CS 235 Quarter Project
2D versus 3D

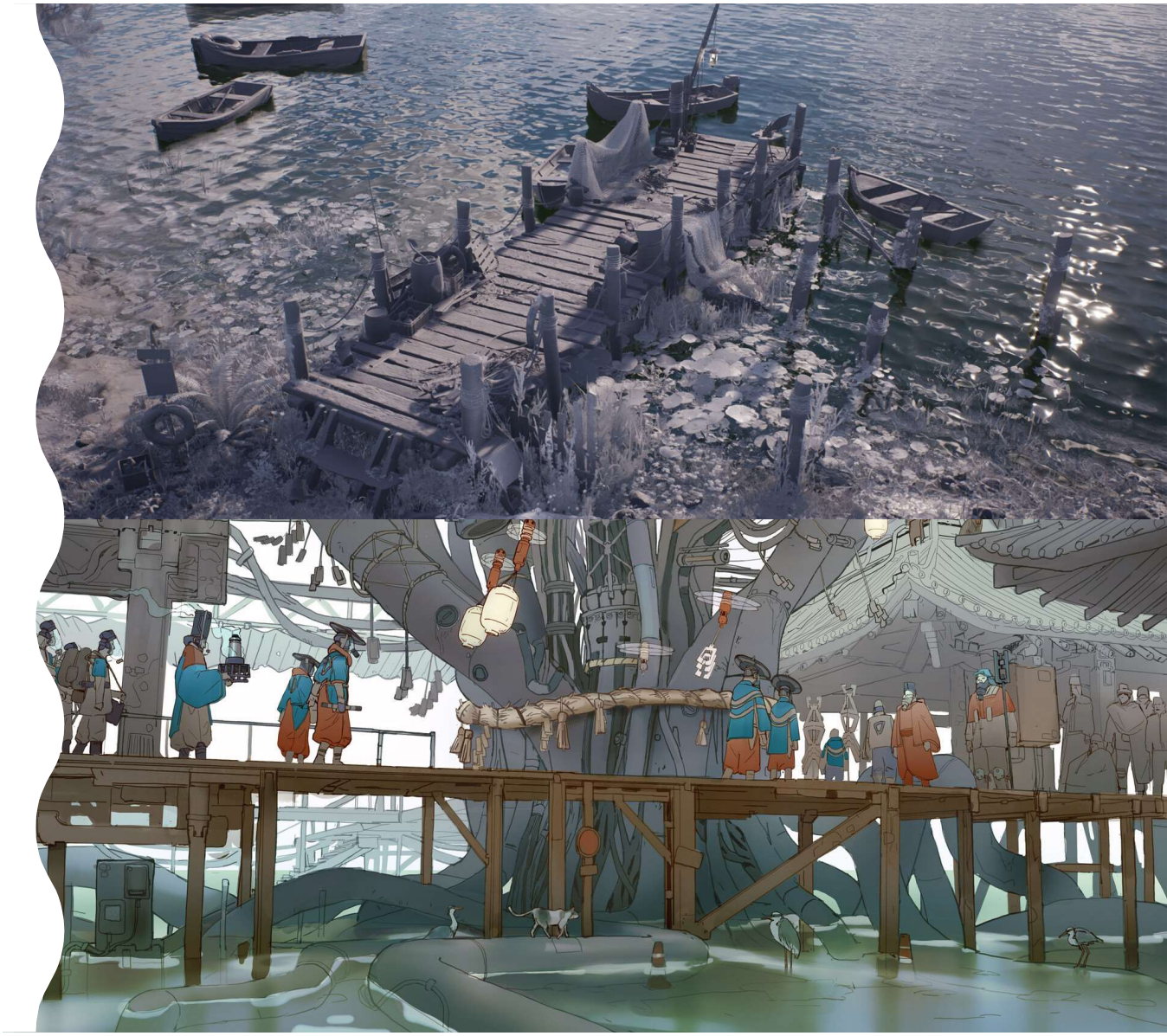
Michael Rojas

SID: 862034677

NETID: mroja013

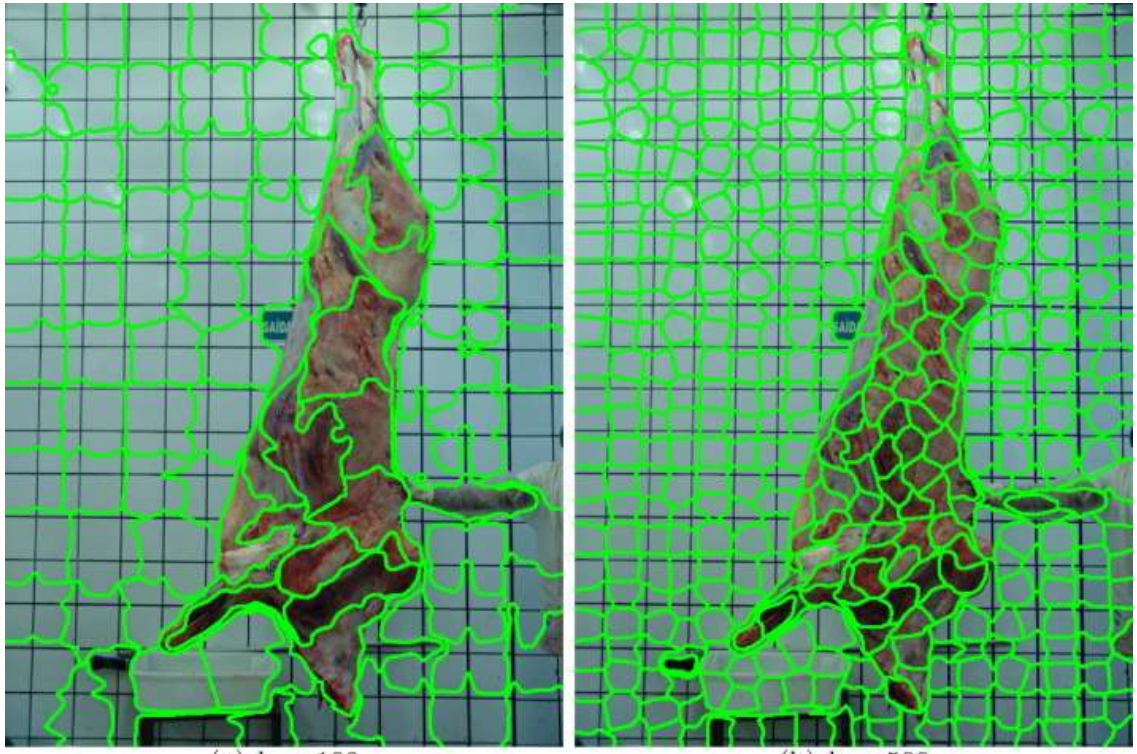
