Facial Emotion Recognition

By Justin Sohn

Agenda

- Overview
- Business Proposal
- Data
- Models
- Results and Evaluation
- Deployment
- Recommendations

Overview

Emotions are feelings that are very essential in people's life. It enables humans to comprehend themselves and communicate with one another, among other things. Emotions, above all, are mostly responsible for our ideas and actions.

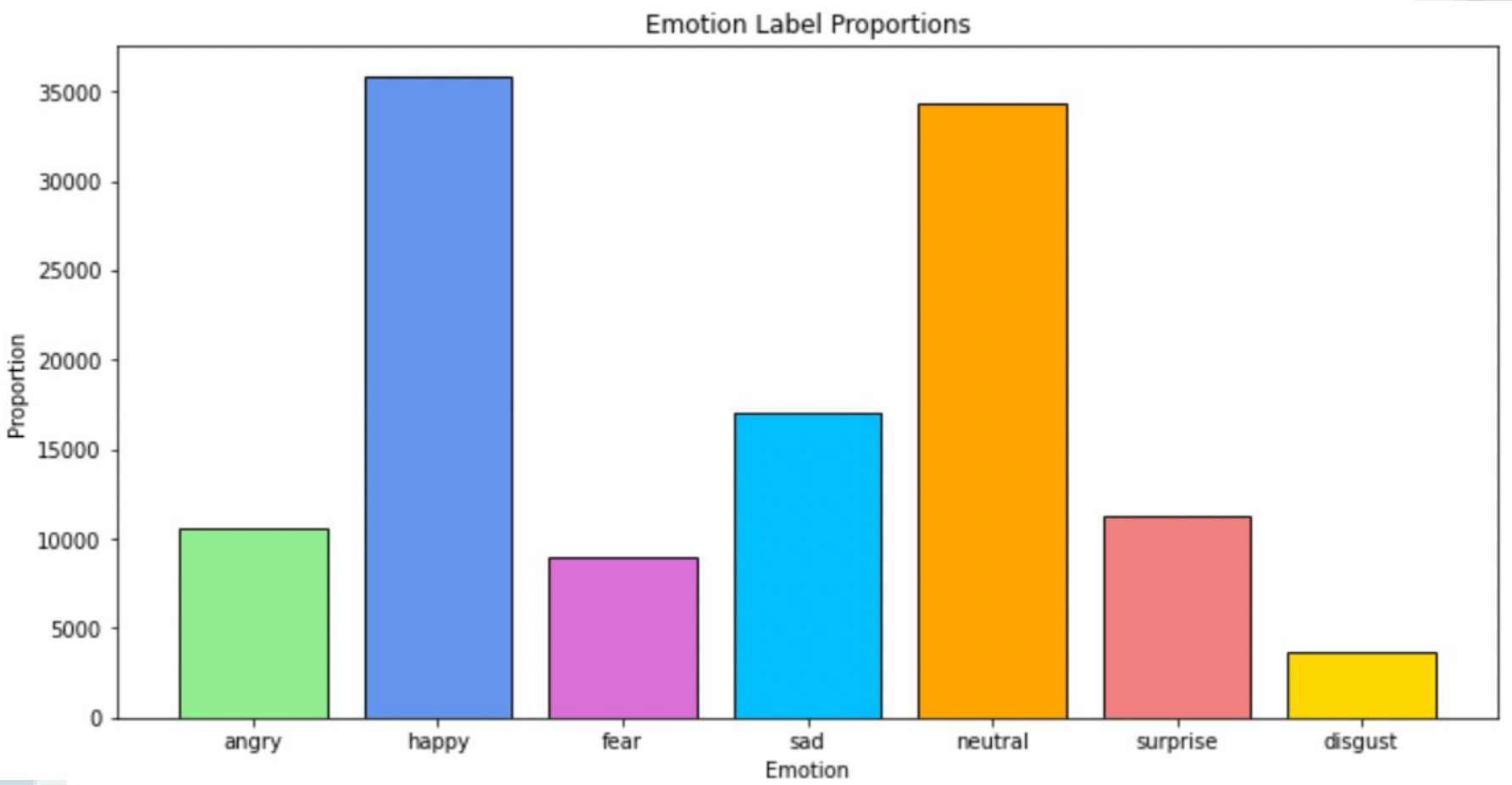
Business Proposal

Deploy a model on a Flask web app that gets Realtime/ live streaming video and show the current emotion for each human from reading his/her face emotions.

