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MediTrackPro: A Technological Approach to Medicine Information Management and Stock Optimization

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ABSTRACT

The StockMeds system is built in order to replace manual based system to computerize. Here system is expected to be efficient, useful and affordable on implementing tasks that is instructed by the pharmacy manager. Software do all things in pharmacy like sale, insert new incoming goods, make bills, calculate taxes, and debt, also compute employees salaries, give information about products, make different statistics as best month to sale some product via provide charts, also manage employees work.

KEYWORDS: *Hospital supply chain, drug shortage prevention, inventory management*

I. INTRODUCTION

A pharmacy was always more than just a place to get your prescription. A StockMeds is any system used in a pharmacy that helps automate the pharmacy workflow. This includes such tasks as reviewing physician orders and preparing medications, controlling the inventory and making drug orders, handling billing and insurance, providing counselling, identifying incompatibilities, and more — all while following legal protocols and compliances.

StockMeds system is a management system that has been developed with the aim to increase the accuracy and improve the safety and effectiveness of a pharmacy-shop. With this program, you can make use of pharmaceutical stores in a database for the conduct of the study. It has been one of the IT-systems, which assists the pharmacist in improving the management of the assets, of the costs, insurance, security, etc.). The software that is being used, you can generate reports as per the requirements of the user. This StockMeds system, the user can get a report within a specified period of time.

The system allows the user to enter the date of the release and the expiration date to a given product or drug when the inventory is open, and the purchase and sale transaction. With the software, you can print invoices, bills, receipts, etc., etc. It can also keep a record of the deliveries from the supplier in writing. The system will generate a report that contains a list of products which are cancelled after this date and before the product is finally out.

StockMeds aims to streamline these operations through automation, improving both efficiency and accuracy. With a user-friendly interface, real-time tracking, and a suite of automated alerts, StockMeds ensures that pharmacy staff can manage stock effortlessly while reducing errors and waste. It also provides seamless billing and invoicing capabilities, simplifying transactions and offering a range of payment options to enhance customer convenience. Overall, StockMeds is designed to improve the operational flow in pharmacies, ensuring that patients receive timely, accurate service and that pharmacies operate at peak efficiency.

II. RELATED WORK

StockMeds System is a system consists of data entry, retrieval and monitoring stock facility and also alerts of expiry dates and minimum quantity of each drugs. [1]This system refers to the database by drugs name, drug code and description of the drugs. This system provides two alerts one for expiry date of medicine and another one for quantity of the drugs. The system checks the date up to-date to remind pharmacist by trigger alert message if the drugs is about to reach the minimal quantity.[2]

Giving alert to the pharmacist will be able to control the stock of the drugs efficiently (RAZALI, 2005). StockMeds System collects, stores and manages information relating to drugs and monitors the use of the drugs with patient care StockMeds System tracks and dispense the medicine to the hospitals and health care organizations.[3]

This system has been regularly used for delivery of pharmacy services since early 1980s. Nowadays system is able to perform function of clinical decision support such as dose range checking, drug-drug interaction checking and drug-laboratory results.[4] This system will reduce the risks of drug dispensation and drug interpretation errors (Asadi, Moghaddasi, Hosseini, Sajjadi, & Maserat, 2011). 16

Due to growing popularity of the use of computers had slowed down the growth of innovation ways for the pharmaceutical companies to distribute and to market their drugs to the pharmacies.[5] Most of the computer systems have been found useful in helping to save lives around the world. In 2010, earthquake had affected Haiti which had led to increase in demand of the need of medicines for the injured victims.[6] Hospitals in the country did not have time to provide medicines for the needy without losing the track of what medicine has been given to who and what has not been given, even when the hospitals were having huge quantities of stock of medicines.[7]

When the StockMeds was introduced to health industry, it had helped the pharmacy inside the hospital to tackle the problem in shortage of medicine thereby hospital is able to save the lives in process (Ernest, Inalegwu, Solomon, & Sam-David, 2016).[8]

