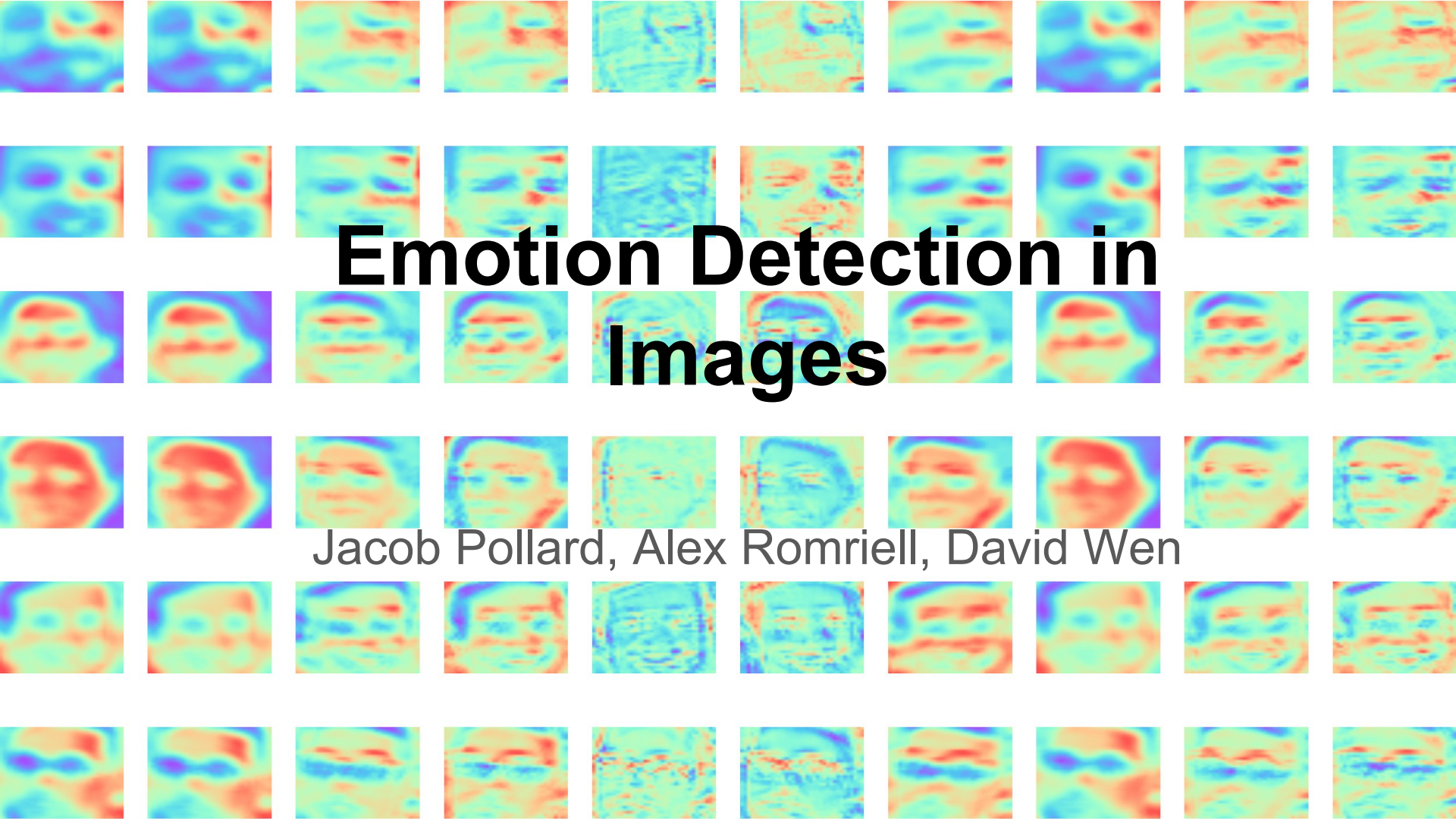


Emotion Detection in Images

Jacob Pollard, Alex Romriell, David Wen

Overview

- Train a neural network to classify emotions from static images

