



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

<b>Name(s)</b> <b>Patrick Z. Yu</b>	<b>Project Number</b>  36368
<b>Project Title</b> <b>A Novel Approach to Image Recognition with Leaves</b>	
<b>Abstract</b> <b>Objectives/Goals</b> Image recognition technology is a hot field in computing that is currently applied in areas including health, security, gaming, autonomous vehicles, and virtual reality. The purpose of this project is to design an efficient image recognition algorithm using leaves as prototype objects. The algorithm will have the ability to learn and classify leaves by inputting a picture of a query leaf and comparing it with existing leaf samples. After mastering leaf identification as demonstrated by this project, the algorithm can be further incorporated into the many applications of image recognition. <b>Methods/Materials</b> A desktop app was created as a proof-of-concept to demonstrate the algorithm, and approximately 30 images of each leaf type were introduced into databases. Then, a series of query leaves was presented to the algorithm for comparison with each of the databases# existing leaves. This comparison is done by calculating the distances from the query leaf#s centroid to its edges and plotting histograms of leaf distances to form an average similarity percentage between the query and the database leaves. The individual comparisons with the database leaves were recorded to graph the data. <b>Results</b> All four leaves were identified correctly, with the first leaf as acer ginnala at 76% similarity, the second leaf as betula alleghaniensis at 87% similarity, the third leaf as castanea dentata at 90%, and finally the cercidiphyllum japonicum at 91%. <b>Conclusions/Discussion</b> The algorithm accurately detected and classified the four given leaves; however, the occasional outliers when comparing the query leaf with database leaves shows the importance of keeping a complete database of leaves. The more data points (or leaves) collected into a database, the better the algorithm will be at recognizing leaves. Consequently, defective samples will contribute less while different variations will be accounted for more in the database.	
<b>Summary Statement</b> The goal of this project was to create a novel and fast image recognition algorithm to classify leaves and other objects such as street signs, etc.	
<b>Help Received</b> My mentor Dr. Ismail provided guidance for parts of the project I wasn't too clear about, such as the Correlation method, and helped improve my slides and overall presentation.	