III. PROPOSED WORK

A. FLOW OF PROJECT:

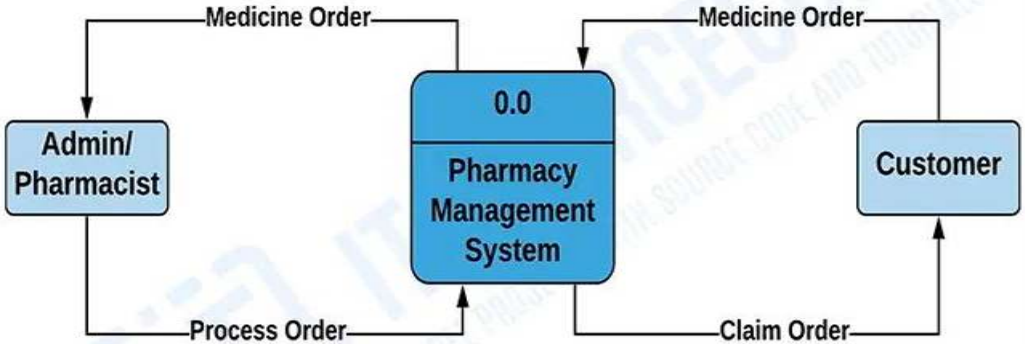

Fig. 1. The flow of proposed work

B. NUMBERS OF MODULES

1. Inventory Management

- **Process Logic:**

➢ Track Stock: Monitors the stock, batch number, supplier, and expiry date.
➢ Stock Alerts: Automatically notifies users of low stock or near-expiry items.
➢ Stock Update: Allows easy addition or removal of items and updates stock quantities.

2. Billing and Invoicing

- **Process Logic:**

➢ Invoice Creation: Generates invoices by applying item prices, taxes, and applicable discounts.
➢ Payment Processing: Supports multiple payment methods, ensuring flexible customer transactions.
➢ Barcode Scanning: Uses barcode information to speed up the checkout process and reduce errors.

3. Customer Management

- **Process Logic:**

➢ Customer Profile: Stores personal details and purchase history.
➢ Loyalty Points: Calculates and applies loyalty points based on customer purchases.
➢ Prescription Tracking: Maintains prescription data for easy reordering of medicines.

4. Reporting and Analytics

- **Process Logic:**

➢ Sales Reports: Generates reports on sales trends and medicine demand.
➢ Inventory Reports: Provides details on stock levels, expiry dates, and low-stock items.
➢ Supplier Performance Reports: Tracks supplier delivery times and order accuracy for better procurement planning.

C. DATA STRUCTURES AND TABLES:

To efficiently store and manage data, StockMeds relies on a well-organized database structure, which consists of tables related to inventory, billing, customer management, and reporting.

Core Tables:

1. Inventory Table:

➢ Columns: Medicine ID, Name, Batch Number, Quantity, Expiry Date, Supplier ID, Reorder Level, Price.
➢ Purpose: Tracks all medicines available in the pharmacy, their quantities, and expiry details.

2. Billing Table:

➢ Columns: Invoice ID, Customer ID, Product ID, Quantity, Total Amount, Date, Payment Method.
➢ Purpose: Records details of all transactions and payments.

3. Customer Table:

➢ Columns: Customer ID, Name, Address, Phone Number, Loyalty Points, Prescription Records.
➢ Purpose: Stores personal details, prescription history, and loyalty information for each customer.

4. Supplier Table:

➢ Columns: Supplier ID, Name, Contact Details, Medicine Supplied, Delivery Times.
➢ Purpose: Holds information about suppliers, enabling easy reordering and stock management.

5. Report Table:

➢ Columns: Report ID, Date, Report Type, Data Summary, Generated By.
➢ Purpose: Stores generated reports, including sales, inventory, and supplier performance reports.

IV. PROPOSED RESEARCH MODEL

This proposed work makes use of a convolutional neural network (CNN) model to categorise brain MRI pics into eleven unique classes: alzheimer mild-demented, alzheimer slight-demented, alzheimer non-demented, alzheimer very slight-demented, brain tumor glioma, brain tumor meningioma, brain tumor pituitary, brain stroke, Parkinson, white matter disorder, and ordinary. CNN is a deep learning structure which is broadly used for photo classification, object recognition, and computer vision duties.

It's specifically useful for photo classification as it could routinely analyze functions and patterns from the pics.

The model consists of several layers that exercise the input pic and produce output with shape of class possibilities. The layers are organized in a sequential order, wherein the output of 1 layer is used because the input for the following layer.

The primary layer within the model is the Conv2D layer, which plays the convolution operation for the input photo with a set of learnable filters. The quantity of filters is described by means of the person; in this situation, 32 filters of size 3x3 are used. The activation feature used is'relu' (rectified linear unit), that's generally used in CNNs.

The next layer is the MaxPooling2D layer, which plays a down-sampling operation through taking the maximum value of the input pixels in a window of length 2x2. this layer allows to lessen the spatial dimensions of the output from the previous layer. The above layers are repeated again with a higher range of filters, i.e., 64 filters, and the identical size kernel and activation feature are used.

