

RASHEED HAMEED ** *CSC 578 Neural Networks and Deep Learning – Section 910 * **Homework 4

```
# TensorFlow and tf.keras
import tensorflow as tf
from tensorflow import keras
```

```
# Helper libraries
import numpy as np
import matplotlib.pyplot as plt
```

```
from keras import regularizers
```

↳ Using TensorFlow backend.

```
fashion_mnist = keras.datasets.fashion_mnist
```

```
(train_images, train_labels), (test_images, test_labels) = fashion_mnist.load_data()
```

```
class_names = ['T-shirt/top', 'Trouser', 'Pullover', 'Dress', 'Coat',
               'Sandal', 'Shirt', 'Sneaker', 'Bag', 'Ankle boot']
```

```
train_images = train_images / 255.0
```

```
test_images = test_images / 255.0
```

```
model1 = keras.Sequential([
    keras.layers.Flatten(input_shape=(28, 28)),
    keras.layers.Dense(50, activation='tanh', kernel_regularizer=regularizers.l2(0.01),
                       activity_regularizer=regularizers.l1(0.01)),
    keras.layers.Dense(10)
])
model1.compile(optimizer='adam',
               loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
               metrics=['accuracy'])
```

```
model1.fit(train_images, train_labels, epochs=10, batch_size=40)
```

↳

```
model2 = keras.Sequential([
    keras.layers.Flatten(input_shape=(28, 28)),
    keras.layers.Dense(50, activation='tanh', kernel_regularizer=regularizers.l2(0.02),
        activity_regularizer=regularizers.l1(0.02)),
    keras.layers.Dense(10)
])
model2.compile(optimizer='adam',
    loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
    metrics=['accuracy'])

model2.fit(train_images, train_labels, epochs=10, batch_size=40)
```



```
model3 = keras.Sequential([
    keras.layers.Flatten(input_shape=(28, 28)),
    keras.layers.Dense(50, activation='tanh', kernel_regularizer=regularizers.l2(0.03),
        activity_regularizer=regularizers.l1(0.03)),
    keras.layers.Dense(10)
])
model3.compile(optimizer='adam',
    loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
    metrics=['accuracy'])
```

```
metrics=[ accuracy ])
```

```
model3.fit(train_images, train_labels, epochs=10, batch_size=40)
```



```
model4 = keras.Sequential([
    keras.layers.Flatten(input_shape=(28, 28)),
    keras.layers.Dense(550, activation='tanh', kernel_regularizer=regularizers.l2(0.04),
        activity_regularizer=regularizers.l1(0.04)),
    keras.layers.Dense(10)
])
model4.compile(optimizer='adam',
               loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
               metrics=['accuracy'])

model4.fit(train_images, train_labels, epochs=10, batch_size=40)
```



