Assignment 3 Mohamed Basuony

Implementation Design:

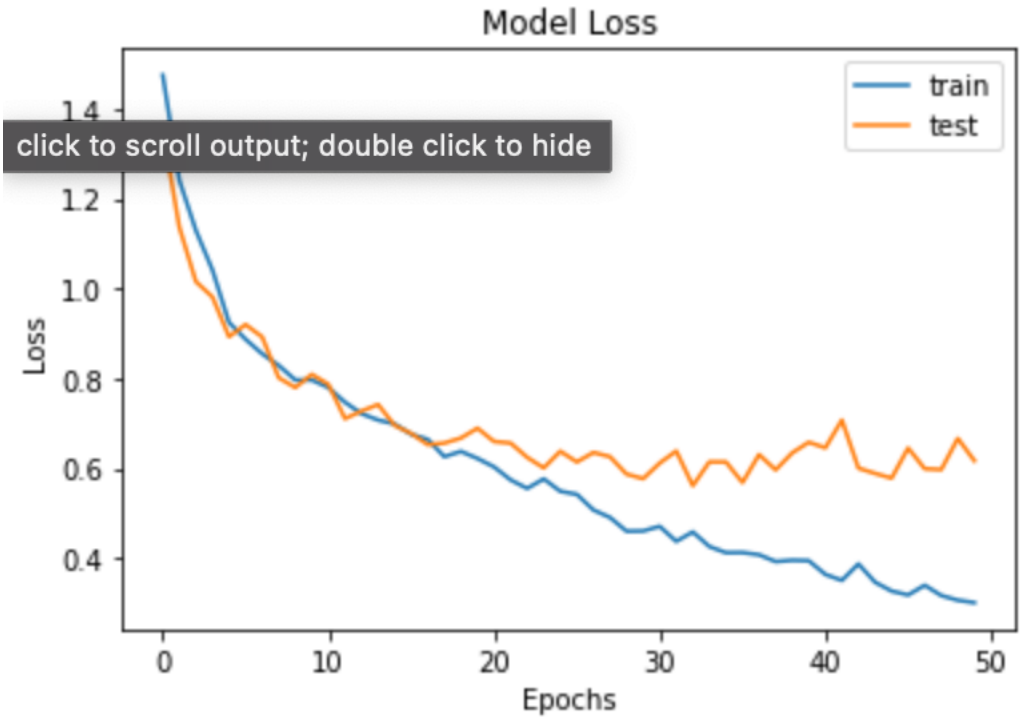
The architecture in the model is as follows. I have 4 layers. The first layer has 32 filters and a kernel size of 5x5. The padding type is same, and the activation function is relu. The second layer has 64 filters and a kernel size of 3x3, the padding is same, and the activation function is also relu. The last 2 layers has 96 filters and the same kernel size, padding, and activation function.

```
CNN.add(Conv2D(filters = 32, kernel_size = (5,5),padding = 'Same',activation ='relu', input_shape = (150,150,3)))
CNN.add(MaxPooling2D(pool_size=(2,2)))


CNN.add(Conv2D(filters = 64, kernel_size = (3,3),padding = 'Same',activation ='relu'))
CNN.add(MaxPooling2D(pool_size=(2,2), strides=(2,2)))


CNN.add(Conv2D(filters =96, kernel_size = (3,3),padding = 'Same',activation ='relu'))
CNN.add(MaxPooling2D(pool_size=(2,2), strides=(2,2)))

CNN.add(Conv2D(filters = 96, kernel_size = (3,3),padding = 'Same',activation ='relu'))
CNN.add(MaxPooling2D(pool_size=(2,2), strides=(2,2)))

CNN.add(Flatten())
CNN.add(Dense(512))
CNN.add(Activation('relu'))
```

Also here, some data augmentation was applied to avoid overfitting that may tamper with the results.

```
generator = ImageDataGenerator(
        featurewise_center=False,
        samplewise_center=False,
        featurewise_std_normalization=False,
        samplewise_std_normalization=False,
        zca_whitening=False,
        rotation_range=10,
        zoom_range = 0.1,
        width_shift_range=0.2,
        height_shift_range=0.2,
        horizontal_flip=True,
        vertical_flip=False)
```

Loss visualization:



Accuracy of the model and each class:

```
correct Predictions: 728 out of 918 with an accuracy of 0.7930283224400871

Diasy's accuracy is 0.8148148148148148
Sunflower accuracy is 0.7737556561085973
Tulips accuracy is 0.7142857142857143
Dandelion accuracy is 0.8607594936708861
Roses accuracy is 0.8086124401913876
```

KNN accuracy of the model and each class:

```
Total correct answers for daisy: 13 and the accuracy is 2.6
Total correct answers for dandelion: 34 and the accuracy is 6.800000000000001
Total correct answers for roses: 21 and the accuracy is 4.2
Total correct answers for sunflowers: 20 and the accuracy is 4.0
Total correct answers for tulips: 32 and the accuracy is 6.4
Total correct answers: 120
Accuracy: 24.0
```

Linear classifier accuracy and each class:

```
Acc: 21.6
Total correct answers for daisy: 23 and the accuracy is 23.0
Total correct answers for dandelion: 25 and the accuracy is 25.0
Total correct answers for roses: 17 and the accuracy is 17.0
Total correct answers for sunflowers:  13 and the accuracy is 13.0
Total correct answers for tulips: 30 and the accuracy is 30
```

CNN is much better and by far more complex than these two models.