# 6.867 Project Proposal

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For our final project, we are interested in exploring classification techniques to classify facial emotions. Specifically, we would like to explore two methods that have been used in facial recognition. The first is to use principal component analysis to represent facial images in the basis of the first principal components. The resulting representation could then be classified using a multiclass classifier. The second method is to explore convolutional neural networks to classify facial emotions with little or no preprocessing. We plan to use existing libraries for this aspect of the project, and refer to the methods and results of Lawrence et al [1] and Matsugu et al [2].

This project can be clearly divided into using PCA for feature extraction from images for classification and using convolutional neural networks for classification with little image preprocessing. The project could then follow the rough timeline:

1. Implement a baseline classifier using existing PCA and neural network package (week 1).
2. Refine and add features to the baseline classifier. Explore other classification methods (multiclass SVM, multilinear perceptron) if time permints (week 2).
3. Implement a convolutional neural network classifier using existing libraries (week 3).
4. Refine and compare the CNN to the other methods explored (week 4).

## References

[1] Lawrence, S.; Giles, L.; Tsoi, A. C.; Back, A. D. (1997) "Face Recognition: A Convolutional Neural-Network Approach" *Neural Networks, IEEE transactions on* 8 (1):98-113

[2] Matsugu, M.; Mori, K.; Mitari Y.; Kaneda Y. (2003) "Subject independent facial expression recognition with robust face detection using a convolutional neural network" *Neural Networks* 16 (5):555-559