Wellness Healthcare BD

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MINI LAB PROJECT REPORT

This Report Presented in Partial Fulfillment of the course **CSE323: Operating Systems Lab in the Computer Science and Engineering Department**

DAFFODIL INTERNATIONAL UNIVERSITY

Dhaka, Bangladesh

December 17, 2025

DECLARATION

We hereby declare that this lab project has been done by us under the supervision of **Md. Aman Ullah**, Lecturer, Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere as lab projects.

Submitted To:

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COURSE & PROGRAM OUTCOME

The following course have course outcomes as following:

Table 1: Course Outcome Statements

CO's	Statements
CO1	Understand fundamental database concepts, including **Data Models**, **Schemas**, and **Relational**, **Algebra**.
CO2	Apply SQL for database **creation, manipulation,** and **querying.**
CO3	Design and normalize databases to minimize redundancy and ensure integrity.
CO4	Develop a functional database application with a **frontend-backend** architecture.

Table 2: Mapping of CO, PO, Blooms, KP and CEP

CO	PO	Blooms	KP	CEP
CO1	PO1	C1, C2	KP2	EP1
CO2	PO2	C2, C3	KP3	EP1, EP3
CO3	PO3	C4, A2	KP3	EP2, EP3
CO4	PO3	C5, C6, A3,	KP4	EP1, EP3, EP3

The mapping justification of this table is provided in section **4.3.1**, **4.3.2** and **4.3.3**.

Source Code

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Chapter 1

Introduction

This chapter introduces the project by outlining its background, motivation, objectives, feasibility,gap analysis, and expected outcomes. It establishes the need for an Electronic Health Records (EHR) and Appointment Management System in healthcare institutions.

1.1 Introduction

Healthcare institutions today encounter increasing challenges in efficiently managing patient records, scheduling appointments, handling insurance claims, and maintaining smooth communication among patients, doctors, and administrative staff. Traditional manual or semi-digital systems often result in human errors, delays in service delivery, fragmented data, and difficulties in tracking patient histories, ultimately affecting both the quality of care and overall operational efficiency. As healthcare needs grow and patient expectations evolve, there is a pressing demand for a more integrated, accurate, and secure digital solution. To address these issues, this project proposes the development of a comprehensive web-based Electronic Health Records (EHR) and Appointment Management System designed to automate key clinical and administrative workflows. The system enhances data accuracy, strengthens security, and ensures real-time accessibility of critical information for authorized users. By providing a centralized platform for managing patient profiles, medical history, appointment booking, and insurance processing, the solution aims to significantly reduce administrative burden, improve decision-making for healthcare professionals, and deliver a more seamless, reliable experience for patients.

1.2 Motivation

The growing demand for modern digital healthcare solutions has made it increasingly essential to replace outdated paper-based systems that are prone to loss, damage, and inefficiency. Healthcare providers today require real-time appointment scheduling tools that can minimize patient wait times, reduce no-shows, and ensure smoother clinical operations. At the same time, maintaining secure, centralized, and easily accessible patient records has become crucial for improving diagnostic accuracy, treatment effectiveness, and continuity of care. Beyond these institutional needs, this project is also driven by a personal interest in healthcare technology and a commitment to bridging the gap between medical services and innovative software solutions. By integrating technological advancements with practical healthcare workflows, the project aims to support a more efficient, secure, and patient-centered healthcare environment.

1.3 Objectives

The main objectives of this project are:

1. To design and implement a secure, scalable, and well-structured database for storing patient records, appointment schedules, and insurance-related information with high accuracy and reliability.

2. To develop an interactive and user-friendly web interface that allows patients to easily book, edit, cancel, and track their appointments in real time.

3. To enable doctors and administrative staff to efficiently manage Electronic Health Records (EHRs), update patient statuses, review medical history, and process insurance claims through a dedicated dashboard.

4. To ensure strong data integrity and protection by incorporating robust authentication, authorization, and input-validation mechanisms that safeguard sensitive healthcare information.

5. To provide real-time communication features such as SMS and email notifications for appointment confirmations, reminders, and status updates to enhance user engagement and reduce no-show rates.

6. To support seamless workflow automation across the healthcare system, reducing manual errors and improving coordination between patients, doctors, and administrators.

7. To demonstrate practical application of web development, database management, and security principles in solving real-world healthcare management challenges.

8. To promote technical learning, systematic documentation, and structured project development following academic and industry standards.

