Deep Learning

Programming Assignment 2

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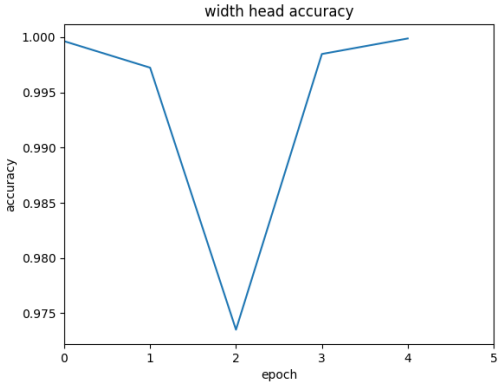
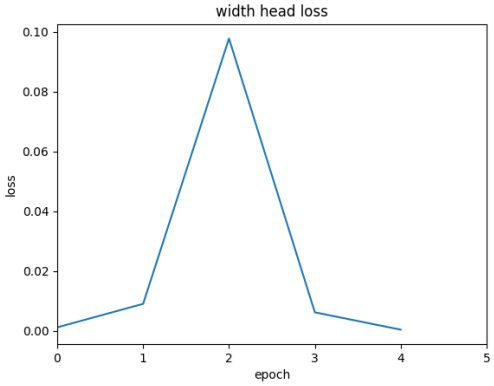
Contents

1 Classification Head 1 - Width

1.1 Learning Curves

Accuracy: 99.988% **Loss: 0.000336**





1.2 F-score

	C_0	C_1
recall	1.0	1.0
precision	1.0	1.0
f_score	1.0	1.0

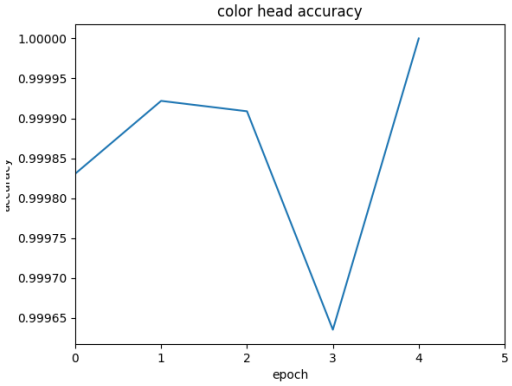
1.3 Confusion Matrix

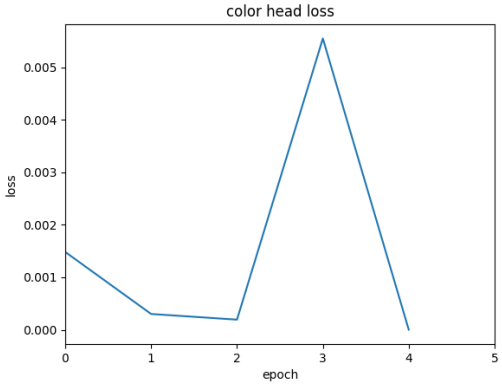
$$\begin{bmatrix} 19200 & 0 \\ 1 & 19199 \end{bmatrix}$$

2 Classification Head 2 - Colour

2.1 Learning Curves

Accuracy: 100% **Loss: 2.6649e-06**





2.2 F-score

	C_0	C_1
recall	1.0	1.0
precision	1.0	1.0
f_score	1.0	1.0

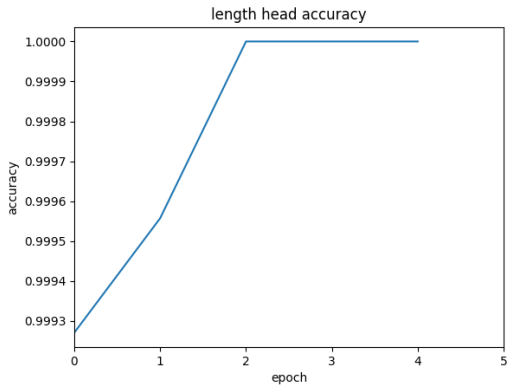
2.3 Confusion Matrix

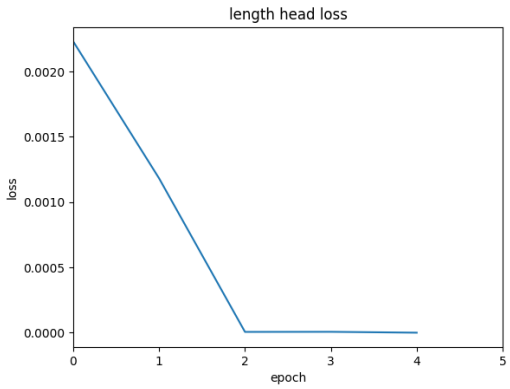
$$\begin{bmatrix} 19200 & 0 \\ 0 & 19200 \end{bmatrix}$$

