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Can AI help to predict the beginning and development of Neurodegenerative Diseases (ND)?

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Problem Statement: Neurodegenerative diseases (ND) are mainly caused by age. As our society ages, the likelihood of developing ND will increase by 2050, and the number of cases could triple. Neurodegeneration can occur silently for 20-30 years before symptoms appear, and there is currently no known cure for ND, including Alzheimer's (AD) or Parkinson's disease (PD) [1]. This study aims to use AI methods to identify early stages of ND and predict disease progression.

Methodology & Theoretical Orientation: We used ML algorithms based on intelligent granular computing to analyze reflexive saccades, antisaccades, and pursuit eye movements (EM) to estimate PD disease progression [1-7] but EM are also good biomarkers for AD [2].

Findings: We used multi-granular computing to estimate possible neurodegeneration processes related to AD in "normal" patients [9-10]. We improved our video-oculography system [3] but demonstrated earlier that by using standard neurological test results and reflexive saccades (RS) [4] parameters we have predicted with AI help PD progression (UPDRS – Unified PD Rating Scale). In addition, based on disease duration, RS parameters, and standard neuropsychological tests, we have predicted PD development in patients with different treatments: medication and/or DBS (deep brain stimulation), and different disease durations [4,5]. We have demonstrated that cognitive changes do not, but depression has a significant influence on the PD progression rate, and their values help to estimate the progression [6,7].

Conclusion & Significance: We confirmed that using intelligent granular and multi- granular methods helped predict AD and PD development. Our method to predict the beginning of ND is based on the objects' recognition mechanism [11]. In a noisy environment, the brain uses modulatory pathway feedback that tunes lower areas to properties of memorized models [11]. To predict the beginning of ND, we will 'AI-tune' above- described ND symptoms to the patient's actual test results.

Biography

Andrzej Przybyszewski specializes in predicting the onset and progression of neurodegenerative diseases, such as Alzheimer's or Parkinson's, using data mining and machine learning algorithms. His research aims to understand how the brain integrates sensory information and converts it into motor actions, intending to discover why they are not effective in Parkinson's disease and repairing their pathologies by AI methods. His work is based on the idea proposed by P. Ricoeur that an individual's identity is shaped not only by their genes but also by their actions, which leave a unique imprint on the way the brain integrates parallel processes that are significantly disturbed in Alzheimer's disease. Since these processes are individually different, sensitive data mining methods such as AI are needed to detect their pathological origins..