Student no :199378T
student name : R.B.Yeshani
github link :
https://github.com/yeshaniR/minist_classifier_Keras/upload/master

Question1
Develop a deep learning model for image classification. Include the following in your report.
a. Explanation to your model, design decisions, training-test data-set descriptions
and what other factors were considered to improve your model.

```
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 26, 26, 64)        640
_________________________________________________________________
max_pooling2d (MaxPooling2D) (None, 13, 13, 64)        0
_________________________________________________________________
conv2d_1 (Conv2D)            (None, 11, 11, 64)        36928
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 5, 5, 64)          0
_________________________________________________________________
flatten (Flatten)            (None, 1600)              0
_________________________________________________________________
dense (Dense)                (None, 128)               204928
_________________________________________________________________
dense_1 (Dense)              (None, 10)                1290
=================================================================
Total params: 243,786
Trainable params: 243,786
Non-trainable params: 0
```

in here didn't applied padding(the edges of a image didn't involve the the digit)

there are two convolution layers and two max pooling layers to select Maximum value to reduce the size

selected 5 epochs(using more than 5 epochs seems like over fitting the model)
kernel size selected as 3*3 as usuall.

softmax activation function used n the dense layer because it was 10 classes classification and the other layers applied relu activation function.

b. Accuracy of the model at the end of each epoch.

```
Epoch 1/5
1875/1875 [==============================] - 30s 16ms/step - loss: 0.4456 - accuracy: 0.8375
Epoch 2/5
1875/1875 [==============================] - 30s 16ms/step - loss: 0.2985 - accuracy: 0.8913
Epoch 3/5
1875/1875 [==============================] - 30s 16ms/step - loss: 0.2528 - accuracy: 0.9057
Epoch 4/5
1875/1875 [==============================] - 30s 16ms/step - loss: 0.2176 - accuracy: 0.9187
Epoch 5/5
1875/1875 [==============================] - 30s 16ms/step - loss: 0.1915 - accuracy: 0.9290
313/313 [==============================] - 1s 4ms/step - loss: 0.2520 - accuracy: 0.9066
```

Question 2

noise factor : 0.25
accuracy : 0.7295

noise factor : 0.2
accuracy : 0.7436

noise factor : 0.15
accuracy : 0.7414

noise factor : 0.3
accuracy : 0.7105

question 3

Explain how the accuracy of the image classifier can be improved for the scenario where the dataset includes noise as in part 2 above. You may implement a new model with the improvements

adding more noise during training it will overcome overfitting the model and model will be robust and reduce generalization error.
So we can use l2 regularization (than l1) for the model

for noise factor 0.25 and L2 regularization(0.01) the accuracy becomes 0.7294