Epoch 1/15

50000/50000 [==============================] - 768s 15ms/step - loss: 0.0597 - mean\_squared\_error: 0.0597 - acc: 0.6715 - val\_loss: 0.0193 - val\_mean\_squared\_error: 0.0193 - val\_acc: 0.8935

Epoch 2/15

50000/50000 [==============================] - 746s 15ms/step - loss: 0.0174 - mean\_squared\_error: 0.0174 - acc: 0.8949 - val\_loss: 0.0132 - val\_mean\_squared\_error: 0.0132 - val\_acc: 0.9179

Epoch 3/15

50000/50000 [==============================] - 740s 15ms/step - loss: 0.0139 - mean\_squared\_error: 0.0139 - acc: 0.9117 - val\_loss: 0.0115 - val\_mean\_squared\_error: 0.0115 - val\_acc: 0.9281

Epoch 4/15

50000/50000 [==============================] - 769s 15ms/step - loss: 0.0124 - mean\_squared\_error: 0.0124 - acc: 0.9211 - val\_loss: 0.0108 - val\_mean\_squared\_error: 0.0108 - val\_acc: 0.9312

Epoch 5/15

50000/50000 [==============================] - 757s 15ms/step - loss: 0.0113 - mean\_squared\_error: 0.0113 - acc: 0.9284 - val\_loss: 0.0100 - val\_mean\_squared\_error: 0.0100 - val\_acc: 0.9363

Epoch 6/15

50000/50000 [==============================] - 750s 15ms/step - loss: 0.0104 - mean\_squared\_error: 0.0104 - acc: 0.9343 - val\_loss: 0.0089 - val\_mean\_squared\_error: 0.0089 - val\_acc: 0.9447

Epoch 7/15

50000/50000 [==============================] - 736s 15ms/step - loss: 0.0096 - mean\_squared\_error: 0.0096 - acc: 0.9386 - val\_loss: 0.0083 - val\_mean\_squared\_error: 0.0083 - val\_acc: 0.9476

Epoch 8/15

50000/50000 [==============================] - 734s 15ms/step - loss: 0.0089 - mean\_squared\_error: 0.0089 - acc: 0.9437 - val\_loss: 0.0078 - val\_mean\_squared\_error: 0.0078 - val\_acc: 0.9504

Epoch 9/15

50000/50000 [==============================] - 734s 15ms/step - loss: 0.0083 - mean\_squared\_error: 0.0083 - acc: 0.9480 - val\_loss: 0.0073 - val\_mean\_squared\_error: 0.0073 - val\_acc: 0.9544

Epoch 10/15

50000/50000 [==============================] - 734s 15ms/step - loss: 0.0077 - mean\_squared\_error: 0.0077 - acc: 0.9518 - val\_loss: 0.0068 - val\_mean\_squared\_error: 0.0068 - val\_acc: 0.9576

Epoch 11/15

50000/50000 [==============================] - 741s 15ms/step - loss: 0.0072 - mean\_squared\_error: 0.0072 - acc: 0.9549 - val\_loss: 0.0067 - val\_mean\_squared\_error: 0.0067 - val\_acc: 0.9566

Epoch 12/15

50000/50000 [==============================] - 733s 15ms/step - loss: 0.0068 - mean\_squared\_error: 0.0068 - acc: 0.9577 - val\_loss: 0.0062 - val\_mean\_squared\_error: 0.0062 - val\_acc: 0.9619

Epoch 13/15

50000/50000 [==============================] - 735s 15ms/step - loss: 0.0064 - mean\_squared\_error: 0.0064 - acc: 0.9602 - val\_loss: 0.0059 - val\_mean\_squared\_error: 0.0059 - val\_acc: 0.9627

Epoch 14/15

50000/50000 [==============================] - 734s 15ms/step - loss: 0.0061 - mean\_squared\_error: 0.0061 - acc: 0.9625 - val\_loss: 0.0059 - val\_mean\_squared\_error: 0.0059 - val\_acc: 0.9625