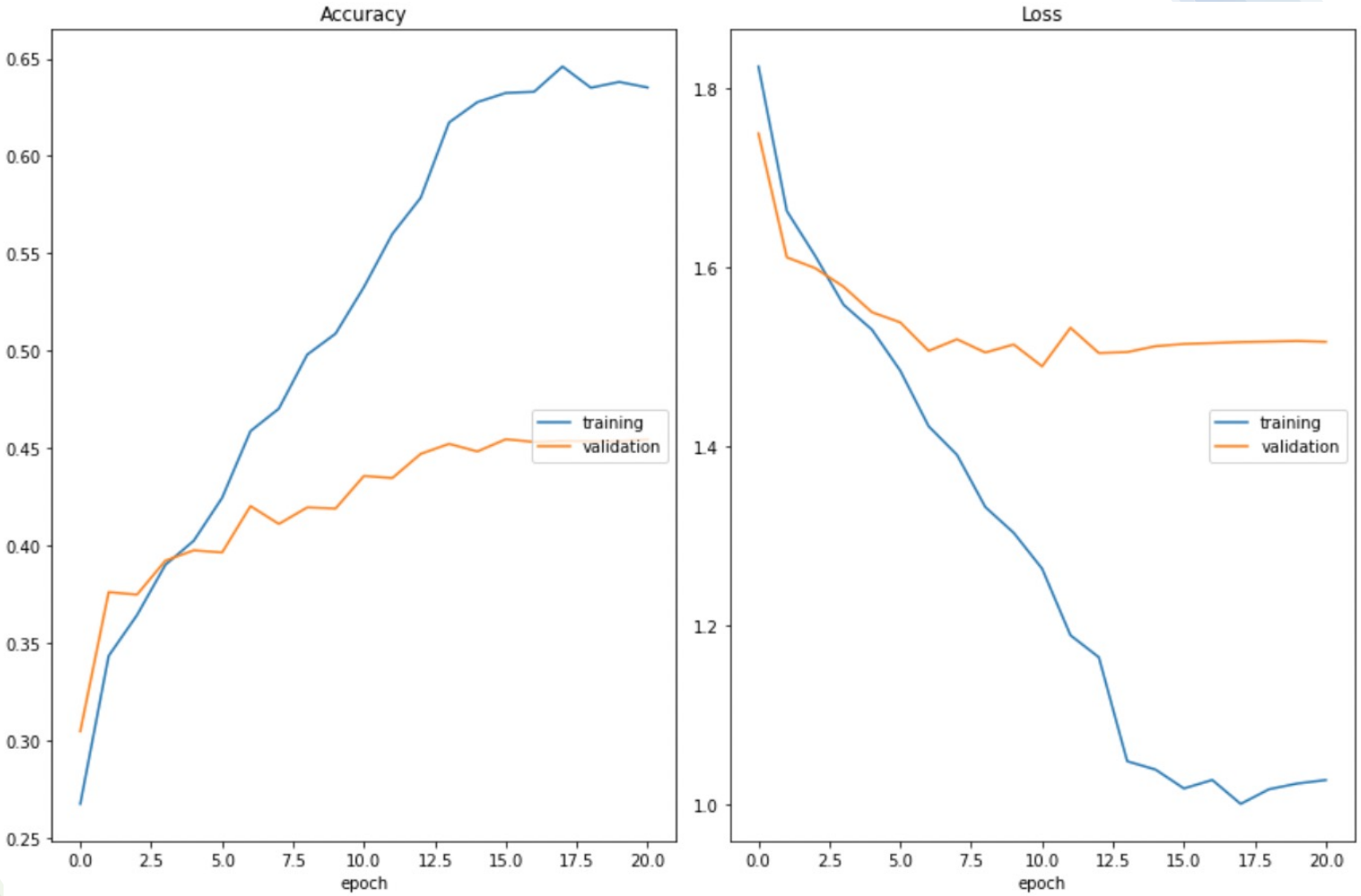
Data

- The data is taken from FER2013 dataset, it consists of 48x48 pixel grayscale images of faces.
- It is divided into train and test sets with seven common basic emotions (Happy, Neutral, Disgust, Surprise, Fear, Sad, Angry)

Data


Emotion Label Proportions
Proportion
35000
30000
25000
20000
15000
10000
5000
0
angry
happy
fear
sad
neutral
surprise
disgust
Emotion

Baseline



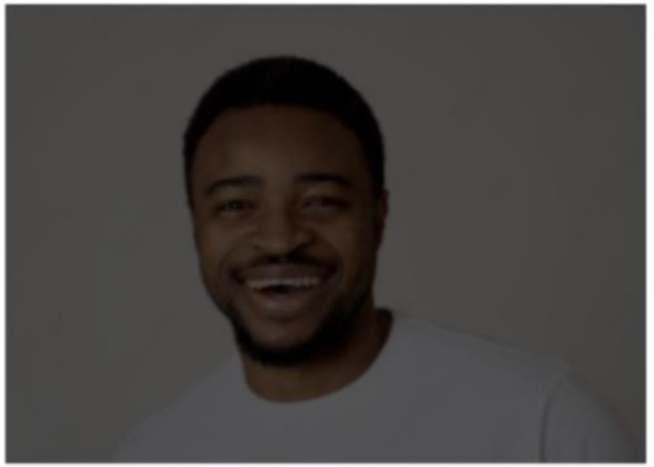

```
Accuracy
        training                (min:    0.268, max:    0.646, cur:    0.635)
        validation              (min:    0.305, max:    0.455, cur:    0.455)
Loss
        training                (min:    1.001, max:    1.825, cur:    1.028)
        validation              (min:    1.490, max:    1.750, cur:    1.517)
```

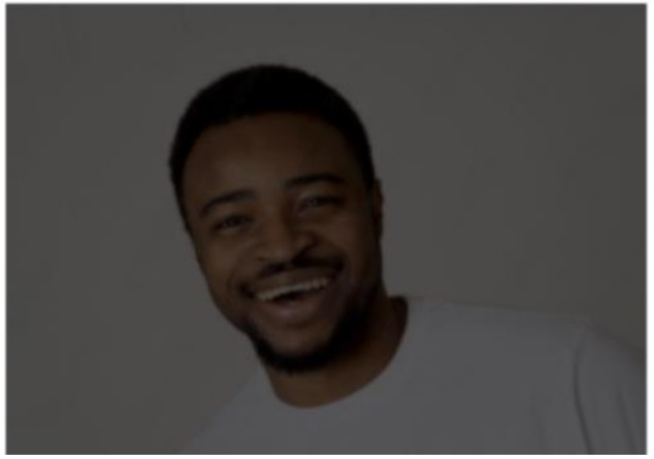
Baseline

With data augmentation added for brightness, rotation and sheared of the image.

