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Predictive Analytics for Early Disease Detection Using Big Data Techniques: A Multidimensional Algorithmic Approach

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Abstract:

The rapid expansion of healthcare data generated from electronic health systems, diagnostic devices, and genomic research has created new opportunities for early disease prediction. Traditional healthcare models primarily focus on treatment after diagnosis, which often delays intervention. This research presents a comprehensive framework that integrates predictive analytics with Big Data technologies to enable early identification of diseases. Machine learning techniques, including Random Forest, Support Vector Machine (SVM), and deep learning models, are utilized to analyze complex and high-dimensional datasets. The proposed approach emphasizes real-time risk prediction for chronic conditions such as cardiovascular diseases and Type 2 diabetes. Experimental results demonstrate that optimized Big Data processing combined with advanced algorithms significantly enhances prediction accuracy and reduces false-negative rates. This approach contributes to cost-effective and proactive healthcare management.

Keywords: *Predictive Analytics, Big Data, Machine Learning, Early Disease Detection, Healthcare Analytics, Data Mining*