VAST (Voice and Spiral Tool): A Novel Multimodal Machine Learning Method To Detect Parkinson's Disease and Assess Severity

ROBO014

Robotics and Intelligent Machines

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Parkinson's disease (PD) is a neurodegenerative disorder primarily prominent in individuals 65 years and older (the elderly population). Despite advances in the medical field, the diagnosis of PD requires examination by a trained neurologist in a clinical setting. However, due to the ongoing coronavirus pandemic in the United States (January 2020-present), requesting individuals to visit their local clinic can place them at potential risk for coronavirus. A literature search with Google Scholar and PubMed databases from January 2020 to January 2023 determined that currently, no machine learning model (n=0/202) has an accuracy of 90% or higher in detecting PD or assessing disease severity from voice and handwriting features. We propose VAST, the Voice and Spiral Tool, as a virtual diagnostic tool for the screening of patients with PD. Clinical specialists have a reported average accuracy of 79.6% to 83.9%. VAST is a state-of-the-art computational tool that validates the use of vocal features and demonstrates a 96% accuracy rate for PD diagnosis and assessment of disease severity (mild or severe) in individuals based on the 'Ah' test (92% accuracy for diagnosis) and hand-drawn Archimedes spirals (100% accuracy for severity). Project VAST is successful in providing an accurate and effective method for PD diagnosis in a clinical or virtual setting through vocal and handwriting feature-based machine learning models. VAST may ultimately aid in accelerating PD diagnosis, resulting in improved clinical outcomes.

1. In this research project, the student directly handled, manipulated, or interacted with (check ALL that apply):

✘ human participants potentially hazardous biological agents

vertebrate animals microorganisms rDNA tissue

2. I/we worked or used equipment in a regulated research institution or industrial setting (Form 1C):	✘ YES	NO
3. This project is a continuation of previous research (Form 7):	YES	✘ NO
4. My display board includes non-published photographs/visual depictions of humans (other than myself):	YES	✘ NO
5. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only:	✘ YES	NO
6. I/we hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.	✘ YES	NO

The stamp or embossed seal attests that this project is in compliance with all federal and state laws and regulations and that all appropriate reviews and approvals have been obtained including the final clearance by the Scientific Review Committee.