Face Emotion Recognition

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Problem

Emotional Face Recognition

- Evaluate human faces to predict emotion

Real World Applications

- Evaluate customers experience
- Level of happiness in business environment
- Give insight on customer satisfaction
- Emotional trends concurring with world events

Input Data

HAPPY

SAD

ANGRY

FEARFUL

NEUTRAL

DISGUST

SURPRISED

POSITIVE




NEGATIVE




Primary Data Analysis

~100 MB of data

7000 positive photos

7000 negative photos

Black and White

Wide variety of people

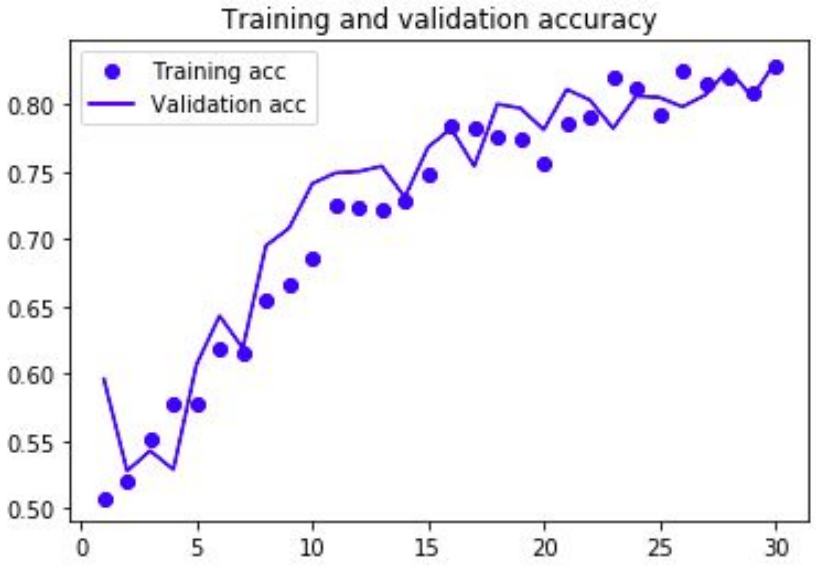
48 pixels

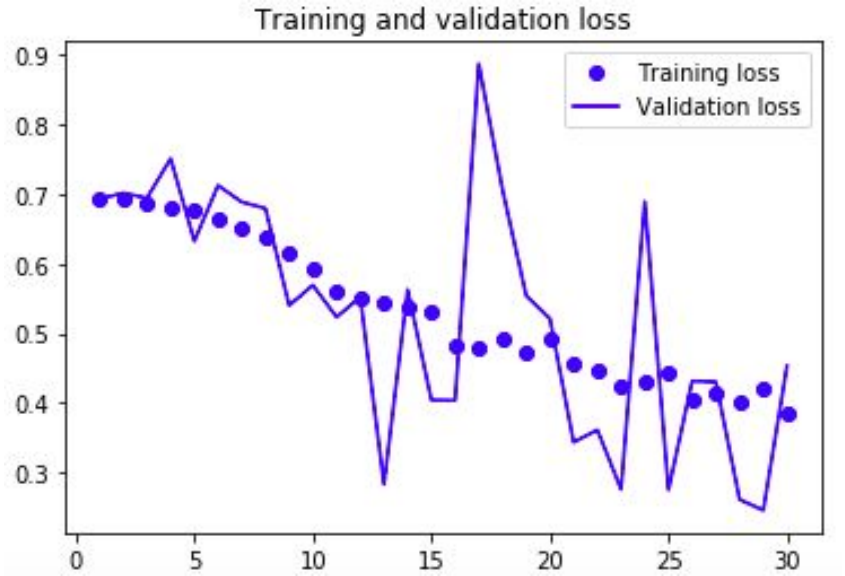
48 pixels

Neural Network Details - First Basic Convnet NN

- Data
  - Training: 5000 (each) images
  - Testing: 1000 (each) images
  - Validation: 1000 (each) image
- Layers
  - Activation
    - Relu
    - Sigmoid (last-layer activation)
  - Loss
    - Binary Cross-Entropy
  - MaxPooling2D
    - 2 x 2
  - Convolution Layer
    - 32,64,128
  - Kernel Dimensions
    - 3 x 3
- Epochs
  - 30
- Drop out
  - None
- Data Augmentation
  - None
- Transfer Learning
  - None

First Basic Convnet NN - Results





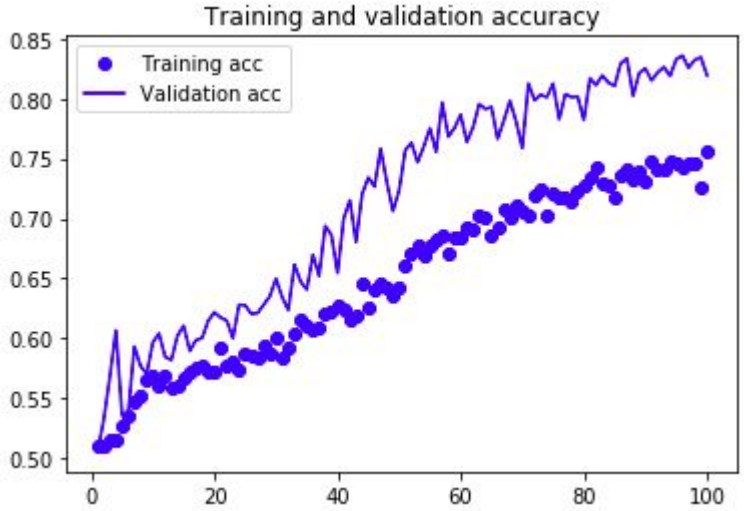
Accuracy Score: ~ 83%
Precision Score: ~84%
Recall Score: ~83%

