Systematic Parkinson Audio Recognition Construct (SPARC): A Novel Approach Implementing a Machine Learning Method To Diagnose Parkinson's Disease Using Voice Features

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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 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 2022 determined that currently, no machine learning model (n=0/188) has an accuracy of 90% or higher in predicting PD from vocal features. We propose our model SPARC, the Systematic Parkinson Audio Recognition Construct, a virtual diagnostic tool for the screening of patients with Parkinson's disease. Project SPARC consisted of the following steps: a) data collection, b) filter audio files, c) feature analysis, d) audio files to images, e) train a convolutional neural network (CNN), and f) determine which test is more accurate (Ah or Rainbow passage) to assist with PD diagnosis. By training a random forest algorithm to extract vocal biometric data for feature selection and a transfer learning CNN on waveform and mel spectrogram images, SPARC is a state-of-the-art model that identified vital vocal features in PD and determined that mel spectrograms and the Ah test are accurate identifiers for PD. Project SPARC is successful in providing an accurate and effective method for PD diagnosis (94% accurate) in a clinical or virtual setting through a vocal feature-based machine learning model.

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