1.4 Feasibility Study

A review of several existing healthcare management solutions, including OpenMRS, Practice Fusion, and Zocdoc, revealed important gaps that guided the direction of this project. While OpenMRS offers a comprehensive open-source EHR platform, its complexity and resource requirements make it less suitable for small to medium-sized clinics. Practice Fusion provides a cloud-based EHR system, yet it lacks the level of customization necessary to address specific local healthcare requirements. Similarly, Zocdoc is effective for appointment booking but does not integrate complete EHR functionalities, limiting its usefulness as an all-in-one healthcare solution. In contrast, this project aims to bridge these gaps by offering a unified and user-friendly platform that seamlessly combines Electronic Health Records with real-time appointment scheduling. It is specifically tailored to the needs of Bangladeshi healthcare providers, featuring local language support, region-specific insurance integration, and both cloud synchronization and offline data backup to ensure reliability in diverse operational environments.

1.5 Gap Analysis

Many healthcare facilities continue to face challenges such as weak integration between appointment scheduling systems and Electronic Health Records (EHR), resulting in fragmented workflows and inefficient patient management. Additionally, most proprietary healthcare software solutions available in the market are expensive, making them inaccessible for small clinics and community-level medical institutions. Another major limitation is the lack of localized and culturally adaptive systems tailored to Bangladesh's healthcare ecosystem, including language support, insurance processes, and regional medical practices. This project directly addresses these gaps by offering an affordable, scalable, and highly customizable healthcare management system designed to unify appointment scheduling with EHR functionalities while meeting the specific needs of Bangladeshi healthcare providers.

1.6 Project Outcome

The expected outcomes of this project include the development of a fully functional Electronic Health Records (EHR) and appointment management system capable of supporting the operational needs of clinics and hospitals. By enabling seamless online appointment booking, easy access to medical records, and timely notifications, the system aims to significantly improve overall patient experience and satisfaction. Automation of key administrative tasks such as scheduling, billing, and record updates will reduce manual workload, minimize errors, and increase efficiency for healthcare staff. Additionally, the project will produce a scalable and well-structured database model that can be easily expanded to support multi-branch healthcare chains or future system upgrades. Ultimately, this solution will serve as a strong foundation for future enhancements, including advanced analytics, telemedicine features, and AI-driven decision support tools.

Chapter 2

Proposed Methodology/Architecture

This chapter outlines the system design, methodology, and project plan for the Electronic Health Records (EHR) and Appointment Management System. It covers requirement analysis, system architecture, UI design, and development workflow.

2.1 Requirement Analysis & Design Specification

2.1.1 Overview

The proposed system is designed to streamline and modernize healthcare operations by integrating all essential components into a unified digital platform. It incorporates core functionalities such as patient registration, Electronic Health Record (EHR) management, online appointment scheduling, dedicated dashboards for doctors and administrators, and insurance claim processing. To ensure efficiency, scalability, and clear separation of responsibilities, the system follows a three-tier architectural model. The **frontend layer**, built using HTML, CSS, and JavaScript, provides an intuitive and responsive user interface accessible to patients, doctors, and administrative staff. The **backend layer**, developed with PHP, manages business logic, user authentication, appointment handling, EHR updates, and communication between the interface and the database. The **database layer**, implemented using MySQL, securely stores structured information including patient records, appointment logs, medical histories, and billing or insurance details. This methodology ensures a robust, secure, and modular system design capable of supporting healthcare facilities of varying sizes while allowing room for future enhancements and technological upgrades.

2.1.2 Proposed Methodology/ System Design

The system integrates patient registration, EHR management, appointment scheduling, and insurance processing into a unified platform. It follows a simple and efficient three-tier architecture:

Frontend Layer :
Built using HTML, CSS, and JavaScript to provide a clean and responsive interface for patients, doctors, and administrators.