Epoch 15/15

50000/50000 [==============================] - 728s 15ms/step - loss: 0.0057 - mean\_squared\_error: 0.0057 - acc: 0.9649 - val\_loss: 0.0054 - val\_mean\_squared\_error: 0.0054 - val\_acc: 0.9666

10000/10000 [==============================] - 26s 3ms/step

The testing accuracy metric for 1 no. of cnn layers is [0.0056532945923274385, 0.0056532945923274385, 0.9653]

---------------------------------------------------

Train on 50000 samples, validate on 10000 samples

Epoch 1/15

50000/50000 [==============================] - 428s 9ms/step - loss: 0.0881 - mean\_squared\_error: 0.0881 - acc: 0.4815 - val\_loss: 0.0851 - val\_mean\_squared\_error: 0.0851 - val\_acc: 0.7157

Epoch 2/15

50000/50000 [==============================] - 425s 8ms/step - loss: 0.0767 - mean\_squared\_error: 0.0767 - acc: 0.6666 - val\_loss: 0.0601 - val\_mean\_squared\_error: 0.0601 - val\_acc: 0.7100

Epoch 3/15

50000/50000 [==============================] - 439s 9ms/step - loss: 0.0436 - mean\_squared\_error: 0.0436 - acc: 0.7715 - val\_loss: 0.0283 - val\_mean\_squared\_error: 0.0283 - val\_acc: 0.8601

Epoch 4/15

50000/50000 [==============================] - 455s 9ms/step - loss: 0.0254 - mean\_squared\_error: 0.0254 - acc: 0.8625 - val\_loss: 0.0193 - val\_mean\_squared\_error: 0.0193 - val\_acc: 0.8904

Epoch 5/15

50000/50000 [==============================] - 484s 10ms/step - loss: 0.0199 - mean\_squared\_error: 0.0199 - acc: 0.8836 - val\_loss: 0.0163 - val\_mean\_squared\_error: 0.0163 - val\_acc: 0.9009

Epoch 6/15

50000/50000 [==============================] - 440s 9ms/step - loss: 0.0176 - mean\_squared\_error: 0.0176 - acc: 0.8937 - val\_loss: 0.0148 - val\_mean\_squared\_error: 0.0148 - val\_acc: 0.9086

Epoch 7/15

50000/50000 [==============================] - 426s 9ms/step - loss: 0.0162 - mean\_squared\_error: 0.0162 - acc: 0.8997 - val\_loss: 0.0138 - val\_mean\_squared\_error: 0.0138 - val\_acc: 0.9127

Epoch 8/15

50000/50000 [==============================] - 433s 9ms/step - loss: 0.0153 - mean\_squared\_error: 0.0153 - acc: 0.9055 - val\_loss: 0.0131 - val\_mean\_squared\_error: 0.0131 - val\_acc: 0.9170

Epoch 9/15

50000/50000 [==============================] - 480s 10ms/step - loss: 0.0145 - mean\_squared\_error: 0.0145 - acc: 0.9085 - val\_loss: 0.0126 - val\_mean\_squared\_error: 0.0126 - val\_acc: 0.9213

Epoch 10/15

50000/50000 [==============================] - 455s 9ms/step - loss: 0.0140 - mean\_squared\_error: 0.0140 - acc: 0.9119 - val\_loss: 0.0122 - val\_mean\_squared\_error: 0.0122 - val\_acc: 0.9231

Epoch 11/15

50000/50000 [==============================] - 435s 9ms/step - loss: 0.0135 - mean\_squared\_error: 0.0135 - acc: 0.9144 - val\_loss: 0.0119 - val\_mean\_squared\_error: 0.0119 - val\_acc: 0.9252

