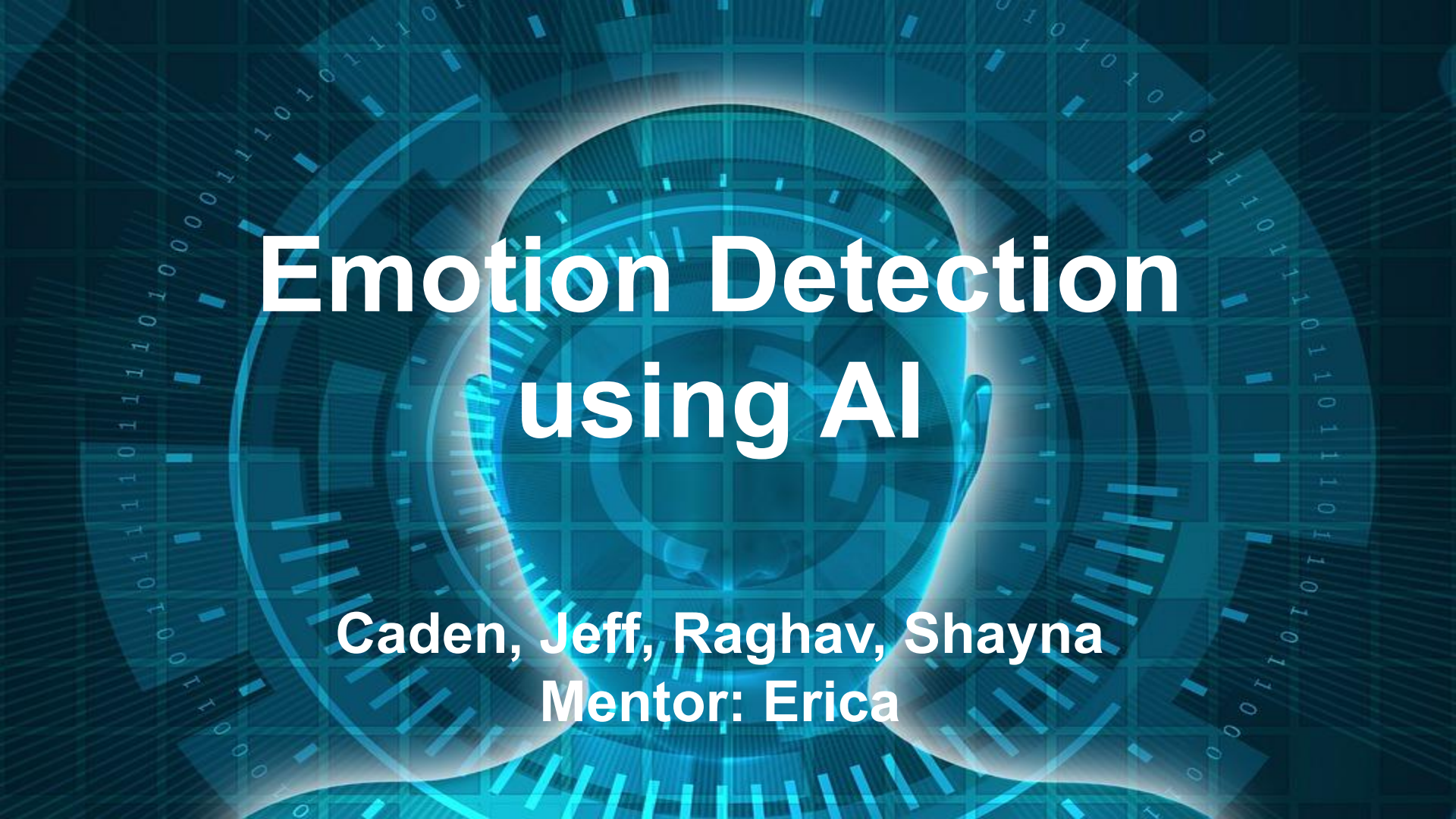

Emotion Detection using AI

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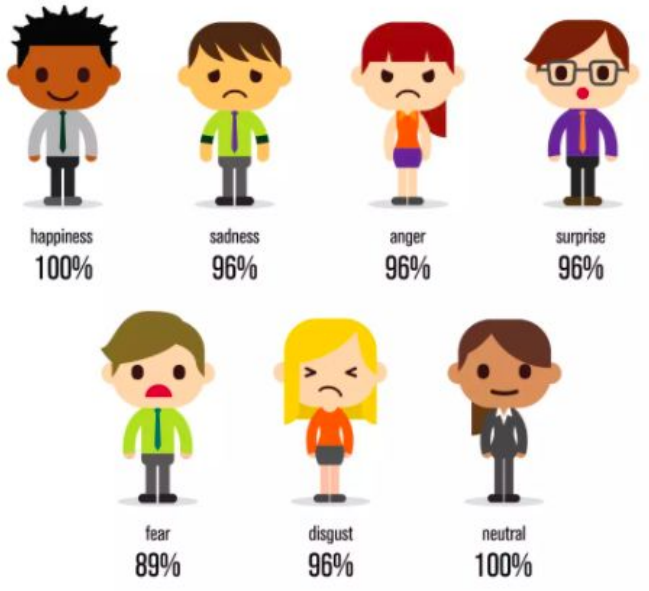
Mentor: Erica

Why do we need emotion detection?

We are trying to build an emotion detector in order for people to be able to detect emotions that would normally be unable to. For example, wearing a device that identifies other people's facial expressions, can help children with autism develop better social skills.

What products are out there?



There are a few different softwares that give an emotion analysis using emotion detection.

- FaceReader

Steps Taken

We explored:

- Detecting all facial landmarks
- Calculating the distance between specific landmarks; i.e. the eyes to check whether they’re open or closed
- Creating different models
- Creating a confusion matrix to see how our model did with classifying emotions
- Transfer learning

Difficulties:

- Pictures were different sizes so we couldn’t use the same threshold for each image
- Technical Difficulties

Data Set

```
#Integer to Label Mapping
label_map = {0:"ANGRY",1:"HAPPY",2:"SAD",3:"SURPRISE",4:"NEUTRAL"}
```

20,000 total images distributed evenly

across 5 emotions.

