Diagnosing and Monitoring Pathological Tremors: Neural Network and Mobile Technologies

Valagolam, Davesh (School: Jericho High School)

In the U.S., over $280 million is allocated annually and is allocated to tremor research. Clinical testing (upwards of 4 hours/day) still results in 37%-50% misdiagnosis in tremors. Smartphone applications for tremors are tremor specific, fail to record medical history, and do not incorporate balance, gait, or speech tasks. Herein, a Recurrent Neural Network was programmed in Python using the keras library to discern specific tremor disorders using a Kaggle dataset and had an accuracy of 93% (n=1024). A tremor disorder application, using React Native, a JavaScript framework coding language, was created containing 16 unique tasks ranging from medical history to balance to speech tasks using the phone's gyroscope and accelerometer. Using VEX Robotics materials, a motion simulator was created to test correlations between the phone and Vernier's Go Direct Accelerometer, which was 0.95. Vicon's Motion Capture System and the phone's sensors were tested and had an average velocity of 0.791 m/s and 0.790 m/s, respectively. A python program utilizing Matpdlotlib was created to determine the average amplitude and period to quantify tremor severity. With this application, researchers can record tremor symptoms remotely instead of clinically, and the FDA can monitor medications' or new technologies' effects over long intervals inexpensively. Doctors can utilize the neural network to classify tremors more accurately and modify the network for non-tremor diseases.

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