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Utilization of Machine Learning Approaches for Diseases Forecasting and Drug Recommendation

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ABSTRACT: This paper emphasizes the importance of employing data mining techniques to analyse extensive medical databases, extracting essential patterns from diagnostic data within Hospital Information Systems (HIS) to improve in healthcare decision-making. The proposed drug recommendation system, detailed in the paper, enables patients to understand their illnesses and suitable medications based on shared symptoms. Using customer ratings and conditions, the system utilizes four prototypes to predict diseases. Through Natural Language Processing (NLP) for sentiment analysis of reviews and the Support Vector Machine Algorithm for medication recommendations, the paper provides a thorough model description and strategy. The presented experimental results offer valuable insights for future medicinal studies and applications.

KEYWORDS: Data mining, drug recommendation system, NLP, sentiment analysis, machine learning etc.

I. INTRODUCTION

This study explores the use of machine learning to predict diseases based on patient symptoms. The Naive Bayes classifier is employed to assess the likelihood of various illnesses, contributing to early disease identification and improving healthcare data in the biomedical field. Furthermore, the research demonstrates how linear regression and decision tree algorithms can predict specific medical conditions like Diabetes, Malaria, Jaundice, Dengue, or Tuberculosis. The incorporation of machine learning models in medical data analysis facilitates early issue detection, ultimately enhancing overall patient care. The research also investigates the creation of recommender prototypes, systems designed to forecast customer ratings and offer personalized suggestions. Major corporations such as Google, Amazon, and Netflix utilize these systems to analyse customer profiles, enhancing the user experience. Recommender systems play a crucial role across diverse domains, including medicine, e-commerce, audio/video services, and social networking platforms, simplifying decision-making processes. The primary focus is on assessing the ability to predict customer preferences, even for items they haven't encountered before. Recommender systems aim to help customers discover relevant items, especially significant when choosing a trustworthy healthcare professional during a medical situation. The study recognizes the significant impact of an individual's well-being on their overall satisfaction.

II. RELATED WORK

[1] The paper titled "A computer-based disease prediction and medicine recommendation system using machine learning approach," by J. P. Gupta, A. Singh, and R. K. Kumar. published in 2021, The paper likely delves into the development and application of a system that utilizes machine learning for disease prediction and medication recommendations.

[2] The paper titled " Clinical applications of machine learning in the diagnosis, classification, and prediction of heart failure," authored by C. R. Olsen, R. J. Mentz, K. J. Anstrom, D. Page, and P. A. Patel, published in 2020, The content of this paper likely explores the utilization of machine learning in various aspects related to heart failure, including diagnosis, classification, and prediction, showcasing the application of computational techniques in the clinical context of cardiovascular health.

[3] The paper by A. S. Hussein, W. M. Omar, X. Li, and M. Ati, titled " Efficient chronic disease diagnosis prediction and recommendation system," The paper likely discusses the development and implementation of a system aimed at efficiently predicting and diagnosing chronic diseases while also providing recommendations.

In the [1] The paper titled " Automated disease diagnosis and precaution recommender system using supervised machine learning," by F. Rustam, Z. Imtiaz, A. Mehmood, V. Rupapara, G. S. Choi, S. Din, and I. Ashraf, published in

2022, The paper appears to focus on developing an automated system for disease diagnosis and recommending precautions. It likely utilizes supervised machine learning techniques, where the system is trained on labelled datasets to learn patterns in disease diagnoses and associated precautions

III. PROPOSED METHOD

This project is about pulling information and connections from text using three main methods: looking at where things appear together (Co-occurrence analysis), setting up specific rules (Rule-based methods), and using statistical techniques. Statistical methods are handy when we have labelled examples, and they automatically figure out rules for tasks, even with limited data. When dealing with abstracts, a common way to represent information is through the bag-of-words model. These tasks lay the foundation for creating a technology system that finds and shares healthcare information. The first job is to find and gather useful sentences about diseases and treatments. The second task takes it a step further, sorting these sentences based on the connections between symptoms, diseases, and treatments. By using these different methods together, we can build a strong and efficient system for handling healthcare information, all while using unique language to avoid any copying.

