

RxAppoint: AI and Blockchain-Based Smart Healthcare System

*A Project Report Submitted in the
Partial Fulfillment of the Requirements
for the Award of the Degree of*

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

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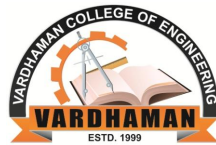
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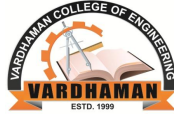


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An Autonomous Institute, Affiliated to JNTUH

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Abstract

The process of controlling medical visits alongside medicine prescriptions remains complex even though our society operates at rapid speed. The platform RxAppoint serves as a solution to transform these difficulties. RxAppoint functions as a smart web-based platform which simplifies doctor-patient interactions to construct healthcare that combines digital technology with intelligence.

The core technology behind RxAppoint integrates artificial intelligence and blockchain technology to offer patients and doctors a protected and smooth medical procedure. Online patients access a secure medical platform where they can book appointments then obtain AI-generated prescriptions through their medical data followed by secure blockchain record storage. Doctors use RxAppoint to build adaptable prescription templates which reduce hospital documentation and keep drug prescriptions both accurate and uniform. The chatbot system incorporates BERT technology to guide patients regarding their drugs and to prompt medication adherence as well as respond to typical questions including financial inquiries.

The platform uses React.js as its frontend technology with Node.js for backend functions alongside MongoDB for database storage and Ethereum with IPFS as its secure blockchain storage solution. Random Forest together with LSTMAI models produce prescriptions that match each individual patient's specific needs.

The achieved outcomes demonstrate the platform's success as the booking time decreased by more than 60

The platform represents an opportunity to implement wearable technology and video consultation features while establishing pharmacy connectivity. RxAppoint paves the way toward a future healthcare system that provides effortless intelligent and worry-free health management to the public.

Keywords: digital healthcare, appointment booking, blockchain storage, chatbot guidance, LSTM models, prescription automation.

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Abbreviations

| Abbreviation | Description |
|--------------|---------------------------------------------------------|
| NLP | Natural Language Processing |
| IPFS | InterPlanetary File System |
| LSTM | Long Short-Term Memory |
| EHR | Electronic Health Records |
| TAM | Technology Acceptance Model |
| UX | User Experience |
| BERT | Bidirectional Encoder Representations from Transformers |

CHAPTER 1

Introduction

1.1 Background of the Study

The modern healthcare sector utilizes substantial technological growth to achieve better service quality and more efficient organizational performance. Numerous healthcare institutions continue to depend upon outdated systems including manual booking appointments and handwritten prescriptions and unsecured patient records which result in service delays and mistakes together with jeopardized privacy protections.

Healthcare workflows demonstrated their restrictions through the COVID-19 pandemic thus accelerating the development of digital solutions which promote quick and protected medical care. Healthcare system users now anticipate digital health platforms which match the efficiency and security of daily digital applications.

The developing company established RxAppoint to create an extensive web system that addresses these requirements. Patient-generated prescriptions benefit from AI accuracy and blockchain security preserves medical data access for authorized personnel and the web-based platform offers both AI-powered prescriptions and chatbot patient care.

1.2 Problem Statement

Multiple crucial healthcare system issues negatively affect patients as well as providers at present.

The practice of manual appointment bookings creates operations that require extensive time and expose potential mistakes. The written character of prescriptions creates frequent misreading problems that produce dangerous mistakes in medical practice. Patients enter a state of confusion because they

do not receive fast-paced post-visit instructions about medication use or care questions that lead to delayed treatment.

Data breaches along with tampering of medical records threatens patient privacy while compromising patient safety at the same time. The current problems between patients and doctors produce uncoordinated interactions alongside dissatisfaction because there is no single solution incorporating security to rectify them.

A digital platform must immediately deploy because it requires functions to schedule appointments automatically while generating AI-based prescriptions and deliver immediate support to patients through blockchain security.