Rotation 10 degrees

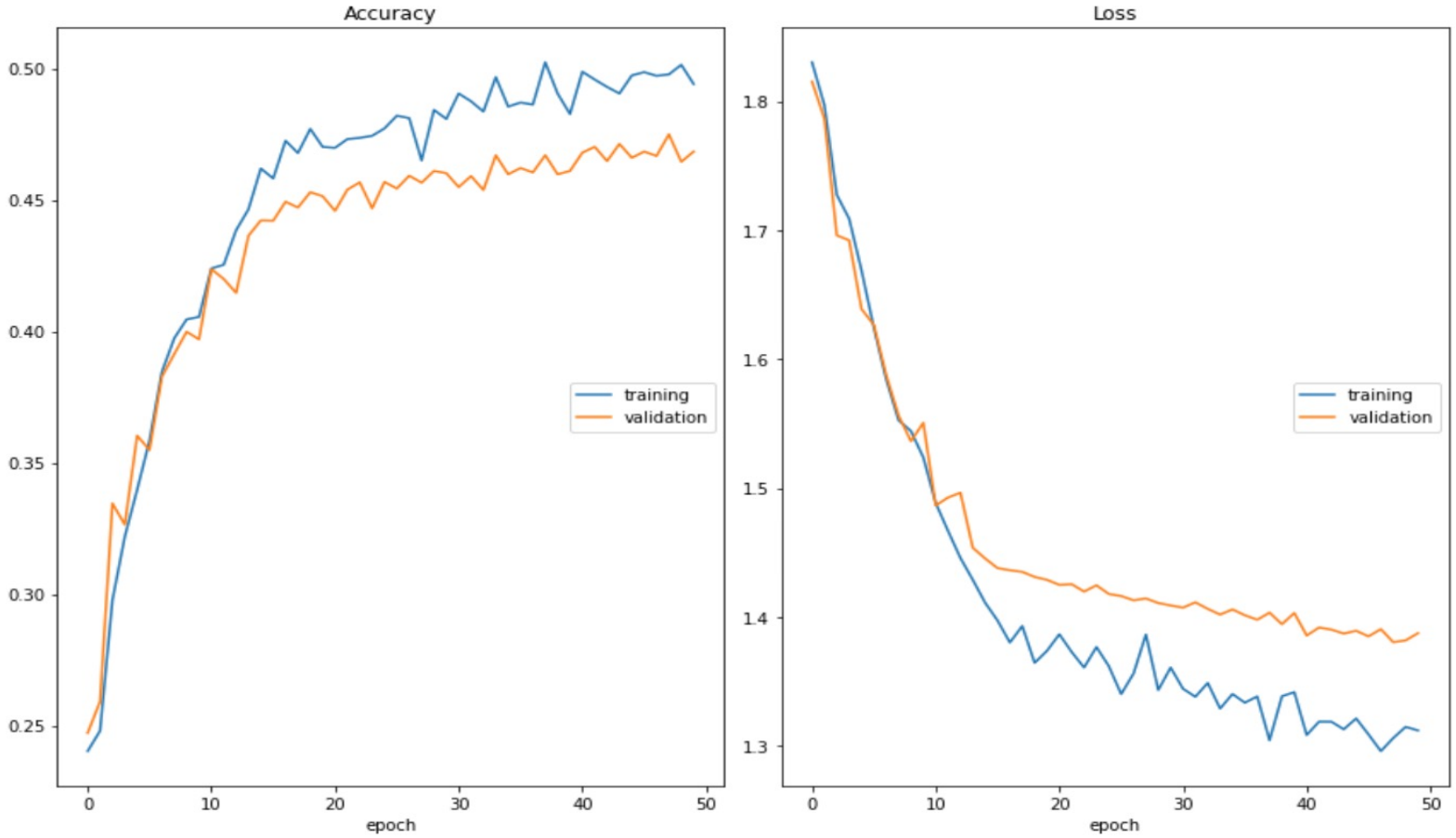
Brightness Changing
Shear the image





Baseline

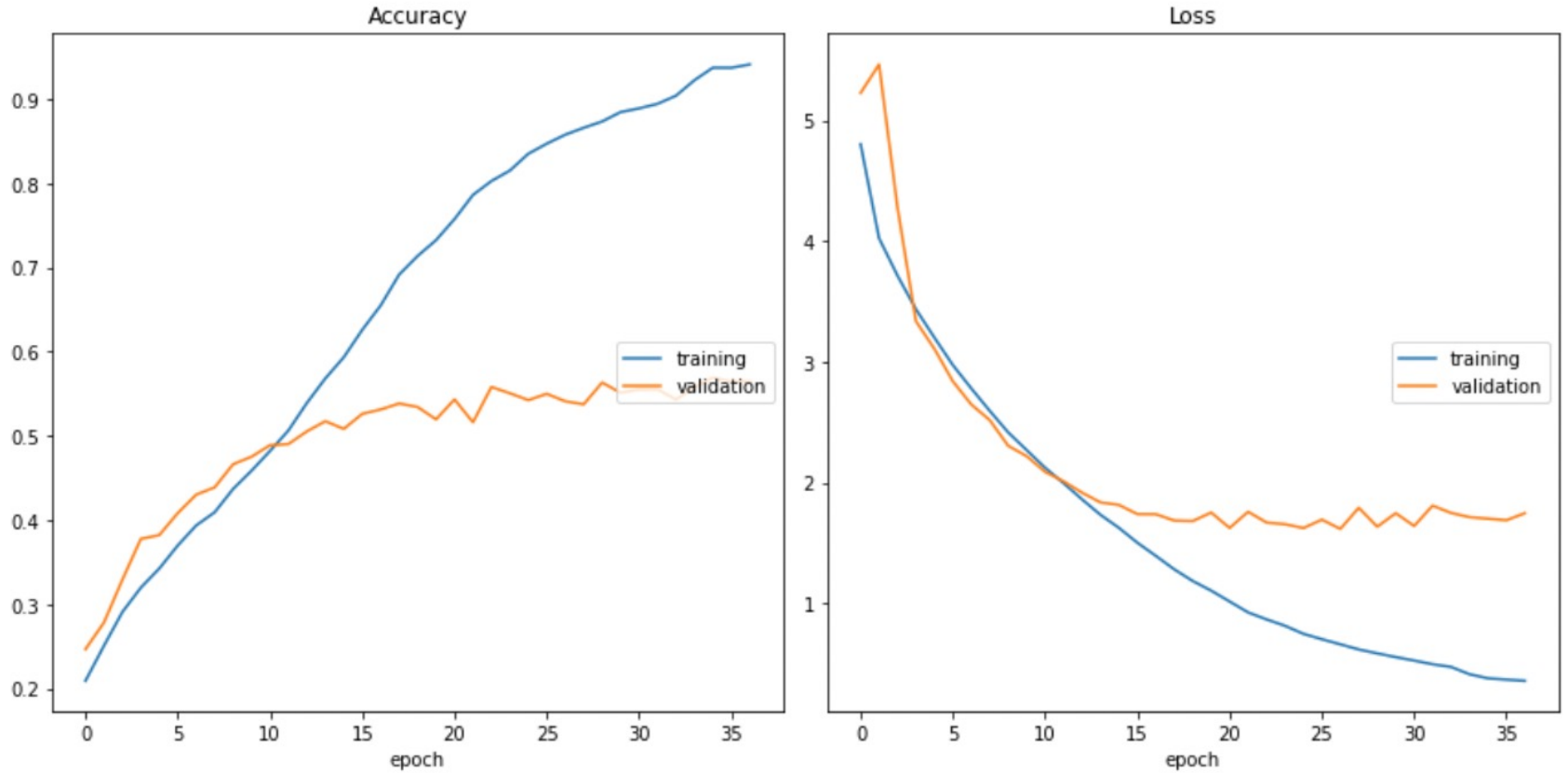
With data augmentation added for brightness, rotation and sheared of the image.




```
Accuracy
        training                 (min:    0.240, max:    0.502, cur:    0.494)
        validation               (min:    0.247, max:    0.475, cur:    0.468)
Loss
        training                 (min:    1.296, max:    1.830, cur:    1.312)
        validation               (min:    1.381, max:    1.815, cur:    1.387)
```

Baseline

- Increased the number of layers:



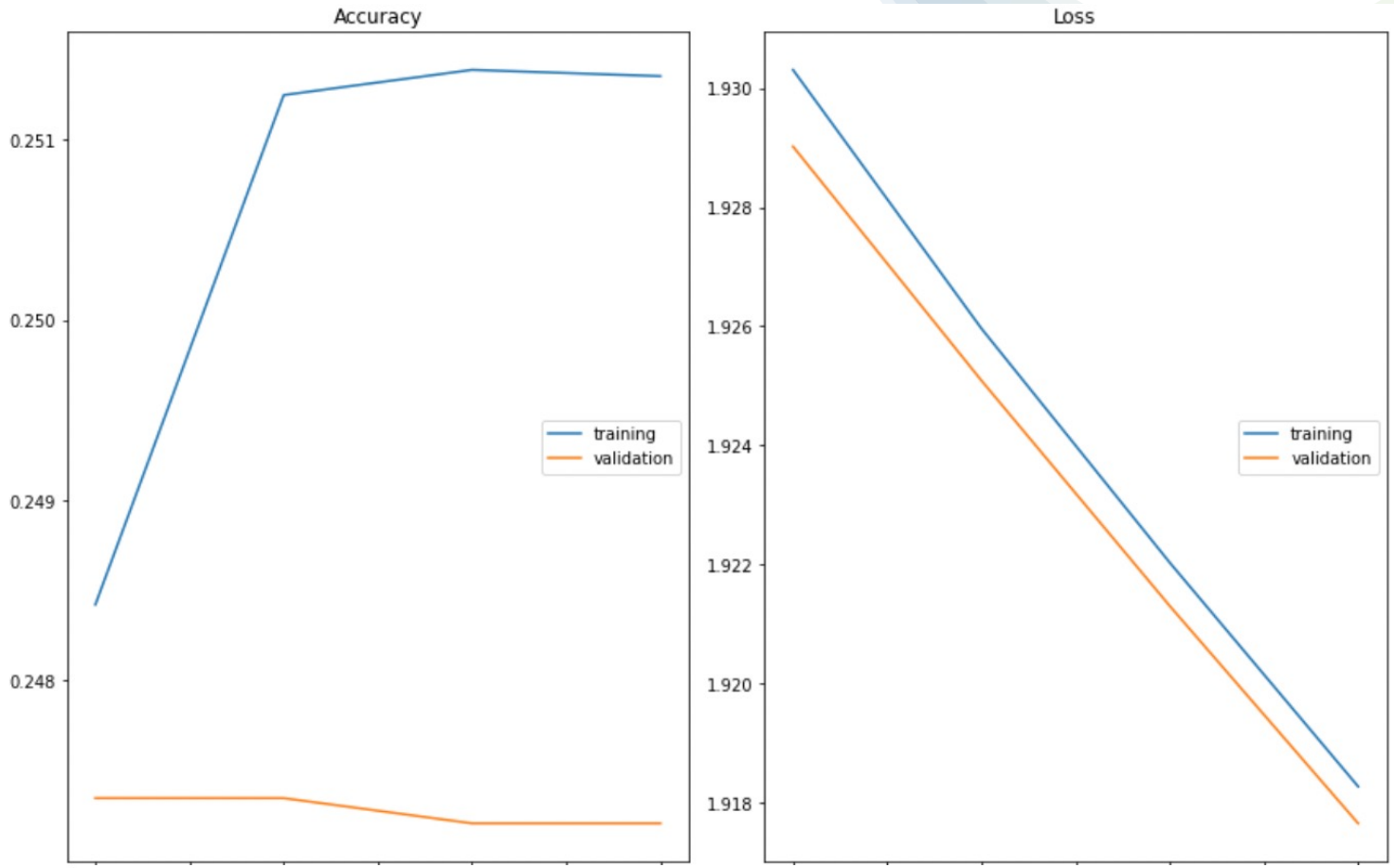

```
Accuracy
        training                (min:    0.209, max:    0.941, cur:    0.941)
        validation              (min:    0.247, max:    0.569, cur:    0.565)
Loss
        training                (min:    0.356, max:    4.803, cur:    0.356)
        validation              (min:    1.615, max:    5.463, cur:    1.745)
```

Transfer Learning Models

- Transfer Learning models:

1) VGG19 model:

The model accuracy the accuracy is not increasing than 25.1% and its loss is too big (1.918) so we would check other transfer models.

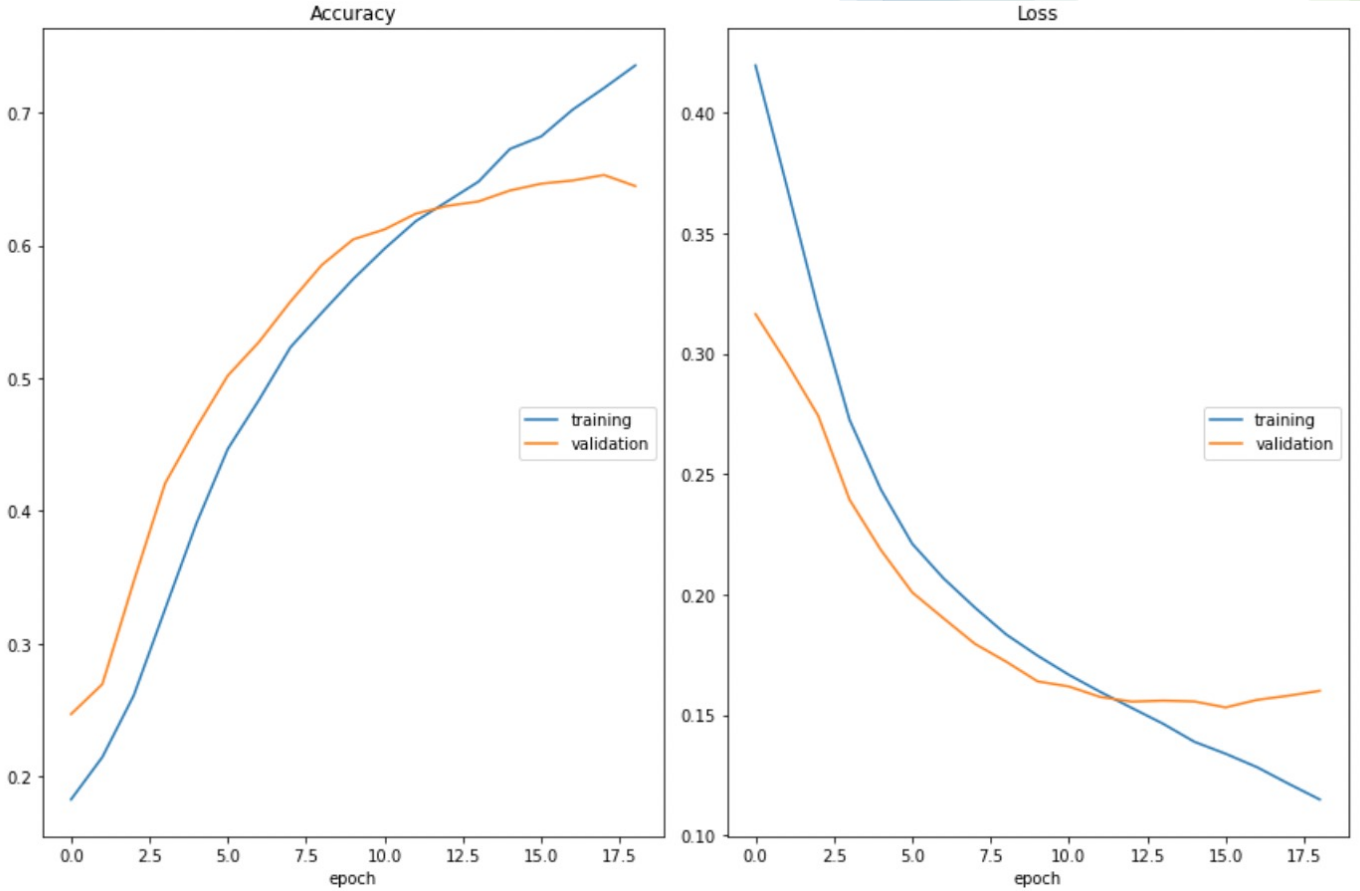



```
Accuracy
        training                (min:    0.248, max:    0.251, cur:    0.251)
        validation              (min:    0.247, max:    0.247, cur:    0.247)
Loss
        training                (min:    1.918, max:    1.930, cur:    1.918)
        validation              (min:    1.918, max:    1.929, cur:    1.918)
```