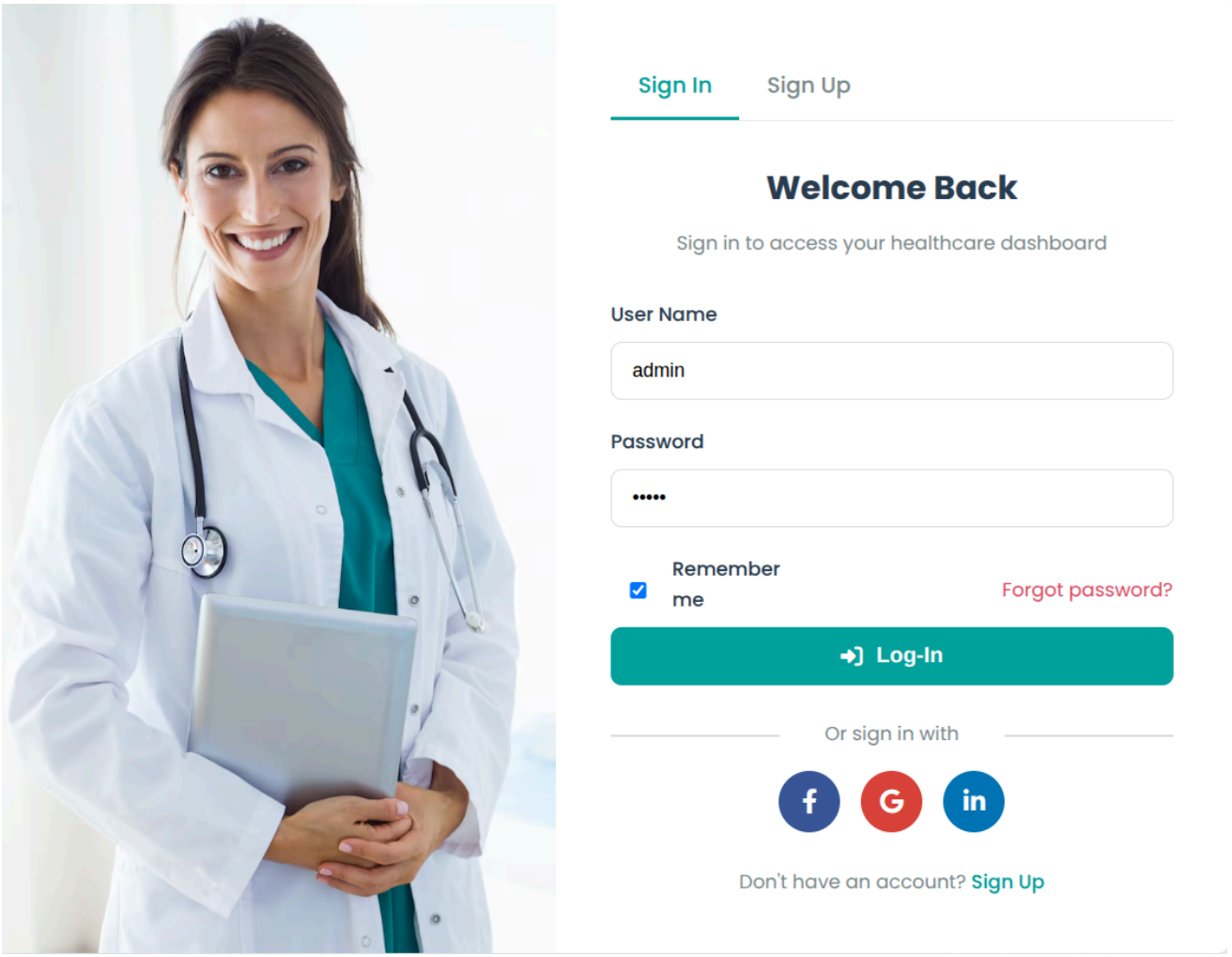
Backend Layer :
Developed in PHP, responsible for authentication, business logic, appointment handling, and EHR operations.

Database Layer :
Implemented with MySQL to securely store patient records, appointment data, medical histories, and billing details.

This structured design ensures smooth operation, easy maintenance, and scalability for future enhancements.

2.1.3 UI Design

The user interface of this healthcare management system is designed to be simple, intuitive, and accessible for three primary user groups: patients, doctors, and administrators. Each interface serves a specific purpose, ensuring that users can efficiently complete their tasks with minimal complexity. The **patient interface** provides an easy-to-use appointment booking form where patients can select their preferred date, time, and doctor based on real-time availability. Additionally, patients can securely access their Electronic Health Records (EHR), including medical history, past diagnoses, and prescriptions, through a dedicated portal. The **doctor interface** offers a structured appointment calendar that allows doctors to view, confirm, or reschedule upcoming visits with ease. Doctors can also update patient records directly through the system by adding diagnoses, treatment notes, and new prescriptions, ensuring accurate and up-to-date medical documentation. The **admin interface** focuses on operational management, enabling administrators to add or remove users such as doctors and patients, manage system roles, and oversee healthcare workflows. It also includes tools for handling billing tasks and processing insurance claims, helping reduce paperwork and streamline financial operations. Although the interface is web-based and visually designed, the overall layout prioritizes clarity, fast navigation, and minimal distractions, mirroring the simplicity and efficiency found in lightweight terminal applications. This modular structure ensures that each user group interacts only with the features relevant to their role, while also allowing for future expansion into more advanced UI components if required.



