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The importance of Integration of AI, Brain Neuro-Imaging Machine Vision, Peripheral Blood Gene Expressions, and Genomics for Better Prognosis and Diagnosis Predictions of Alzheimer's Disease

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Abstract

Many diseases, including cancer, have received much attention from their respective research communities in machine learning, deep learning, and bioinformatics tools for predictive models based on gene expressions and other biomarkers in the life sciences. Alzheimer's disease (AD) has not yet gotten the attention it deserves. This is due to what appears to be (a) the lack of relevant large enough data sets with biological samples throughout the different stages of the disease with the same patients, (b) other challenges such as noisy peripheral blood, (c) availability in many instances of human AD patients brain biological RNA, and mRNA tissue samples only post mortem, (d) some of the testing modalities are expensive, maybe intrusive, or available only in some specific clinics, or researchers, and not to the general community. In general, the analysis of peripheral blood mRNA gene expressions, among others, is a powerful tool for predicting AD biological progression and process phases related to mental and physiological changes in the disease for better diagnosis and prognosis predictions and the eventual identification of novel therapeutics and drug discovery. In this study and talk, we present some of the results and show and discuss the importance of integrating brain neuro-imaging & machine vision, peripheral blood gene expressions, genomics, and other AD biomarker modalities for better prognosis, diagnosis, and risk assessment predictions in the early stages of Alzheimer's disease. It also focuses on better data mining techniques for a better selection of biomarkers using the ADNI data sets and other related ones. Unlike some other known Alzheimer's biomarkers/tests, such as brain neuroimaging (CT, MRI, PET, Amyloid PET, Tau PET, Fluorodeoxyglucose (FDG) PET scans), Cerebrospinal fluid biomarkers (CSF), Blood tests (genetic testing), clinical, demographic data, genomics, gene expressions and differential gene expressions (DEGs), integrated with other neuro-imaging machine vision biomarkers , are uniquely tuned for eventual better disease prognosis and diagnosis predictions, and eventual drug discovery and novel therapeutics identification in early stages of Alzheimer's disease.