3 Classification Head 3 - Length

3.1 Learning Curves

Accuracy: 100% **Loss: 5.4991e-07**





3.2 F-score

	C_0	C_1
recall	1.0	1.0
precision	1.0	1.0
f_score	1.0	1.0

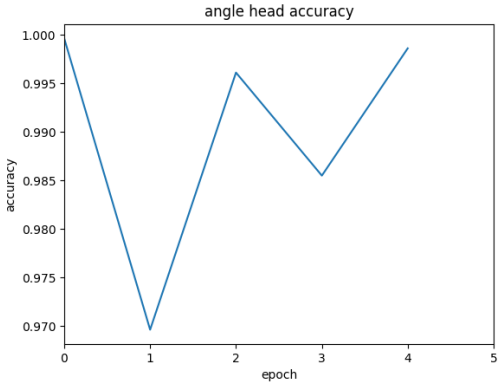
3.3 Confusion Matrix

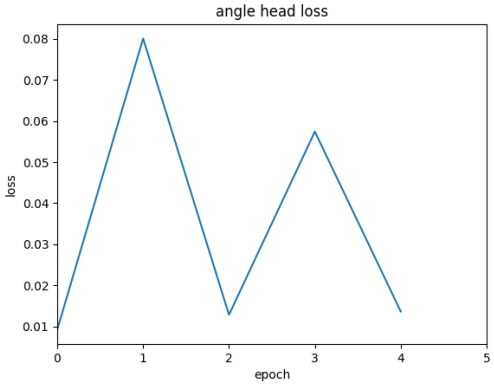
$$\begin{bmatrix} 19200 & 0 \\ 0 & 19200 \end{bmatrix}$$

4 Classification Head 4 - Angle

4.1 Learning Curves

Accuracy: 99.86% **Loss: 0.01362524**





4.2 F-score

	C_0	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}
recall	0.997	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.986
precision	0.99	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.996	0.997
f_score	0.994	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.998	0.992

4.3 Confusion Matrix

$$\begin{bmatrix}
3191 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 9 & & & & & & & & \\
0 & 3200 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 3200 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 3200 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 3200 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 0 & 3200 & 0 & 0 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 0 & 0 & 3200 & 0 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 3200 & 0 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 3200 & 0 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 3200 \\
0 & 0 & & & & & & & & \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
3200 & 0 & & & & & & & & \\
31 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
13 & 3156 & & & & & & & &
\end{bmatrix}$$

5 Total Accuracy and Loss

Total Accuracy = 99.62 % (this is taken as the average of all accuracy) Total Loss = 0.008209 (this is taken as weighted average of all losses)

6 Variations Tried

1. Taking 2 convolution layers of filters size 3*3 and 32 and 64 as number of filters gives same accuracy as compare to 2 convolution layers of same filters size but with 6 and 12 as number of filters.
2. Tried 2 dense layers and 1 layer, accuracy was same but loss value was less as compare to head having only 1 dense layer.
3. Significant change in less value was observe when activation was chosen

RELU instead of Sigmoid in initial batches of 1st epoch.
4. Using of BatchNormalization() layer gives higher accuracy faster.

7 Inferences

1. Use of larger no. of filters gives no benefit in this case as there is no much intense information in the images, the line dataset is very simple.
2. Using BatchNormalization giver greater accuracy because it brings all the values in a confined range which make easier to give good loss prediction and how much data is actually deviated from its ground truth.
3. We infer that in such datasets, using of greater filter size is much affective as it makes learnig fast and there is no significant change in accuracy.
4.In case of using sigmoid function, we need to run greater number epochs in order to achieve higher frequency as compare to number of epochs in RELU/softmax function.
5. Use of functional API is better then sequential API for parallel networks.