- Models:
  - Convolutional Neural Network
  - Support Vector Machine

- Binary Classification versus 7-Class Classification

Seven Emotions

Angry

Disgust

Fear

Happy

Neutral

Sad

Surprise

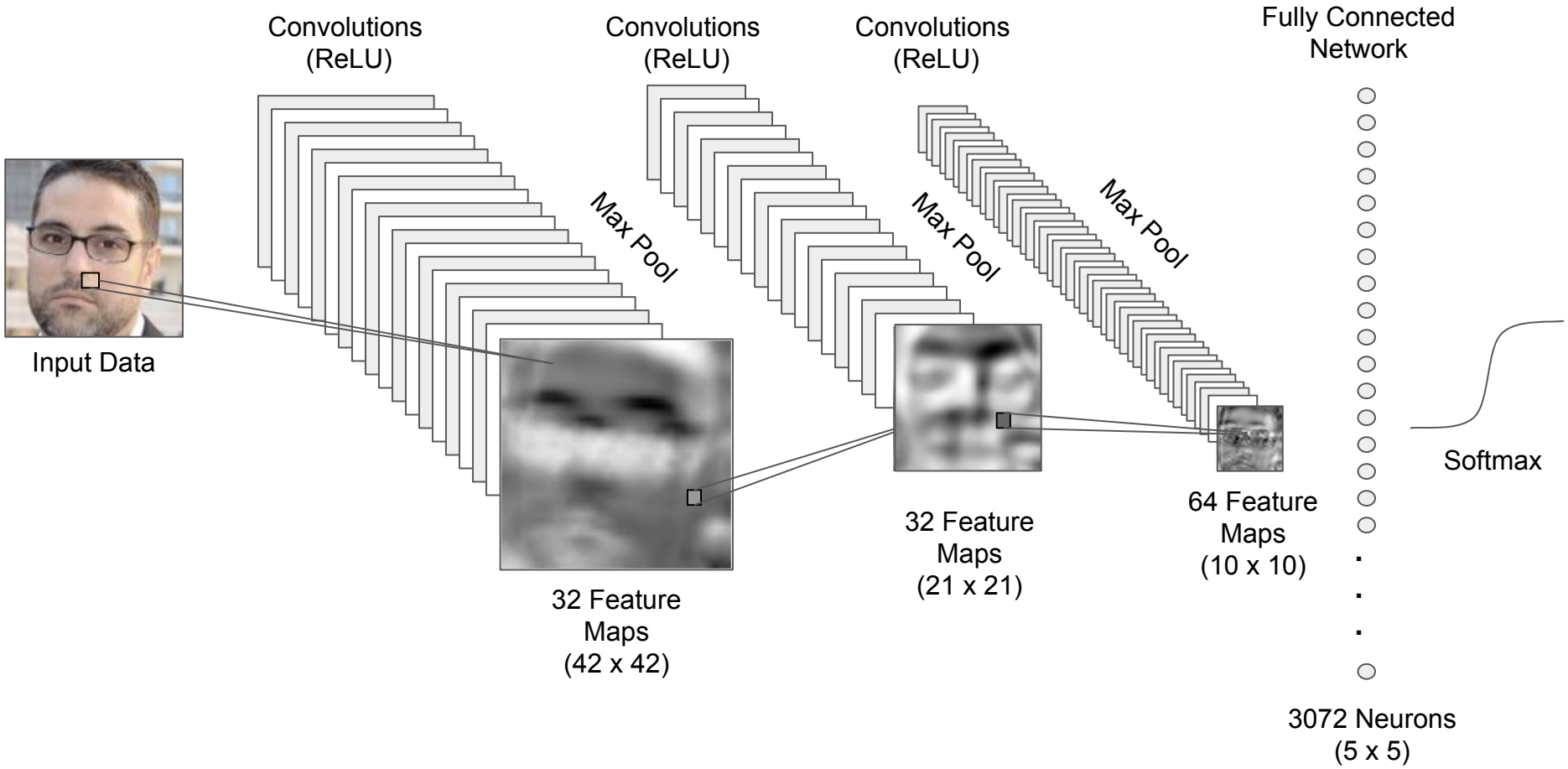
Data Preprocessing

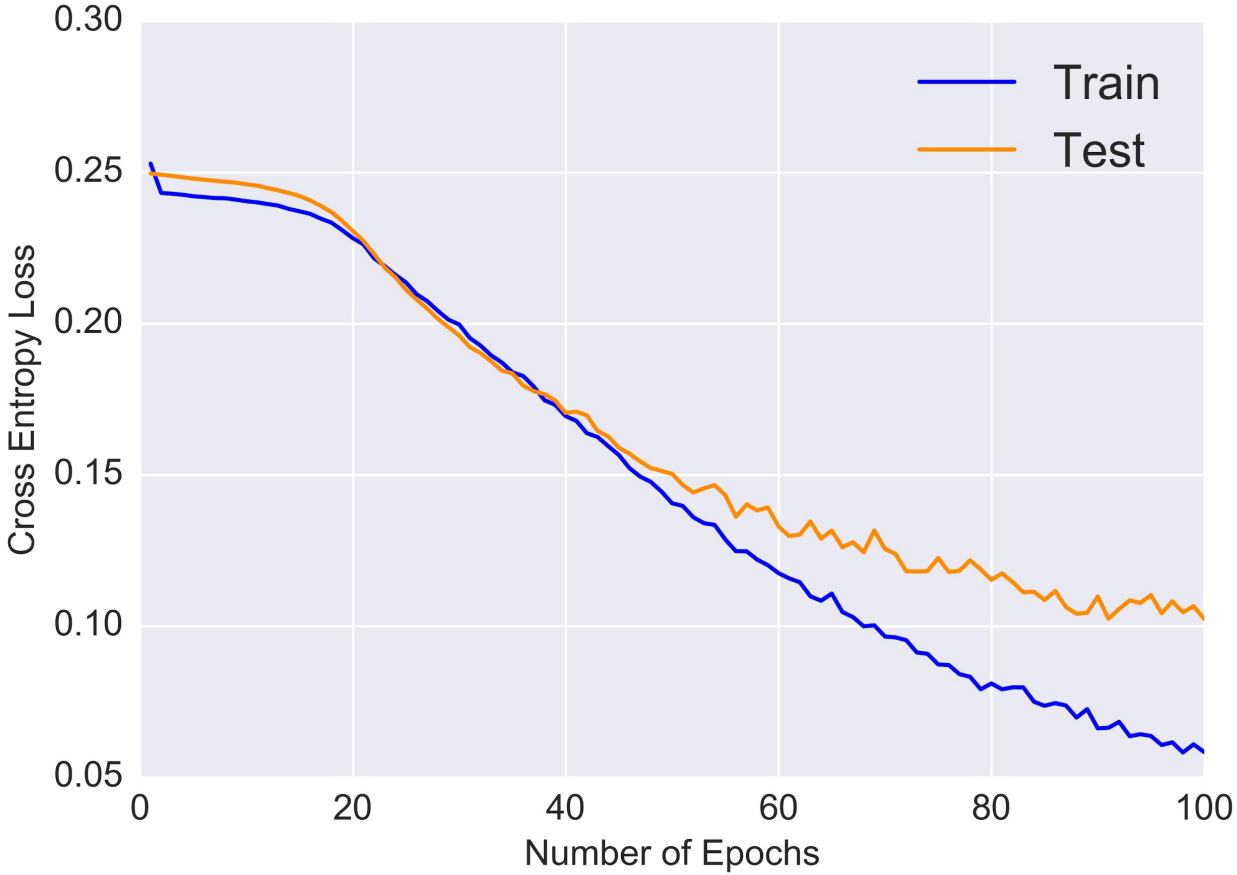