2D art VERSUS 3D art

- We can tell the difference between the two most of the time: how?



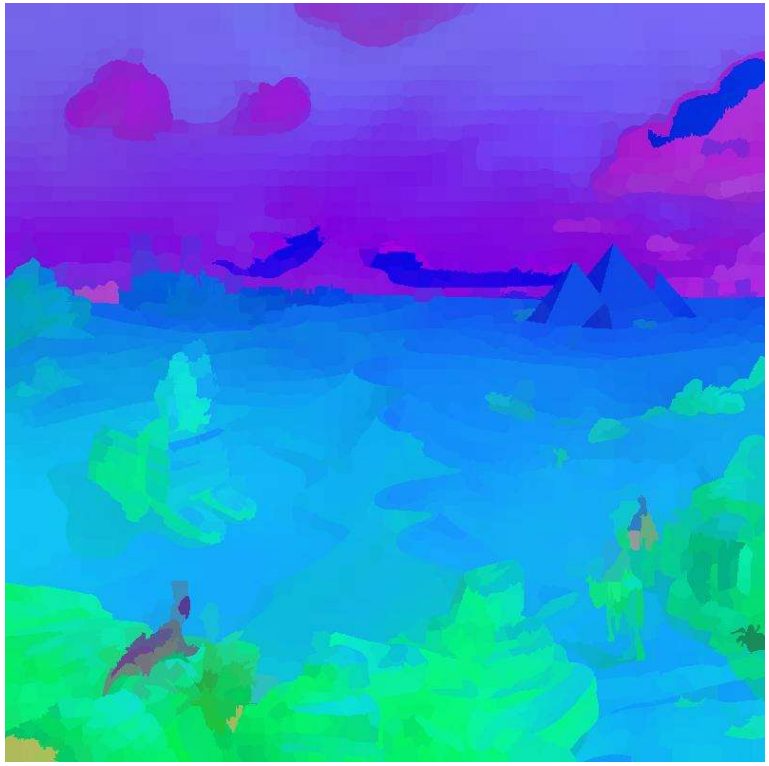
‘Color dynamics’ hypothesis and superpixellation

