Bacteria features prediction using CRNA (Convolutional Regression Neural Network)

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Data Augmentation:

Original Dataset – 266 Images

Pre-processing techniques:

1. Rotate at random degrees
2. Flip Left-Right, top-bottom
3. Add gaussian blur
4. Changing color Saturation
5. Compressed and resized to 256x256 pixels

Total Images Generated: 2000 Images

Training Images Sampled: 1600(80%)

Testing Images Sampled: 400 (20%)

Language used: Python
Editor used: Pycharm, Jupyter

Neural Network Implementation:

Network selected: Convolutional Neural Network

Network Architecture:

1. 2D-Convulutuional Layer (32 Filters of Size 3x3), Activation – Relu
2. 2D-Convulutuional Layer (32 Filters of Size 3x3), Activation – Relu
3. 2D-MaxPooling layer (pool_size = (2,2)), Dropout (0.25)

4. 2D-Convulutuional Layer (32 Filters of Size 3x3), Activation – Relu
5. 2D-Convulutuional Layer (32 Filters of Size 3x3), Activation – Relu
6. 2D-MaxPooling layer (pool_size = (2,2)), Dropout (0.25)
7. 2D-Convulutuional Layer (32 Filters of Size 3x3), Activation – Relu
8. 2D-Convulutuional Layer (32 Filters of Size 3x3), Activation – Relu
9. 2D-MaxPooling layer (pool_size = (3,3)), Dropout (0.25)
10. Flatten layer
11. Dense layer (neurons: 512), Activation – Relu, Dropout (0.5)
12. Dense layer (neurons: 256), Activation – Relu, Dropout (0.5)
13. Dense layer (neurons: 29), Activation – Relu, Dropout (0.25)
14. Dense layer (neurons: 18), Activation – Relu, Dropout (0.25)

Parameter's selected for predication:

These parameters have been selected for their highest correlation factor.

1. Strain
2. Live
3. Dead
4. Id.od
5. Phe
6. Od.avg
7. Od.harvest
8. Pvd
9. Pch
10. Cont.max.od
11. Cont.ax.rate
12. Carb.max.rate
13. Carb.max.od
14. Cont.auc
15. Carb.auc
16. Toby.auc
17. Bfrac

Number of Iterations: 200 epochs
Optimizing the network on mean square error.
Batch Size: 15

Conclusion :

The absolute mean error and accuracy are selected as the metrics to analyze the model.

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3 [..............................] - ETA: 56s - loss: 127.2705 - mean_absolute_error: 5.5804 - acc: 0.6000
3 [>.............................] - ETA: 53s - loss: 176.3473 - mean_absolute_error: 6.2331 - acc: 0.5000
3 [=>............................] - ETA: 51s - loss: 187.0114 - mean_absolute_error: 6.1312 - acc: 0.5333
3 [=>............................] - ETA: 53s - loss: 192.3712 - mean_absolute_error: 6.0698 - acc: 0.5500
3 [==>...........................] - ETA: 57s - loss: 182.5495 - mean_absolute_error: 6.1642 - acc: 0.5600
3 [===>..........................] - ETA: 55s - loss: 166.1329 - mean_absolute_error: 6.0406 - acc: 0.6000
3 [====>.........................] - ETA: 52s - loss: 153.6590 - mean_absolute_error: 5.9452 - acc: 0.6286
3 [====>.........................] - ETA: 50s - loss: 152.8305 - mean_absolute_error: 5.8774 - acc: 0.6500
3 [=====>........................] - ETA: 49s - loss: 152.2967 - mean_absolute_error: 5.8773 - acc: 0.6667
3 [======>.......................] - ETA: 47s - loss: 151.6078 - mean_absolute_error: 5.8499 - acc: 0.6800
3 [=======>......................] - ETA: 45s - loss: 154.6839 - mean_absolute_error: 5.8808 - acc: 0.6727
3 [=======>......................] - ETA: 43s - loss: 164.7382 - mean_absolute_error: 6.0418 - acc: 0.6667
3 [========>.....................] - ETA: 42s - loss: 161.0761 - mean_absolute_error: 6.0387 - acc: 0.6615
3 [========>.....................] - ETA: 40s - loss: 158.6358 - mean_absolute_error: 6.0247 - acc: 0.6857
3 [=========>....................] - ETA: 39s - loss: 161.8279 - mean_absolute_error: 6.1141 - acc: 0.6800
3 [=========>....................] - ETA: 37s - loss: 161.7120 - mean_absolute_error: 6.1930 - acc: 0.6750
3 [==========>...................] - ETA: 35s - loss: 160.2241 - mean_absolute_error: 6.1966 - acc: 0.6824
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