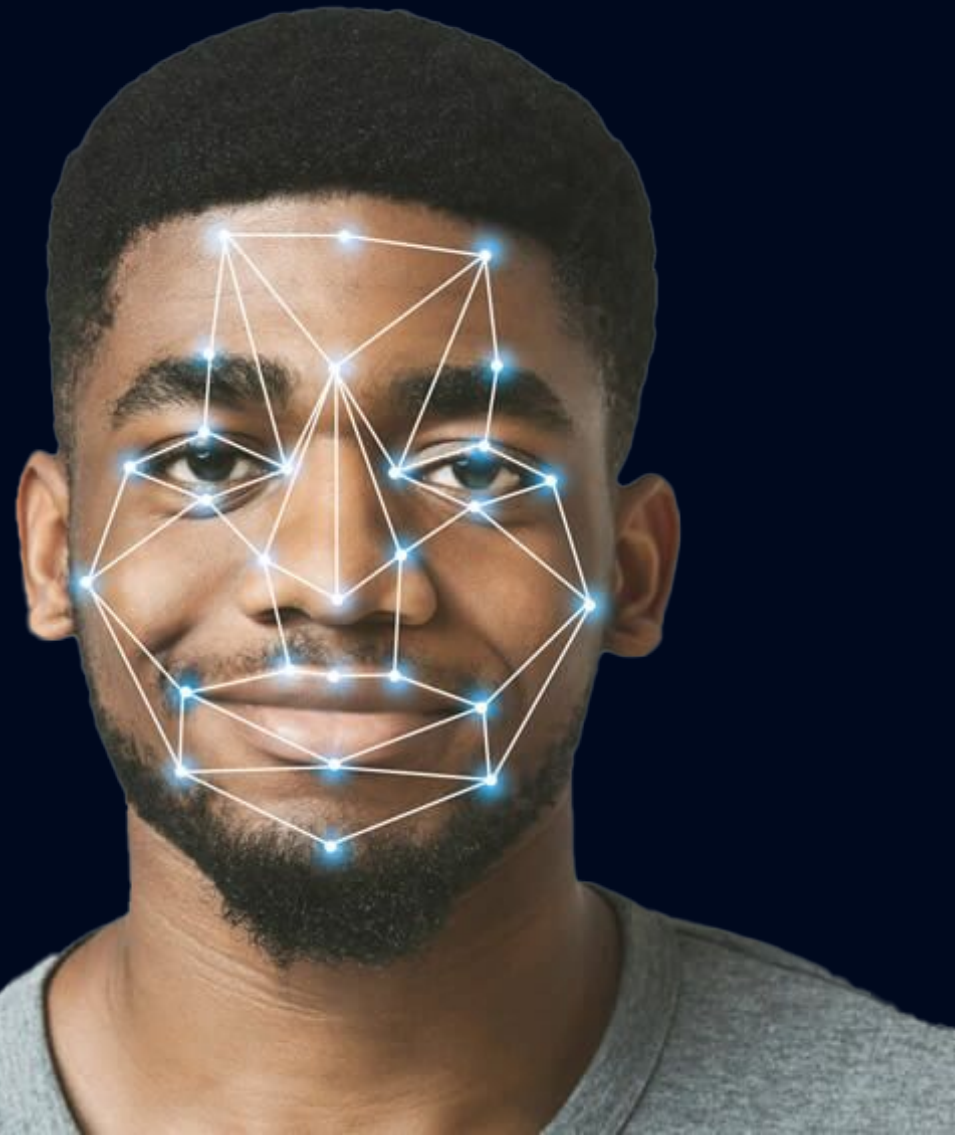
LET'S FACE IT

EMOTIONAL RECOGNITION MODEL



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PROBLEM STATEMENT

THE CURRENT SITUATION

- Facial recognition is an active area of research…
    - But next step is ***Emotion Recognition***, as this is mainly a manual process currently
- Applications:
    - Marketing & Advertising
    - Education
    - Media
    - Population Research

THE PROBLEM WE FACE

How would one predict emotions through computational methods?

PROJECT OVERVIEW

THE DATA

- This Kaggle Facial Recognition Dataset contains grayscale images with different facial expressions.
  - surprise, anger, happiness, sad, neutral, fear
- Faces are more or less centered and occupy about the same amount of space in each image.
- Training Set: 28,079 (80%) // Testing set: 7,178 (20%)
- Attributes: 2304 (48 x 48 pixels)

How do we predict emotions?