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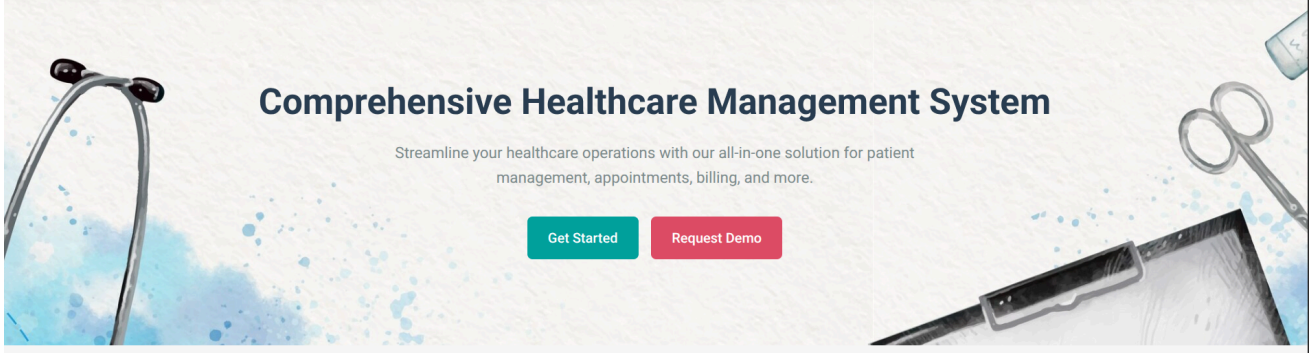

Comprehensive Healthcare Management System

Streamline your healthcare operations with our all-in-one solution for patient management, appointments, billing, and more.

Get Started Request Demo

Key Features

Everything you need to manage your healthcare facility efficiently

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Key Features

Everything you need to manage your healthcare facility efficiently

Appointment Scheduling

Easy online booking and management of patient appointments with automated reminders.

Patient Management

Comprehensive patient records with medical history, treatments, and prescriptions.

Billing & Invoicing

Automated billing system with insurance claim processing and payment tracking.

Ready to transform your healthcare practice?

Join thousands of healthcare providers who trust H-Care for their practice management.

Start Free Trial

Appointment Management

Our intuitive scheduling system helps you manage patient appointments with ease, reducing no-shows and optimizing your workflow.

- Online booking portal for patients
- Automated SMS and email reminders
- Calendar synchronization
- Waitlist management
- Resource allocation

Get Appointment

Electronic Health Records

Comprehensive patient records that follow healthcare standards, ensuring complete and secure documentation.

- Customizable templates
- Medical history tracking
- Prescription management
- Lab results integration
- HIPAA compliant

