 

HAROHALLI, KANAKAPURA ROAD – 562112

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(DATA SCIENCE)

**FODS PROJECT REPORT**

ON

#### 

#### "Smart Prescription System"

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BACHELOR OF TECHNOLOGY IN

COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

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#### SCHOOL OF ENGINEERING

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CERTIFICATE

#### It is certified that the mini project work entitled “Smart Prescription System” has been carried out at *Dayananda Sagar University*, Bangalore, by *Lakshmi.R (ENG23DS0017), YellareddyHarshitha (ENG23DS0047) , AmbatiSameeksha (ENG23DS0053)* ,Bonafide student of *fourth Semester*, B.Tech in partial fulfilment for the award of degree in *Bachelor of Technology in Computer Science & Engineering (Data Science)* during academic year *2024-25*. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in departmental library.

#### The project report has been approved as it satisfies the academic requirements in respect of project work for the said degree.

**Signature of the Guide Signature of the Chairperson**

**ACKNOWLEDGEMENT**

A project's successful completion offers a sense of satisfaction, but it is never finished without expressing gratitude to everyone who contributed to its accomplishment. We would like to convey our sincere gratitude to our esteemed university, Dayananda Sagar University, for offering the first-rate facilities.

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**DECLARATION**

We hereby declare that the project entitled **"Smart Prescription System"** submitted *to* **Dayananda Sagar University**, Bengaluru, is a bona fide record of the work carried out by us under the guidance of *Prof. Sindhu A* in the **Dayananda Sagar University** School of Engineering's Department of *Computer Science and* *Engineering (Data Science).* This work is submitted toward the partial fulfillment of the requirements for the award of a Bachelor of Technology in *Computer Science and Engineering (Data Science).*

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**ABSTRACT**

This paper explores the concept and potential of a smart prescription system to revolutionize medication management and enhance healthcare delivery. By leveraging technologies such as artificial intelligence, machine learning, and secure digital platforms, a smart prescription system aims to overcome the limitations of traditional paper-based prescriptions. This system facilitates accurate and efficient prescription generation, reduces medication errors through automated checks for drug interactions and allergies, and improves patient adherence via digital reminders and refill management. Furthermore, it enables seamless communication between healthcare providers, pharmacists, and patients, fostering a more collaborative and informed approach to treatment. This abstract highlights the key features, benefits, and potential impact of smart prescription systems on modern healthcare.

Keywords – prescription generation, medication errors, digital reminders, refill management.

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**INTRODUCTION**

The traditional process of prescribing and dispensing medications, often reliant on handwritten prescriptions and manual data entry, is fraught with challenges. These include the risk of illegible handwriting leading to dispensing errors, potential for harmful drug interactions or allergic reactions going unnoticed, and difficulties in tracking patient adherence. In an increasingly digital world, the need for a more intelligent, efficient, and safer approach to medication management has become paramount. This has paved the way for the emergence of the "smart prescription system" – a transformative concept that integrates advanced technologies to streamline the entire prescription lifecycle, from initial generation to patient consumption. This introduction will delve into the fundamental principles of smart prescription systems and highlight their potential to revolutionize the landscape of pharmaceutical care.

Ultimately, the introduction of a smart prescription system is about creating a more cohesive, transparent, and patient-centric approach to medication management, leading to better health outcomes and a more efficient healthcare landscape. It's a fundamental shift from a reactive to a proactive model, ensuring that the right medication gets to the right patient, at the right time, with the right information.

For patients, it means clearer communication about their medications, automated reminders, and convenient access to their prescription information, fostering greater engagement in their own healthcare journey. For healthcare providers, it translates to reduced administrative burden, improved prescribing accuracy, and enhanced patient safety. Pharmacists benefit from clearer, instantly transmitted prescriptions, reducing transcription errors and improving dispensing efficiency.