The following layer, the flatten layer, is answerable for reworking the multi-dimensional output from the convolutional layers into a one-dimensional array. This variation allows the following, completely linked layers to obtain the information in a format appropriate for processing. Basically, the flatten layer serves as a bridge between the convolutional layers, which extract capabilities from the input pics, and the completely linked layers, which carry out classification based on those functions. Through flattening the records, the Flatten layer helps the seamless transition of records, beaing an effective classification via the neural network model.

Following is a dense layer, that's a completely related layer with 'a'relu' activation feature. The last density makes use of a'softmax' activation characteristic. The model is then compiled with 'categorical_crossentropy' as the loss feature, 'adam' as well as optimizer, and 'accuracy' and metric. Throughout training, the model is trained for 10 epochs with a batch size of 32. The training records is divided right into training set and a validation set with a 80:20 ratio. After training, model is evaluated at the test set, and the test loss and accuracy are stated. Ultimately, the model is saved to the disk

Generally, the model used a CNN structure with many Conv2D and MaxPooling2D layers, along side flattening and dense layers. The model achieves an accuracy of 92.14% at the test set, indicating that it's a beneficial model for classifying brain MRI photos.

But also, we explain at the thorough usage of CNN algorithms in training and evaluating our model for devoted training and testing datasets. We emphasize the meticulous pre-processing steps undertaken and the meticulous selection of many parameters to improve the model's efficacy in disease detection. Further down, we delineate the complete CNN structure deployed in our model.

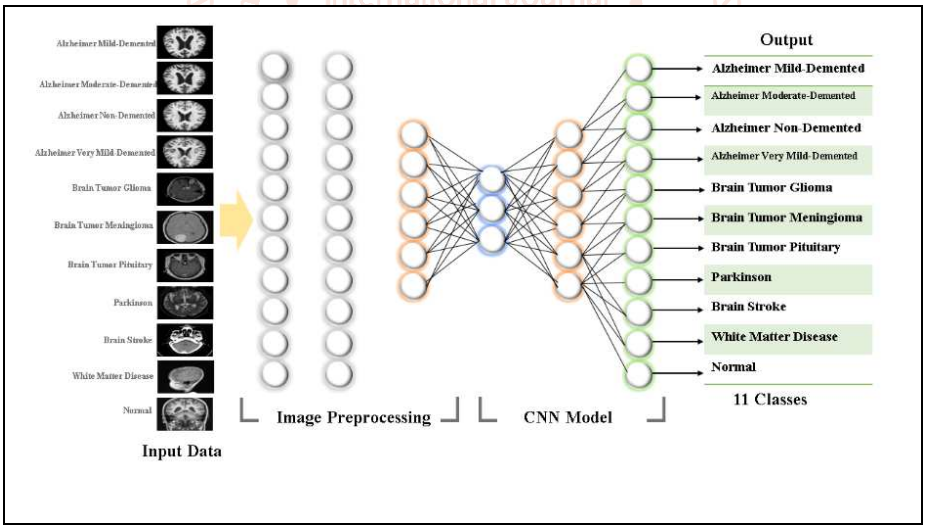

Fig 3: Proposed CNN Architecture

V. CODES

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<!doctype html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial scale=1">
    <title>Pharmacy Management System</title>
    <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.3/dist/css/bootstrap.min.css" rel="stylesheet"
integrity="sha384QWTKZyjpPEjISv5WaRU9OFeRpok6YctnYmDr5pNlyT2bRjXh0JMhjY6hW+ALEwIH"
crossorigin="anonymous">
    <style>
    /* Custom styles */
    body {
```