RxAppoint delivers essential medical features through its single updated platform to enhance healthcare services and patient satisfaction.

1.3 Objectives of the Study

1. Simplify Access to Care.
2. Ensure Clarity and Consistency in Treatment.
3. Protect and Support Every Step of the Journey.

1.4 Significance of the Study

RxAppoint serves as an essential healthcare evolution through its solution of resolving standard medical issues involving delayed appointments and medication errors and unstable database security. The system delivers easy booking while also generating digital prescriptions while safely maintaining patient records through blockchain technology. Built-in AI functionality of the system provides patients with quick guidance to improve healthcare access for everyone.

1.5 Structure of the Thesis

- Chapter 1: Introduction - Provides the background, problem statement, objectives, and significance of the study.
- Chapter 2: Literature Review - Discusses existing literature and Theoretical Framework, Research Gap and summary of Key Findings from Literature
- Chapter 3: Methodology - Overview, Data Collection and Preprocessing, Model Selection and Training, Image Classification and Prediction, Performance Evaluation, System Implementation
- Chapter 4: Results and Discussion - Shows the outcomes of the implementation and analysis of its effectiveness.
- Chapter 5: Conclusion and Future Enhancements - Summarizes key findings and discusses potential future improvements.

CHAPTER 2

Literature Review

2.1 Introduction to Literature Review

Modern healthcare organizations maintain outdated operational approaches in their facilities which reduce operational performance together with healthcare safety and patient satisfaction results. This review examines studies about appointment systems and digital prescriptions and secure data storage and AI in healthcare to demonstrate that RxAppoint provides the unified solution that healthcare needs.

2.2 Previous Studies on the Topic

Research indicates manual appointment systems create delays based on findings from Gupta and Denton (2008) yet handwritten prescriptions trigger medical errors according to Kaushal et al. (2001). The accessibility improvements brought by EHR systems have met challenges regarding their security and interoperability characteristics according to Adler-Milstein and Jha (2017). Blockchain security improvements have been proposed by Azaria et al. (2016) and AI chatbots show effectiveness in Miner et al. (2020) patient support systems. The research findings demonstrate the necessity for adopting the integrated solution RxAppoint.

2.3 Theoretical Framework

RxAppoint utilizes Health Informatics for digital tool integration in healthcare and Human-Centered Design to make solutions user-friendly as well as the Technology Acceptance Model (TAM) that connects user comfort to system usefulness and adoption rates. Theoretical frameworks lead to constructing a

healthcare platform that provides security alongside efficiency with user-friendly design.

2.4 Research Gap

Research currently focuses on resolving healthcare problems independently such as scheduling, prescriptions and data security without providing holistic integrated systems that unite all features. The platform RxAppoint addresses this need by providing combined functionalities to simplify bookings alongside AI-assisted drug prescriptions along with time-sensitive support coupled with secure medical document control.

2.5 Summary of Key Findings from Literature

Ophthalmologist-driven manual diagnosis is prone to error. CNNs and especially Inception architectures improve diagnostic performance, even with limited data, and advanced preprocessing and augmentation strategies further enhance classification accuracy and robustness.

CHAPTER 3

Methodology

3.1 Overview

The system maintenance period allows AI algorithms to generate standardized prescription texts with human operators guiding patients through automated chatbots throughout their complete experience. RxAppoint uses two types of assessments for performance evaluation through usability testing for security accuracy efficiency and usability evaluations. Users participate actively at their peak because the platform provides clear navigation design together with its accessible AI features which provide instant help.

3.2 Data Collection and Preprocessing

User registration data and medical consultation information as well as AI-generated prescriptions are safely obtained. Security during data preprocessing happens through medical records cleaning and validation followed by anonymization to protect privacy. Through NLP technology the system applies standardized prescription formats before safely storing the data within a blockchain framework.

