**PROJECT ON**

**PHARMACY MANAGEMENT SYSTEM WITH AI INVENTORY PREDICTION**

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**ABSTRACT**

The Pharmacy Management System with AI Inventory Prediction is designed to enhance the efficiency of pharmacy operations by automating inventory management and utilizing artificial intelligence for stock forecasting. This system includes essential features such as medication tracking, sales management, user authentication, and automated alerts for low stock and expired medicines.

By leveraging AI-driven inventory prediction, the system analyzes historical sales data to forecast future inventory requirements, which helps reduce the chances of stock shortages and waste. The AI model uses machine learning techniques to generate insights, allowing pharmacies to optimize their purchasing strategies and maintain an adequate supply of medications.

The project is developed using Python (Flask) for the backend, with HTML, CSS, and JavaScript for the frontend, and PostgreSQL as the database. The AI component is implemented with machine learning libraries like Scikit-learn and Facebook Prophet for time-series forecasting.

This system will help pharmacies streamline their operational processes, minimize losses from expired drugs, and ensure that medications are available for customers. With role-based access control, secure data management, and real-time analytics, the platform provides a comprehensive solution for modern pharmacy management. Future enhancements may include barcode scanning, support for multiple branches, and integration with supplier networks for automated restocking.

By adopting this solution, pharmacies can significantly improve their operational efficiency, reduce manual tasks, and make data-driven decisions to enhance overall business performance.

1. **INTRODUCTION**

Running a pharmacy successfully involves monitoring medicines, stock, sales, and expiry dates. Pharmacies can experience stock shortages and expired medicines and lose money unless managed properly.

This Pharmacy Management System with Predictive Inventory based on Artificial Intelligence will address these issues through an easy-to-use system with automated pharmacy operations. It will enable pharmacists and administrators to control medicine stock, monitor sales, and get reminders when stock is low or approaching the date of expiry. It also includes Artificial Intelligence (AI) for predictive inventory, which predicts future stock requirements based on sales.

With this system, the pharmacies are able to supply medicines around the clock, minimize drug wastage, and make informed business decisions. The forecasting through AI reduces the amount of manual labor needed, enhances efficiency, and ensures smooth operations for medium, small, and large pharmacies.

The project is built upon the foundation of improving accuracy, efficiency, and intelligence in pharmacy operations. By leveraging technologies like React.js for frontend, Flask for backend, and PostgreSQL for database management, the system ensures real-time data handling and a seamless user experience. Furthermore, the incorporation of an AI model capable of learning from historical inventory and sales data brings a predictive edge to the system. This not only enables pharmacies to make informed restocking decisions but also optimizes medicine availability and minimizes waste.

The decision to pursue this project stems from a deep interest in the application of software engineering principles in real-world healthcare scenarios. As a computer science engineering student, building a practical and impactful solution that bridges healthcare and technology provides both academic enrichment and personal satisfaction.

1. **SOFTWARE AND HARDWARE REQUIREMENTS**

**2.1 Software Requirements:**

1. **Operating System:** Windows 10/11 or Linux-based OS  
   (For development and deployment environments)
2. **Frontend**:

React.js (for responsive and interactive UI)

Tailwind CSS + ShadCN/UI (for modern and sleek styling)

1. **Backend**:

Python (Flask framework for API development)

PostgreSQL (for database management)

1. **Additional Tools:**

VS Code (IDE for coding)

Postman (for API testing)

Git & GitHub (for version control and collaboration)

Node.js & npm (for frontend package management)

**2.2 Hardware Requirements:**

**Processor**: Intel i5 or higher / AMD Ryzen 5 or above

**RAM**: Minimum 8 GB

**Storage**: At least 256 GB SSD (for faster performance)

**Display**: 13” or larger monitor with HD resolution (for UI design and testing)

**Internet**: Stable connection (for fetching packages, APIs, and cloud backup)

1. **EXISTING SYSTEM**

In many small to medium-sized pharmacies, traditional inventory and sales management systems are either completely manual or rely on outdated standalone software applications. These systems typically involve maintaining physical records, Excel sheets, or basic POS (Point of Sale) software that lacks advanced features like real-time tracking, automated stock prediction, or centralized databases. Some pharmacies use fragmented tools that are not integrated with supplier data, expiry tracking, or AI-based analytics.

**Advantages of the Existing System:**

* **Simplicity:**  
  Manual or basic systems are easy to use with minimal training required.
* **Low Cost:**  
  Initial setup cost is low, especially for small businesses using paper-based or Excel systems.
* **Independence:**  
  No internet dependency for manual or offline desktop-based tools.
* **Familiarity:**  
  Staff are usually accustomed to traditional ways of managing inventory and billing.

**Disadvantages of the Existing System:**

* **Lack of Real-Time Tracking:**  
  Stock levels, expiry dates, and supplier updates are not monitored in real time.
* **High Error Rate:**  
  Manual entry leads to human errors in stock counts, pricing, and expiry records.
* **No AI or Prediction Capabilities:**  
  Inability to forecast medicine demand or prevent overstocking/understocking issues.
* **Poor Data Accessibility:**  
  Data is often not centralized or backed up, leading to difficulties in tracking performance over time.
* **Limited Reporting and Analysis:**  
  Minimal insights into sales trends, expired stock reports, or supplier efficiency.
* **Security Risks:**  
  Physical records or non-secure local files are prone to loss, damage, or unauthorized access.

1. **PROPOSED SYSTEM**

The proposed system is a Pharmacy Management System with AI-based Inventory Prediction, designed as a web application using React.js (frontend), Flask (backend), and PostgreSQL (database). It aims to streamline all pharmacy operations such as inventory management, sales tracking, supplier/customer management, expiry monitoring, and stock forecasting using AI.

This system centralizes all data into a structured database, offers real-time updates, and leverages machine learning techniques to predict future inventory needs based on historical sales data and expiry patterns. The system is scalable, secure, and designed for better decision-making and operational efficiency.

**4.1 Advantages of the Proposed System:**

* **Automation of Inventory Management:**  
  Real-time updates for stock in, stock out, and expiry reduce manual effort.
* **AI-Powered Predictions:**  
  Helps forecast medicine demand to avoid overstocking or stockouts.
* **Enhanced Accuracy:**Reduces human error in inventory records, expiry tracking, and sales data.
* **User-Friendly Interface:**Intuitive dashboard and forms make it easy for pharmacists to manage data.
* **Centralized Data Storage:**All records are securely stored in a single PostgreSQL database, accessible anytime.
* **Responsive and Scalable:**Web-based UI works on multiple devices; the system can scale with business growth.
* **Improved Reporting and Analysis:**  
  Generates dynamic reports for inventory, sales, expiry, and suppliers.

**4.2 Disadvantages of the Proposed System:**

* **Initial Setup Cost & Time:**Requires time and technical expertise to deploy and configure the system.
* **Learning Curve:**Some staff may need training to operate the new software effectively.
* **Internet Dependency:**Being a web-based system, continuous internet access is required.
* **Maintenance Required:**Regular updates, backups, and occasional bug fixes are necessary for smooth functioning.