

## Assignment #3

### Problem1- Color Recognition

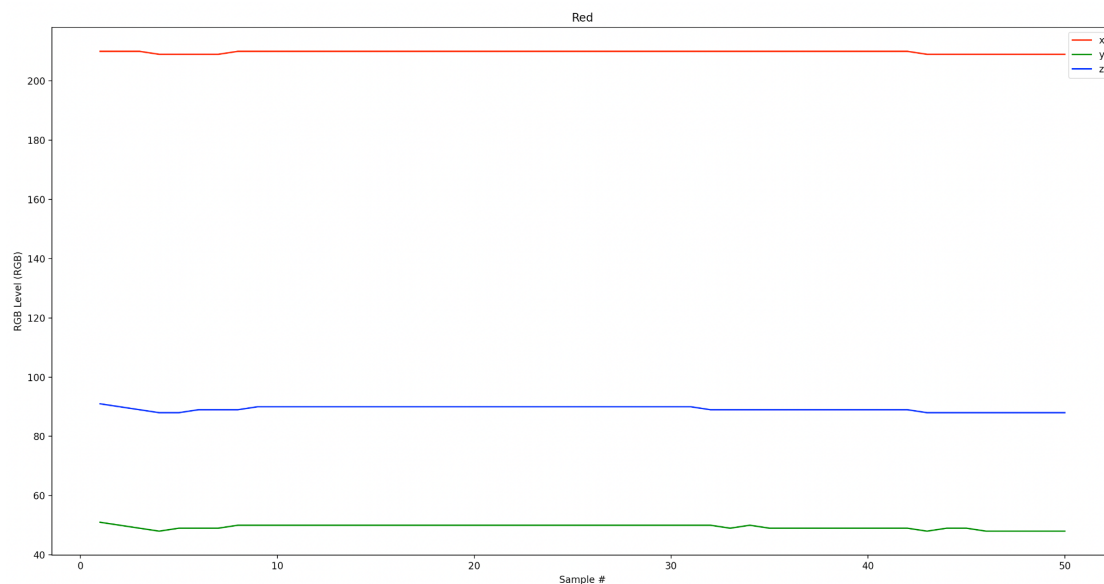
1. Color recognition with 6 categories/classes: “red” “orange” “yellow” “green” “blue” “purple”

2a. I initiate a sample window by notifying the user that the Arduino is ready to take samples of color detection.

2b. My sample window consists of 50 total samples with a color reading taken every half second.

2c. I collected 50 total samples for each category.

2d. I did save my data from the serial monitor and then graph it using matplotlib before exporting it to the model. For example my red.csv looked like:



2e. The APDS9960 sensor didn't have any user changeable settings like sampling rate, gain etc. However, I did have to take into account the distance the sensor was from the color I was trying to sample, I found that about 5 inches away gives the best output.

3a. My model is a Sequential model with 3 layers. The first two layers use relu as their activation for better performance, and the last layer uses softmax since each input is one color detection sample. My model summary is:

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Model: "sequential"
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Layer (type)	Output Shape	Param #
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dense (Dense)	(1, 50)	7550
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dense_1 (Dense)	(1, 15)	765
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dense_2 (Dense)	(1, 6)	96
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Total params: 8,411