Transfer Learning Models

4) DenseNet 121 with small drop out and large number of epochs:

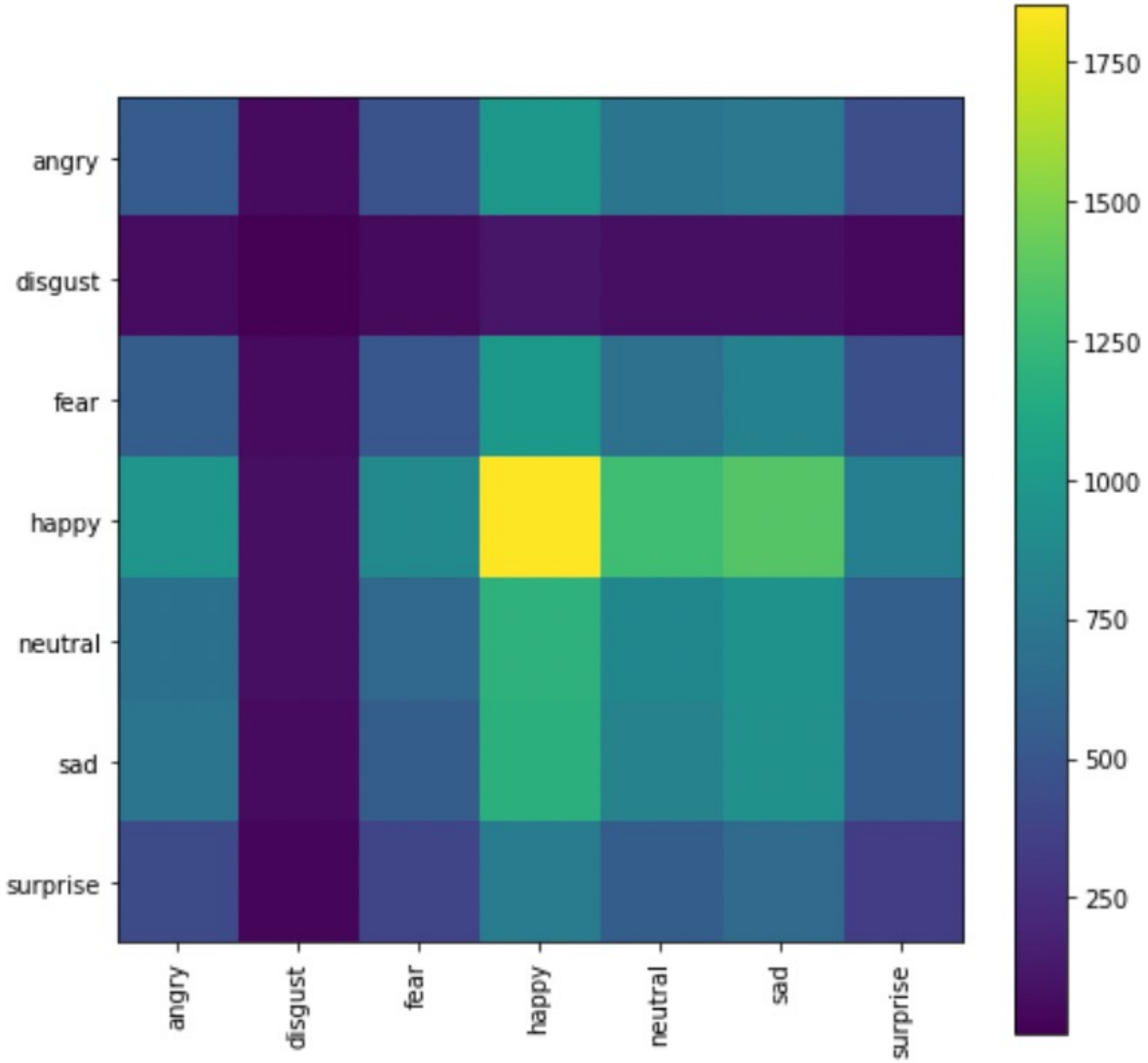
The accuracies increased to 73.6% for training set and 64.5% for validation set while the losses have decrease to the lowest numbers 0.115 for training and 0.160 for validation set. which is the best model for this dataset.