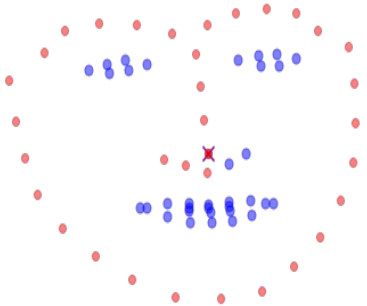
48x48 grayscale cropped images from

fer2013 dataset

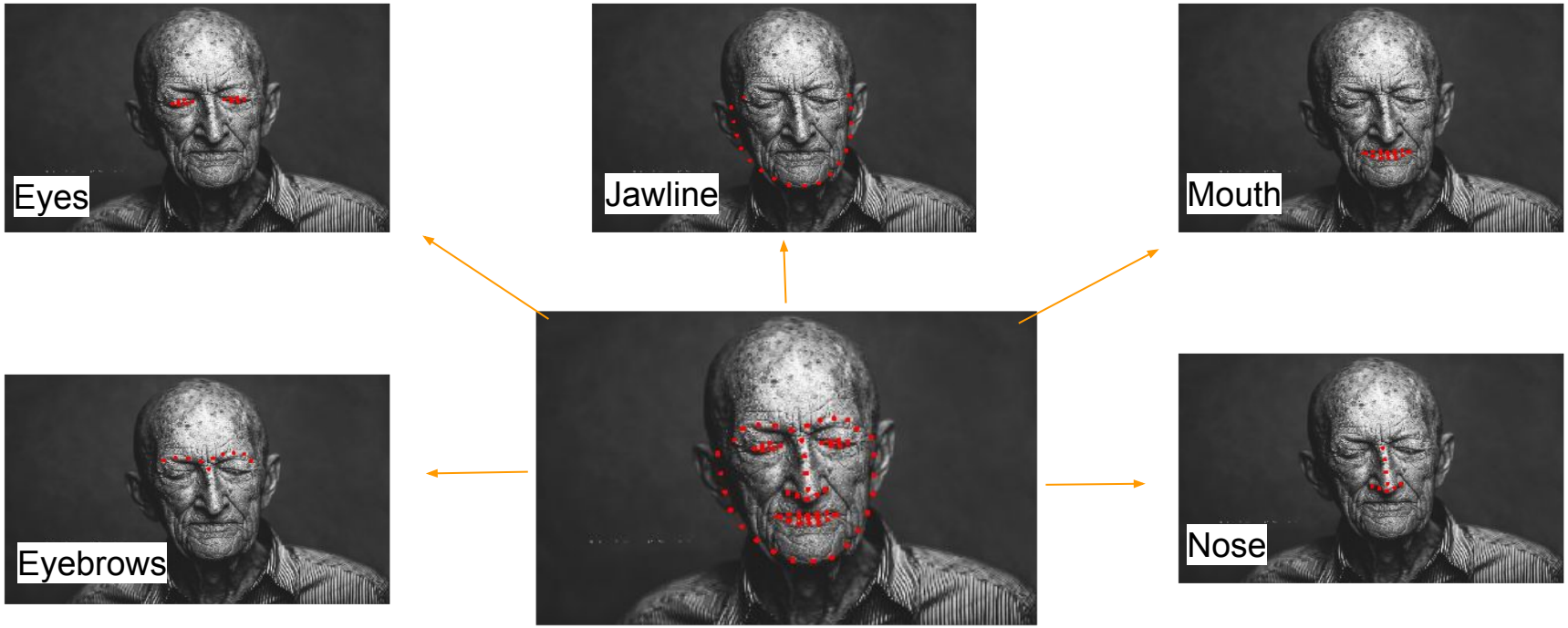
What We Explored to Solve the Problem?

- **Face Detection**
  - computer vision
  - detects faces in pictures.

- **Facial Landmarks**
  - key points on a human face on an image.

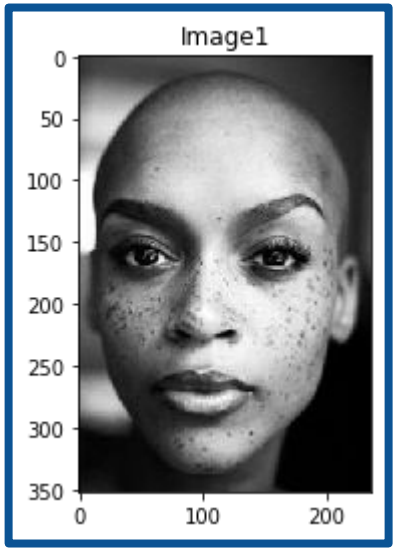


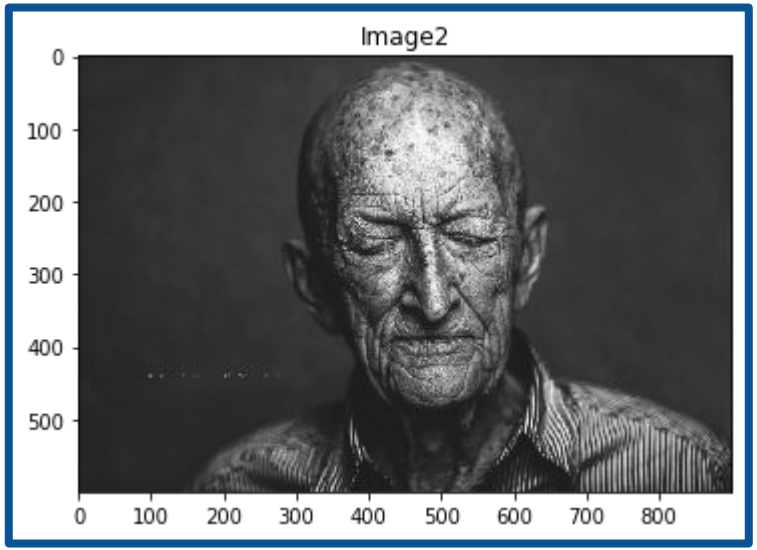
Facial Landmarks to Facial Features



How do you think landmarks can give us more information?