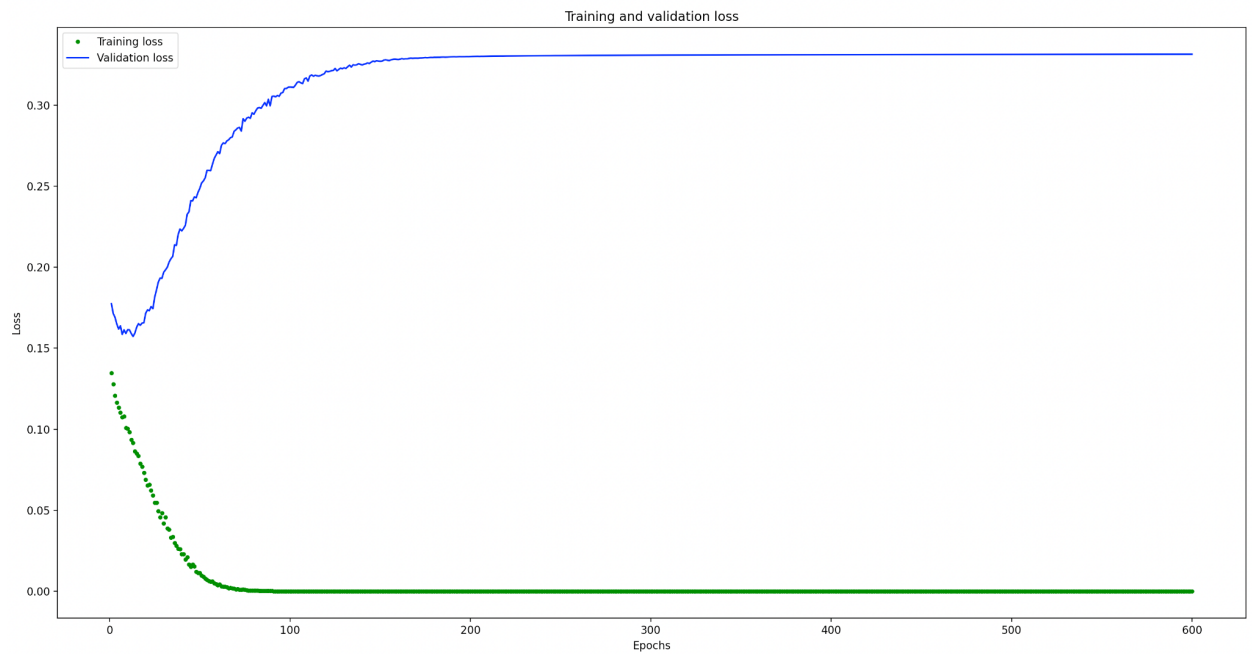
Trainable params: 8,411

Non-trainable params: 0

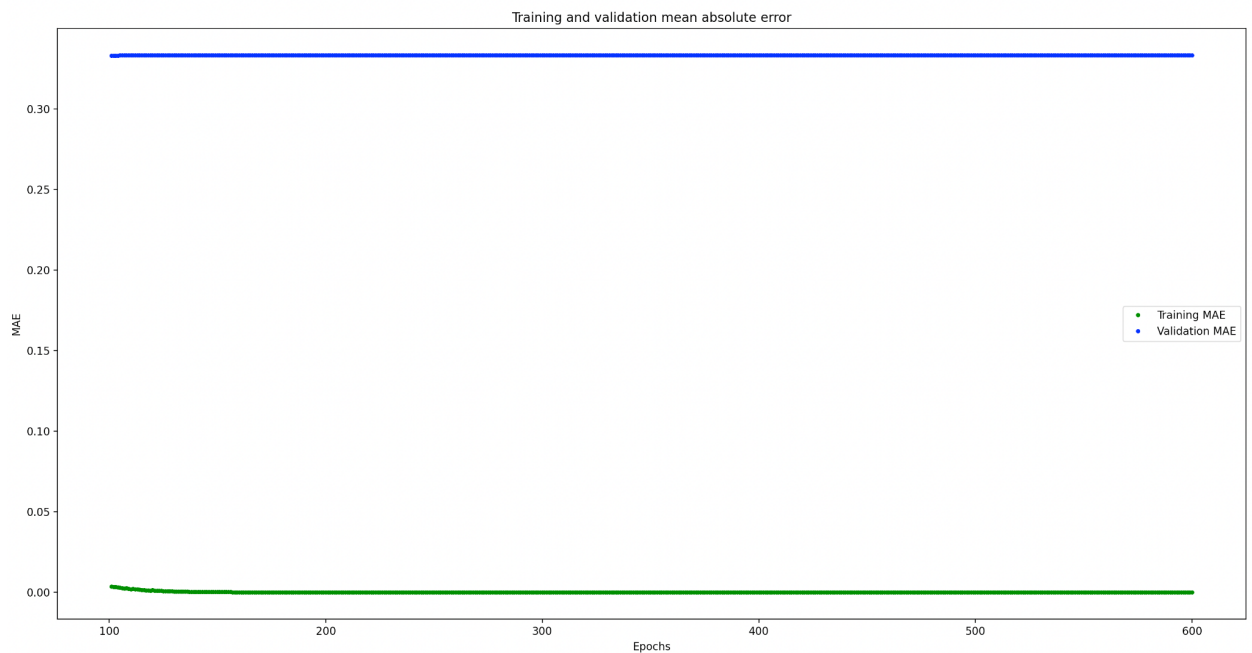
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3b.

My Loss curves seem to show that my model may be over fit since the validation loss begins to increase again.



My Mean Absolute Error curve:



4. To test the accuracy of my model I pulled up ten images on my monitor and held the Arduino approximately 5 inches away. The sample images were:

- A banana
- A red apple
- A blue shirt
- An orange
- Grass
- Grapes
- A green apple
- The ocean
- A sunflower
- A stop sign

The predictions were as following:

- |   |   |
|---|---|
| - The banana predicted yellow 0.998473                          | √ |
| - The red apple predicted orange 0.766542 (red second most)     | X |
| - The blue shirt predicted blue 0.563155 (almost purple)        | X |
| - The orange predicted orange 0.999104                          | √ |
| - The grass predicted green 0.786301                            | √ |
| - The grapes predicted blue 0.689032 (purple second most)       | X |
| - The green apple predicted green 0.810029                      | √ |
| - The ocean predicted green 0.879021 (green or blue acceptable) | √ |
| - The sun flower predicted orange 0.975905                      | X |
| - The stop sign predicted red 0.514456                          | √ |

So out of 10 readings my model accurately predicted the color 60% of the time, however with more training of different hues of color I'm sure it could be way higher (some test outcomes were close to correct).

## Problem 2

Omitting due to time needed for other Finals, Thanks Noyan :)