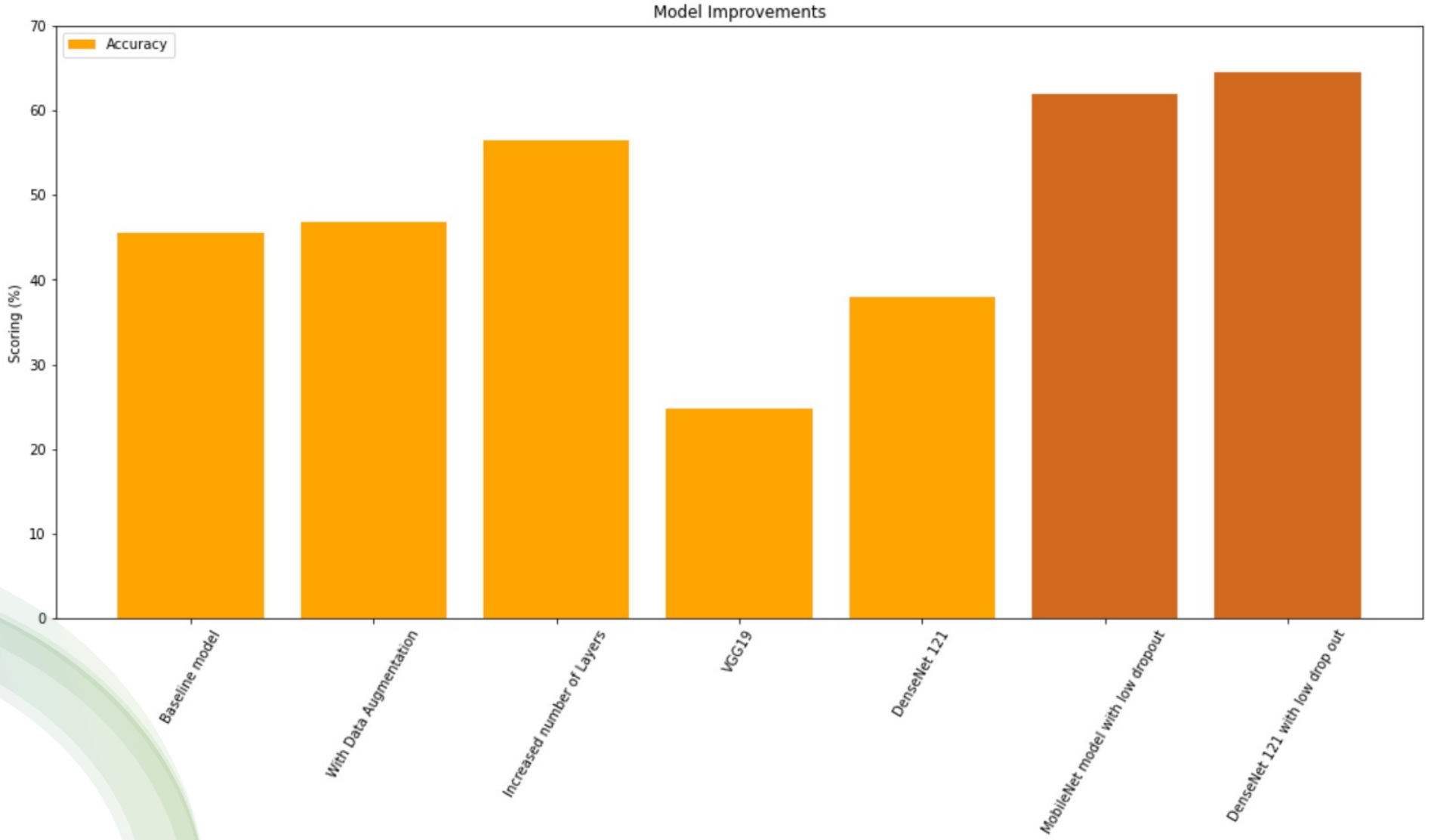

```
Accuracy
        training                 (min:    0.183, max:    0.736, cur:    0.736)
        validation               (min:    0.247, max:    0.653, cur:    0.645)
Loss
        training                 (min:    0.115, max:    0.420, cur:    0.115)
        validation               (min:    0.153, max:    0.316, cur:    0.160)
```