Do you see any difference?






```
['Image 1: Open', 'Image 2: Closed']
```

Models

Model Overview

Input: Distances between facial landmarks or Pixels

Output: Integer encoded emotions

What will this model solve?

Classification of labels

Benchmark

Guessing would lead to an accuracy of 20%

Human Detection would lead to an accuracy of about

65%

Models

DecisionTreeClassifier Model:

- Accuracy Score: 43.1% with a max Depth of 100

KNeighborsClassifier Model:

- Accuracy Score: 47.2% with 5 neighbors

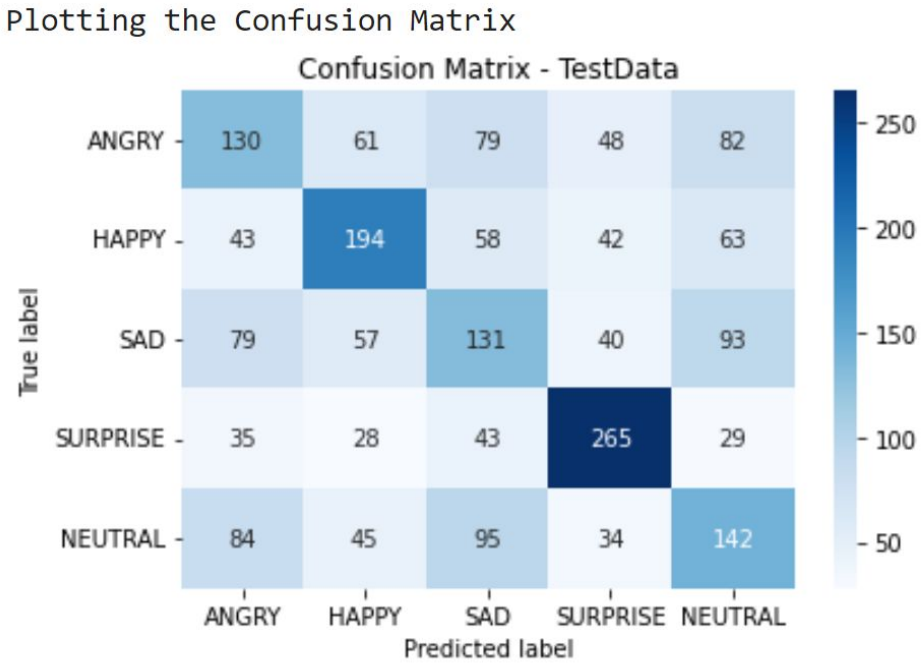
LogisticRegression Model:

- Accuracy Score: 40.8%

All models were slightly above 2x better than guessing as the theoretical probability of guessing the correct emotion is 20%.

How well did our model do?

