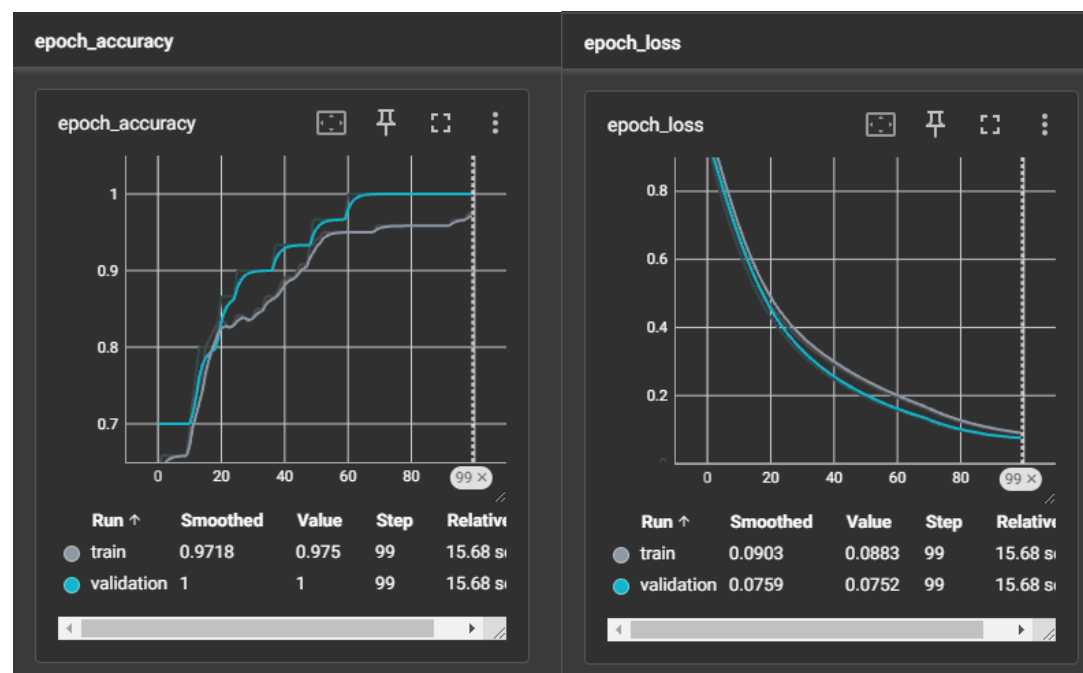


5-1



5-2

```

Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 ----- 1s 0us/step
Epoch 1/15
/usr/local/lib/python3.10/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an `input_shape`/`input_dim` argument to a
super().__init__(activity_regularizer=activity_regularizer, **kwargs)
/usr/local/lib/python3.10/dist-packages/keras/src/trainers/data_adapters/py_dataset_adapter.py:122: UserWarning: Your `PyDataset` class should call `super().
self._warn_if_super_not_called()
938/938 ----- 37s 30ms/step - accuracy: 0.6776 - loss: 0.9659 - val_accuracy: 0.9818 - val_loss: 0.0582
Epoch 2/15
938/938 ----- 31s 27ms/step - accuracy: 0.9244 - loss: 0.2470 - val_accuracy: 0.9875 - val_loss: 0.0374
Epoch 3/15
938/938 ----- 25s 27ms/step - accuracy: 0.9458 - loss: 0.1825 - val_accuracy: 0.9902 - val_loss: 0.0287
Epoch 4/15
938/938 ----- 26s 27ms/step - accuracy: 0.9535 - loss: 0.1566 - val_accuracy: 0.9912 - val_loss: 0.0266
Epoch 5/15
938/938 ----- 39s 25ms/step - accuracy: 0.9596 - loss: 0.1360 - val_accuracy: 0.9914 - val_loss: 0.0256
Epoch 6/15
938/938 ----- 25s 27ms/step - accuracy: 0.9630 - loss: 0.1232 - val_accuracy: 0.9932 - val_loss: 0.0197
Epoch 7/15
938/938 ----- 25s 27ms/step - accuracy: 0.9662 - loss: 0.1120 - val_accuracy: 0.9931 - val_loss: 0.0207
Epoch 8/15
938/938 ----- 25s 26ms/step - accuracy: 0.9683 - loss: 0.1090 - val_accuracy: 0.9934 - val_loss: 0.0194
Epoch 9/15
938/938 ----- 24s 26ms/step - accuracy: 0.9701 - loss: 0.1016 - val_accuracy: 0.9934 - val_loss: 0.0182
Epoch 10/15
938/938 ----- 26s 27ms/step - accuracy: 0.9710 - loss: 0.0952 - val_accuracy: 0.9943 - val_loss: 0.0162
Epoch 11/15
938/938 ----- 25s 27ms/step - accuracy: 0.9731 - loss: 0.0936 - val_accuracy: 0.9937 - val_loss: 0.0177
Epoch 12/15
938/938 ----- 24s 26ms/step - accuracy: 0.9715 - loss: 0.0921 - val_accuracy: 0.9942 - val_loss: 0.0159