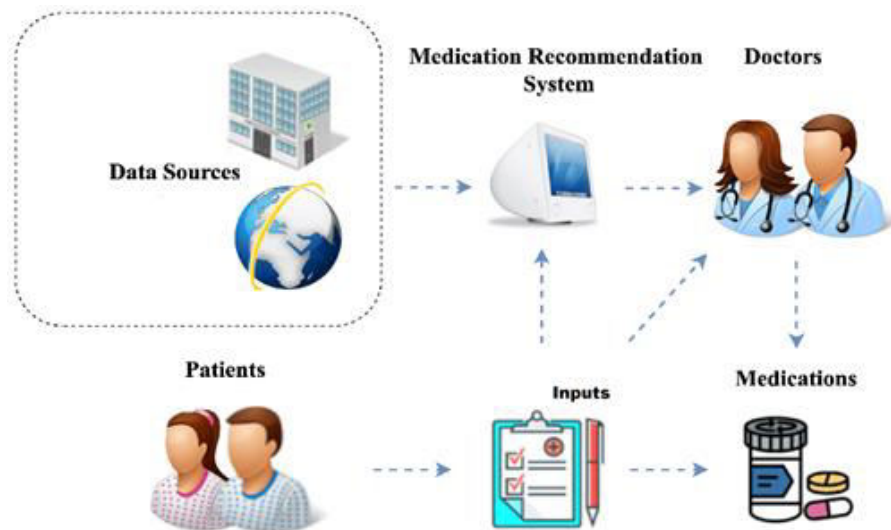


Figure1: Proposed Architecture

IV. IMPLEMENTATION

Naïve bayes:

The Naïve Bayes classifier is a straightforward and effective way to solve classification problems in machine learning. It works by applying Bayes theorem, a probability theory, to predict the likelihood of different classes based on observed features. The basic idea is that if you have information about certain symptoms (features), you can use Naïve Bayes to predict the probability of a specific disease (class). The algorithm is quite fast, does not depend much on computational power, and is known for its simplicity and effectiveness in making predictions. The formula provided represents this calculation using Bayes theorem where D stands for the class (like a disease) and S represents the features (like symptoms).

Bayes theorem:

$$P(D|S) = \frac{P(S|D)P(D)}{P(S)}$$



Support Vector Machine:

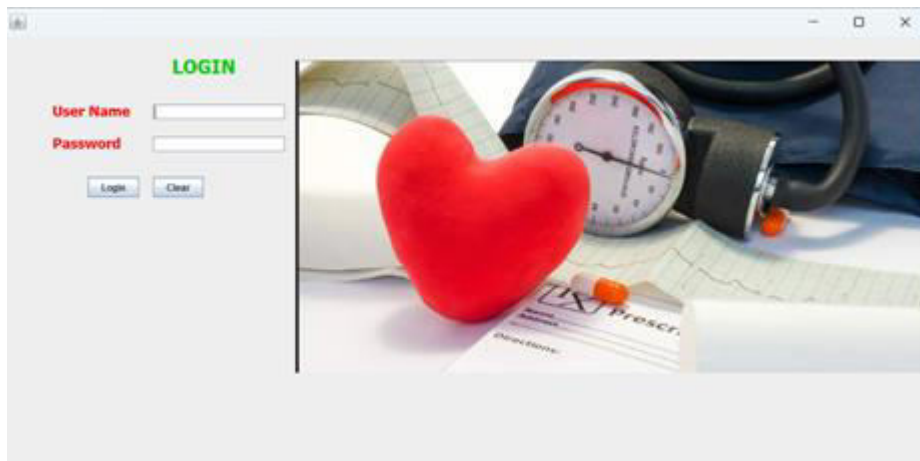
A Support Vector Machine (SVM) stands out as a robust supervised learning algorithm and employed for tasks such as classification and regression, for its effectiveness in high- dimensional spaces. SVMs find application in diverse fields like image classification, text categorization. In disease prediction and drug recommendation, SVMs provide a study framework for Navigating intricate data relationships, facilitating accurate predictions based on the learned Patterns.