**OBJECTIVES AND SCOPE OF WORK**

The overarching objective of a smart prescription system is to revolutionize the traditional prescription process by enhancing efficiency, accuracy, safety, and accessibility for patients, healthcare providers, and pharmacists alike. This comprehensive digital solution aims to minimize medication errors, improve patient adherence, streamline communication between various stakeholders, and ultimately contribute to better health outcomes. By leveraging technology such as electronic health records (EHRs), artificial intelligence (AI), machine learning (ML), and secure cloud platforms, the system will provide real-time access to patient medical history, drug interaction alerts, dosage recommendations, and automated refill reminders. A key objective is to move away from paper-based prescriptions, thereby reducing the risk of illegible handwriting, lost prescriptions, and fraudulent activities. Furthermore, the system seeks to empower patients with greater control over their medication management, offering features like medication schedules, educational resources about prescribed drugs, and direct communication channels with their healthcare providers. From a healthcare provider's perspective, the objective is to reduce administrative burden, improve prescribing accuracy through clinical decision support, and gain deeper insights into patient medication adherence patterns. For pharmacies, the goal is to expedite the dispensing process, reduce transcription errors, and improve inventory management through seamless integration with prescribing systems. Ultimately, the smart prescription system aims to create a cohesive and interconnected ecosystem where all parties involved in medication management operate with greater transparency, efficiency, and patient safety at the forefront.

### DESCRIPTION OF WORK

The work for a smart prescription system involves the comprehensive design, development, and implementation of a digital platform that streamlines medication prescribing and management. This encompasses creating a user-friendly interface for healthcare providers to electronically generate prescriptions, complete with automated features for drug selection, dosage recommendations, and crucial safety checks like allergy and drug-interaction alerts, leveraging integration with Electronic Health Records (EHR) for patient history. Simultaneously, a patient-facing application will be developed to allow convenient access to their active prescriptions, set medication reminders, and access educational content about their prescribed drugs. For pharmacists, the system will facilitate seamless electronic receipt, verification, and dispensing of prescriptions, integrated with their existing pharmacy management systems for efficient inventory and billing. A core component of the work is the development of a robust Clinical Decision Support System (CDSS) powered by AI and machine learning, offering evidence-based recommendations and flagging potential issues. Furthermore, the project includes establishing secure communication channels among all users, ensuring data privacy and compliance with healthcare regulations, and building analytical dashboards for monitoring system performance and patient outcomes. Finally, the scope of work also extends to thorough testing, pilot programs, user training, and continuous system maintenance and updates to adapt to evolving healthcare needs and technological advancements.

### METHODOLOGY

### The methodology for developing a smart prescription system begins with a thorough Inception and Planning phase that prioritizes understanding the specific needs and challenges of local healthcare stakeholders through detailed needs assessments, followed by a feasibility study and the elicitation of comprehensive functional and non-functional requirements. Crucially, this phase includes a detailed analysis of relevant Indian regulations and the development of a robust project plan. The subsequent System Design and Architecture phase focuses on creating a scalable and secure system architecture, designing user-friendly interfaces (potentially with local language support), establishing a secure database, and planning for interoperability with existing healthcare systems prevalent in Bengaluru. The System Development and Implementation phase adopts an agile approach for iterative development, rigorous testing, and secure deployment, potentially starting with a pilot program in Bengaluru. Successful Deployment, Training, and Adoption involve providing comprehensive training materials (potentially in local languages) and ongoing support to facilitate user onboarding. Finally, the Monitoring, Evaluation, and Maintenance phase ensures continuous system performance monitoring, impact evaluation within the Bengaluru context, regular updates, and planned scalability for wider adoption in Karnataka. This iterative and user-centric methodology emphasizes local needs, regulatory compliance, and continuous improvement throughout the system lifecycle.

### Premium Vector | Online prescription system.Vector illustration

### 

### Number of Drugs Received: EDA Analysis Guide:

### Histogram showing prescription pattern at the Ghana Police Hospital ... Exploratory Data Analysis (EDA) : Guide

### Prescription and AES graph: Average Number of Drug use:

### Scatter plots for the average number of days of prescription drug use ...Bar graph showing the delay between prescription and AES received in ...

### Weekly average ratio of patients: Average Number of Seizures:

### How do you interpret a line graph? – TESS Research FoundationThe line graph shows the average number of weekly patients visiting ...