This confusion matrix shows how well our model did at recognizing emotions

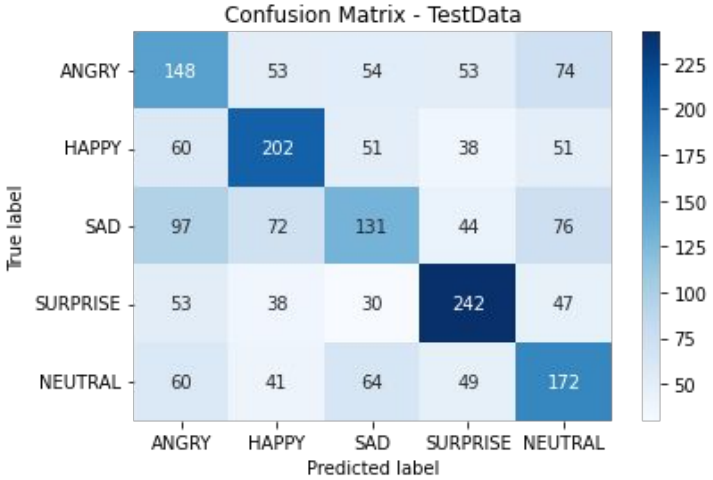


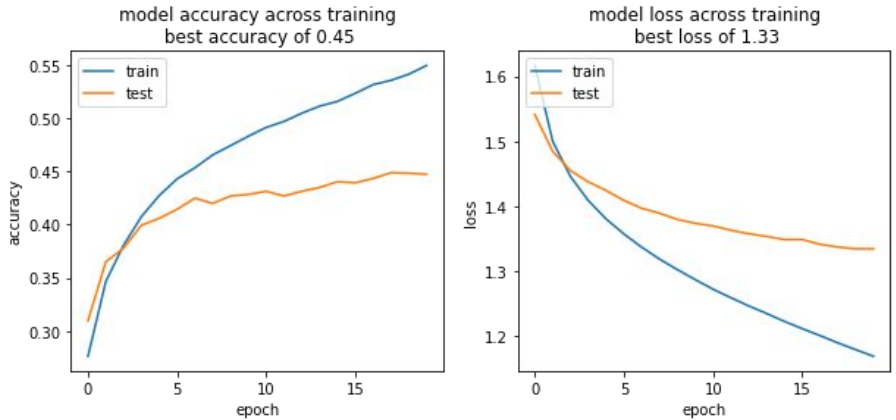
Creating Our Own Models

Neural Network

Input: Pixel Data

Highest Accuracy: 44.75%

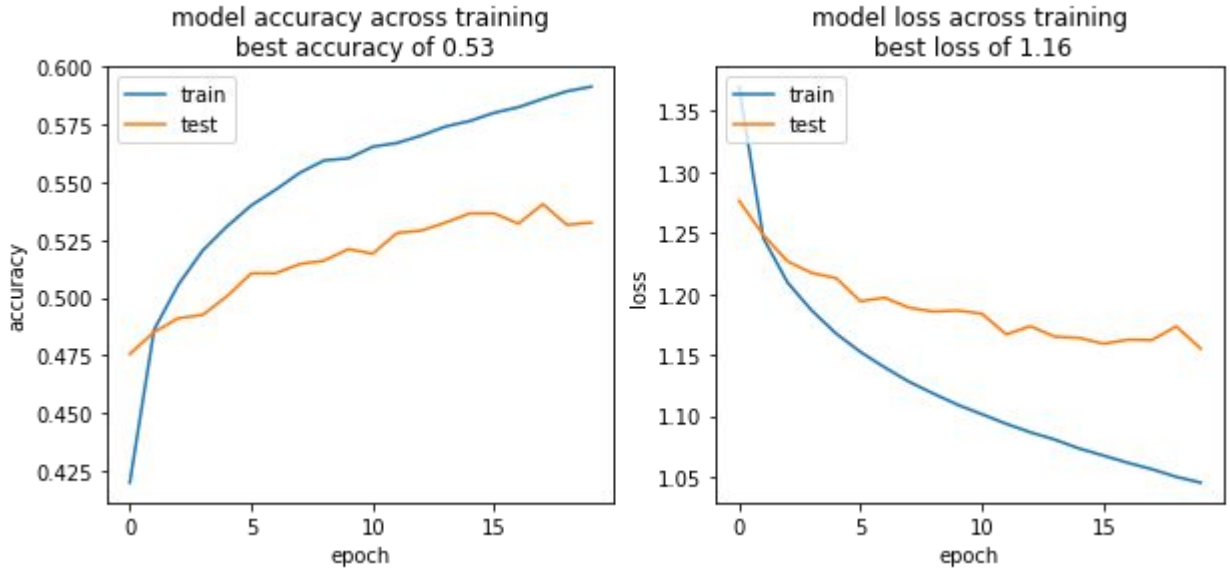




Neural Network

Input: Distance between facial landmarks

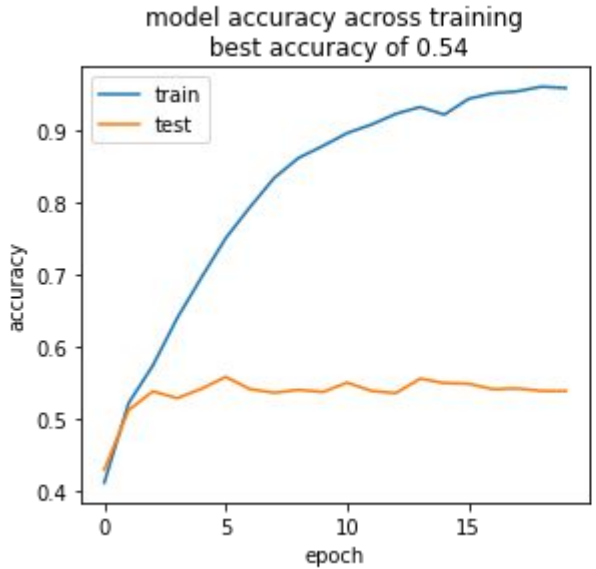
Highest Accuracy: 53.25%



CNN

Input: Distance between facial landmarks