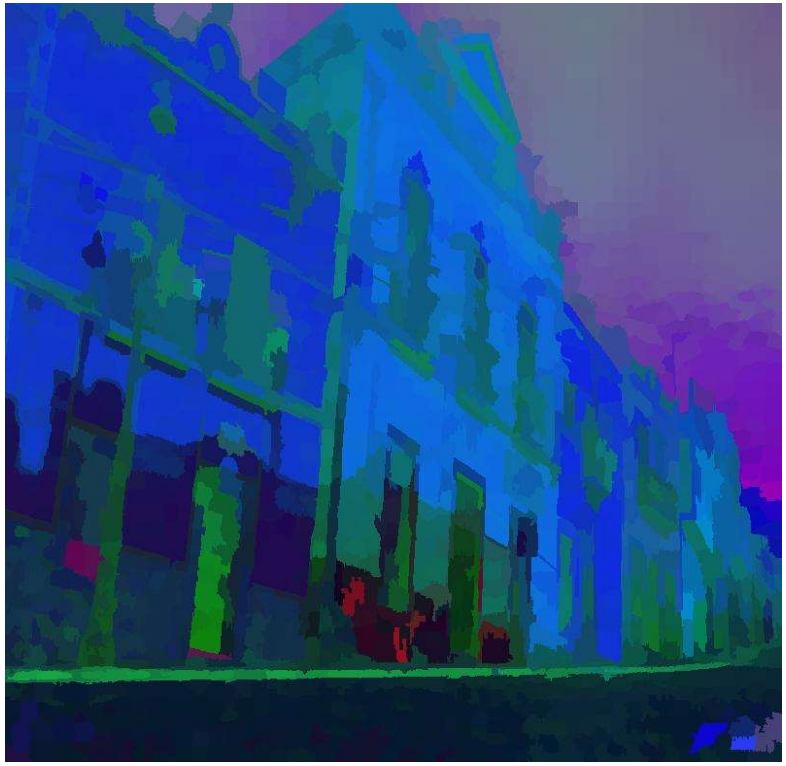
- 2D has a higher tendency for “matte” or “flat” coloring
- 3D artworks simulate more realistic lighting/shading and therefore have many more color dynamics going on
- Superpixellation segmentation by colors should be different for both of them