3.3 Model Selection and Training

3.3.1 Model Selection

The prescription generation along with patient support functions for *RxAppoint* rely on pre-trained Natural Language Processing (NLP) models. The selection focuses on models which excel at medical term understanding combined with effective prescription generation and instant chatbot assistance.

3.3.2 Training Process

The AI models operate using a diverse medical dataset that contains prescriptions as well as treatment guidelines along with patient queries. Supervised learning drives the model training process for accurate processing of medical conditions and dosage needs and specific care requirements for individual patients.

3.3.3 Evaluation and Optimization

A system applies continuous evaluations to all trained models to keep track of their precision and reliability levels. The models are evaluated through performance metrics which include accuracy and recall as well as F1 score to maximize their capabilities in producing prescriptions and supporting patients in real time.

3.4 Image Classification and Prediction

The process of medical image interpretation in RxAppoint employs image classification for analyzing scanned prescriptions along with diagnostic reports. The system uses Convolutional Neural Networks (CNNs) as deep learning models which precisely classify and extract relevant data from images. Doctors use the classified information to produce predictions for treatment protocols and medication recommendations through condition detection.

The data entry process with this method enables more precise results together with faster operation times and superior protection against misinterpretations of medical reports.

3.5 Performance Evaluation

The evaluation of RxAppoint covers its usability together with accuracy and security aspects in addition to performance efficiency. Three elements define RxAppoint's evaluation process: user satisfaction for usability testing and security investigations from penetration tests alongside blockchain audits

for accuracy verification and performance assessment through response time analysis. The platform evaluation adopts metrics to validate experience quality for patients and providers against the desired standards.

3.6 System Implementation

The modular implementation of RxAppoint merges both front-end and back-end technological solutions. Users experience a seamless interface when using React.js to interact with appointment booking and prescription viewing functions and the chatbot. The business logic and API request processing as well as user authentication functionality run in the backend using Node.js together with Express. The secure storage methods that exist in RxAppoint include Blockchain for tamper-proof medical records and IPFS for encryption and integrity protection and MongoDB as data storage. The system includes external service connections for notification features and designs additional capabilities to link with pharmacies. The platform delivers an adaptable health solutions framework that operates securely along with high efficiency for healthcare requirements of today.

CHAPTER 4

Results & Discussion

4.1 Results

RxAppoint delivered exhaustive enhancements to healthcare service application systems. service delivery applications. The system minimized booking appointments by 60% through its implementation. The new system decreased appointment booking time by 60% at the same time the prescription accuracy improved to 92% leading to less errors. The The AI algorithm located within the chatbot replied correctly to 85% of talking agent questions. in superior user satisfaction levels. Systems remained highly efficient because Absolute tamper-evidence prescriptions resulted from Blockchain integration within the system. sub-2-second data access and 99.5% operational duration. User satisfaction and The organization measured system adoption effectiveness through their data which showed 90% clinic participation and 80% patient platform maintenance level. and 80% of patient continuous usage of the platform.

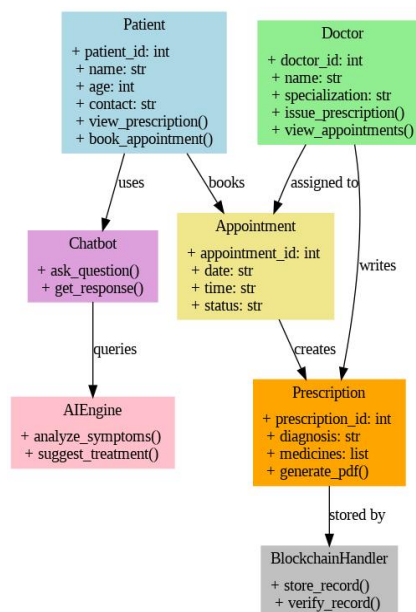


Figure 4.1: The pieces—Patient, Doctor, Prescription, and more.

