

# Emotion Detection Through Facial Feature Analysis

James Pao

Department of Electrical Engineering, Stanford University

## Motivation



It has been proposed that humans experience 7 basic emotions, and exhibit them through universally recognizable facial expressions [1][2]. It is of interest then to develop effective and efficient computer algorithms that can recognize facial expressions for both data analysis and real-time tasks, finding applications in entertainment, criminal justice, healthcare and more.

## Related Work

As emotion detection is significant for both human-human and human-computer interaction, there has been much work in face detection, face recognition, and expression recognition. Some of note are the use of Gabor wavelets with neural networks [3], the detection of Active Appearance Models and support vector machine (SVM) classification [4], local binary pattern extraction [5], and histogram-of-gradient (HOG) feature extraction [6].

## Results

A dual-approach emotion detection algorithm is implemented in MATLAB using Fisherfaces and HOG+SVM, trained on 240 images from the CK+ dataset [4]. This allows for faster detection via projection on Fisherfaces for easier-to-detect emotions, or HOG extraction (leveraging the fact that there are unique inner facial feature manipulations to express emotions) and classification if further predictive measures are required. The algorithm works reasonably well on test images from the CK+ dataset, performing with same accuracy as HOG-only but with a speed improvement of 20%. The algorithm however has trouble with test samples from the JAFFE dataset [7] and some random test samples. This may be attributed to factors such as face-angling and nuanced/mixed expressions for non-dataset images. Future work should involve larger training sets, exploration of other feature identification techniques, and examination of more subtle/undefined facial expressions.

Performed on test set of 32 images from CK+

Algorithm	Acc.	Runtime(s)
Fisherface only	56%	7.40
HOG only	81%	9.87
Fisherface + HOG	81%	7.91

### References

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## Implementation