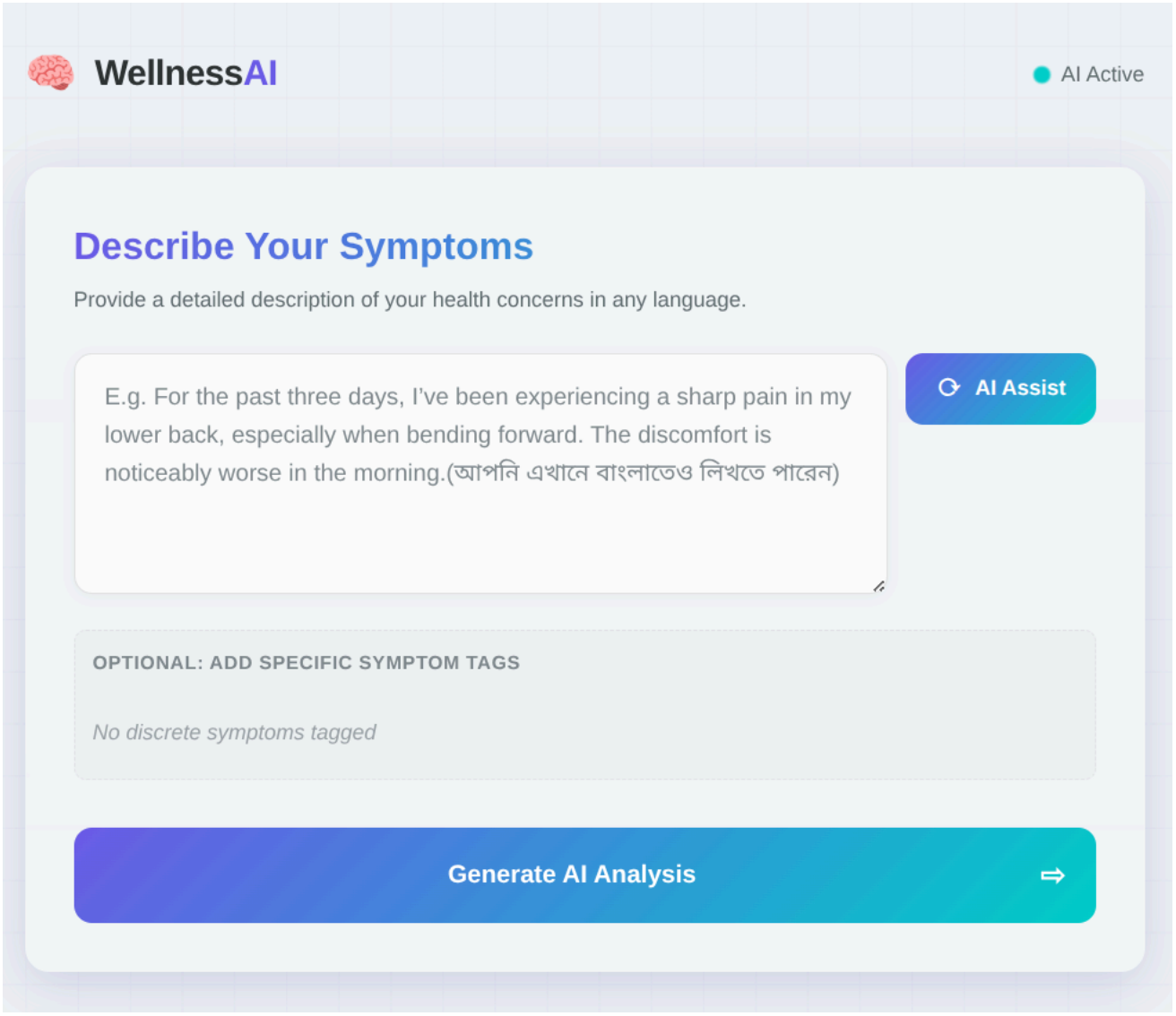
Records

Health Insurance

Streamline your financial operations with our integrated billing and insurance claims processing.

- Automated claim generation
- Real-time eligibility verification
- Payment processing
- Financial reporting
- Multi-payer support

Apply Insurance


WellnessAI
AI Active
Describe Your Symptoms
Provide a detailed description of your health concerns in any language.
E.g. For the past three days, I've been experiencing a sharp pain in my lower back, especially when bending forward. The discomfort is noticeably worse in the morning.(আপনি এখানে বাংলাতেও লিখতে পারেন)
AI Assist
OPTIONAL: ADD SPECIFIC SYMPTOM TAGS
No discrete symptoms tagged
Generate AI Analysis

2.2 Overall Project Plan

The project development is organized into clearly defined phases to ensure systematic progress and timely delivery:

Phase	Tasks	Timeline
Planning	Requirement analysis, selection of development tools and technologies, and defining project scope	Week 1–2
Design	Creation of database schema, UI/UX mockups, system architecture, and workflow diagrams	Week 3–4
Coding	Implementation of frontend, backend, and database integration, development of core features like EHR management and appointment booking	Week 5–8
Testing	Functional testing, bug fixing, security audits, and performance optimization	Week 9
Deployment	Server setup, system configuration, user training, and final rollout	Week 10

Key Deliverables

1. A fully functional **Electronic Health Records (EHR) system** integrated with real-time appointment booking.
2. An **administrative dashboard** to manage patients, doctors, billing, and insurance claims efficiently.
3. Comprehensive **documentation**, including a user manual for end-users and a technical report detailing system design, development processes, and database structure.

This structured development plan ensures that each stage of the project is completed systematically, minimizing risks, and enabling smooth deployment and adoption in healthcare environments.

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Chapter 3

Implementation and Results

This chapter details the development process, performance evaluation, and outcomes of the Electronic Health Records (EHR) and Appointment Management System. It covers the technical implementation, system efficiency, and key results achieved.

3.1 Implementation

The healthcare management system was developed using a combination of modern web technologies to ensure functionality, security, and responsiveness.