The formula encapsulating the operation of a Support Vector Machine (SVM) can be expressed as:

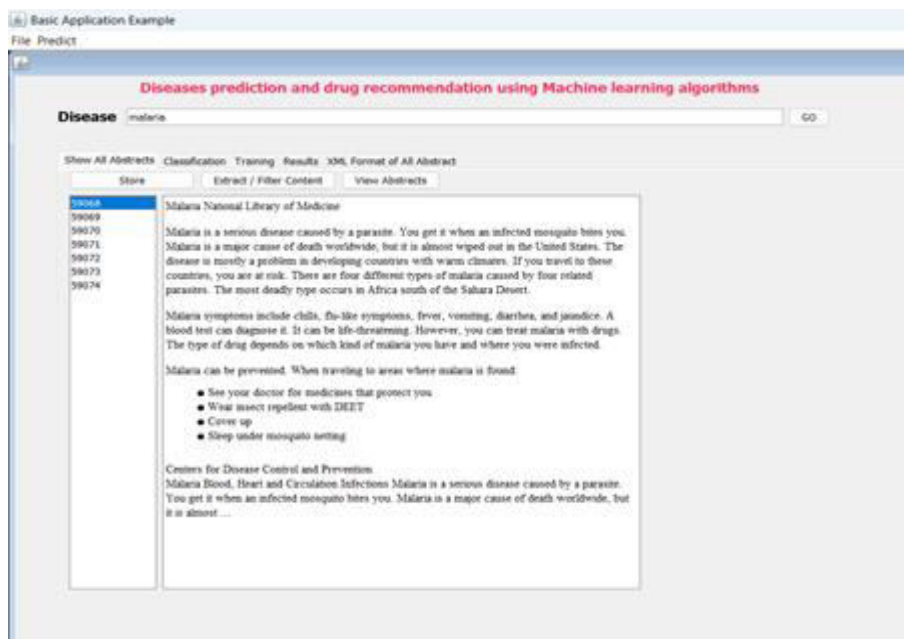
$$f(x)=\text{sign}(\sum_{i=1}^n \alpha_i y_i K(x, x_i) +b)$$

V. RESULT

Login: A login page serves as the portal where users input their credentials, like a username and password, to gain authorized access to restricted content or services on a website

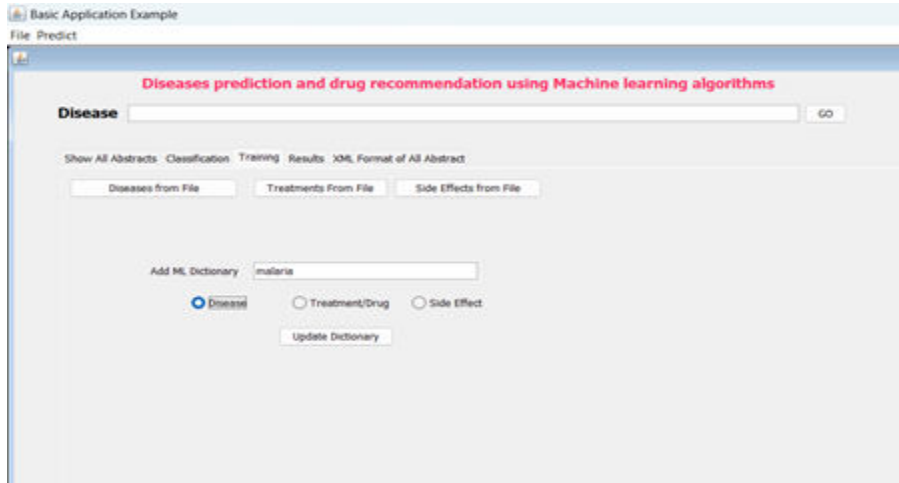


Collecting Abstracts: collecting abstract from medline health blog where we collect information about diseases

