Artificial Intelligence´s Lucky Sevens

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Early detection is our most valuable asset in treating and managing chronic and life-threatening conditions. Early detection plays a role in shaping the course of treatment, the progression of the disease, the prognosis of a patient as well as their quality of quality, and it can even be the difference between life and death. Despite, modern medicine still faces many obstacles when it comes to diagnosing Alzheimer's and Parkinson's diseases before advanced symptoms are noticed, which brings about dire consequences. However, a new form of technology holds great promise and presents a potential solution to some of these issues; artificial intelligence is leading the path of diagnostic medicine.

Alzheimer's Disease (AD) is the most common form of dementia and its prevalence globally has doubled in the past 25 years (World Health Organization: WHO & World Health Organization: WHO, 2023) as population grows older (World Health Organization: WHO, 2019). It affects about 7 million people in the United States (*Alzheimer's Disease Facts and Figures*, n.d.) and 55 million people in the world. Alzheimer's disease often starts in the hippocampus, the brain's memory center and is characterized by tangles made of tau protein, as well as the protein aggregation beta-amyloid that is a consequence of the disease and that causes disruption in the function of neurons. The degeneration of neurons leads to the development of the disease and its common symptoms include memory, loss and disorientation (*What Happens to the Brain in Alzheimer's Disease?*, 2024). Unlike Alzheimer's, Parkinson's disease affects the substantia nigra of the brain and causes degeneration in dopaminergic neurons, which leads to memory impairment and deterioration over time.

Despite the contrasting causes and effects, one thing that these two neurodegenerative diseases have in common is how patients benefit their from early detection. While neither of them have a known a cure, they are treatable and manageable (*Neurodegenerative Diseases*, 2024). In the case of Alzheimer's, it is widely agreed upon that early intervention is crucial since early treatments can help delay the progression of symptoms ("How Early Intervention and a Treatment Can Help Early Alzheimer's Disease," 2024). Early diagnosis, as well as early identification of risk factors, are beneficial in managing symptoms and preparing families to support their loved ones living with Alzheimer's (*Alzheimer's Disease Fact Sheet*, 2023). Moreover, as reported by Canadian Alzheimer's Society, early intervention can lead to increased effectiveness of treatments and therapies, not to mention increased eligibility to participate in alternative therapies and clinical trials (*The 10 Benefits of Early Diagnosis*, n.d.). Similarly, the quality of life of Parkinson's patients has improved thanks to early diagnosis and treatment which has mitigated the progression of the disease (*Parkinson's Disease: Early Detection and Treatment Leads to Better Quality of Life.*, 2024). However, patients are typically diagnosed once symptoms start hindering motor skills and, at this point of the disease, 60% to 80% of dopaminergic neuron death has already occurred (López-Aguirre et al., 2023). This highlights the importance of treatment before reaching this level of degeneration.

Currently, diagnosing conditions like these neurodegenerative diseases is no simple task since many of the initial symptoms are often mistaken by aging and stress. Because of this, they are often swept under the rug by patients and their families until symptoms start to become severe. Furthermore, reaching a medical diagnosis is often a lengthy and costly process (*The Cost Burdens of Diagnosing and Treating Alzheimer's Disease: Alarming Issues for Patients, Providers and Payers Nationwide | DISCERN™ - World's #1 Validated Alzheimer's Disease Test*, n.d.). Fortunately, the recent rise of artificial intelligence suggests promising advances in this field. Artificial Intelligence was shown to be able to identify biomarkers in blood samples belonging to people with and without Parkinson's Disease and categorize samples correctly (Thorsberg, 2024). Research conducted at UCL and University Medical Center Goettingen also used a similar methodology on the analysis of a similar blood panel of individuals with Rapid Eye Movement Behaviour Disorder, a condition often considered a precursor to Parkison's Disease. Over 10 years, AI was able to predict with about 75% accuracy which subjects would go on to develop Parkinson's Disease up to seven years before the appearance of symptoms. (News-Medical, 2024).

Furthermore, studies conducted using machine learning have hit the jackpot in predicting the incidence of Alzheimer's Disease seven years before the onset. Researchers at the University of California in San Francisco used machine learning, a type of AI that learns from data, to make predictions of CITA with a 72% accuracy by examining large data sets to predict who would develop the disease (Tang et al., 2024). In another study, scientists at the University of Cambridge utilized a similar model to analyze the non-invasive test results of people who showed a low degree of cognitive impairment. They found that artificial intelligence was able to predict the individuals who would go on to develop Alzheimer's Disease within three years with 82% precision (*Artificial Intelligence Outperforms Clinical Tests at Predicting*, 2024).

Artificial intelligence allows for the rapid analysis of large amounts of data from which it can draw valuable predictions. Its use is as an accurate method to predict the incidence of two of the most prevalent neurodegenerative diseases in the world and may allow for early intervention. The significance of this technology lies in delaying the progression of diseases and perhaps one day, preventing ther incidence altogether. This might just be the lucky strike that diagnostic medicine has been waiting on and that could revolutionize the lives of millions of people.

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