Exercise 1

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DSC 650
Week 1: Intro to Big Data & Deep Learning

In [2]:
```
%run mnist_mlp.py
```

```
60000 train samples
10000 test samples
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_3 (Dense)             (None, 512)               401920

 dropout_2 (Dropout)         (None, 512)               0

 dense_4 (Dense)             (None, 512)               262656

 dropout_3 (Dropout)         (None, 512)               0

 dense_5 (Dense)             (None, 10)                5130

=================================================================
Total params: 669,706
Trainable params: 669,706
Non-trainable params: 0
_________________________________________________________________
Epoch 1/20
469/469 [==============================] - 9s 18ms/step - loss: 0.2456 - ac
curacy: 0.9238 - val_loss: 0.1314 - val_accuracy: 0.9578
Epoch 2/20
469/469 [==============================] - 8s 17ms/step - loss: 0.1020 - ac
curacy: 0.9695 - val_loss: 0.0822 - val_accuracy: 0.9763
Epoch 3/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0739 - ac
curacy: 0.9777 - val_loss: 0.0719 - val_accuracy: 0.9790
Epoch 4/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0588 - ac
curacy: 0.9819 - val_loss: 0.0710 - val_accuracy: 0.9795
Epoch 5/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0494 - ac
curacy: 0.9853 - val_loss: 0.0725 - val_accuracy: 0.9803
Epoch 6/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0437 - ac
curacy: 0.9871 - val_loss: 0.0820 - val_accuracy: 0.9812
Epoch 7/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0377 - ac
curacy: 0.9886 - val_loss: 0.0895 - val_accuracy: 0.9823
Epoch 8/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0355 - ac
curacy: 0.9891 - val_loss: 0.0849 - val_accuracy: 0.9806
Epoch 9/20
469/469 [==============================] - 8s 16ms/step - loss: 0.0299 - ac
curacy: 0.9914 - val_loss: 0.0822 - val_accuracy: 0.9835
Epoch 10/20
469/469 [==============================] - 12s 25ms/step - loss: 0.0302 - a
ccuracy: 0.9913 - val_loss: 0.0854 - val_accuracy: 0.9836
Epoch 11/20
469/469 [==============================] - 12s 26ms/step - loss: 0.0264 - a
ccuracy: 0.9926 - val_loss: 0.0954 - val_accuracy: 0.9830
Epoch 12/20
469/469 [==============================] - 11s 23ms/step - loss: 0.0243 - a
```

```
ccuracy: 0.9929 - val_loss: 0.0926 - val_accuracy: 0.9823
Epoch 13/20
469/469 [==============================] - 11s 23ms/step - loss: 0.0229 - a
ccuracy: 0.9934 - val_loss: 0.0998 - val_accuracy: 0.9838
Epoch 14/20
469/469 [==============================] - 9s 20ms/step - loss: 0.0223 - ac
curacy: 0.9937 - val_loss: 0.1144 - val_accuracy: 0.9825
Epoch 15/20
469/469 [==============================] - 9s 19ms/step - loss: 0.0210 - ac
curacy: 0.9944 - val_loss: 0.1312 - val_accuracy: 0.9823
Epoch 16/20
469/469 [==============================] - 9s 20ms/step - loss: 0.0188 - ac
curacy: 0.9947 - val_loss: 0.1185 - val_accuracy: 0.9815
Epoch 17/20
469/469 [==============================] - 11s 23ms/step - loss: 0.0184 - a
ccuracy: 0.9945 - val_loss: 0.1263 - val_accuracy: 0.9820
Epoch 18/20
469/469 [==============================] - 9s 19ms/step - loss: 0.0188 - ac
curacy: 0.9947 - val_loss: 0.1134 - val_accuracy: 0.9840
Epoch 19/20
469/469 [==============================] - 10s 21ms/step - loss: 0.0190 - a
ccuracy: 0.9952 - val_loss: 0.1161 - val_accuracy: 0.9839
Epoch 20/20
469/469 [==============================] - 12s 26ms/step - loss: 0.0149 - a
ccuracy: 0.9958 - val_loss: 0.1334 - val_accuracy: 0.9820
Test loss: 0.13339389860630035
Test accuracy: 0.9819999933242798
```

In [4]:
```
%run pi.py
```

```
Pi is roughly 3.137400
```