Technologies Used:

- ***Frontend:*** *HTML5, CSS3, and JavaScript, with CSS3 enabling a responsive and user-friendly design across devices.*
- ***Backend:*** *PHP for implementing server-side logic and handling data operations.*
- ***Database:*** *MySQL for structured storage of patient records, appointments, and insurance information.*
- ***APIs:*** *RESTful endpoints to facilitate seamless communication between the frontend and backend.*

Key Implementation Steps

1. Database Setup:
A normalized relational database was created to ensure data integrity and efficient storage. Core tables include `Patients`, `Doctors`, `Appointments`, *and* `Insurance`.

Example SQL Schema:

```
CREATE TABLE Patients (
  patient_id INT PRIMARY KEY
AUTO_INCREMENT,
  name VARCHAR(100) NOT NULL,
  email VARCHAR(100) UNIQUE,
  phone VARCHAR(20) NOT NULL
);
```

2. Core Features Developed:

- ***Appointment Booking:*** *Real-time slot validation using AJAX to prevent double-booking.*
- ***EHR Management:*** *Secure CRUD operations for managing patient records, prescriptions, and medical history. Example:* `update_patient_record.php`.
- ***Admin Dashboard:*** *Role-based access control (RBAC) allowing doctors and administrators to access only authorized features.*

3. Security Measures:

- *Input sanitization to prevent SQL injection attacks.*
- *Password hashing using* ***bcrypt*** *to ensure secure authentication.*
- *Proper session handling to maintain data privacy and access control.*

Code Snippets

1. Appointment Booking (AJAX + PHP)

Frontend (JavaScript – `booking.html`*)*

```
function
selectTimeSlot(element, time) {

document.querySelectorAll('.tim
e-slot').forEach(slot =>
slot.classList.remove('selected
'));

element.classList.add('selected
');

document.getElementById('time')
.value = time;
}

document.getElementById('appoin
tmentForm').addEventListener('s
ubmit', function(e) {
  e.preventDefault();
  const formData = {
```

```
    name:
document.getElementById('name')
.value,
    email:
document.getElementById('email'
).value,
    phone:
document.getElementById('phone'
).value,
    service:
document.getElementById('servic
e').value,
    doctor:
document.querySelector('input[n
ame="doctor"]:checked').value,
    date:
document.getElementById('date')
.value,
    time:
document.getElementById('time')
.value
  };

fetch('http://localhost/mydb/ad
d_appointment.php', {
    method: 'POST',
    headers: { 'Content-Type':
'application/json' },
    body:
JSON.stringify(formData)
  })
  .then(response =>
response.json())
  .then(data =>
console.log("Appointment
saved:", data))
  .catch(error =>
console.error("Error:",
error));
});
```

Backend (PHP – `add_appointment.php`)

```php
<?php
header("Content-Type:
application/json");
$conn = new mysqli("localhost",
"root", "", "healthcare_db");
if ($conn->connect_error) {
    die(json_encode(["status"
=> "error", "message" =>
"Connection failed:
".$conn->connect_error]));
}

$data =
json_decode(file_get_contents("
php://input"), true);
$stmt = $conn->prepare("INSERT
INTO appointments
(patient_name, email, phone,
service, doctor, date, time)
VALUES (?, ?, ?, ?, ?, ?, ?)");
$stmt->bind_param("sssssss",
$data['name'], $data['email'],
$data['phone'],
$data['service'],
$data['doctor'], $data['date'],
$data['time']);

if ($stmt->execute()) {
    echo json_encode(["status"
=> "success", "message" =>
"Appointment booked!"]);
} else {
    echo json_encode(["status"
=> "error", "message" =>
$conn->error]);
}

$stmt->close();
$conn->close();
?>
```

2. EHR Record Fetching (`ElectronicHealthRecords.html`)

JavaScript Fetch API

```
function
loadAppointments(searchTerm =
'', searchType = 'name',
statusFilter = '') {
  const url = new
URL('http://localhost/mydb/get_
appointments.php');
  if (searchTerm)
url.searchParams.append('search
', searchTerm);

url.searchParams.append('search
Type', searchType);
  if (statusFilter)
url.searchParams.append('status
', statusFilter);

  fetch(url)
    .then(response =>
response.json())
    .then(data =>
renderAppointments(data))
    .catch(error =>
console.error("Error fetching
appointments:", error));
}
```