### Source Code

### %% Exploratory Data Analysis (EDA) for Smart Prescription System Data

### % This script performs EDA on the 'case\_history.xlsx' file generated by the

### % smartPrescriptionGUI.

### clear; close all; clc;

### %% 1. Configuration and Data Loading

### caseHistoryFile = 'case\_history.xlsx';

### if isfile(caseHistoryFile)

### T = readtable(caseHistoryFile);

### disp('--- Data Loaded Successfully ---');

### disp(head(T));

### fprintf('Total records loaded: %d\n\n', height(T));

### else

### error('The ''case\_history.xlsx'' file does not exist. Please run the ''smartPrescriptionGUI'' function a few times to generate some data first.');

### end

### %% 2. Initial Data Inspection and Cleaning

### disp('--- Data Types ---');

### disp(T.Properties.VariableTypes);

### % Convert 'Symptoms' and 'Medications' columns to cell arrays of strings

### T.Symptoms = cellfun(@(x) split(x, ','), T.Symptoms, 'UniformOutput', false);

### T.Medications = cellfun(@(x) split(x, ','), T.Medications, 'UniformOutput', false);

### % Missing value check

### fprintf('\n--- Missing Values Check ---\n');

### for varIdx = 1:width(T)

### varName = T.Properties.VariableNames{varIdx};

### numMissing = sum(ismissing(T.(varName)));

### if numMissing > 0

### fprintf('Variable ''%s'' has %d missing values.\n', varName, numMissing);

### end

### end

### if all(sum(ismissing(T)) == 0)

### disp('No missing values detected in the dataset.');

### end

### % Standardize Gender to uppercase

### T.Gender = upper(T.Gender);

### %% 3. Descriptive Statistics

### disp('--- Descriptive Statistics ---');

### fprintf('\nAge (Years):\n');

### fprintf(' Mean: %.2f\n', mean(T.Age));

### fprintf(' Median: %.2f\n', median(T.Age));

### fprintf(' Min: %.0f\n', min(T.Age));

### fprintf(' Max: %.0f\n', max(T.Age));

### fprintf(' Standard Deviation: %.2f\n', std(T.Age));

### disp('\nGender Distribution:');

### genderCounts = groupcounts(T, 'Gender');

### disp(genderCounts);

### disp('\nTop Symptoms by Frequency:');

### allSymptomsList = {};

### for i = 1:height(T)

### cleanedSymptoms = cellfun(@(s) lower(strtrim(s)), T.Symptoms{i}, 'UniformOutput', false);

### allSymptomsList = [allSymptomsList; cleanedSymptoms]; %#ok<AGROW>

### end

### allSymptomsList(cellfun('isempty', allSymptomsList)) = [];

### symptomFrequency = groupcounts(table(allSymptomsList), 'allSymptomsList');

### disp(symptomFrequency.Properties.VariableNames);

### symptomFrequency = sortrows(symptomFrequency, 'GroupCount', 'Desc');

### disp(head(symptomFrequency, 10));

### disp('\nTop Medications by Frequency:');

### allMedicationsList = {};

### for i = 1:height(T)

### if ~isempty(T.Medications{i}) && ~all(cellfun('isempty', T.Medications{i})) && ~strcmp(T.Medications{i}{1}, '')

### cleanedMedications = cellfun(@(m) lower(strtrim(m)), T.Medications{i}, 'UniformOutput', false);

### allMedicationsList = [allMedicationsList; cleanedMedications]; %#ok<AGROW>

### end

### end

### allMedicationsList(cellfun('isempty', allMedicationsList)) = [];

### medicationFrequency = groupcounts(table(allMedicationsList), 'allMedicationsList'); % ✅ Fixed column name

### medicationFrequency = sortrows(medicationFrequency, 'GroupCount', 'desc');

### disp(head(medicationFrequency, 10));

### %% 4. Data Visualization

### disp('--- Data Visualizations ---');

### % Age Distribution Histogram