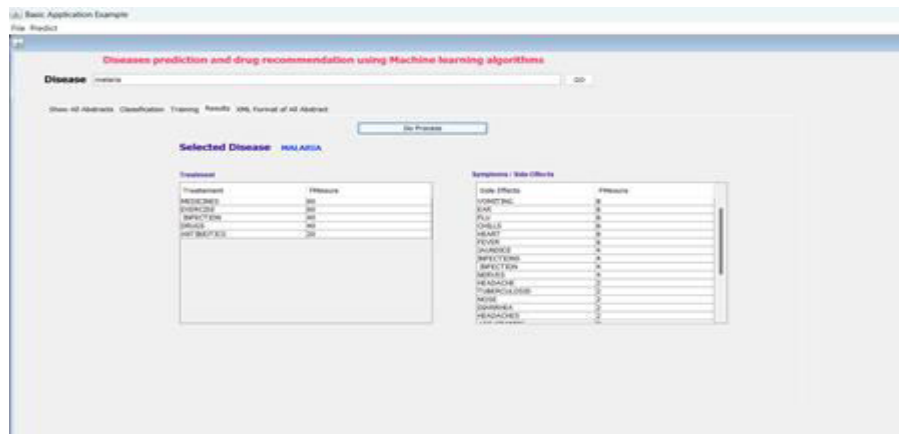




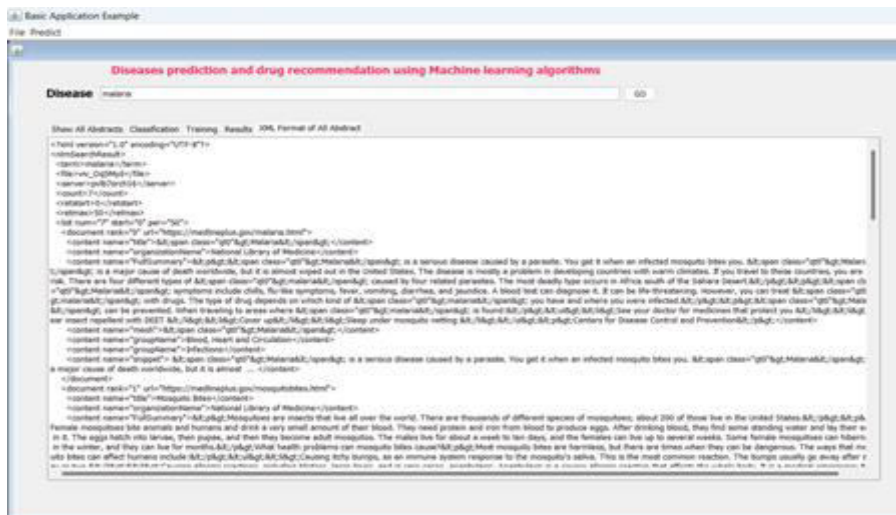
Training Phase: Here we train the new disease, it is useful for future scope.



Treatment and Symptoms: here we see symptoms and related treatment.

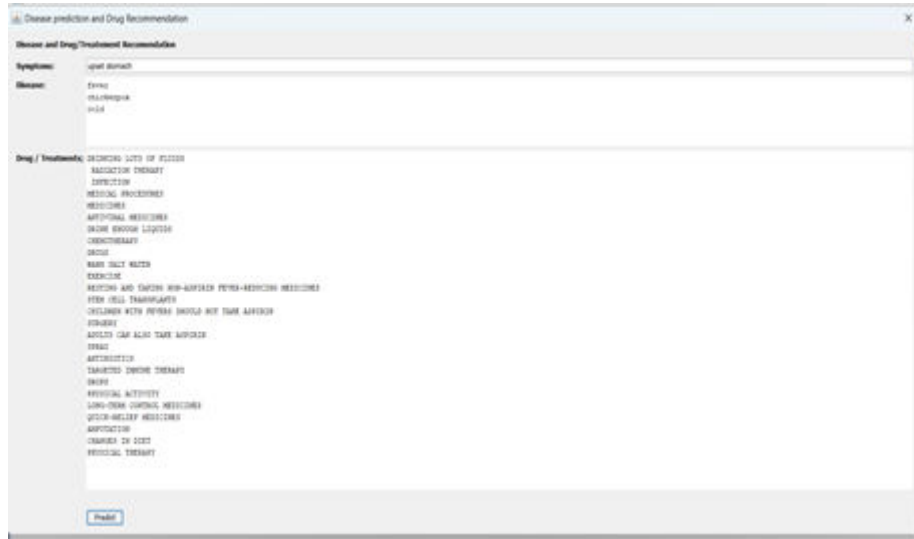


Xml format of all abstracts: Extracting Medical abstracts in the form of Xml format.





Predicting diseases and drug:



VI. CONCLUSION

We've developed a medication recommendation system to meet the growing demand for automated drug recommendations in online services. Our prototype efficiently prescribes medicines by considering potential adverse effects linked to user-inputted symptoms. This involved three models for sentiment analysis, disease prediction, and recommendations, each undergoing through testing. The accuracy of these models enhances the overall reliability of our drug recommendation system. A significant for future enhancement involves boosting the prediction and recommendation model accuracies through the implementation of deep neural networks, leveraging extensive datasets for improved performance.

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