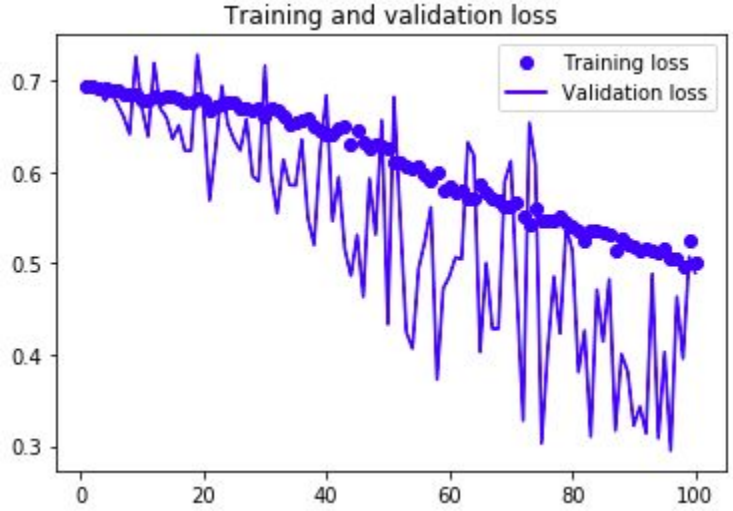
Neural Network Details - Second Convnet NN

- Data
  - Training: 5000 (each) images
  - Testing: 1000 (each) images
  - Validation: 1000 (each) image
- Layers
  - Activation
    - Relu
    - Sigmoid (last-layer activation)
  - Loss
    - Binary Cross-Entropy
  - MaxPooling2D
    - 2 x 2
  - Convolution Layer
    - 32,64,128
  - Kernel Dimensions
    - 3 x 3

- **Epochs**
  - **100**
- **Drop out**
  - **0.5 drop out rate**
- **Data Augmentation**
  - **rotation_range=40**
  - **width_shift_range=0.2**
  - **height_shift_range=0.2**
  - **shear_range=0.2**
  - **zoom_range=0.2**
- Transfer Learning
  - None

Second Convnet NN - Results



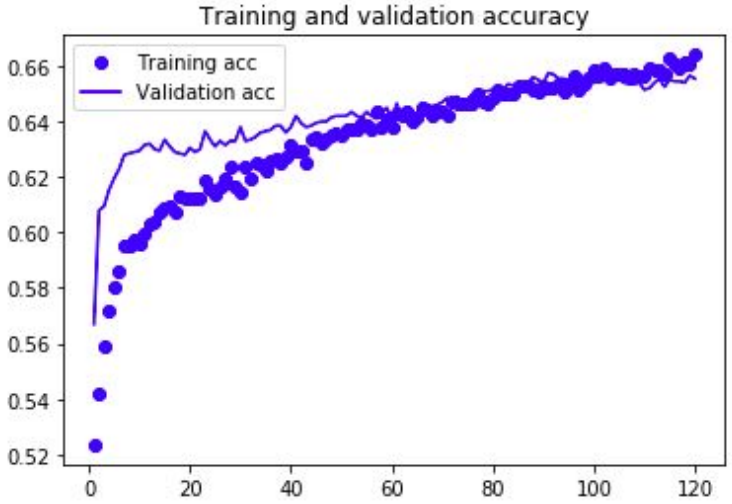


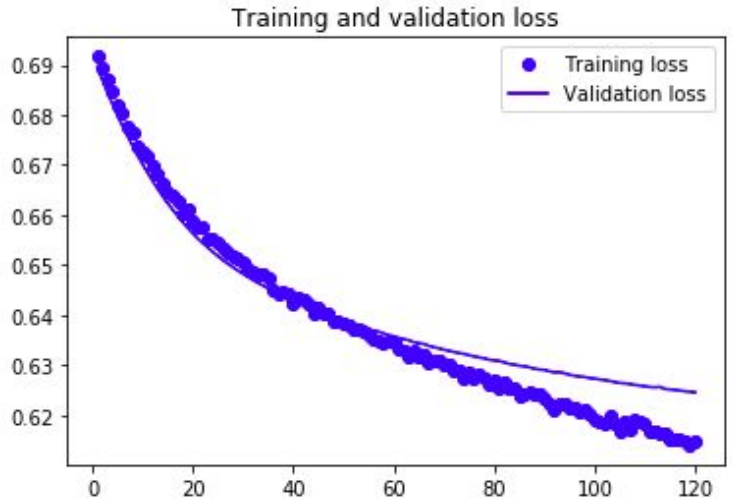
Accuracy Score: ~ 76%
Precision Score: ~77%
Recall Score: ~73%

Neural Network Details - Third Pre-trained Convnet NN

- Epochs
  - 120
- Drop out
  - 0.5 drop out rate
- Transfer Learning
  - Pre-trained
    - VGGFace
      - A series of models developed for face recognition. Created by members of the Visual Geometry Group (VGG) at Oxford University

VGGface Results





Accuracy Score: ~ 66%
Precision Score: ~66%
Recall Score: ~67%

In the Future

- Using spyder instead of Jupyter Notebooks
- Attempt models on colored images
- More data
- Attempt another pre-trained model (FaceNet)
- Began to see if there was a gender bias from the model, did not produce sufficient results in time to show class

References

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- https://stackoverflow.com/questions/3397752/copy-multiple-files-in-python/3399299
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- https://stackoverflow.com/questions/44054082/keras-utils-to-categorical-name-keras-not-defined