```
            background-image: url('https://example.com/path-to-yourbackground-image.jpg');
            background-size: cover;
            background-repeat: no-repeat;
            background-opacity: 0.905; /* Adjust opacity (0 to 1) */
            font-family: Arial, sans-serif;
            color: #333; /* Text color */
        }
            .container {
            max-width: 800px;
            margin: 0 auto;
            padding: 20px;
            text-align: center;
        }
            .btn-primary {
            background-color: #000; /* Black button theme */
            border: none;
            font-weight: bold; /* Bolder font */
        }
            .btn-primary:hover {
            background-color: #111; /* Darker hover color */
        }
            .logo {
            max-width: 100px; /* Adjust logo size as needed */
        }
            h2 { font-size: 24px; /* Larger font size */
            font-weight: bold; /* Bolder font */
        }
</style>
</head>
<body>
<div class="container">
<img src="https://seeklogo.com/images/P/pharmacy-logo4729C66E18-seeklogo.com.png" alt="Pharmacy Logo" class="logo"> <!-- Add your logo image -->
<h2 class="text-center mb-5">New Supplier Detail</h2>
<form method="post" th:action="@{/supplier/create}" th:object="${supplierDTO}" class="mt-4">
<div class="mb-3 row">
<label for="supplierName" class="col-sm-4 col-form
label">Supplier Name:</label>
<div class="col-sm-8">
<input type="text" id="supplierName" name="supplierName" th:field="*{supplierName}" class="form control">
</div>
</div>
<div class="mb-3 row">
<label for="supplierEmail" class="col-sm-4 col-formlabel">Email ID:</label>
<div class="col-sm-8">
<input type="text" id="supplierEmail" name="supplierEmail" th:field="*{supplierEmail}" class="formcontrol">
</div>
</div>
<div class="mb-3 row">
<label for="supplierContact" class="col-sm-4 col-formlabel">Contact No:</label>
<div class="col-sm-8">
<input type="text" id="supplierContact" name="supplierContact" th:field="*{supplierContact}" class="form
```