### figure('Name', 'Patient Age Distribution');

### histogram(T.Age, 'BinWidth', 5);

### title('Distribution of Patient Ages');

### xlabel('Age (Years)');

### ylabel('Number of Patients');

### grid on;

### % Gender Distribution

### figure('Name', 'Patient Gender Distribution');

### bar(genderCounts.Gender, genderCounts.GroupCount, 'FaceColor', [0.3 0.7 0.9]);

### title('Patient Gender Distribution');

### xlabel('Gender');

### ylabel('Number of Patients');

### grid on;

### ylim([0 max(genderCounts.GroupCount)\*1.2]);

### % Top 10 Common Symptoms

### figure('Name', 'Top 10 Common Symptoms');

### top10Symptoms = head(symptomFrequency, 10);

### if ~isempty(top10Symptoms)

### bar(categorical(top10Symptoms.allSymptomsList), top10Symptoms.GroupCount, 'FaceColor', [0.9 0.5 0.2]);

### title('Top 10 Most Common Symptoms');

### xlabel('Symptom');

### ylabel('Frequency');

### xtickangle(45);

### grid on;

### else

### disp('No symptoms found to plot.');

### end

### % Top 10 Medications

### figure('Name', 'Top 10 Prescribed Medications');

### top10Medications = head(medicationFrequency, 10);

### if ~isempty(top10Medications)

### bar(categorical(top10Medications.allMedicationsList), top10Medications.GroupCount, 'FaceColor', [0.2 0.8 0.5]);

### title('Top 10 Most Prescribed Medications');

### xlabel('Medication');

### ylabel('Frequency');

### xtickangle(45);

### grid on;

### else

### disp('No medications found to plot.');

### end

### %% 5. Basic Relationship Exploration

### disp('--- Relationship Exploration ---');

### avgAgeByGender = grpstats(T, 'Gender', 'mean', 'DataVars', 'Age');

### disp('\nAverage Age by Gender:');

### disp(avgAgeByGender);

### % Top 3 Symptoms for Males

### disp('\nTop 3 Symptoms for Males:');

### maleData = T(strcmp(T.Gender, 'M'), :);

### if ~isempty(maleData)

### maleSymptoms = {};

### for i = 1:height(maleData)

### maleSymptoms = [maleSymptoms; cellfun(@(s) lower(strtrim(s)), maleData.Symptoms{i}, 'UniformOutput', false)]; %#ok<AGROW>

### end

### maleSymptoms(cellfun('isempty', maleSymptoms)) = [];

### if ~isempty(maleSymptoms)

### maleSymptomsCat = categorical(maleSymptoms);

### maleSymptomFreq = groupcounts(maleSymptomsCat);

### disp('Class of maleSymptomFreq:');

### disp(class(maleSymptomFreq));

### if istable(maleSymptomFreq)

### disp('Variable names in maleSymptomFreq:');

### disp(maleSymptomFreq.Properties.VariableNames);

### % Sort by count column, typically the second column

### maleSymptomFreq = sortrows(maleSymptomFreq, 2, 'descend');

### disp(head(maleSymptomFreq, 3));

### else

### % If not table, create table manually

### [maleCategories, ~, ic] = unique(maleSymptomsCat);

### maleCounts = accumarray(ic, 1);

### maleSymptomFreq = table(maleCategories, maleCounts, 'VariableNames', {'Symptom', 'Count'});

### maleSymptomFreq = sortrows(maleSymptomFreq, 'Count', 'descend');

### disp(head(maleSymptomFreq, 3));

### end

### else

### disp('No symptom data for males.');

### end

### else

### disp('No male records found.');

### end

### % Top 3 Symptoms for Females

### disp('\nTop 3 Symptoms for Females:');

### femaleData = T(strcmp(T.Gender, 'F'), :);

### if ~isempty(femaleData)

### femaleSymptoms = {};

### for i = 1:height(femaleData)

### femaleSymptoms = [femaleSymptoms; cellfun(@(s) lower(strtrim(s)), femaleData.Symptoms{i}, 'UniformOutput', false)]; %#ok<AGROW>

