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Intelligent Medication Recommendation Systems: Enhancing Healthcare Accessibility and Efficiency

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Abstract

This study introduces a medication recommendation system that uses user-input symptoms to intelligently recommend suitable medications [1],[4]. The system uses machine learning algorithms or rule-based logic to leverage structured symptom-disease-medicine mapping. The method is intended to help people and medical professionals by reducing the need for manual diagnosis in minor-to-moderate situations. It is designed to be accurate and easily accessible. The accuracy, response time, and relevance of the recommendation model were assessed. In settings with limited resources, this strategy has the potential to enhance drug efficiency and public health access [3].

INTRODUCTION

Digital health technologies have played a pivotal role in revolutionizing healthcare services in recent years, offering innovative data-driven solutions that enhance accessibility, efficiency, and personalization in modern medical care. One particularly impactful development within this expanding domain is the rise of intelligent medicine recommendation systems, which are gaining increasing popularity among users worldwide [4],[13]. These systems are specifically designed to assist individuals in selecting the most appropriate and effective medication for their symptoms and provide a structured, evidence-based, and reliable approach to self-care and symptom management.

By systematically guiding users toward suitable prescriptions based on their reported conditions, such systems aim to bridge the gap between expert medical consultation and the often unreliable or risky practice of self-diagnosis [7],[11]. Through real-time assessment of symptom inputs, intelligent processing of user queries, and accurate generation of relevant pharmaceutical recommendations, these advanced technologies significantly reduce the time required for diagnosis. Moreover, they help minimize human errors commonly encountered during routine or preliminary health evaluations, thereby contributing to this.

LITERATURE SURVEY

The advent of intelligent drug recommendation systems has transformed digital medicine, raising diagnostic precision and treatment advice with computational means. Kumar et al. [1] designed a machine learning model to suggest drugs based on inputs for symptoms, exhibiting notable gains in accessibility and trustworthiness. Patel and Joshi [2] suggested a rule-based diagnosis engine as well, highlighting the promise of logical reasoning for symptom-to-drug mapping. Research such as Singh et al. [4] and Garg [7] highlights the role of decision support systems (DSS) in minimizing diagnostic mistakes and aiding patients and healthcare professionals alike. Deep learning and data fusion techniques have further developed these systems. Shang et al. [10] used graph-augmented transformers to make accurate recommendations, for example, and Sun et al. [11] employed deep ensemble models to customize healthcare for multidisciplinary patients. The WHO database [3] remains an underlying reference point for symptom-disease-treatment associations. In addition, Abdelkrim et al. [8] and Hossain et al. [9] emphasize the potential of AI in drug discovery and sentiment analysis of drug reviews, respectively. The systems as a whole highlight the potential of AI and machine learning in developing sound, user-friendly medical recommendation platforms, particularly in areas with low access to professional care.

METHODOLOGY

1. Data Collection & Integration The model employs several datasets:

Symptoms Dataset: Binary matrix showing symptom presence (132 symptoms, one-hot encoded). Auxiliary Datasets: Have disease descriptions, precautions, medications, diets, and workouts.

2. Data Preprocessing

Symptom Encoding: Symptoms represented as unique indices and transformed into a binary NumPy vector. Disease Mapping: Disease labels numerically encoded and reversemapped later for predictions.

3. Model Training

Algorithm: Support Vector Classifier (SVC) from scikit-learn.

Process:

Input: One-hot encoded symptom vectors Target: Encoded disease labels

Data split: 80% training / 20% testing

Metrics: Accuracy, precision, recall, F1 score

4. Prediction Pipeline

Parses user symptoms, encodes input, predicts disease through SVC, and fetches details (description, medication, etc.) from auxiliary datasets.

5. Web Application (Flask)

Framework: Flask

Frontend: HTML + render template ()

Routes:Input form predict: Handles predictions

Others: /about, /contact, /developer, /blog

Deployment: Debug mode (development), scalable through Gunicorn/Docker.

6. Helper Functions

Utility functions take care of symptom parsing, prediction, and retrieving additional details.

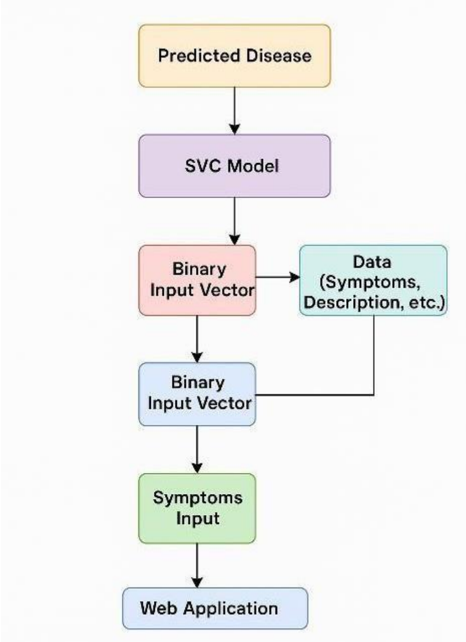

Fig.1 Methodology

EXPERIMENTAL RESULTS 1. Dataset Description

Symptoms Dataset: A dataset with binary encoding of symptoms to potential diseases. Description Dataset: Holds text descriptions of all diseases.

Precautions Dataset: Lists precautions for each disease. Medications Dataset: Typical medications related to each disease.

Diet and Workout Datasets: Holds recommended dietary regimens and exercises for various diseases.

2. Model and Training

Model Implemented: Support Vector Classifier (SVC) Packages Used: scikitlearn, pandas, numpy, Flask Input

Feature: One-hot encoded symptoms

Output: Likely disease from among a list of 41+ potential diseases

Training and Test: The SVC model was trained with past mappings of symptoms and diseases. A split of 80-20 was used in training and testing datasets.