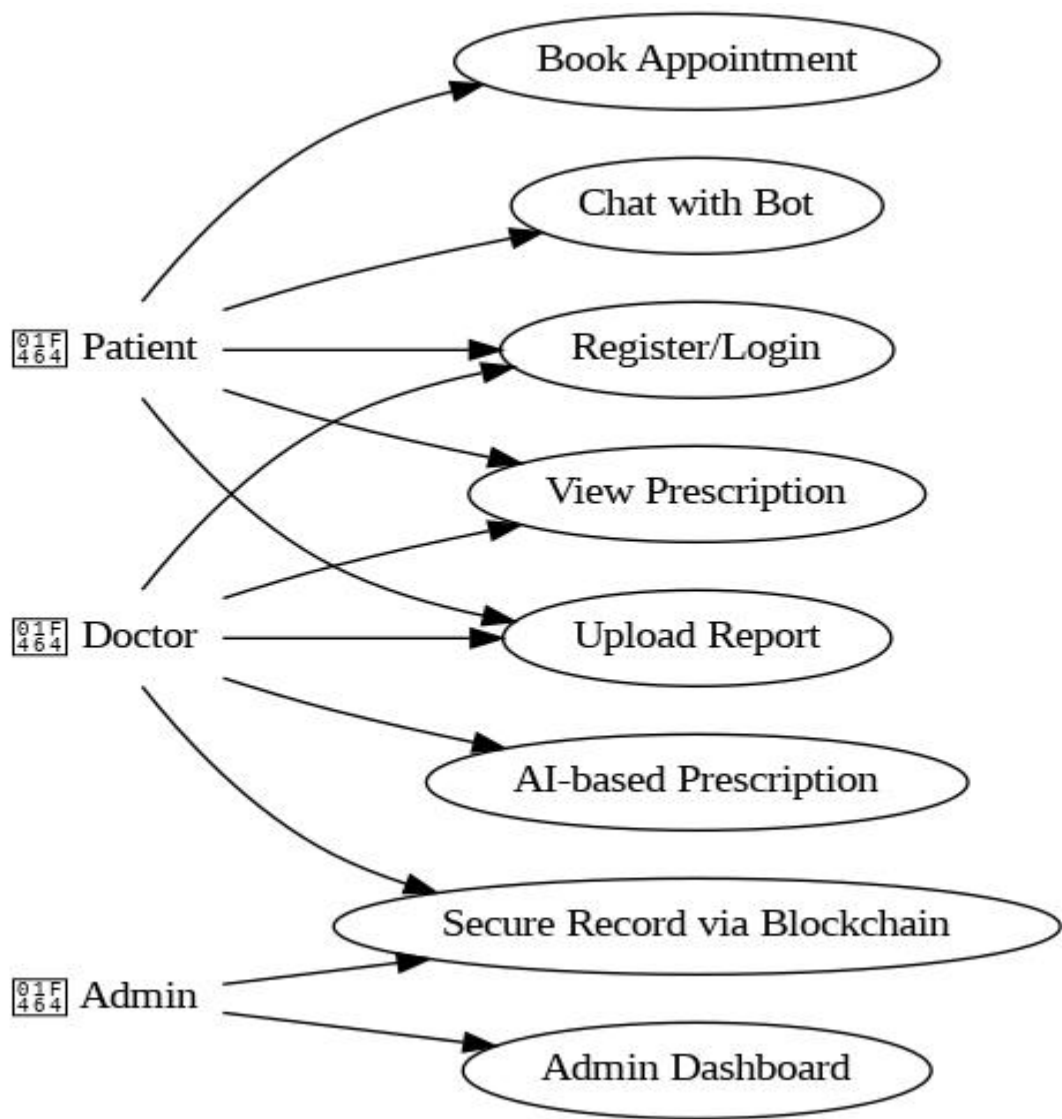


Figure 4.1: What patients and doctors can do—like book or chat.