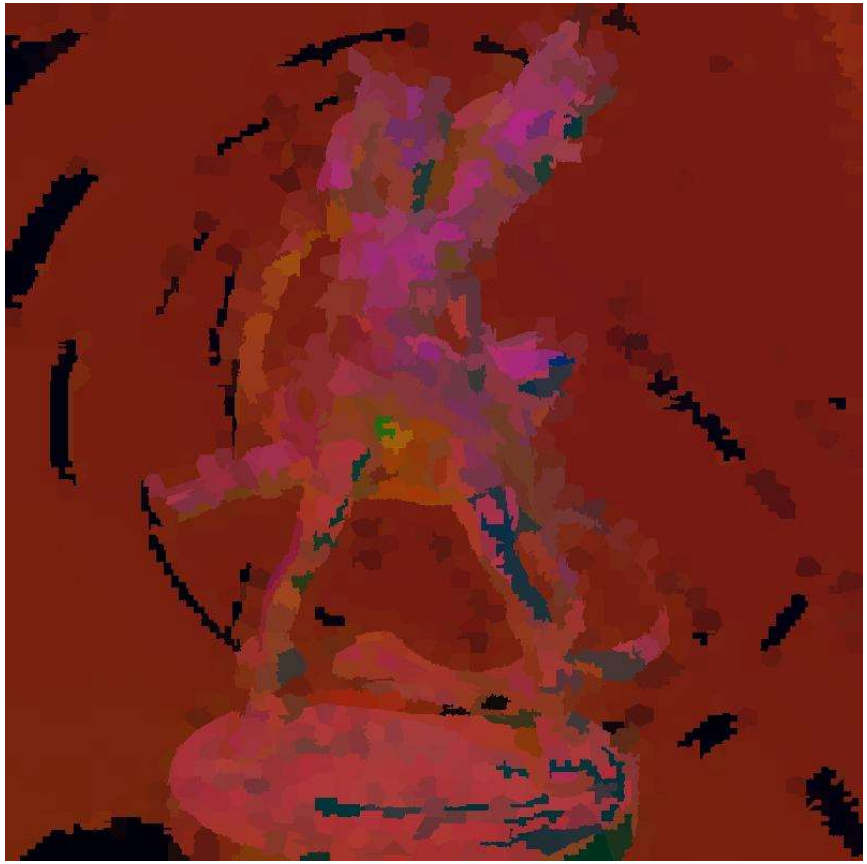
(a) k = 100 (b) k = 500

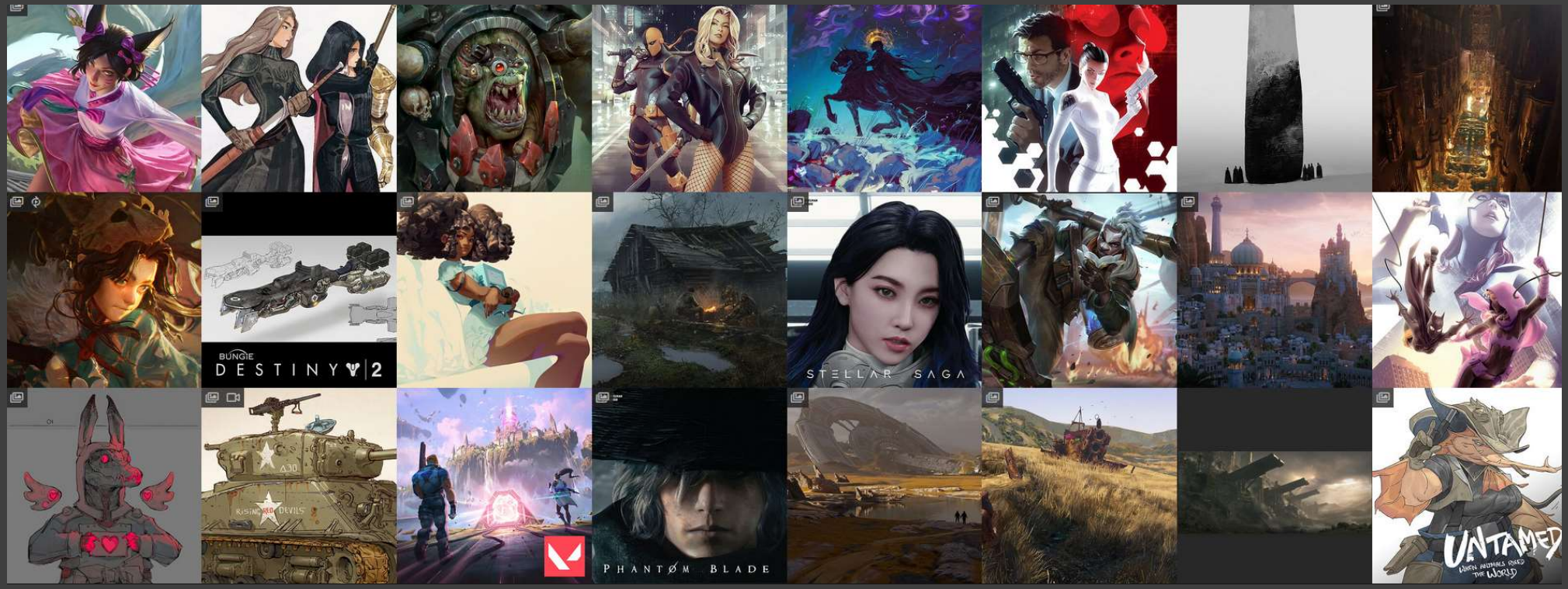
Superpixel average coloring





Compare them!





Methodology: Data scraping

- Python based webscraping
  - Logic for differentiating between 2D and 3D
  - 25% randomly assigned to the test set

Methodology: Average coloring

Segment and color the average

Downscale resolution at 800x800

3D images usually clearer than 2D

```
model.add(Conv2D(32, (3, 3), activation='relu', kernel_initializer='he_uniform', padding='same', input_shape=(175, 175, 3)))
model.add(MaxPooling2D((2, 2)))
##second block
model.add(Conv2D(64, (3, 3), activation='relu', kernel_initializer='he_uniform', padding='same'))