OUR APPROACH

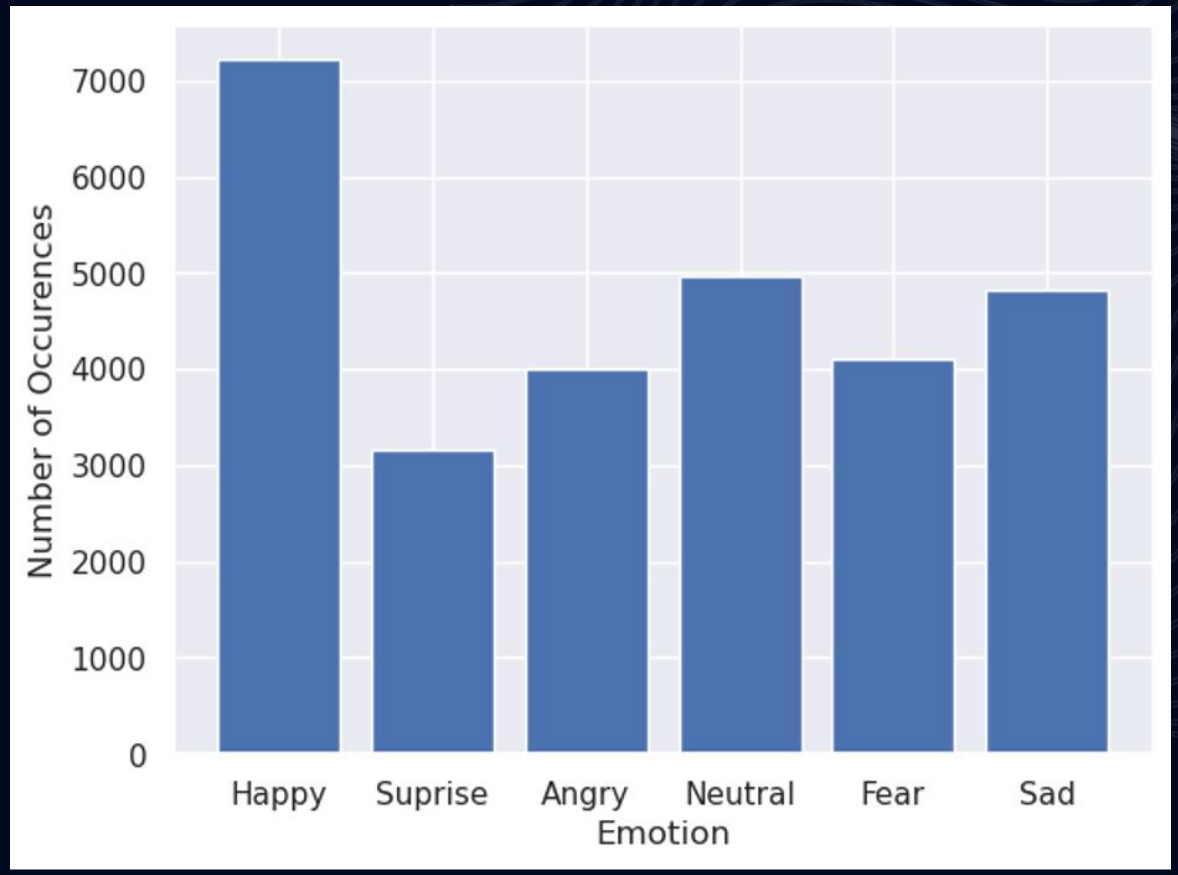
Attempt to build an FNN model first and assess performance. If performance is low, will build a Convolutional Neural Network Model (CNN).

EXPLORATORY DATA ANALYSIS

- Image data was provided in training and testing folders, with 6 subfolders containing images for each emotion.
- All the images in the subfolders were combined into two dataframes, for training and testing respectively
- Each of the datasets were normalized, for ease of modeling and visualization

OUR INITIAL OBSERVATIONS

- Unequal distribution of observations per emotion
- Some images were not of faces



ANALYZING PIXEL DIFFERENCES

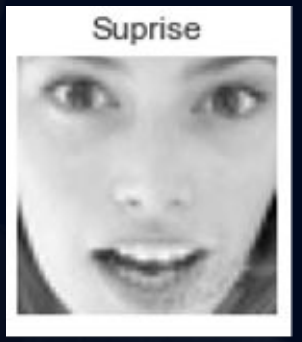
We performed pixel analysis on images of different emotions to determine differences:

Emotion	Mean	St Dev
Angry	0.630	0.198
Fear	0.663	0.187
Happy	0.656	0.178
Neutral	0.650	0.194
Sad	0.616	0.202
Surprised	0.724	0.162

[24, 24] Center Pixel

Emotion	Mean	St Dev
Angry	0.546	0.222
Fear	0.559	0.217
Happy	0.563	0.216
Neutral	0.529	0.227
Sad	0.505	0.229
Surprised	0.592	0.206

[12, 30] Eyes Pixel



(Our reaction)

INITIAL BASELINE MODEL - FNN

THE FIRST THOUGHT...

- We decided to a train classifier for detecting emotions using logistic regression and Tensorflow.
- Created an FNN model:
  - A layer to flatten the image
  - Additional ReLu and softmax layer
  - SGD optimizer
  - Categorical cross-entropy for error

... BUT OUR FIRST ATTEMPT FAILED.

We faced some surprises.