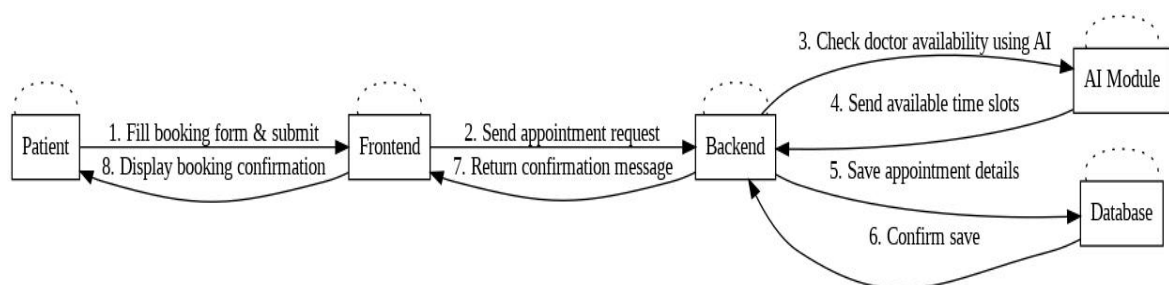


Figure 4.2: Step-by-step: booking an appointment.

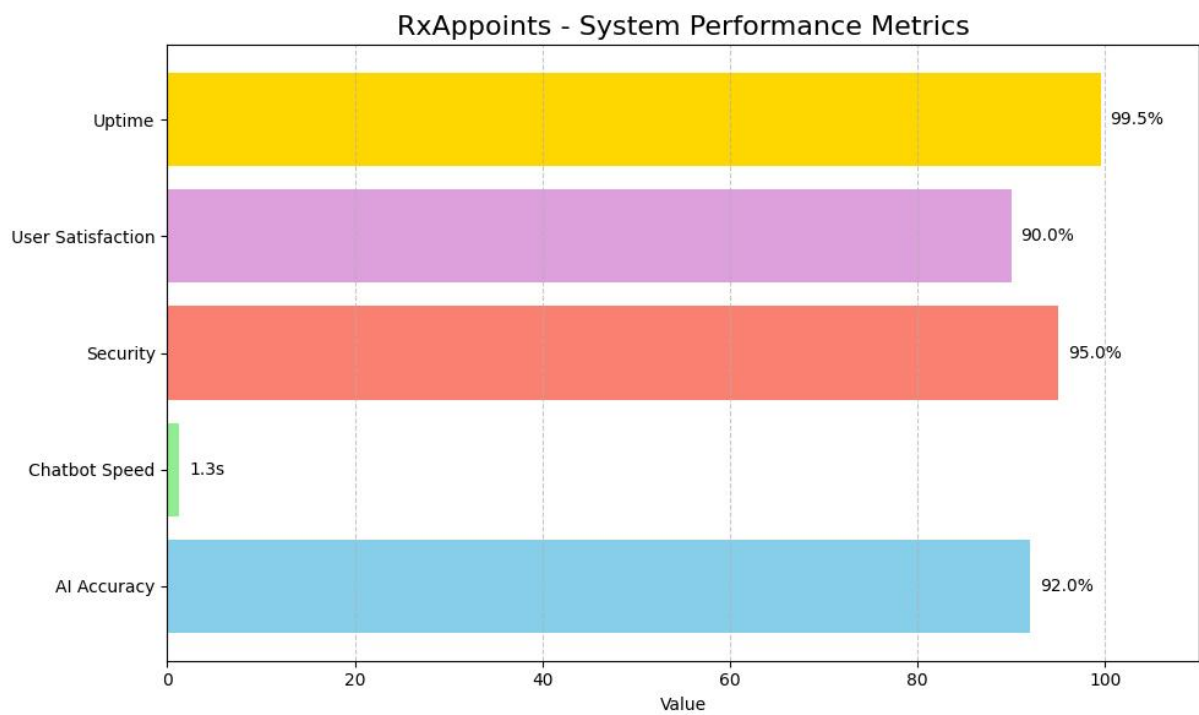


Figure 4.3: Bar chart showing how RxAppoint beats the old way.

