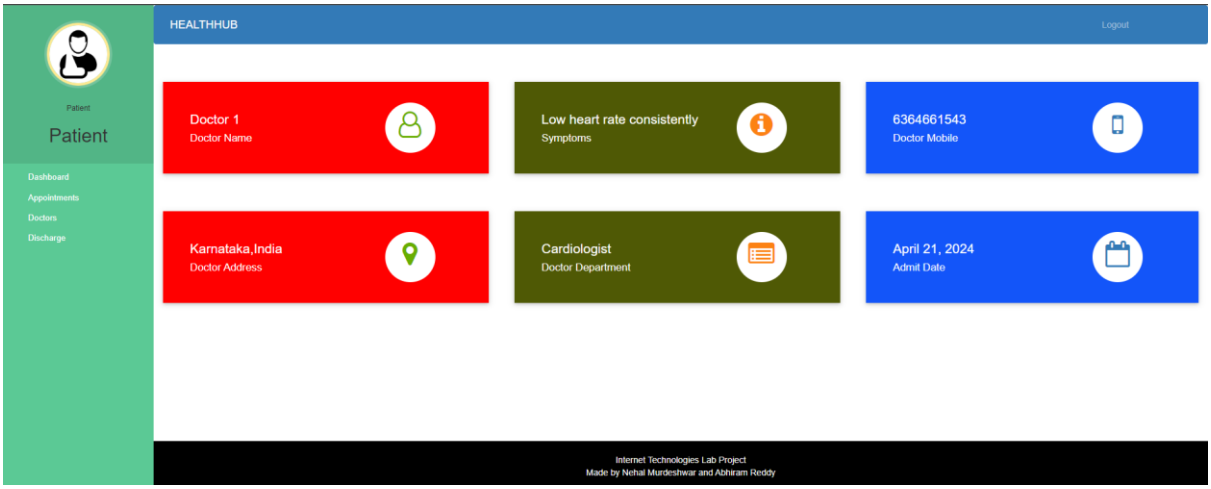

Figure I. Patient Dashboard

The patient dashboard, as depicted in the image, is a tailored section of the Hospital Management System designed with patient engagement and information accessibility in mind. Upon logging in, patients are greeted with a user-friendly interface that showcases essential information at a glance. This includes a clear display of their assigned doctor, complete with name and department, and direct contact information, which is crucial for maintaining open lines of communication. Patients can also see a summary of their medical issues, such as symptoms, thus keeping their health concerns front and center.

The dashboard layout ensures that patients are aware of their admission details, like the date of admission, and it simplifies the process of managing their hospital stay. This dedicated patient portal is integral to the system, fostering a sense of involvement in the patients' own healthcare journey and providing them with a sense of autonomy over their personal health information. Such a design philosophy underpins the system's commitment to delivering a healthcare experience that is not only efficient but also empathetic and patient-oriented.

In the Hospital Management System, a patient-oriented process is established, starting with account creation, which is a prerequisite for admission to the hospital. This initial step requires administrative approval, ensuring that only authenticated patients can proceed to log in to the system. Once access is granted, patients can actively engage with various facets of their medical care.

The patient portal allows individuals to view detailed profiles of their assigned doctors, including specializations, contact details, and office locations, fostering an environment of transparency and ease of communication. Moreover, patients have the capability to check the status of their appointments, with clear indicators for those still pending admin confirmation and those that have been confirmed, thus keeping them informed of their upcoming consultations.

Appointment scheduling is another critical feature available to patients. They can book appointments through the system, which are subject to admin approval, ensuring that scheduling aligns with hospital operations and doctor availability.

Furthermore, the system provides patients with access to their financial transactions with the hospital. Once a patient is discharged by the admin, they have the option to view and download a detailed invoice PDF, which includes all charges incurred during their stay. This document serves as an official record of the services rendered and the expenses associated.