model.add(MaxPooling2D((2, 2)))
#third block
model.add(Conv2D(128, (3, 3), activation='relu', kernel_initializer='he_uniform', padding='same'))
model.add(MaxPooling2D((2, 2)))
```

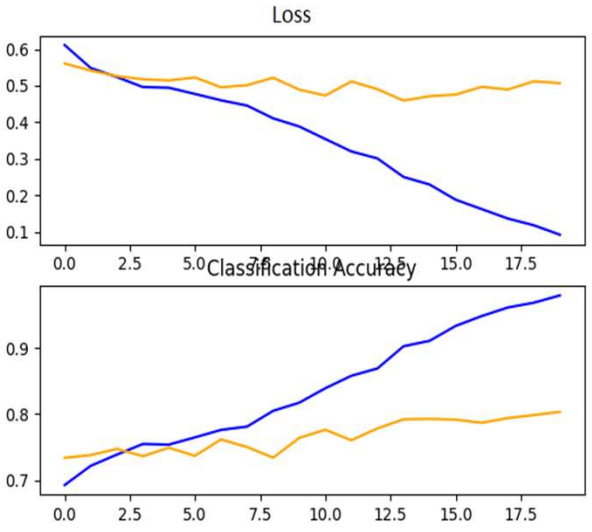
Methodology: Train on a basic CNN

- Baseline = non-deep VGG-like architecture
  - Alternate block counts (1-3) with increasing
  - 2D convolution for images
  - Standard for image processing in a neural network
  - VGG16 and 19 show promising returns in large applications

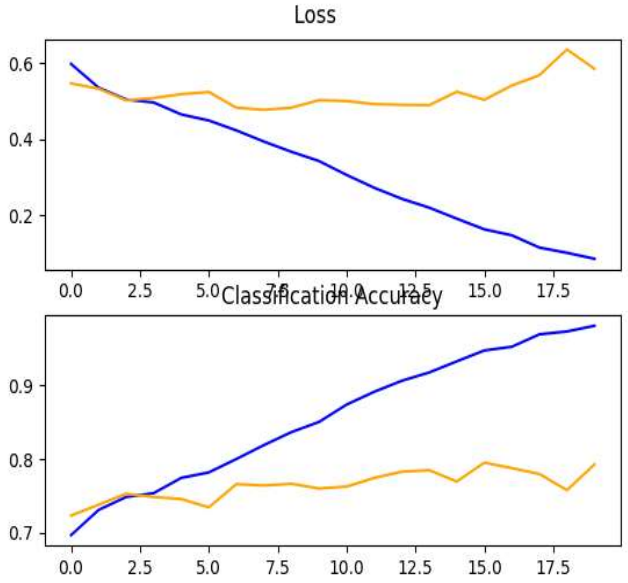
Methodology: VGG16 Training

- Provided by Tensorflow
- Heightened accuracy due to layer count
- Good comparison for higher precision on predictions