Epoch 13/15
938/938 ----- 42s 27ms/step - accuracy: 0.9743 - loss: 0.0868 - val_accuracy: 0.9936 - val_loss: 0.0179
Epoch 14/15
938/938 ----- 42s 28ms/step - accuracy: 0.9767 - loss: 0.0817 - val_accuracy: 0.9935 - val_loss: 0.0171
Epoch 15/15
938/938 ----- 26s 28ms/step - accuracy: 0.9755 - loss: 0.0824 - val_accuracy: 0.9946 - val_loss: 0.0165
<keras.src.callbacks.history.History at 0x7e3eee53b700>

```

5-3

```
Epoch 1/10
1563/1563 — 38s 23ms/step - accuracy: 0.2895 - loss: 1.9092 - val_accuracy: 0.5034 - val_loss: 1.3939
Epoch 2/10
1563/1563 — 35s 23ms/step - accuracy: 0.4508 - loss: 1.5255 - val_accuracy: 0.5589 - val_loss: 1.2445
Epoch 3/10
1563/1563 — 35s 22ms/step - accuracy: 0.4872 - loss: 1.4261 - val_accuracy: 0.5982 - val_loss: 1.1316
Epoch 4/10
1563/1563 — 35s 22ms/step - accuracy: 0.5105 - loss: 1.3683 - val_accuracy: 0.6030 - val_loss: 1.1169
Epoch 5/10
1563/1563 — 34s 22ms/step - accuracy: 0.5241 - loss: 1.3353 - val_accuracy: 0.6350 - val_loss: 1.0454
Epoch 6/10
1563/1563 — 35s 22ms/step - accuracy: 0.5429 - loss: 1.2804 - val_accuracy: 0.6425 - val_loss: 1.0273
Epoch 7/10
1563/1563 — 33s 21ms/step - accuracy: 0.5505 - loss: 1.2641 - val_accuracy: 0.6465 - val_loss: 1.0030
Epoch 8/10
1563/1563 — 33s 21ms/step - accuracy: 0.5578 - loss: 1.2510 - val_accuracy: 0.6465 - val_loss: 1.0013
Epoch 9/10
1563/1563 — 33s 21ms/step - accuracy: 0.5601 - loss: 1.2346 - val_accuracy: 0.6461 - val_loss: 1.0068
Epoch 10/10
1563/1563 — 33s 21ms/step - accuracy: 0.5725 - loss: 1.2121 - val_accuracy: 0.6665 - val_loss: 0.9645
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my_model.keras')` or `keras.saving.save_model(model, 'my_model.keras')`.
Model saved to 'saved_models/cifar10_cnn.h5'
313/313 — 1s 4ms/step - accuracy: 0.6677 - loss: 0.9570
Test Accuracy: 0.67
```