This systematic, yet patient-centered approach emphasizes the importance of administrative oversight while granting patients meaningful access to their health and administrative information, thereby enhancing the patient experience within the hospital's ecosystem.

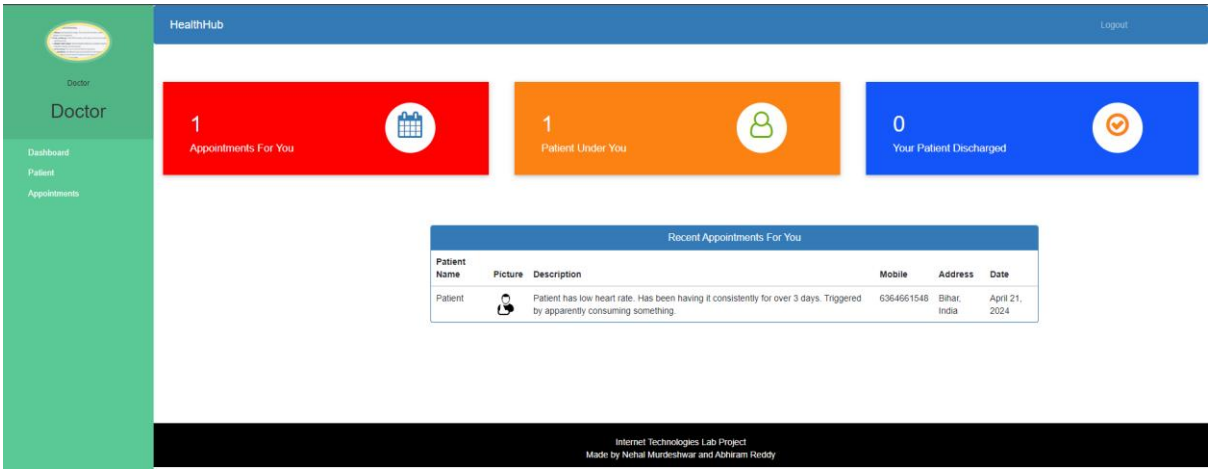

Figure J. Doctor Dashboard

For doctors within the Hospital Management System, their interaction begins with an application process for a position at the hospital. Post-application, they require administrative approval to gain access to their dedicated portal—a process that ensures the vetting of medical professionals and maintains hospital security protocols. Upon successful login, doctors have the ability to view the list of patients assigned to them by the hospital administrator, providing vital information such as symptoms, contact details, and medical history, which are essential for preparing and delivering appropriate medical care.

Doctors also have the functionality to monitor their list of discharged patients. This helps maintain a record of past treatments and patient outcomes—a valuable tool for follow-up care and medical history analysis. Additionally, the system allows doctors to view upcoming appointments scheduled by the hospital admin, aiding in effective time management and patient consultation preparation.

Importantly, doctors can manage their appointment schedules within the system, including the deletion of appointments once they have been completed, ensuring the schedule reflects current and upcoming commitments accurately. This closed-loop system not only streamlines the communication between doctors and the administration but also centralizes patient care under one accessible, manageable digital roof, enhancing the overall efficiency of the hospital's operations.