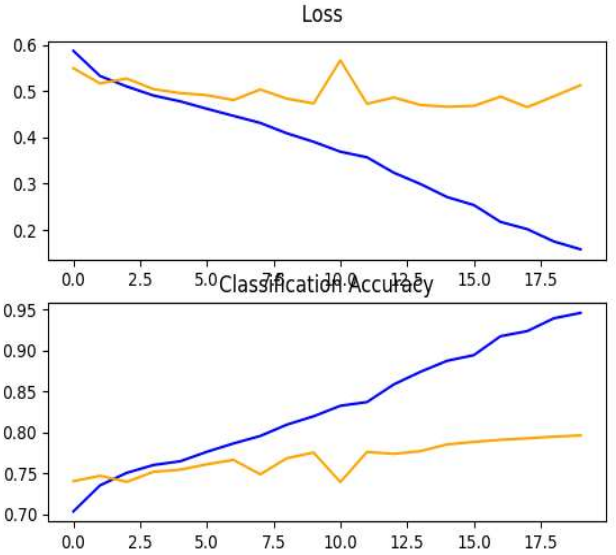
Results: Original Dataset on Baseline



80.332% accuracy



79.285% accuracy



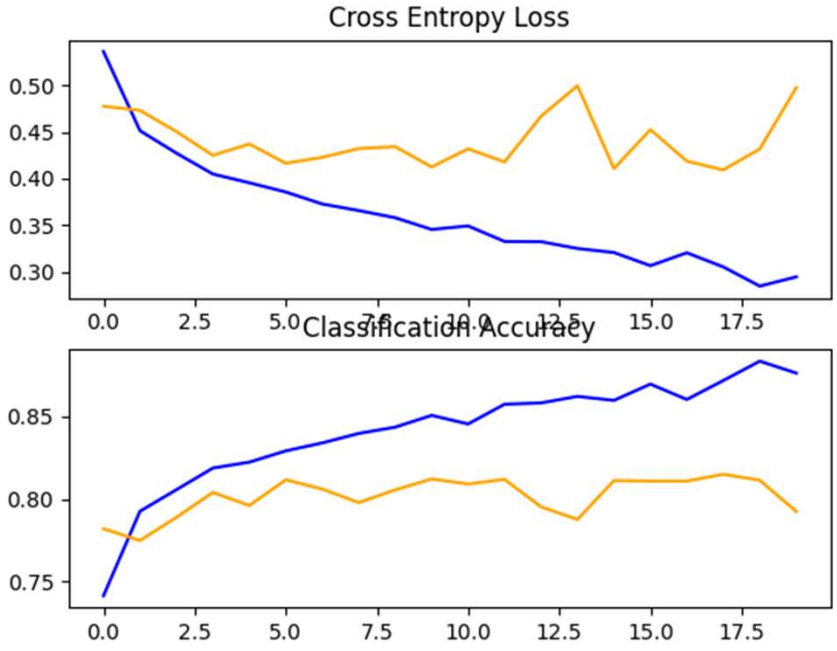
79.642% accuracy

Results: Processed and Colored Images on Baseline

- 1-block accuracy = 78.161%
- 2-block accuracy = 76.858%
- 3-block accuracy = 78.238%
- Missing graphs/plots due to file corruption and timeliness

Results: VGG16 Model with Processed Images

- Lack of comparison with original data set
- Lack of hyperparameter tweaking



79.259% accuracy

Afterthoughts and Considerations

- Underestimated processing time
- Time management between looking into other methods and getting a working implementation could have been handled better
- Different colorspace transformations combined with superpixel segmentation tweaking
- Obviously model hyperparameter tweaking

Thank you!