CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S0807

Project Title

Accurate, Low-Cost Diagnosis of Parkinson's Disease by Detecting Dysphonic Features through a Machine-Learning Algorithm

Abstract

Objectives/Goals

The objective of this project was to make an accurate diagnostic and telemonitoring tool for Parkinson#s disease through a mobile application - aimed at providing accessibility to everyone, including those who do not have access to proper medical facilities.

Another objective of our project was not only to develop efficient algorithms, but also to develop an easy-to-use, reliable interface for the user.

Methods/Materials

The application takes the .wav audio file and uploads the file via Amazon Web Services to a feature extraction program: PRAAT. PRAAT extracts 16 linear and nonlinear dysphonic features and runs them through multiple trained machine-learning learning algorithms. These machine-learning algorithms serve as a classifier to determine the onset of Parkinson's in a patient. We trained the machine-learning algorithm via 196 unique voice samples from the NCVS (National Center for Voice and Speech) database. The application then displays the results of the voice recordings to the user via the mobile app.

Results

Using ten-fold cross evaluation, we have achieved a fairly high accuracy of 90%, which is significantly higher than the accuracy of the current diagnostic method, which holds a 70% accuracy. Using 195 test samples, our algorithms currently identified 175, leading to an official true positive/negative rate of 90.2%.

In addition, we successfully built an easy-to-use front-end mobile application coupled with a highly reliable back-end infrastructure.

Conclusions/Discussion

We believe that our tool significantly enhances an accurate detection of Parkinson's through our intelligent machine-learning algorithm, and with our reliable backend infrastructure, we can provide this tool to anyone with a smartphone and an internet connection.

Summary Statement

We developed an accurate and low-cost diagnostic tool for Parkinson's disease where users submit a voice sample via a mobile iOS application and get a diagnosis within 15 seconds.

Help Received

We received a dataset from Dr. Max Little, a professor at MIT, whom we have worked with throughout our project.