

Computer Vision Assignment 2 Report

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1. Goal:

To classify and analyze various classifiers by classifying the images our dataset of 1888 training and 800 testing images into 8 defined categories.

2. Statistical Analysis of the Predictions

2.1. K means and KNN

2.1.1 Accuracies

Clusters	Neighbours	Accuracies
2	5	29.25%
4	5	35.125%
8	5	39.5%
16	8	46.75%
16	5	47%
32	5	47.625%
64	5	50.375%

Clusters - 4, neighbours - 5			
Accuracy : 35.125%			
Precision	Recall	F1-Score	Support
0.37	0.45	0.41	100
0.72	0.74	0.73	100
0.35	0.29	0.32	100
0.36	0.36	0.36	100
0.21	0.24	0.22	100
0.23	0.28	0.25	100
0.32	0.29	0.31	100
0.25	0.16	0.19	100
avg 0.35	0.35	0.35	800

Clusters - 8, neighbours - 5			
Accuracy : 39.5%			
Precision	Recall	F1-Score	Support
0.45	0.52	0.48	100
0.69	0.75	0.72	100
0.44	0.37	0.40	100
0.35	0.32	0.34	100
0.28	0.36	0.32	100
0.17	0.20	0.18	100
0.42	0.40	0.41	100
0.41	0.24	0.30	100
avg 0.40	0.40	0.39	800

2.1.2 Confusion Matrices

Clusters - 2, neighbours - 5			
Accuracy : 29.25%			
Precision	Recall	F1-Score	Support
0.33	0.47	0.39	100
0.58	0.72	0.64	100
0.31	0.26	0.28	100
0.34	0.30	0.32	100
0.13	0.14	0.13	100
0.17	0.19	0.18	100
0.16	0.12	0.14	100
0.20	0.14	0.16	100
avg 0.28	0.29	0.28	800

Clusters - 16, neighbours - 8			
Accuracy : 46.75%			
Precision	Recall	F1-Score	Support
0.42	0.54	0.47	100
0.76	0.82	0.79	100
0.53	0.42	0.47	100
0.53	0.47	0.50	100
0.41	0.45	0.43	100
0.28	0.33	0.30	100
0.46	0.46	0.46	100
0.41	0.27	0.33	100
avg 0.40	0.40	0.39	800

Clusters - 16, neighbours - 5			
Accuracy : 47%			
Precision	Recall	F1-Score	Support
0.42	0.54	0.47	100
0.76	0.82	0.79	100
0.53	0.42	0.47	100
0.53	0.47	0.50	100
0.41	0.45	0.43	100
0.28	0.33	0.30	100
0.46	0.46	0.46	100
0.41	0.27	0.33	100
avg 0.47	0.47	0.47	800

Clusters - 32, neighbours - 5			
Accuracy : 47.625%			
Precision	Recall	F1-Score	Support
0.42	0.52	0.47	100
0.75	0.91	0.82	100
0.43	0.40	0.42	100
0.58	0.42	0.49	100
0.42	0.47	0.45	100
0.29	0.34	0.31	100
0.46	0.45	0.46	100
0.47	0.30	0.37	100
avg 0.48	0.48	0.47	800

Clusters - 64, neighbours - 5			
Accuracy : 50.375%			
Precision	Recall	F1-Score	Support
0.41	0.64	0.50	100
0.63	0.89	0.74	100
0.52	0.38	0.44	100
0.60	0.47	0.53	100
0.54	0.56	0.55	100
0.37	0.35	0.36	100
0.46	0.45	0.45	100
0.53	0.29	0.37	100
avg 0.51	0.50	0.49	800

2.2. K means and SVM

2.2.1 Accuracies

Clusters	Accuracies
8	27%
20	29.75%
40	40.75%
60	45.5%
100	55.375%

2.2.2 SVM training and testing times

Clusters	Train time	Test time
8	0.55978680	0.0004930496
20	0.85493612	0.0007178783
40	1.00226544	0.00095254
60	1.1526987	0.001254781
100	1.36136198	0.00229096

2.2.3 Confusion Matrices

Clusters - 8			
Accuracy : 27%			
Precision	Recall	F1-Score	Support
0.65	0.24	0.35	100
1.00	0.09	0.17	100
0.17	0.80	0.28	100
0.28	0.79	0.42	100
0.00	0.00	0.00	100
0.00	0.00	0.00	100
0.00	0.00	0.00	100
0.00	0.00	0.00	100
avg 0.26	0.24	0.15	800

Clusters - 20			
Accuracy : 29.5%			
Precision	Recall	F1-Score	Support
0.19	1.00	0.31	100
0.69	0.86	0.77	100
0.00	0.00	0.00	100
0.79	0.15	0.25	100
0.00	0.00	0.00	100
0.09	0.03	0.05	100
0.64	0.14	0.23	100
0.31	0.20	0.24	100
avg 0.34	0.30	0.23	800

Clusters - 40			
Accuracy : 40.75%			
Precision	Recall	F1-Score	Support
0.57	0.42	0.48	100
0.94	0.51	0.66	100
0.60	0.06	0.11	100
0.89	0.16	0.27	100
0.40	0.40	0.40	100
0.31	0.55	0.40	100
0.26	0.83	0.40	100
0.67	0.33	0.44	100
avg 0.58	0.41	0.40	800

Clusters - 60			
Accuracy : 45.5%			
Precision	Recall	F1-Score	Support
0.43	0.58	0.49	100
0.85	0.57	0.68	100
0.41	0.15	0.22	100
0.79	0.44	0.56	100
0.32	0.71	0.44	100
0.60	0.15	0.24	100
0.55	0.37	0.44	100
0.35	0.67	0.46	100
avg 0.54	0.46	0.44	800

Clusters - 60			
Accuracy : 55.375%			
Precision	Recall	F1-Score	Support
0.45	0.79	0.57	100
0.87	0.71	0.78	100
0.62	0.26	0.37	100
0.65	0.64	0.65	100
0.50	0.45	0.47	100
0.56	0.31	0.40	100
0.44	0.77	0.56	100
0.61	0.50	0.55	100
avg 0.59	0.55	0.54	800

2.3. CNN Architectures

Transfer learning was applied on the ResNet and VGG16 architectures trained on the "ImageNet" database. They were trained to classify 8 categories of images of our database.

Their individual performances are depicted in the following tables:

Last layer training		
Architecture	Train Accuracy	Test Accuracy
ResNet	96.47%	72.62%
VGG16	96.65%	93.18%

Last two layers training		
Architecture	Train Accuracy	Test Accuracy
ResNet	97.24%	86.50%
VGG16	96.7%	85.62%