



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Kalyani Ramadurgam	Project Number 34688
Project Title High Dimensional Clustering Algorithms Applied to Face Recognition of Obscured Faces	
Objectives/Goals The objective of this project is to develop a method for identifying faces in situations where a face is angled away from the camera or partially obscured. Novel recognition of hidden faces is urgently needed in settings of both military security and personal use. Using high dimensional clustering algorithms like KNN, this project aims to increase the accuracy and versatility over current facial recognition software as well as run on devices that can be used in daily life. Abstract Methods/Materials I used parts of the CMU Face Images Dataset as training and testing data and OpenCV libraries to implement parts of the preprocessing steps. I processed and filtered all pictures in the dataset with Gaussian blurring, Dodge high-contrast filtering, and greyscale conversion. To crop the faces and extract facial features and ratios, I used the Viola Jones Algorithm rejection cascade. The KNN clustering algorithm was used as the main machine learning algorithm to calculate the pictures closest together in a high-dimensional hyperspace. Results Using the complete CMU dataset with both obscured and unobscured faces, the system generated an accuracy rate of 90.4%, which is very comparable to modern use. When faced with only obscured faces, the algorithm had an accuracy of 55%. Current techniques have proven to be almost completely random when only given hidden faces, which is about a 4.95% accuracy rate. So, the algorithm presented in this project provides almost a 50% increase in accuracy over current methods when working with hidden faces. Further analysis shows that pixel mapping carried the weight of the system when compared to facial features. Conclusions/Discussion I have successfully created a face recognition system that recognizes obscured faces with a higher accuracy than current techniques. The combination of pixel mapping and feature extraction makes it possible to classify faces that are facing away from the camera, wearing sunglasses, or are hidden from view. This is applicable to areas such as biometric security, crime identification, military security, and many other fields. As a result, this project has the potential to make the world a safer and more functional place.	
Summary Statement By combining pixel mapping and feature extraction, I created a successful and powerful facial recognition system that accurately recognizes angled and obscured faces, and is applicable in both military security and personal identity.	
Help Received Thanks to Samvit Ramadurgam for inspiring me and guiding me in my search for the best algorithms and approaches.	