Highest Accuracy: 53.9%

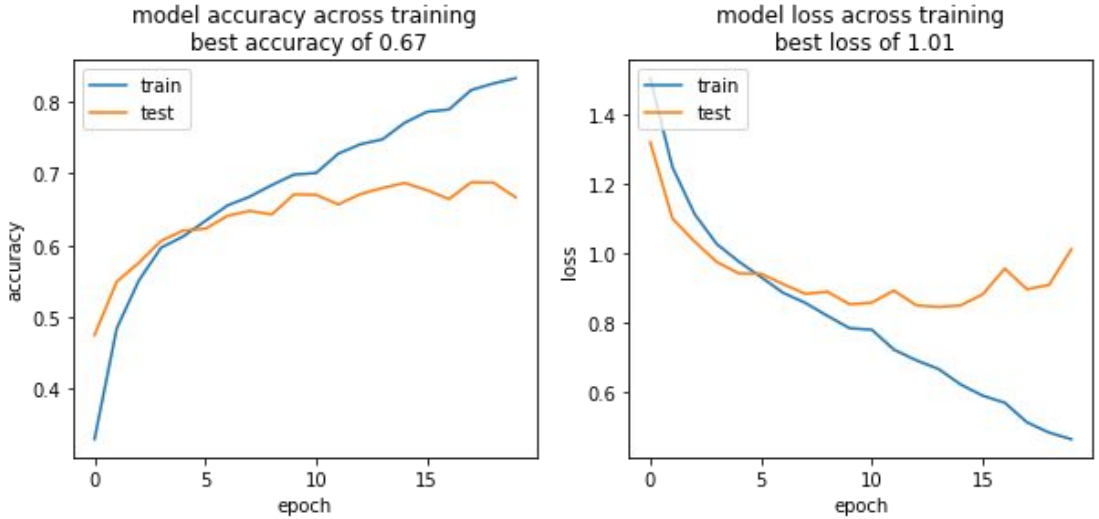


Transfer Learning Model

Vgg Model

Input: Distance between facial landmarks

Highest Accuracy: 66.7%



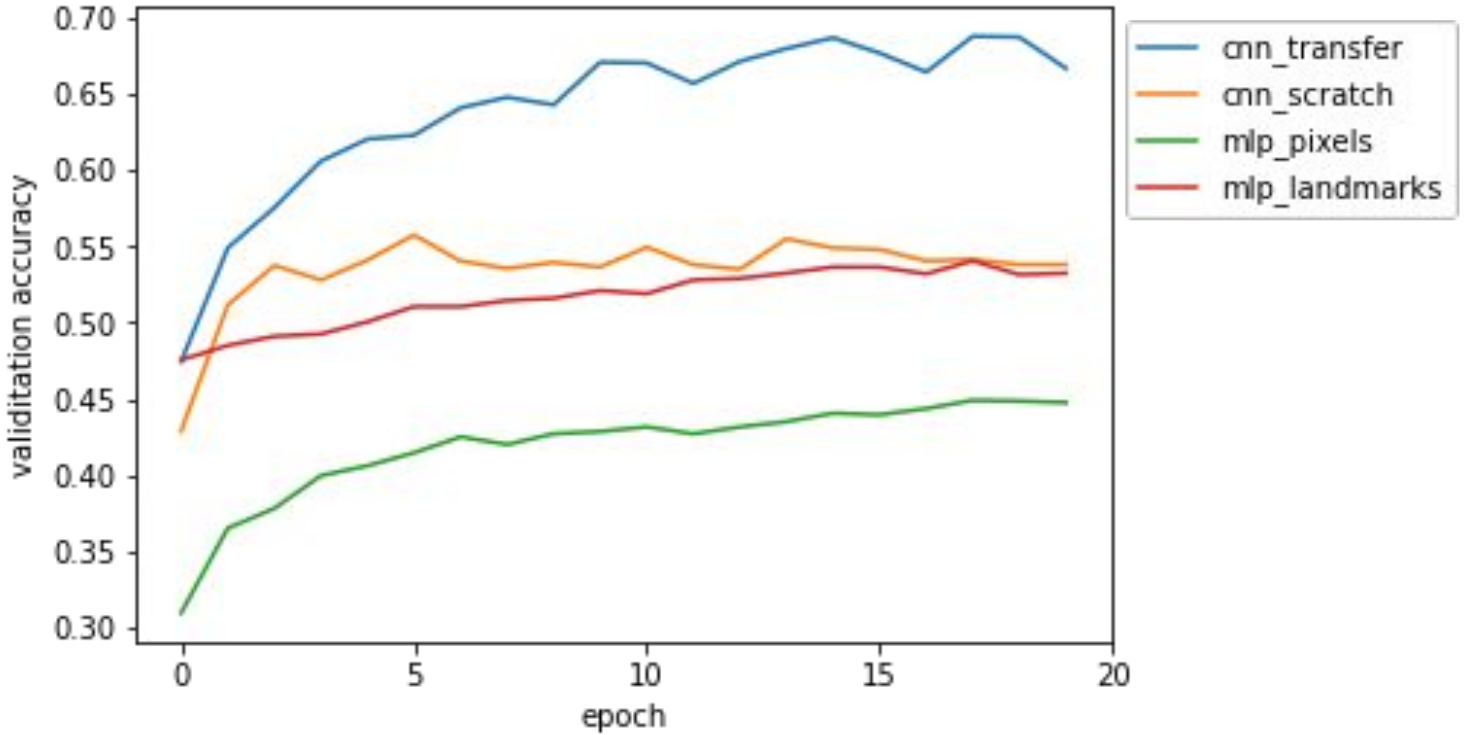
Results

- **Our final models used a Convolutional Neural Network on images**
- **Accuracy of almost 67% in emotion classification from pictures of different emotions**
  - Angry, Happy, Sad, Surprise, Neutral
- **Future models could take much more data**
  - Body language
  - Voice/Tone
- **Future models could have tons of variables**
- **Human detection at 65%**
- **Machines are already better**

'Image 3: 0'

0 = Angry

Comparison of Different Models



Applications

This technology can be used for:

- **Helping people who do not comprehend emotions as well**
- **Find out how a customer responds to a product**
- **Find out how nervous someone is**
  - Job interview
  - Security/Airports


Thank
You