C. Invoice Page

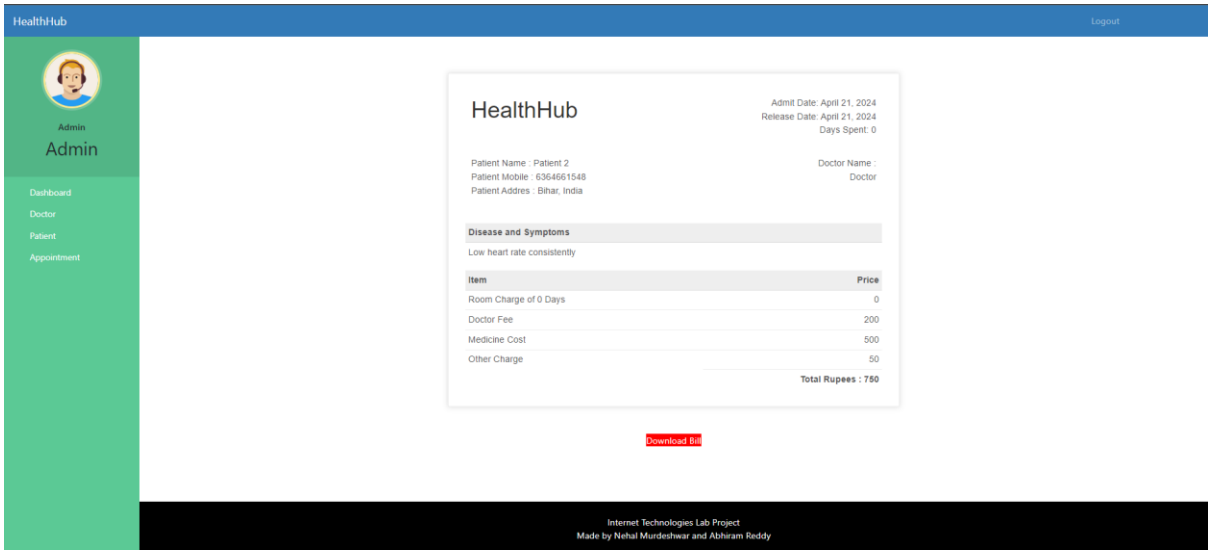

Figure K. Invoice Page

The invoice interface within the Hospital Management System, as illustrated in the image, is a crucial component of the administrative toolkit, enabling efficient financial management. This particular interface displays a comprehensive summary of a patient's hospital charges, neatly categorized into items such as room charges, doctor's fees, medication costs, and other miscellaneous fees. It presents the pertinent details of the patient's stay, including admission and release dates, alongside a diagnosis summary, establishing context for the incurred charges.

The displayed charges are meticulously itemized, allowing for transparency and clarity in billing. The total amount due is clearly calculated and presented, ensuring that both the administration and the patients have a mutual understanding of the financial obligations. A prominent feature is the 'Download Bill' option, which affords users the convenience of obtaining a portable copy of the invoice, typically in PDF format, for their records or insurance purposes.

This interface exemplifies the system's commitment to providing clear, accessible financial information, a testament to the system's dedication to ensuring straightforward and honest communication regarding patient billing.

VII. **LIMITATIONS AND FUTURE WORK**

The current iteration of this hospital management system, while robust and feature-rich, presents certain drawbacks and loopholes that could be addressed in future updates to enhance security and operational logic.

A notable security concern is the current capability for anyone to register as an admin without any approval process. This openness could potentially lead to unauthorized access and misuse of sensitive information. As a future safeguard, disabling the admin signup process from the user interface and shifting to a more secure method of account creation, such as creating superuser accounts via backend processes or implementing an invitation-only registration system with multi-factor authentication, would significantly enhance system integrity.

Another operational limitation is the system's requirement to have at least one doctor registered before any patient admissions. This dependency creates a bottleneck in the event of a new hospital setup where patient intake must be deferred until a doctor is onboarded. Future versions could automate the doctor addition process during initial system setup or provide a temporary solution to admit patients with a generic doctor account that can be reassigned later.

Furthermore, the necessity to update passwords on the update pages of doctor/patient profiles presents a security risk. Users could inadvertently lower their account security if forced to change passwords frequently or in an unsecured manner. A more refined approach would involve separating password updates from other profile changes, perhaps moving to a dedicated secure module that includes password strength validation and the option for password resets via email verification.

Future work could also explore the development of an integrated feedback loop, allowing system users to report issues or suggest enhancements. This would ensure continuous improvement and responsiveness to user needs. Additionally, implementing AI-driven analytics could offer predictive insights into hospital operations, such as forecasting patient admission rates and optimizing staff allocation.