NextCare: An Intelligent System for the Early Diagnosis and Remote Monitoring of Parkinson’s Disease Using Machine Learning, Signal Processing and a 3D Printed Wearable Device

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Parkinson’s Disease (PD) is a progressive neurodegenerative disease with over 10 million people suffering from it. Currently, diagnosis of PD is often late and inaccurate ~ 25% of the time, leading to reduced treatment options, high morbidity rates and a lower quality of life. Even after proper diagnosis, there is a critical need to monitor PD symptoms to determine effectiveness of treatment. Further, most patients have difficulty going to the doctors regularly because of age and severe shortage of neurologists, especially in the rural area. Thus, even after an early and accurate diagnosis, these problems persist due to ineffective monitoring. To that end, a three-pronged system, NextCare, is developed for the early diagnosis and remote monitoring of PD. First, an algorithm utilizing Machine Learning and Signal Processing is developed for the early diagnosis of PD through a 30 second voice sample of a patient saying a phonetic vowel. The Algorithm is able to diagnose PD 5 years before existing methods with an accuracy of 97.29%. This is 17.4% better than the current clinical accuracy. Second, a system was created for the remote monitoring of motor disease progression by quantifying Rest, Postural and Kinetic Tremors, using the Unified Parkinson's Disease Rating Scale (UPDRS) . This is done by processing the data collected from a 3D printed wrist-wear equipped with inertial sensors. Finally, a mobile application is created to serve as an interface for patients to enter a voice sample for diagnosis, for neurologists to monitor tremor levels and visualize them in real time. By providing an effective low-cost system for the early diagnosis and remote monitoring of Parkinson’s Disease, NextCare can provide a valuable tool to neurologists and better the care of PD patients.

Awards Won:

Fourth Award of $500

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