Epoch 12/15

50000/50000 [==============================] - 430s 9ms/step - loss: 0.0130 - mean\_squared\_error: 0.0130 - acc: 0.9170 - val\_loss: 0.0115 - val\_mean\_squared\_error: 0.0115 - val\_acc: 0.9268

Epoch 13/15

50000/50000 [==============================] - 440s 9ms/step - loss: 0.0126 - mean\_squared\_error: 0.0126 - acc: 0.9197 - val\_loss: 0.0111 - val\_mean\_squared\_error: 0.0111 - val\_acc: 0.9295

Epoch 14/15

50000/50000 [==============================] - 437s 9ms/step - loss: 0.0123 - mean\_squared\_error: 0.0123 - acc: 0.9211 - val\_loss: 0.0109 - val\_mean\_squared\_error: 0.0109 - val\_acc: 0.9314

Epoch 15/15

50000/50000 [==============================] - 441s 9ms/step - loss: 0.0120 - mean\_squared\_error: 0.0120 - acc: 0.9235 - val\_loss: 0.0106 - val\_mean\_squared\_error: 0.0106 - val\_acc: 0.9328

10000/10000 [==============================] - 29s 3ms/step

The testing accuracy metric for 1 no. of cnn layers is [0.011013695731805637, 0.011013695731805637, 0.9299]

---------------------------------------------------

Train on 50000 samples, validate on 10000 samples

Epoch 1/15

50000/50000 [==============================] - 403s 8ms/step - loss: 0.0898 - mean\_squared\_error: 0.0898 - acc: 0.1810 - val\_loss: 0.0895 - val\_mean\_squared\_error: 0.0895 - val\_acc: 0.2411

Epoch 2/15

50000/50000 [==============================] - 393s 8ms/step - loss: 0.0892 - mean\_squared\_error: 0.0892 - acc: 0.2830 - val\_loss: 0.0888 - val\_mean\_squared\_error: 0.0888 - val\_acc: 0.3684

Epoch 3/15

50000/50000 [==============================] - 392s 8ms/step - loss: 0.0885 - mean\_squared\_error: 0.0885 - acc: 0.4271 - val\_loss: 0.0881 - val\_mean\_squared\_error: 0.0881 - val\_acc: 0.5054

Epoch 4/15

50000/50000 [==============================] - 392s 8ms/step - loss: 0.0878 - mean\_squared\_error: 0.0878 - acc: 0.5287 - val\_loss: 0.0873 - val\_mean\_squared\_error: 0.0873 - val\_acc: 0.5902

Epoch 5/15

50000/50000 [==============================] - 393s 8ms/step - loss: 0.0870 - mean\_squared\_error: 0.0870 - acc: 0.5905 - val\_loss: 0.0863 - val\_mean\_squared\_error: 0.0863 - val\_acc: 0.6358

Epoch 6/15

50000/50000 [==============================] - 396s 8ms/step - loss: 0.0859 - mean\_squared\_error: 0.0859 - acc: 0.6182 - val\_loss: 0.0852 - val\_mean\_squared\_error: 0.0852 - val\_acc: 0.6555

Epoch 7/15

50000/50000 [==============================] - 392s 8ms/step - loss: 0.0847 - mean\_squared\_error: 0.0847 - acc: 0.6302 - val\_loss: 0.0837 - val\_mean\_squared\_error: 0.0837 - val\_acc: 0.6602

Epoch 8/15

50000/50000 [==============================] - 394s 8ms/step - loss: 0.0831 - mean\_squared\_error: 0.0831 - acc: 0.6365 - val\_loss: 0.0818 - val\_mean\_squared\_error: 0.0818 - val\_acc: 0.6632

Epoch 9/15

50000/50000 [==============================] - 390s 8ms/step - loss: 0.0810 - mean\_squared\_error: 0.0810 - acc: 0.6379 - val\_loss: 0.0794 - val\_mean\_squared\_error: 0.0794 - val\_acc: 0.6664