```
control">
</div>
</div> <div class="mb-3 row">
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label">Address:</label>
<div class="col-sm-8">
<input type="text" id="supplierAddress" name="supplierAddress" th:field="*{supplierAddress}" class="formcontrol">
</div>
</div>
<div class="mb-3 row">
<label for="companyName" class="col-sm-4 col-formlabel">Company Name:</label>
<div class="col-sm-8">
<input type="text" id="company Name" name="company Name" the field="*{company Name}"class="form control">
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control">
<button type="submit" class="btn btn primary">Create</button>
</form>
</div>
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</script>
</body>
</html>
```

VI. RESULT ANALYSIS

Fig 1. Front View

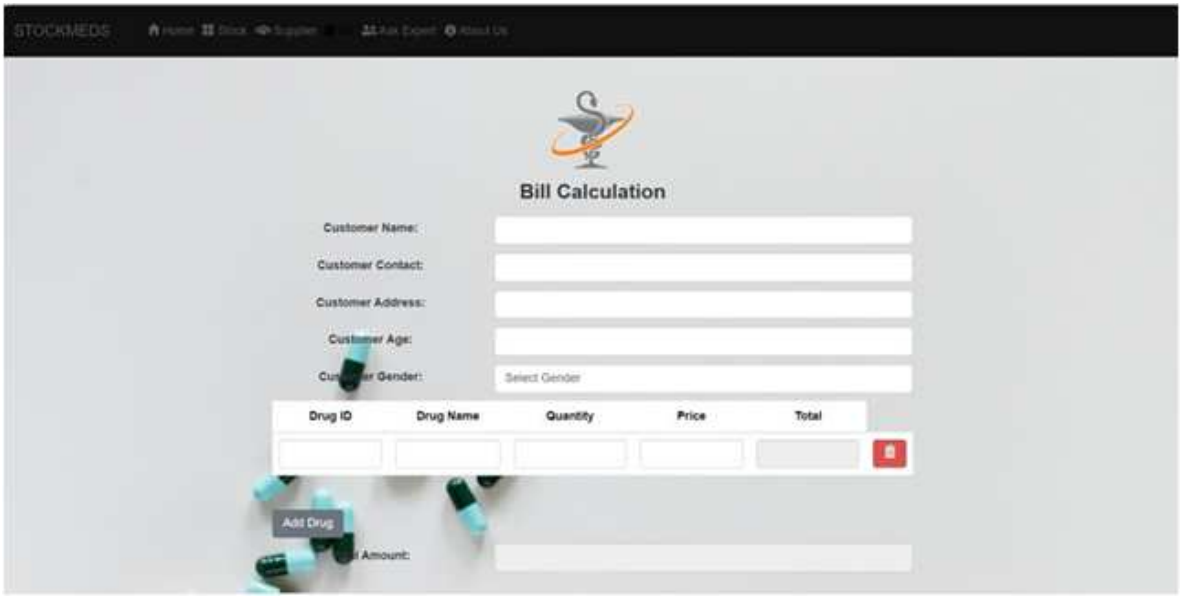

Fig 2. Billing Section

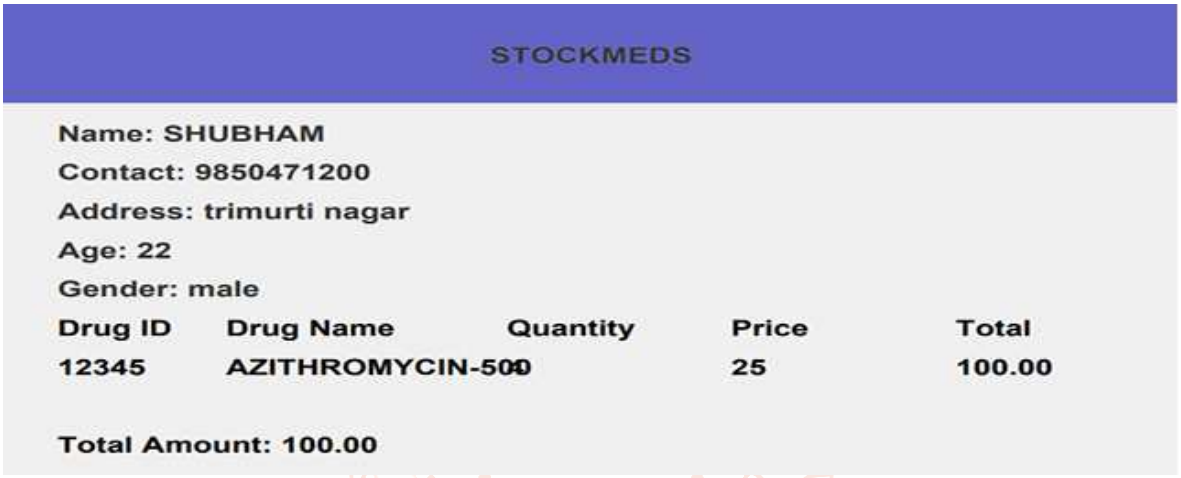

Fig 3. Bill

VII. CONCLUSION

The project has successfully achieved all the objectives, user requirements and aims set forth in the introduction. In order to enhance the project, future work will focus on implementing a secure online payment system and a secure website. If more time were available, it would have been possible to include a profile picture and details of the pharmacist. The project has enabled the development of knowledge in areas such as displaying or populating data on a form, reducing stock quantities and making use of user sessions. The proposed system Stockmeds may be demonstrated to pharmacists and company staff, and once their satisfaction is obtained, the system will be deployed to a real environment by hosting it on Google Cloud Platform and making it searchable.

A Stockmeds system is essential for healthcare facilities to operate efficiently and effectively. The system ensures that medical supplies are available in adequate quantities, at the right time, and at the right place. By implementing an inventory management system, healthcare providers 70 can streamline their processes, reduce waste, and ultimately provide better patient care.

The system should be designed to include features such as automated inventory tracking, real time data reporting, and supply chain management. It should also be user-friendly, accessible, and secure.

Overall, the benefits of a Stockmeds system are significant, including cost savings, improved efficiency, and enhanced patient safety. This system can help healthcare providers to reduce costs associated with stock outs, overstocking, and expired supplies. Furthermore, it can minimize the risk of medical errors caused by inadequate supplies, ensure regulatory compliance, and improve overall patient outcomes.

Therefore, healthcare providers should prioritize the implementation of a Stockmeds system as part of their efforts to improve patient care and reduce operational costs.

VIII. FUTURE SCOPE

1. **Scalability and Multi-Location Support**: StockMeds can expand to support multi-location pharmacies, with a cloud-based system for centralized management and real-time inventory tracking across locations.
2. **Advanced Data Analytics and AI**: Incorporating predictive analytics and AI can enhance demand forecasting, optimize stock management, and provide personalized customer insights.
3. **Healthcare System Integration**: StockMeds can integrate with electronic health records (EHR),

telemedicine, and third-party healthcare systems for seamless prescription management and improved patient care.

4. **Mobile Application**: A mobile app for both pharmacy staff and customers can increase operational flexibility and improve customer engagement with features like prescription refills and loyalty tracking.
5. **Blockchain for Security**: Blockchain can be used for secure transactions, inventory tracking, and compliance with regulatory standards, enhancing transparency and reducing fraud.
6. **IoT Integration**: IoT-enabled smart shelves and temperature sensors can automate stock management and ensure proper storage conditions for sensitive medications.
7. **Customer Engagement Features**: Enhanced loyalty programs, appointment scheduling, and prescription reminders can improve customer retention and satisfaction.
8. **Regulatory Compliance**: StockMeds can stay updated with evolving regulations, offering features like audit trails and compliance reporting.
9. **AI for Drug Optimization**: AI can help monitor drug interactions and optimize inventory replenishment, ensuring better patient safety and operational efficiency.

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