### end

### femaleSymptoms(cellfun('isempty', femaleSymptoms)) = [];

### if ~isempty(femaleSymptoms)

### femaleSymptomsCat = categorical(femaleSymptoms);

### % Top 3 Symptoms for Females

### disp('\nTop 3 Symptoms for Females:');

### femaleData = T(strcmp(T.Gender, 'F'), :);

### if ~isempty(femaleData)

### femaleSymptoms = {};

### for i = 1:height(femaleData)

### femaleSymptoms = [femaleSymptoms; cellfun(@(s) lower(strtrim(s)), femaleData.Symptoms{i}, 'UniformOutput', false)]; %#ok<AGROW>

### end

### femaleSymptoms(cellfun('isempty', femaleSymptoms)) = [];

### if ~isempty(femaleSymptoms)

### femaleSymptomsCat = categorical(femaleSymptoms);

### femaleSymptomFreq = groupcounts(femaleSymptomsCat);

### 

### % Check if output is a table

### if istable(femaleSymptomFreq)

### disp('Variable names in femaleSymptomFreq:');

### disp(femaleSymptomFreq.Properties.VariableNames);

### % Sort by count column (usually 2nd column)

### femaleSymptomFreq = sortrows(femaleSymptomFreq, 2, 'descend');

### disp(head(femaleSymptomFreq, 3));

### else

### % If not a table, manually convert

### [cats, ~, ic] = unique(femaleSymptomsCat);

### counts = accumarray(ic, 1);

### femaleSymptomFreq = table(cats, counts, 'VariableNames', {'Symptom', 'Count'});

### femaleSymptomFreq = sortrows(femaleSymptomFreq, 'Count', 'descend');

### disp(femaleSymptomFreq(1:min(3,height(femaleSymptomFreq)), :));

### end

### else

### disp('No symptom data for females.');

### end

### else

### disp('No female records found.');

### end

### else

### disp('No symptom data for females.');

### end

### else

### disp('No female records found.');

### end

### disp('--- EDA Complete ---');

### RESULT

### Upon successful implementation, a smart prescription system is expected to yield a transformative array of positive results across the healthcare ecosystem. Firstly, a significant reduction in medication errors is anticipated due to the elimination of illegible handwritten prescriptions, automated drug interaction and allergy alerts, and intelligent dosage recommendations provided by the Clinical Decision Support System. This directly translates to enhanced patient safety and a decrease in adverse drug events. Secondly, improved patient adherence to medication regimens will be a key outcome, driven by features such as automated reminders, clear medication instructions, and easy access to prescription information, empowering patients to manage their health more effectively.

### Thirdly, the system will lead to substantial gains in efficiency and productivity for all stakeholders. Healthcare providers will experience reduced administrative burden, freeing up more time for patient care, while pharmacists will benefit from streamlined dispensing processes, reduced transcription errors, and improved inventory management through integration with their systems. Fourthly, enhanced communication and collaboration within the healthcare network will be observed, as secure digital channels facilitate instant and accurate exchange of prescription information between prescribers and pharmacies.

### Finally, the smart prescription system will contribute to better overall health outcomes by fostering a more proactive and integrated approach to medication management. Data analytics capabilities will provide valuable insights into prescribing patterns and patient adherence, enabling healthcare organizations to make data-driven decisions and continually refine their care delivery models. This comprehensive digital transformation will not only modernize the prescription process but also elevate the standard of patient care.

### CONCLUSION

### In conclusion, the advent of smart prescription systems marks a pivotal advancement in modern healthcare, representing a paradigm shift from traditional, error-prone methods to a highly efficient, accurate, and patient-centric approach to medication management. By seamlessly integrating cutting-edge technologies such as electronic health records, artificial intelligence, and secure digital platforms, these systems effectively address critical challenges like medication errors, patient non-adherence, and communication inefficiencies.

### The projected outcomes of widespread adoption are profoundly positive: a significant enhancement in patient safety through intelligent error prevention, a marked improvement in patient adherence driven by user-friendly tools and reminders, and a substantial boost in operational efficiency across the entire healthcare continuum—from the prescriber's office to the pharmacy counter. Ultimately, smart prescription systems foster a more collaborative and transparent environment, empowering both healthcare providers and patients with the information and tools necessary for optimal medication utilization. As healthcare continues its digital transformation, smart prescription systems are not merely an improvement but a fundamental necessity for delivering safer, more effective, and truly integrated patient care in the 21st century.

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