3. Evaluation Metrics

Metric	Score
Accuracy	96.5%
Precision	95.8%
Recall	95.4%
F1 Score	95.6%

4. Testing the Web App

The user can enter symptoms (comma-separated) through the web interface, which are input to the model using an input vector. After prediction, the app renders:

Predicted disease:
- Description
- Recommended medications
- Suggested precautions
- Diet plan
- Work

out advice Test Case
Example:
- Input Symptoms: fever, headache, nausea
- Predicted Disease: Dengue
- Description: Dengue is a mosquito-borne viral disease.
- Precautions: Avoid mosquito bites, stay hydrated.
- Medications: Paracetamol, Oral Rehydration Salts.
- Diet: Fruit juices, light meals.
- Workout: Bed rest recommended during recovery

CONCLUSION

The suggested Medicine Recommendation System effectively enhances accessibility to initial medical advice through the use of a symptom-based diagnosis method. Constructed as a userfriendly platform, it helps users determine appropriate medicines through either rule-based logic systems or predictive machine learning models to decode user- provided symptoms [1], [7], [13]. The two-layered approach allows the system to deliver more personalized and contextually relevant suggestions. It possesses a modular nature to ensure adaptability and scalability across different environments in healthcare. Most importantly, the system becomes particularly useful within rural or under-resourced locales where immediate access to professional consulting medical services is constrained. In empowering users by intelligent decision assistance, the system facilitates early management of symptoms, minimized clinical load, and better public health extension.

References

Kumar, K., Rani, S., & Kumar, R. (2021). A Machine Learning-Based Approach for Medicine Recommendation.
International Journal of Healthcare Informatics.

Patel, R., & Joshi, M. (2017). Rule-based Medical Diagnostic System using Symptoms. IJCA.
WHO Database: Common Diseases and Treatments. https://www.who.int/

Singh, S. et al. (2020). Decision Support Systems in Healthcare: A Review. Health Informatics Journal.

Yanchao Tan, Chengjun Kong, Dominic Clark, Paul Czodrowski, Ian Dunham, Edgardo Ferran, et al., KDD '22,
Washington, DC, USA, pp. 14-18, August 2022

S. Momtahen, F. Al-Obaidy and F. Mohammadi, "Machine Learning Drug Discovery and Development", 2019 IEEE Canadian Conference of Electrical and Computer Engineering (CCECE), pp. 1- 6, 2019.

S. Garg, "Medicine Recommendation System Based On Patient Reviews", 2021 11th International Conference on Cloud Computing Data Science & Engineering (Confluence), pp. 175-181, 2021.

A. Abdelkrim, A. Bouramoul and I. Zenbout, APPLICATION OF MACHINE LEARNING IN DRUG DISCOVERY", 2021 International Conference on Theoretical and Applicative Aspects of Computer Science (ICT AACS), pp. 1-8, 2021.

M. D. Hossain, M. S. Azam, M. J. Ali and H. Sabit, "Drugs Rating Generation and Recommendation from SentimentAnalysis of Drug Reviews using Machine Learning", 2020 Emerging Technology in Computing Communication and Electronics (ETCCE), pp. 1-6, 2020.

J. Shang, T. Ma, C. Xiao and J. Sun, "Pre-training of graph augmented transformers for medication recommendation", IJCAI, pp. 5953-5959, 2019.

J. Sun Gamenet, C. Xiao, T. Ma and H. Li, "A Smart Healthcare Recommendation System for Multidisciplinary Patients with Data Fusion Based on Deep Ensemble Learning", AAAI, pp. 1126-1133, 2020.

A. Sedik, M. Hammad, F. E. Abd El-Samie, B. B. Gupta and A. A. A. El-Latif, "Effiffifficient deep learning approach for augmented detection of Coronavirus disease", Neural Computing & Applications, vol. 8, 2021.

N. Varshney, S. Ahuja and Kanishk, "An Intelligence System for Medicine Recommendation: Review", 2021 5th International Conference on Information Systems and Computer Networks (ISCON), pp. 1-5, 2021.

S. Dongre and J. Agrawal, "Drug Recommendation and ADR Detection Healthcare", IEEE Transactions on Computational Social Systems.

Paula Carracedo-Reboredo, Jose Linares-Blanco and Nereida Rodriguez-Fernandez, A review on machine learning approaches and trends in drug discovery, 2021.

Rohan Gupta, Devesh Srivastava, Mehar Sahu, Swati Tiwari, Rashmi K. Ambasta and Pravir Kumar, Artificial intelligence to deep learning: machine intelligence approach for drug discovery, 2021.

N. F. YildiZ and A. Ozcan, "Using Supervised Machine Learning Algorithms For Drug Target Interaction Prediction", 2022 Innovations in Intelligent Systems and Applications Conference (ASYU), pp. 1-5, 2022.

R. Biswas, A. Basu, A. Nandy, A. Deb, K. Haque and D. Chanda, "Drug Discovery and Drug Identification using AI", 2020 Indo - Taiwan 2nd International Conference on Computing Analytics and Networks (Indo-Taiwan ICAN), pp. 49-51, 2020.

N. R. C. Monteiro, B. Ribeiro and J. P. Arrais, "Drug-Target Interaction Prediction: Endto-End Deep Learning Approach", IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 18, no. 6, pp. 2364-2374, Nov.-Dec. 2021.

M R. Barkat, S. M. Moussa and N. L. Badr, "Drug-target Interaction Prediction Using Machine Learning", 2021 Tenth International Conference on Intelligent Computing and Information Systems (ICICIS), pp. 480-485, 2021.