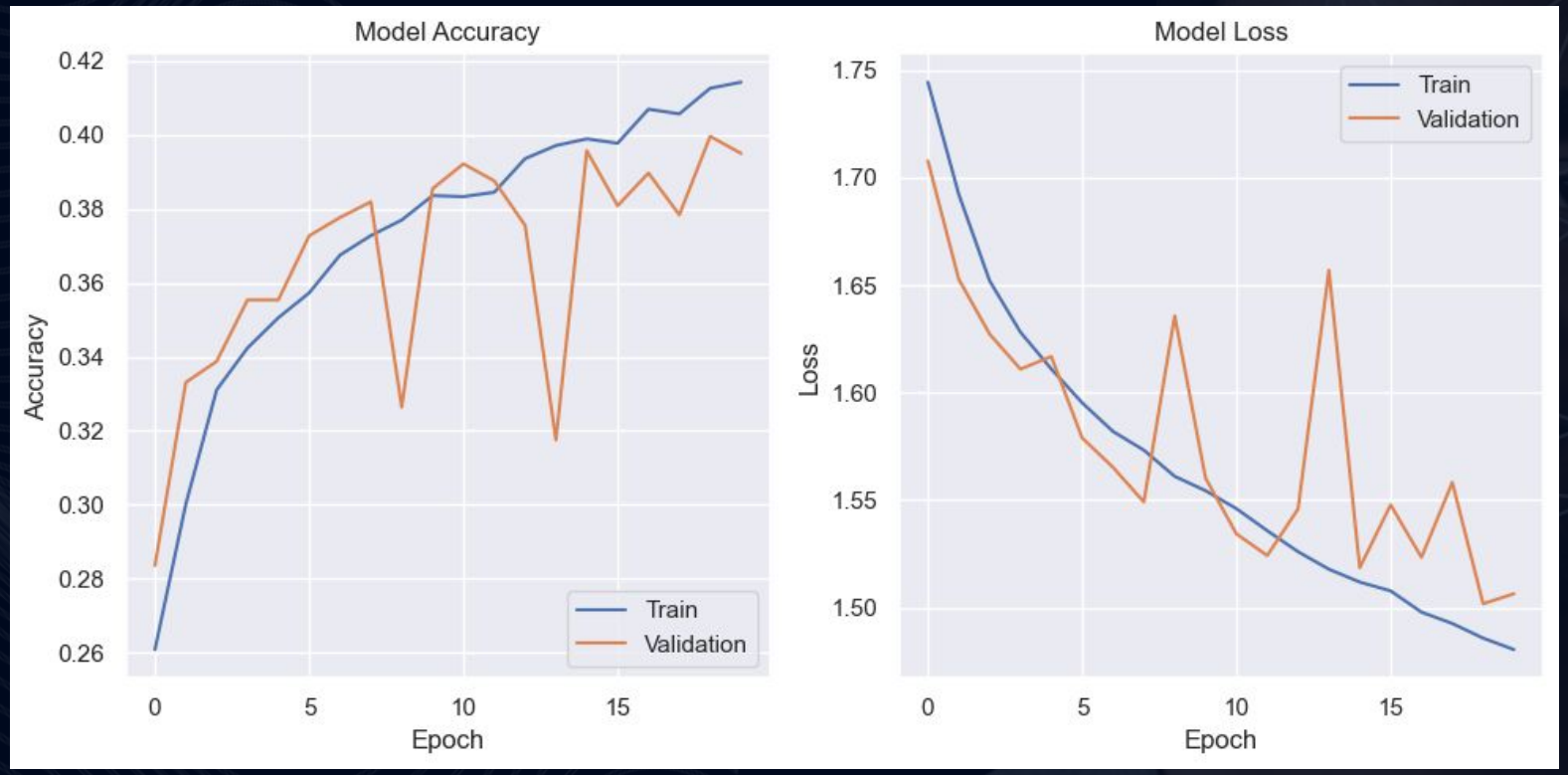
Poor performance. The loss was high and accuracy was very low.

	loss	accuracy	val_loss	val_accuracy
0	1.746051	0.256042	1.714608	0.284300
1	1.697853	0.293103	1.660462	0.330622
2	1.658126	0.327216	1.635355	0.328147
3	1.631851	0.341796	1.606680	0.359618
4	1.615929	0.349578	1.600538	0.357496

INITIAL BASELINE MODEL - FNN

BUT ON THE BRIGHT SIDE...

- The model performed ~2x better than random guessing would



OUR NEXT MODEL - CNN

LIMITATIONS

- Pixel analysis failed to find large difference in the pixel average and standard deviations.
- Emotions are not mutually exclusive. Some images can be classified as both sad and neutral.
- This is a multi-class classification problem - will need to learn separate groups of parameters.

THE NEXT APPROACH - MULTI-CLASS CLASSIFICATION

Will create a multi-layered neural network with multiple convolutional filters for image classification.

Will pool different layers with filters of different strides (using Conv3D and MaxPooling3D operators).
Each filter will look for a different emotional pattern in the data.


THANK YOU!
HAPPY TO ANSWER ANY ADDITIONAL QUESTIONS