

localhost:8888/notebooks/dl-4Feedforward%20MNIST.ipynb

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```
In [2]: #build a feed forward neural network using a deep Learning framework and
#train it to classify images from the MNIST dataset.

# Import Libraries
from tensorflow.keras.datasets import mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.utils import to_categorical

C:\Users\anike\anaconda3\lib\site-packages\scipy\_init_.py:146: UserWarning: A NumPy version >=1.1
6.5 and <1.23.0 is required for this version of SciPy (detected version 1.26.2
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}")

WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\losses.py:2976: The name
tf.losses.sparse_softmax_cross_entropy is deprecated. Please use tf.compat.v1.losses.sparse_softmax_c
ross_entropy instead.

In [3]: # Load MNIST dataset
(x_train, y_train), (x_test, y_test) = mnist.load_data()
```

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Download data from <https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz>
11490434/11490434 [=====] - 37s 3us/step

```
In [4]: # Preprocess data
x_train = x_train.reshape(60000, 784) # Reshape 28x28 images to 784 pixels
x_test = x_test.reshape(10000, 784)
x_train = x_train.astype('float32') / 255 # Normalize pixel values
x_test = x_test.astype('float32') / 255
```

```
In [5]: # One-hot encode Labels
y_train = to_categorical(y_train)
y_test = to_categorical(y_test)
```

```
In [6]: # Define model architecture
model = Sequential()
model.add(Dense(512, activation='relu', input_shape=(784,))) # Hidden Layer with 512 neurons and ReLU
model.add(Dense(10, activation='softmax')) # Output Layer with 10 neurons (for 10 digits) and softmax

# Compile model
model.compile(loss='categorical_crossentropy', optimizer=Adam(), metrics=['accuracy'])
```

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```
# Train model
model.fit(x_train, y_train, epochs=5, batch_size=64) # Train for 5 epochs with batch size of 64

# Evaluate model
loss, accuracy = model.evaluate(x_test, y_test)
print('Test accuracy:', accuracy)
```

WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\backend.py:873: The name tf.get_default_graph is deprecated. Please use tf.compat.v1.get_default_graph instead.

Epoch 1/5
WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\utils\tf_utils.py:492: The name tf.ragged.RaggedTensorValue is deprecated. Please use tf.compat.v1.ragged.RaggedTensorValue instead.

WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\engine\base_layer_utils.py:384: The name tf.executing_eagerly_outside_functions is deprecated. Please use tf.compat.v1.executing_eagerly_outside_functions instead.

938/938 [=====] - 21s 17ms/step - loss: 0.2289 - accuracy: 0.9332
Epoch 2/5
938/938 [=====] - 17s 18ms/step - loss: 0.0903 - accuracy: 0.9732
Epoch 3/5
938/938 [=====] - 11s 11ms/step - loss: 0.0587 - accuracy: 0.9818
Epoch 4/5

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Epoch 4/5
938/938 [=====] - 13s 14ms/step - loss: 0.0400 - accuracy: 0.9879
Epoch 5/5
938/938 [=====] - 12s 12ms/step - loss: 0.0298 - accuracy: 0.9904
313/313 [=====] - 2s 4ms/step - loss: 0.0627 - accuracy: 0.9802
Test accuracy: 0.9801999926567078
```

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