

MULTI-DISEASE PREDICTION USING MACHINE LEARNING: AN INTEGRATIVE APPROACH

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The fact that we can diagnose multiple diseases in one patient is an enormous stepping stone towards increasing the efficiency of a diagnosis in general. Nevertheless, common conventional methods of disease forecasting are regularly carried out disjointedly, predicting specific diseases without regard to the existing synergy between diseases. This study introduces a new approach to using multi-disease models for AMD, glaucoma, and DR prediction through machine learning, considering the patient's EHR data and genetic and environmental attributes simultaneously. Furthermore, by fusing a comprehensive array of deep learning networks and ensemble strategies, our framework integrates heirarchical and tabular/contextual information while gauging interdependencies and intricate nonlinear trends inherent in disparate data structures. On large real-world data sets used with permission, we validate the effectiveness of the proposed method compared to simple single-disease predictive models and other multi-label classification techniques. In this study, we offered an efficient and generalizable framework for risk prediction of more than 20 chronic and acute diseases, including cardiovascular diseases, cancer, neurological disorders, and so on, with an average F1 score of 0.87 and an overall accuracy of 92% with an AUC-ROC of 0.92. In addition, the proposed interpretability framework reveals new aspects of disease co-morbidity and the interactions of risk factors to promote prevention medicine approaches. This integrative multi-disease prediction framework holds the promise of radically transforming disease care to advance screening and diagnosis, optimize decision-making, and individualized therapeutic intervention, resulting in better treatment regimens and overall population health, as well as decreased costs to the healthcare system.