Fashion-MNIST Image Classification using Deep Learning with Python

Python Implementation of Neural Network Model using GridSearchCV is available on **GitHub**

1. Neural Network Model Accuracy Results on Training and Validation Data with the Best Hyperparameters Obtained using GridSearchCV

```
Epoch 45/50
960/960 [==============================] - 2s 2ms/step - loss: 0.3821 - accuracy: 0.8679 - val_loss: 0.3725 - val_accuracy: 0.8693
Epoch 46/50
960/960 [==============================] - 2s 2ms/step - loss: 0.3816 - accuracy: 0.8679 - val_loss: 0.3731 - val_accuracy: 0.8698
Epoch 47/50
960/960 [==============================] - 2s 2ms/step - loss: 0.3807 - accuracy: 0.8666 - val_loss: 0.3715 - val_accuracy: 0.8701
Epoch 48/50
960/960 [==============================] - 2s 2ms/step - loss: 0.3780 - accuracy: 0.8684 - val_loss: 0.3798 - val_accuracy: 0.8689
Epoch 49/50
960/960 [==============================] - 2s 2ms/step - loss: 0.3761 - accuracy: 0.8691 - val_loss: 0.3898 - val_accuracy: 0.8632
Epoch 50/50
960/960 [==============================] - 2s 2ms/step - loss: 0.3780 - accuracy: 0.8678 - val_loss: 0.3786 - val_accuracy: 0.8696
```

Results:

- 1500/1500 - 2s - loss: 0.2915 - accuracy: 0.8983 - 2s/epoch - 2ms/step
- **Training Accuracy: 89.83%**
- 375/375 - 1s - loss: 0.3786 - accuracy: 0.8696 - 593ms/epoch - 2ms/step
- **Validation Accuracy: 86.96%**

Overall Neural Network Model Accuracy Results Summary on Training and Testing Data

Accuracy given by the Training set is **89.83%** and Accuracy given by the Testing set is **85.66%.** Hence, we can say that the neural network model is more generalized (learns well) and even performs better on testing data.

NN Model	Hyperparameter Tuning - GridSearchCV	Training Accuracy	Testing Accuracy
model	No	96.78%	89.08%
model_final	Yes	89.83%	86%

2. Neural Network Model Architecture Summary

```
Model: "sequential_1"
_____
 Layer (type)                Output Shape              Param #
=================================================================
 flatten_1 (Flatten)         (None, 784)               0

 dense_2 (Dense)             (None, 16)                12560

 dropout (Dropout)           (None, 16)                0

 dense_3 (Dense)             (None, 8)                 136

 dropout_1 (Dropout)         (None, 8)                 0

 dense_4 (Dense)             (None, 10)                90

=================================================================
Total params: 12,786
Trainable params: 12,786
Non-trainable params: 0
```

3. Neural Network Model Loss on Train and Validation Data
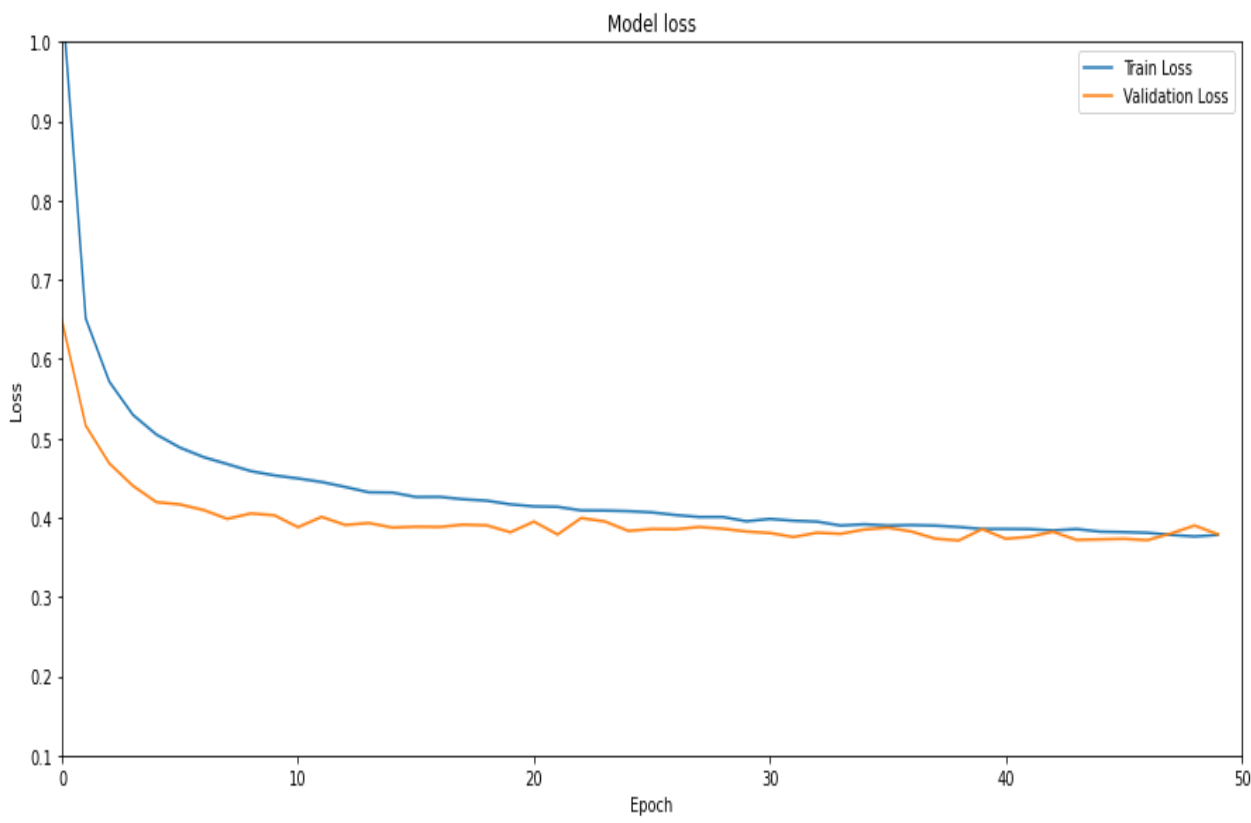
4. Neural Network Model Accuracy on Train and Validation Data