Confusion Matrix

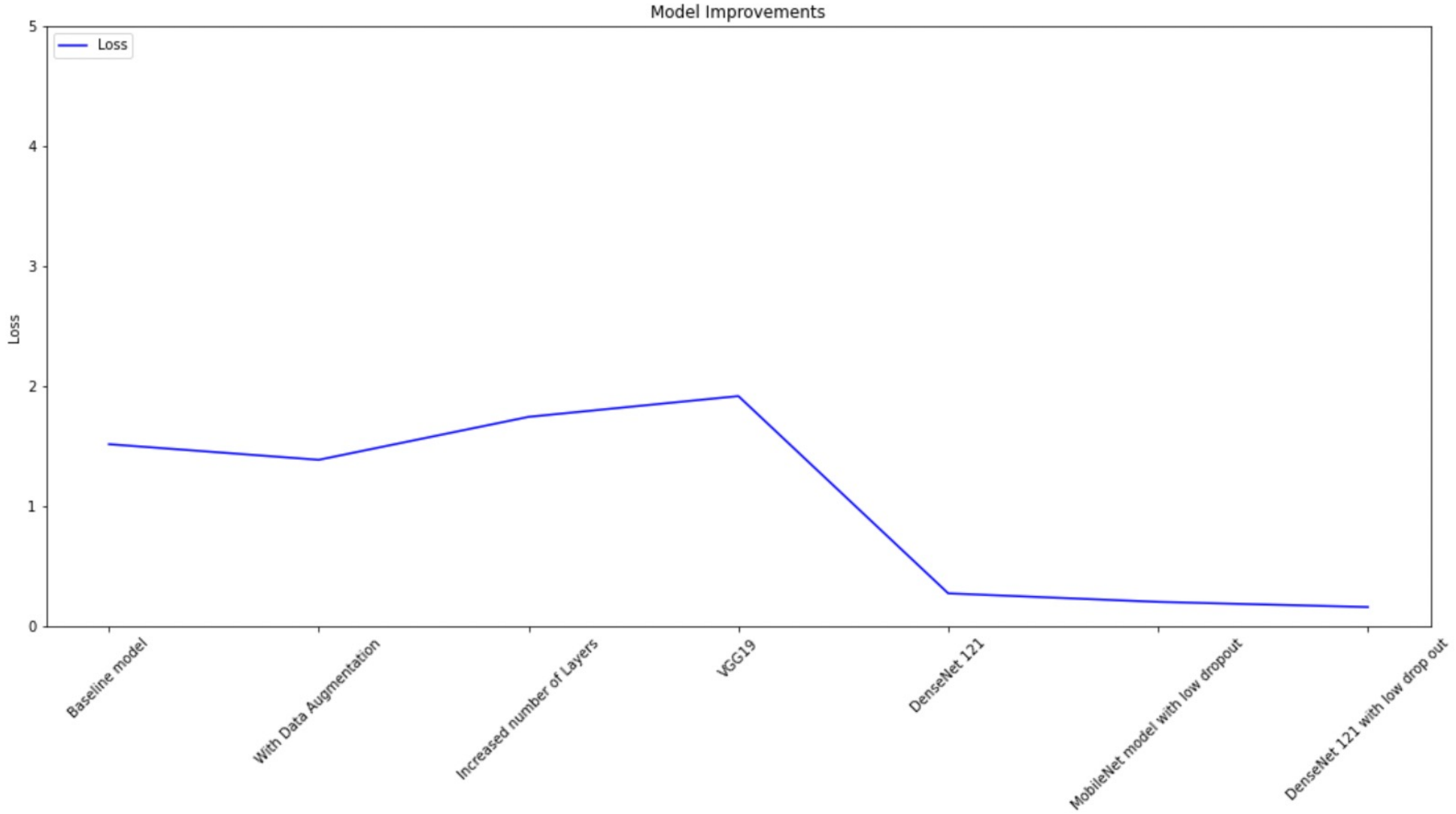
4) DenseNet 121 with small drop out and large number of epochs.



Evaluation and Results

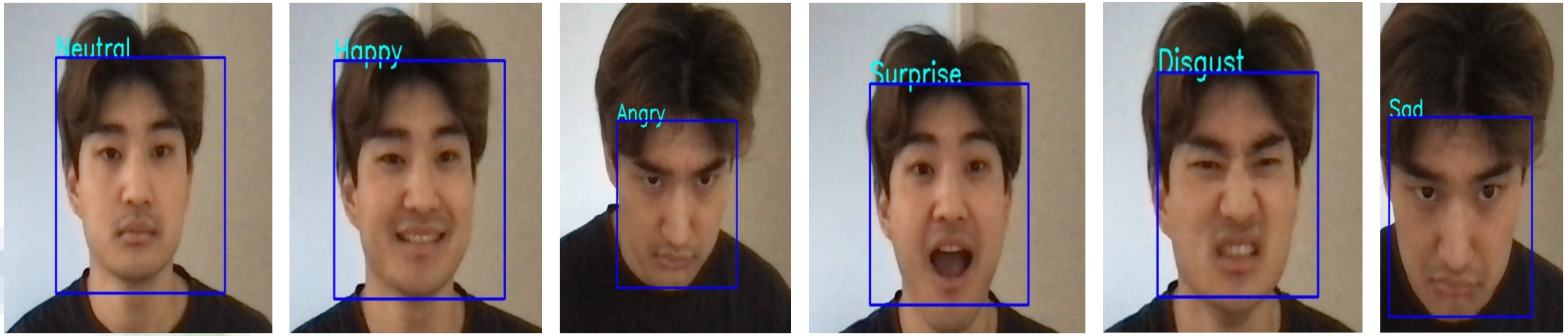


Evaluation and Results



Deployment

The model is deployed on a Flask web app that gets Realtime/ live streaming video and shows the current emotion for each human from reading his/her face emotions.



Recommendations and Future Work

- Check more different Datasets such as MMA, CK+ to improve the accuracies of the application.
- Try other different techniques for face detection like Yolo other than OpenCV.
- Deploy the app to a mobile app.

Thank you!

Any Questions?

Justin Sohn

https://www.linkedin.com/in/justin-sohn-689901193/