CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Aayush Gupta

Project Number

J1404

Project Title

The Effect of Features on Dementia Detection Accuracy

Abstract

Objectives/Goals

13% of people above age 65 have dementia. The objective of my project is to detect dementia presence from MRI data through machine learning. In my work, I used the OASIS dataset. This dataset includes MRI data for 436 patients and other features for each patient, like gender and dementia rating.

Methods/Materials

First, I read the MRI data into MATLAB. My MATLAB code counts different voxels and computes features like the amount of white matter in the brain. I designed a new feature for symmetry along various axes that weights different brain matter equally. Then, using a Python program, I combine these features with the feature values from the original dataset into a form that I can input into a machine learning algorithm.

Results

The machine learning algorithm, called Support Vector Machine (SVM), takes the feature values and graphs it. Then, it finds a plane of best fit separating the dementia patients and the non-dementia patients. This algorithm is applied repeatedly to different test sets, and the accuracy is recorded and averaged and found to be 86.3%.

Conclusions/Discussion

My accuracy of detecting dementia is 86.3%, 1.6% higher than previous studies. This result is obtained primarily due to my new symmetry feature. My work can help develop radiologist's tools that can filter and prioritize dementia cases requiring further human review.

Summary Statement

My project detects presence of dementia in humans from MRI data using machine learning

Help Received

My advisor Mr Jason Robertson helped me find the OASIS dataset. My father helped me install Matlab and learn Python and machine learning.