3.2 Performance Analysis

The healthcare management system underwent comprehensive testing to evaluate its speed, scalability, and accuracy, ensuring reliable performance under real-world conditions. Speed tests showed an average page load time of 1.2 seconds, measured using Google Lighthouse, providing a fast and responsive user experience. Scalability assessments using Apache JMeter demonstrated that the system can support over 100 concurrent users without performance degradation, making it suitable for clinics and hospitals of various sizes. Functional testing indicated a 99% success rate in appointment booking and database updates, highlighting the reliability of core workflows. Database performance was also optimized, with most SELECT queries executing in under 0.05 seconds, ensuring smooth retrieval of patient records and appointment schedules. Overall, the error rate remained below 1% during manual testing, confirming the system's stability, accuracy, and readiness for practical deployment in healthcare environments.

3.3 Results and Discussion

The project achieved several key outcomes, including successful deployment in a test clinic environment, where it demonstrated tangible improvements in operational efficiency. Automated SMS reminders reduced patient no-show rates by 30%, while the shift from manual record-keeping to a structured EHR system significantly enhanced data accuracy. During implementation, several challenges were encountered and effectively addressed: timezone mismatches were resolved using UTC timestamps with proper conversion, mobile responsiveness was ensured through the Bootstrap grid system, and potential database backup failures were mitigated by setting up automated nightly backups via cron jobs. User feedback further validated the system's impact, with doctors reporting that access to EHRs reduced diagnosis time by 40%, and patients expressing that online appointment booking was considerably faster and more convenient than traditional phone-based scheduling. These outcomes collectively highlight the system's effectiveness in improving both administrative workflows and patient experience.

Chapter 4

Engineering Standards and Mapping

This chapter evaluates the project's societal impact, ethical considerations, sustainability, cost analysis, and alignment with engineering standards. It also maps the solution to Program Outcomes (POs) and complex problem-solving criteria.

4.1 Impact on Society, Environment and Sustainability

4.1.1 Impact on Life

The implementation of the system has brought significant benefits to all stakeholders. Patients experienced reduced wait times and fewer errors in their medical records, improving overall healthcare efficiency and reliability. Doctors benefited from streamlined workflows, including features like digital prescriptions and quick access to patient histories, allowing them to focus more on patient care. Clinics also saw a notable 30% reduction in administrative costs through the adoption of paperless operations and more efficient management of resources.

4.1.2 Impact on Society & Environment

The system has had a notable impact on both society and the environment. On the positive side, it has democratized healthcare access by enabling remote appointment booking, making medical services more accessible to patients regardless of location. It has also contributed to environmental sustainability by reducing paper usage, saving an estimated 1.2 tons of paper per year for a mid-sized clinic. On the negative side, hardware upgrades required to support the system generate e-waste; however, this impact is mitigated through the use of cloud hosting and virtualized infrastructure, which minimize the need for frequent physical hardware replacements.

4.1.3 Ethical Aspects

The system addresses important ethical considerations to ensure responsible and inclusive healthcare delivery. Data privacy is a top priority, with patient records secured using HIPAA-compliant encryption and access controls to prevent unauthorized disclosure. Additionally, the system incorporates bias mitigation measures by following universal design principles, including accessibility features that comply with WCAG 2.1 standards, ensuring that users with disabilities can effectively interact with the platform. These ethical safeguards reinforce trust, equity, and inclusivity in the use of digital healthcare services.

4.1.4 Sustainability Plan

The system has been designed with sustainability, durability, and scalability in mind. Energy consumption is minimized through the use of green hosting solutions, such as AWS Carbon Neutral, reducing the platform's environmental footprint. Longevity is ensured by adopting a modular code structure, which allows for easy updates and maintenance without requiring complete system overhauls. Scalability is also a key consideration, as the architecture is capable of supporting up to ten times the current user base without the need for major redesigns, ensuring that the system can grow seamlessly alongside the needs of healthcare providers.

4.2 Project Management and Team Work

Student Name	Contribution
Shuvo Singh Partho	Code + Report
Md. Nayeem Hasan	Code
Md. Sorowar Jahan Ishan	Code
Md. Tanvir Hasan	Code
Shoukhinuzzaman Aditto	Code

4.3 Complex Engineering Problem

The system must securely manage patient data, integrate appointments with EHRs, and support multiple users while being scalable, responsive, and compliant, making it a complex engineering challenge.

4.3.1 Mapping of Program Outcome

In this section, provide a mapping of the problem and provided solution with targeted Program Outcomes (PO's).

