Disease Prediction using Medical Data

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***Abstract*— The rapid advancement of machine learning techniques has revolutionized disease prediction, enabling early diagnosis and improving patient outcomes. This study introduces a machine learning-based disease prediction system that leverages symptom data to classify 41 diseases, integrated with a Flask server and a frontend visualizer for real-time accessibility. Utilizing a dataset of 132 symptoms, we trained and evaluated multiple models, including RandomForest, Support Vector Machine (SVM), and Logistic Regression, to predict diseases with high accuracy. Our methodology emphasizes robust data preprocessing, feature selection, and model comparison to enhance predictive performance. Preliminary results show that RandomForest achieved an accuracy of [insert accuracy], with SVM and Logistic Regression yielding [insert accuracies], highlighting the potential of ensemble and linear models in symptom-based diagnosis. The system's integration with a web interface distinguishes it from prior works, offering a practical tool for healthcare applications. Drawing from a comprehensive literature review, our approach addresses common limitations such as overfitting and dataset constraints by proposing multi-model evaluation and potential ensemble techniques. However, challenges remain, including the need for larger datasets and mitigation of computational complexity. This study contributes to the field by combining advanced machine learning with user-friendly deployment, paving the way for future enhancements such as real-time data integration and deep learning adoption.**

Keywords—component, formatting, style, styling, insert (key words**)**

I. INTRODUCTION (*HEADING 1*)

Human disease prediction is a cornerstone of healthcare, profoundly impacting quality of life and treatment success. Early detection is a critical step in managing diseases effectively, yet traditionally, this responsibility has rested almost entirely with physicians. The healthcare industry relies heavily on innovation to optimize logistics and improve patient outcomes [1]. Innovation fuels advancements in treatments, therapies, and cures, ensuring the medical field remains dynamic and relevant [12]. With vast potential for growth, the industry seeks progress in areas such as developing novel treatments, enhancing patient care, and streamlining medical procedures [13, 14]. In today's digital era, the digitalization of medical processes offers a transformative path forward [15]. Among the pressing challenges in healthcare are the overwhelming workload on doctors [16] and the high cost of consultations [17], particularly evident in symptom-based disease prediction.

Current diagnostic practices typically involve patients consulting a general practitioner, describing their symptoms, and being referred to specialists based on the doctor's inference [18]. This process, while effective, is logistically cumbersome and resource-intensive. Machine learning provides a solution by automating disease prediction, reducing human effort, and improving efficiency. Our research introduces an ensemble approach combining Random Forest, Support Vector Machine (SVM), and Logistic Regression algorithms to classify diseases based on symptom inputs [19]. Unlike traditional models, this ensemble leverages the strengths of multiple algorithms to enhance prediction accuracy and robustness, offering a practical alternative to manual diagnosis.

Existing disease prediction architectures often lack precision and fail to incorporate comprehensive patient data, relying solely on recent symptoms and extensive human interaction [18]. For instance, methods like SVM typically use only immediate symptom inputs, neglecting broader medical context [20]. Such approaches limit effectiveness and adaptability, often resulting in suboptimal accuracy as demonstrated in prior studies. In contrast, our proposed model prioritizes efficiency and precision, delivering predictions through a user-friendly web platform. Patients can input symptoms directly, and the system outputs the most likely disease along with the top three probable diseases, enhancing interpretability and decision-making support.

The proposed model offers the following major contributions:

1. Improved efficiency and accuracy in disease prediction through an ensemble of Random Forest, SVM, and Logistic Regression.
2. Deployment via a web interface for real-time, accessible predictions.
3. Enhanced user insight with top disease probabilities, tested on real-world symptom scenarios.

The remainder of this paper is structured as follows: Section 2 reviews prior work in disease prediction. Section 3 details the proposed methodology and techniques to boost prediction accuracy. Section 4 presents a comparative analysis of our model against earlier methods. Section 5 concludes the study, followed by future scope in Section 6.

II. Literature Review/Survey

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TABLE I. Table Type Styles

Table Head	**Table Column Head**		
	Table column subhead	***Subhead***	***Subhead***
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[a] Sample of a Table footnote. (*Table footnote*)

Fig. 1. Example of a figure caption. (*figure caption*)

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V. Future Directions

VI. Conclusion

Acknowledgment *(Heading 5)*

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VII. References

[1] M. A. Hider, "Early Disease Detection through Advanced Machine Learning Techniques," A comprehensive Analysis and Implementation in Healthcare systems, vol. 15, no. 01, 2024.

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[1] G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*

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[4] K. Elissa, “Title of paper if known,” unpublished.

[5] R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.

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[7] M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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