Analysing Machine Learning Models to Determine Alzheimer's Disease Using Gut Microbiome

Al-Juboori, Moumal (School: ProCivitas Privata Gymnasium Malmö)

In recent years, research has demonstrated that the gut microbiome has an important role in normal brain function. This opens up possibilities for novel treatments of Alzheimer's, which affects one in five women and one in ten men over their lifetimes. The study investigated the connections between gut microbiota compositions and Alzheimer's disease from a machine learning-based approach. Pivotal parts of developing a machine learning model include pre-processing data and assembling a unified structure. Fecal shotgun metagenomics rRNA sequence data was used to differentiate between subjects affected by Alzheimer's Disease (AD) and the Healthy Control (HC) group (n = 175 patients, 100 AD, 75 HC). In addition, three different machine learning models were utilized to find the optimal one. To validate the models, confusion matrices and AUC-ROC curves were employed. Results showed that a machine learning algorithm can be developed and achieve high precision (77%), with a confidence interval of 0.61 - 0.94, using relatively few parameters. Subsequent to the training phase, the testing set specifies that the model can be employed in a data set with new patient data and predict with a 67% accuracy. Accurate, non-invasive diagnostic techniques, such as utilizing the gut-brain axis, can assist in solving the pressing need for an easier and faster way to diagnose in primary care. Creating predictive models to determine outcomes based on microbiome and clinical metadata has been shown to be possible and will help with decision-making in health care and facilitate many patients with Alzheimer's in getting sufficient care.

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