Initially: 37,422 Images

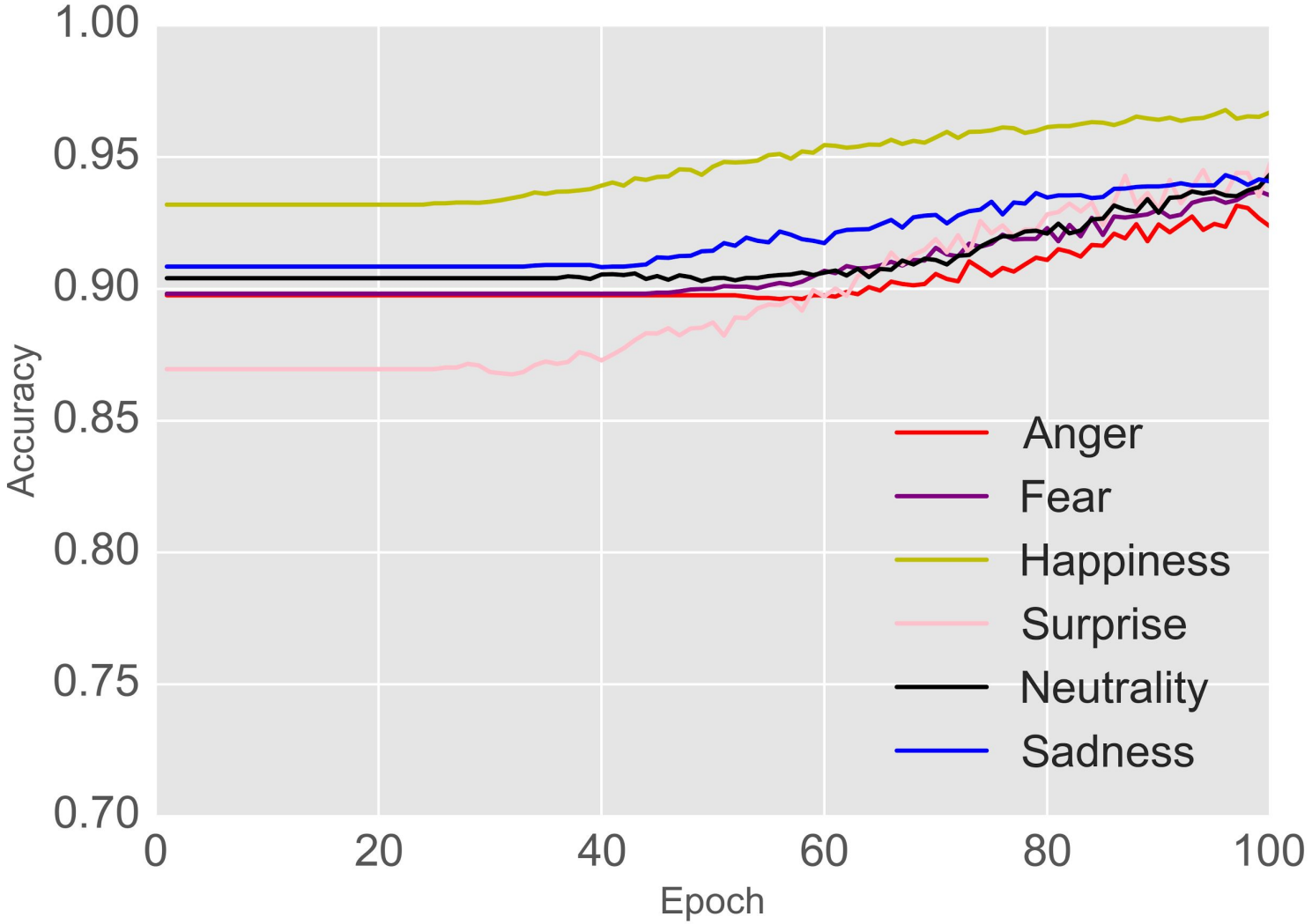
- Static Facial Emotions in the Wild
- Japanese Female Facial Expression
- Facial Expression Recognition