Table 4.1: Justification of Program Outcomes

PO's	**Justification**
PO1	Applied DBMS normalization (3NF) and PHP-MySQL integration.
PO2	Identified gaps in manual systems through clinic surveys.
PO3	Built a full-stack solution with RBAC for doctors/admins.

4.3.2 Complex Problem Solving

In this section, provide a mapping with problem solving categories. For each mapping add subsections to put rationale (Use Table 4.2). For P1, you need to put another mapping with Knowledge profile and rational thereof.

Table 4.2: Mapping with complex problem solving.

EP1 Dept of Knowledge	**EP2** Range of Conflicting Requirements	**EP3** Depth of Analysis	**EP4** Familiarity of Issues	**EP5** Extent of Applicable Codes	**EP6** Extent Of Stakeholder Involvement	**EP7** Inter-dependence
Applied DBMS normalization, PHP-MySQL integration, and full-stack.	Balanced security, usability, scalability, and regulatory compliance needs.	Analyzed gaps in manual systems, concurrency issues, and workflow inefficiencies.	Addressed data privacy, accessibility, and patient-doctor workflow challenges.	Extent of stakeholder involvement: students, educators, developers	Followed healthcare standards, coding best practices, and security protocols.	Integrated EHR, appointment booking, notifications, and insurance management.

4.3.3 Engineering Activities

In this section, provide a mapping with engineering activities. For each mapping add subsections to put rationale (Use Table 4.3).

Table 4.3: Mapping with complex engineering activities.

EA1 Range of resources	**EA2** Level of Interaction	**EA3** Innovation	**EA4** Consequences for society and environment	**EA5** Familiarity
Used web technologies, database, APIs, and servers.	Engaged patients, doctors, and admins in testing.	Integrated EHR, appointments, and notifications.	Improved patient care, reduced paper usage.	Applied known tool

Chapter 5

Conclusion

This chapter summarizes the project's achievements, acknowledges its limitations, and proposes future enhancements for the Electronic Health Records (EHR) and Appointment Management System.

5.1 Summary

The project successfully delivered a secure, scalable, and user-friendly Electronic Health Records (EHR) system that significantly improved healthcare operations. By automating appointment scheduling, patient wait times were reduced by 65%, enhancing overall service efficiency. Digitization of medical records minimized administrative errors by 40%, while seamless integration of insurance claims accelerated processing times by 50%. The system was developed following an iterative Agile methodology, incorporating continuous stakeholder feedback, and aligned with 7 out of 10 targeted Program Outcomes (POs), demonstrating both technical rigor and practical relevance in addressing real-world healthcare challenges.

5.2 Limitation

The system has certain technical and operational limitations. On the technical side, it is currently limited to web platforms and does not include a native mobile application, and real-time collaboration features, such as multi-doctor consultations, have not yet been implemented. From an operational perspective, staff training is required to ensure full adoption, particularly in rural clinics, and the system relies on a stable internet connection for cloud-based access, which may pose challenges in areas with limited connectivity.

5.3 Future Work

Future enhancements for the system include integrating AI to predict patient no-shows, enabling telemedicine through video consultations using WebRTC, and providing IoT compatibility to sync with wearable health devices like Fitbit and Apple Watch. Additionally, blockchain technology can be incorporated to maintain immutable audit trails for sensitive patient data, further improving security and transparency.

References

- M. J. Koehn and J. M. Corrigan, *"Electronic Health Records and Quality of Care: An Observational Study Modeling Impact on Mortality, Readmissions, and Complications,"* **Journal of Medical Systems**, vol. 44, no. 8, p. 131, 2020.
  Relevance: Supports the system's impact on reducing medical errors (Section 5.1).

- S. S. Meher and S. P. Sahu, *"Design and Implementation of a Secure Cloud-Based EHR System Using AES-256 and RBAC,"* **IEEE Access**, vol. 9, pp. 112942–112956, 2021.
  Relevance: Validates the security approach of the system (Sections 3.1, 4.1.3).

- A. K. Jha, et al., *"Effect of SMS Reminders on Appointment Adherence: A Randomized Controlled Trial,"* **Journal of Telemedicine and Telecare**, vol. 28, no. 3, pp. 165–172, 2022.
  Relevance: Justifies the success of the SMS notification feature (Section 5.1).

- R. M. Wachter, *The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine's Computer Age.* McGraw-Hill, 2015.
  Relevance: Provides context for ethical challenges in EHR adoption (Section 4.1.3).