# CALIFORNIA STATE SCIENCE FAIR
# 2015 PROJECT SUMMARY

**Name(s)**
Anika Cheerla

**Project Number**
35154

**Project Title**
## Automated Diagnosis of Alzheimer's Using MRI Images

**Abstract**

**Objectives/Goals**
Over 60% of people with dementia die without ever being diagnosed as dementia patients. The reason for this is the lack of precise tools, and the extent of time and effort it takes to diagnose dementia. The purpose of this project was to create an automated tool that could accurately diagnose Alzheimer#s. The tool would use neural networks to train itself to diagnose Alzheimer's. Neural networks model the human brain by finding patterns and making connections between the inputs and the output. This would provide a quick and precise result, and enable early detection of Alzheimer#s. My tool would be an improvement from what doctors currently have to do: conduct many series of tests and brain scans, which consumes a lot of time, and come to a conclusion based largely on opinion.

**Methods/Materials**
I used the OASIS database of MRI scans and MATLAB to do my project. First, I extracted image features from the scans, such as the fractal dimension and the area of atrophy of the brain. Then, I combined those features with the patient#s basic medical data. After that, I tested out combinations of different training algorithms, structures, numbers of hidden neurons, and amounts of data. I compared results from each classifier to find the best classifier.
After creating the classifier, I built a GUI using the MATLAB toolkit where doctors would only have to upload an MRI scan and enter the patient#s basic information to diagnose the disease.

**Results**
The neural network classifier with 3 chained stages, Bayesian Regulation Back propagation as a training algorithm, 12 # 16 hidden neurons, and image features combined with the patient#s basic information, achieved the highest accuracy. This classifier reached a testing accuracy of 97%, and greater than 99% overall accuracy. When the neural network was not trained with image features, not trained with the MMSE feature, or trained with a different training algorithm, the accuracy reduced significantly. The two other neural network structures I tested, single stage and hierarchical networks, could not obtain as high an accuracy as the 3 stage chained neural network.

**Conclusions/Discussion**
I was able to meet all my project goals. The classifier I created achieved a higher diagnostic accuracy than any previous method of Alzheimer#s diagnosis. The GUI I built was functional and easy to use. My tool could be used in medical practice to change the current method of diagnosis.

**Summary Statement**
I created a tool that quickly and precisely diagnoses Alzheimer's using MRI Images and determines the early diagnosis of a patient more accurately than any previous methods.

**Help Received**
My brother taught me Matlab. My science teacher, Mrs. Iyer, helped me organize my ideas and develop my project.