SIT 789

Task 4.1: Image recognition

1) KNN:

```
Correct predictions for k 10 is 64
Accuracy for k 10 is 0.7111111111111111
Confusion Matrix:
 [[17  6  7]
 [ 0 27  3]
 [ 1  9 20]]
#########################################################
Correct predictions for k 15 is 61
Accuracy for k 15 is 0.6777777777777778
Confusion Matrix:
 [[14  6 10]
 [ 0 26  4]
 [ 0  9 21]]
#########################################################
Correct predictions for k 20 is 59
Accuracy for k 20 is 0.6555555555555556
Confusion Matrix:
 [[11  9 10]
 [ 0 27  3]
 [ 0  9 21]]
#########################################################
Correct predictions for k 25 is 56
Accuracy for k 25 is 0.6222222222222222
Confusion Matrix:
 [[ 9  9 12]
 [ 0 26  4]
 [ 0  9 21]]
#########################################################
Correct predictions for k 30 is 53
Accuracy for k 30 is 0.5888888888888889
Confusion Matrix:
 [[ 7 11 12]
 [ 0 26  4]
 [ 0 10 20]]
#########################################################
```

The best value for K is 10 with accuracy of 71.1%

3) SVM

```
Training SVM using C = 10
Correct predictions for c 10 is 70
Accuracy for c 10 is 0.7777777777777778
Confusion Matrix:
 [[23  4  3]
 [ 0 25  5]
 [ 1  7 22]]
#########################################################
Training SVM using C = 20
Correct predictions for c 20 is 73
Accuracy for c 20 is 0.8111111111111111
Confusion Matrix:
 [[24  3  3]
 [ 0 21  9]
 [ 1  1 28]]
#########################################################
Training SVM using C = 30
Correct predictions for c 30 is 72
Accuracy for c 30 is 0.8
Confusion Matrix:
 [[24  3  3]
 [ 0 22  8]
 [ 1  3 26]]
#########################################################
Training SVM using C = 40
Correct predictions for c 40 is 74
Accuracy for c 40 is 0.8222222222222222
Confusion Matrix:
 [[26  2  2]
 [ 0 23  7]
 [ 1  4 25]]
#########################################################
Training SVM using C = 50
Correct predictions for c 50 is 73
Accuracy for c 50 is 0.8111111111111111
Confusion Matrix:
 [[26  2  2]
 [ 0 23  7]
 [ 1  5 24]]
#########################################################
```

The best value for C is 40 with accuracy of 82.2%

4) Adaboost

```
Correct predictions for n_estimators 50 is 65
Accuracy for n_estimators 50 is 0.7222222222222222
Confusion Matrix:
 [[22  1  7]
 [ 0 19 11]
 [ 1  5 24]]
#########################################################
Correct predictions for n_estimators 100 is 64
Accuracy for n_estimators 100 is 0.7111111111111111
Confusion Matrix:
 [[18  3  9]
 [ 0 23  7]
 [ 2  5 23]]
#########################################################
Correct predictions for n_estimators 150 is 62
Accuracy for n_estimators 150 is 0.6888888888888889
Confusion Matrix:
 [[18  2 10]
 [ 0 19 11]
 [ 2  3 25]]
#########################################################
Correct predictions for n_estimators 200 is 61
Accuracy for n_estimators 200 is 0.6777777777777778
Confusion Matrix:
 [[18  1 11]
 [ 0 19 11]
 [ 1  5 24]]
#########################################################
Correct predictions for n_estimators 250 is 63
Accuracy for n_estimators 250 is 0.7
Confusion Matrix:
 [[18  2 10]
 [ 1 20  9]
 [ 1  4 25]]
#########################################################
```

The best value for n_estimators is 50 with accuracy of 72.2%

Observations:

- **SVM (C=40; best param) is the best performing model. (Accuracy = 82.2%)**
- **AdaboostClassifier (n_estimators = 50; best param) is 2nd best model. (Accuracy = 72.2%)**
- **KNN (K=10; best param) is the worst performing model. (Accuracy = 71.1%)**