Epoch 10/15

50000/50000 [==============================] - 392s 8ms/step - loss: 0.0784 - mean\_squared\_error: 0.0784 - acc: 0.6422 - val\_loss: 0.0764 - val\_mean\_squared\_error: 0.0764 - val\_acc: 0.6738

Epoch 11/15

50000/50000 [==============================] - 395s 8ms/step - loss: 0.0751 - mean\_squared\_error: 0.0751 - acc: 0.6538 - val\_loss: 0.0725 - val\_mean\_squared\_error: 0.0725 - val\_acc: 0.6859

Epoch 12/15

50000/50000 [==============================] - 394s 8ms/step - loss: 0.0710 - mean\_squared\_error: 0.0710 - acc: 0.6678 - val\_loss: 0.0678 - val\_mean\_squared\_error: 0.0678 - val\_acc: 0.6979

Epoch 13/15

50000/50000 [==============================] - 383s 8ms/step - loss: 0.0660 - mean\_squared\_error: 0.0660 - acc: 0.6755 - val\_loss: 0.0621 - val\_mean\_squared\_error: 0.0621 - val\_acc: 0.7066

Epoch 14/15

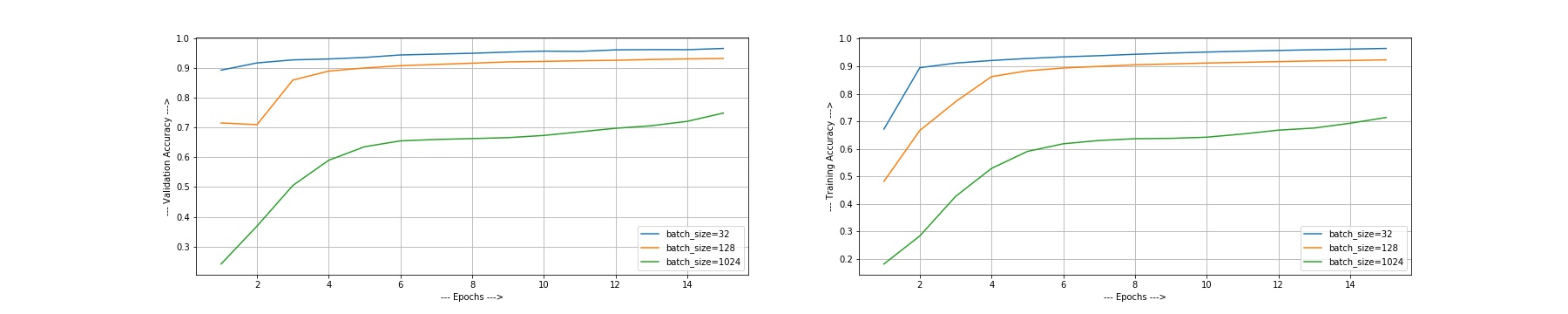
50000/50000 [==============================] - 397s 8ms/step - loss: 0.0604 - mean\_squared\_error: 0.0604 - acc: 0.6929 - val\_loss: 0.0561 - val\_mean\_squared\_error: 0.0561 - val\_acc: 0.7213

Epoch 15/15

50000/50000 [==============================] - 225s 4ms/step - loss: 0.0546 - mean\_squared\_error: 0.0546 - acc: 0.7138 - val\_loss: 0.0503 - val\_mean\_squared\_error: 0.0503 - val\_acc: 0.7491

10000/10000 [==============================] - 13s 1ms/step

The testing accuracy metric for 1 no. of cnn layers is [0.050816748827695844, 0.050816748827695844, 0.7467]



**OBSERVATIONS:**

1. **Batch Size Vs Accuracy**: More batch size means less iterations in one epoch. We observed that as we decrease the batch size, the accuracy increases and stabilizes around 96%. Both validation and training accuracy increased indicating that the model didn’t overfit. As we can see from above data, testing accuracy also increased.