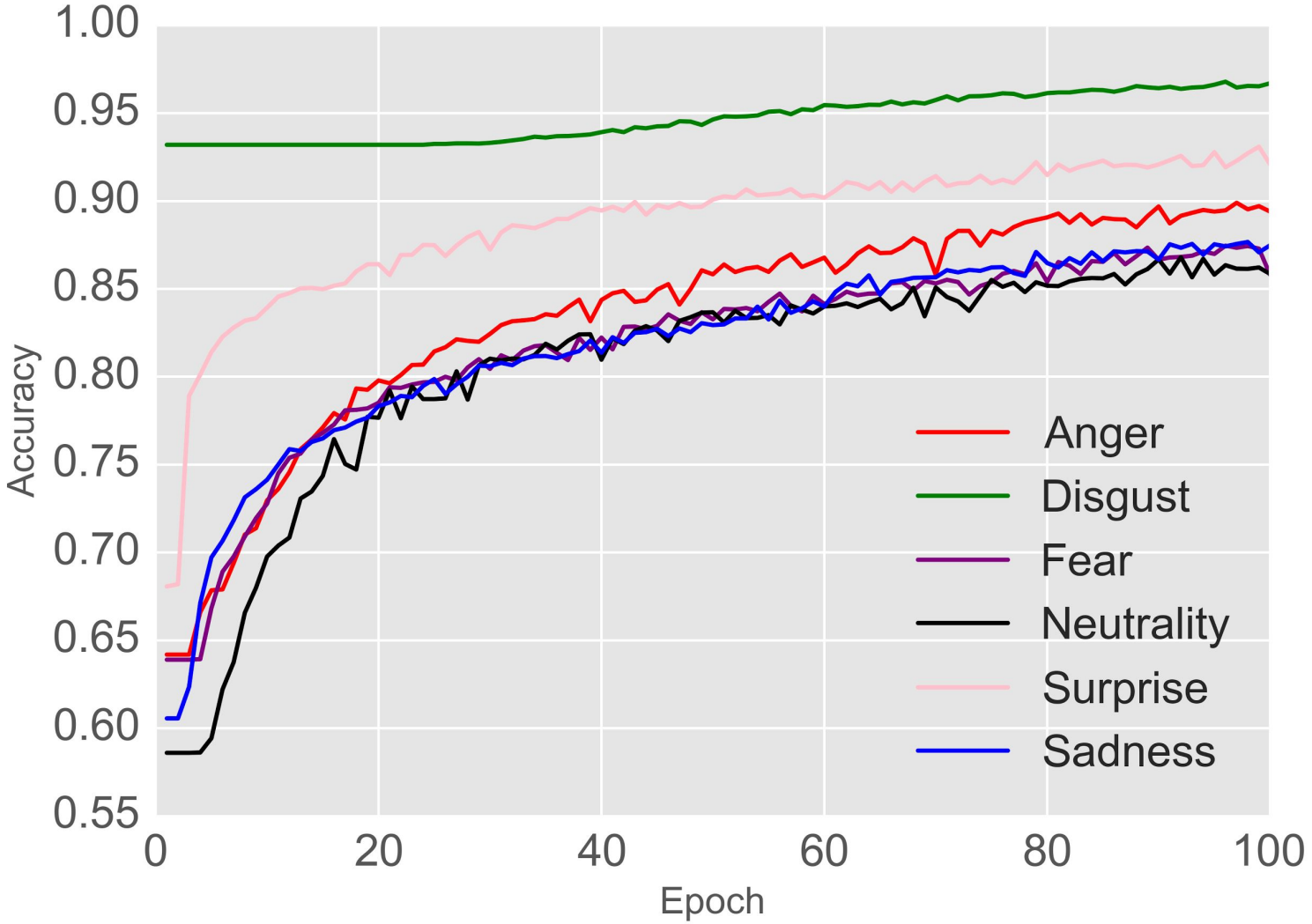
Doubling our data:

- Copy and distort the images to bring the total number of images to 74,822


Convolutions
(ReLU)
Convolutions
(ReLU)
Convolutions
(ReLU)
Fully Connected
Network
Max Pool
Max Pool
Max Pool
Input Data
32 Feature
Maps
(42 x 42)
32 Feature
Maps
(21 x 21)
64 Feature
Maps
(10 x 10)
Softmax
3072 Neurons
(5 x 5)

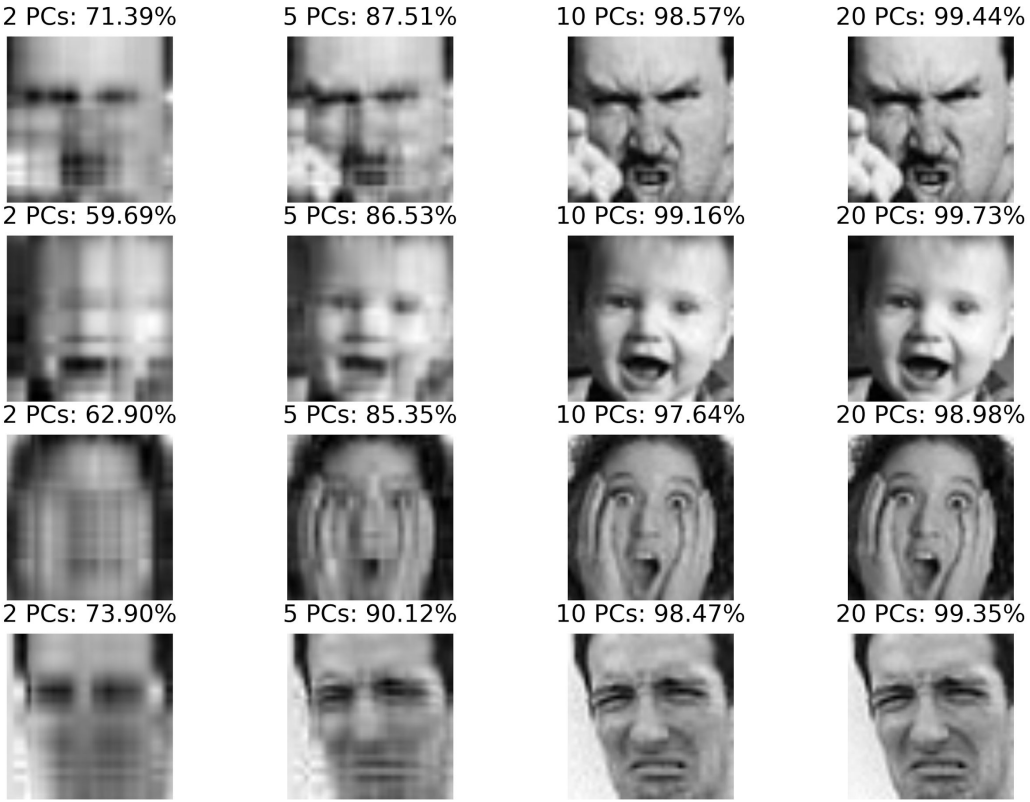

Validation Curves for CNN Classifying Happy vs Disgust
Train
Test
Cross Entropy Loss
0.30
0.25
0.20
0.15
0.10
0.05
0
20
40
60
80
100
Number of Epochs


1.00
0.95
0.90
0.85
0.80
0.75
0.70
Accuracy
0
20
40
60
80
100
Epoch
Anger
Fear
Happiness
Surprise
Neutrality
Sadness


1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
Accuracy
0
20
40
60
80
100
Epoch
Anger
Disgust
Fear
Neutrality
Surprise
Sadness

Support Vector Machines and Principal Component Analysis

- Gaussian and Quadratic Kernels
- The first 10 PC's explain well over 90% of the variation in each image
- Used as features to reduce dimensions of inputs to SVM Classifier



Speed of SVM and PCA

Tools


SciPy


amazon
web services™


scikit
learn


NumPy


scikit-image
image processing in python


theano

Future Work

- Experiment with different image preprocessing techniques
- Different weight initializations
- Compete in this year’s Emotion Detection in the Wild Competition