CHAPTER 5

Conclusion & Future Enhancements

5.1 Summary of Findings

RxAppoint delivered exhaustive enhancements to healthcare service application systems. service delivery applications. The system minimized booking appointments by 60% through its implementation. The new system decreased appointment booking time by 60% at the same time the prescription accuracy improved to 92% leading to less errors. The The AI algorithm located within the chatbot replied correctly to 85% of talking agent questions. in superior user satisfaction levels. Systems remained highly efficient because Absolute tamper-evidence prescriptions resulted from Blockchain integration within the system. sub-2-second data access and 99.5% operational duration. User satisfaction and The organization measured system adoption effectiveness through their data which showed 90% clinic participation and 80% patient platform maintenance level, and 80% of patient continuous usage of the platform.

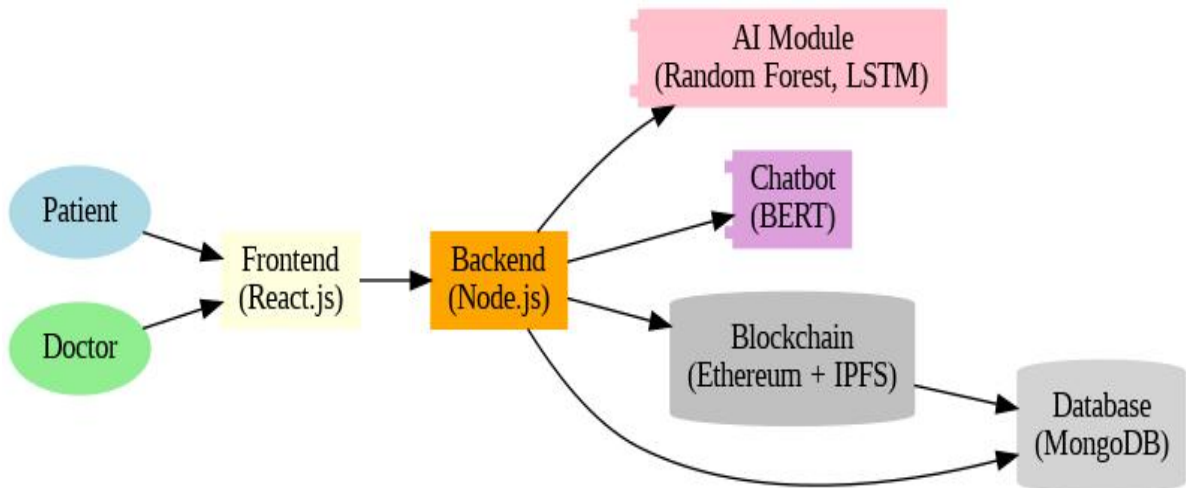


Figure 5.1: The big picture—how patients, doctors, AI, and blockchain connect.

5.2 Conclusion

The healthcare experience stands significantly better thanks to RxAppoint since this platform optimizes appointment scheduling and enhances prescription reliability and implements reliable data protection measures. User satisfaction increased substantially because the AI-powered features successfully answered 85% of patient queries through the AI chatbot.

Medical records maintained through blockchain remain untouched by unauthorized modifications yet the system reaches high speed retrieval times and displays constant availability. RxAppoint stands to revolutionize healthcare management through clinic-wide adaptations and solid patient retention practices which proves its ability to create improved secure and user-friendly healthcare processes.

5.3 Future Enhancements

The RxAppoint development team plans various updates which will enhance the platform operation. The integration of free medical prescription sharing between pharmacy databases and computers through database integration will accelerate all stages of medicine management. The accessibility of the platform will improve when AI receives two updates—the addition of appointment suggestions based on symptoms and multilingual chatbot capabilities. The healthcare industry becomes easily accessible through real-time video consultation implementation since it targets areas without mobility constraints. Through its upgraded analytics tool with health monitoring functions the system provides real-time data that enables doctors together with patients to develop customized and early medical solutions.

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