Report

Part 2: Neural Networks, K-nearest neighbours and SVMs

Error Metrics for KNN classifier

Classifier	Parameters	Test Error Rate
KNN	Algorithm: kd_tree , n_neighbors: 1 , p: 1 , weights: uniform	0.0369
KNN	Algorithm: kd_tree , n_neighbors: 3 , p: 1 , weights: uniform	0.036699
KNN	Algorithm: kd_tree , n_neighbors: 7 , p: 1 , weights: uniform	0.038499
KNN	Algorithm: kd_tree , n_neighbors: 1 , p: 2 , weights: uniform	0.03090
KNN	Algorithm: kd_tree , n_neighbors: 3 , p: 2 , weights: uniform	0.029499
KNN	Algorithm: kd_tree , n_neighbors: 7 , p: 2 , weights: uniform	0.030599
KNN	Algorithm: brute , n_neighbors: 5 , p: 2 , weights: distance	0.03090
KNN	Algorithm: brute , n_neighbors: 5 , p: 1 , weights: distance	0.03710
KNN	Algorithm: auto , n_neighbors: 7 , p: 2 , weights: uniform	0.030599
KNN	Algorithm: auto , n_neighbors: 7 , p: 1 , weights: distance	0.037699
KNN	Algorithm: auto , n_neighbors: 5 , p: 2 , weights: distance	0.03090
KNN	Algorithm: kd_tree , n_neighbors: 3 , p: 2 , weights: distance	0.028299

Error Metrics for SVC classifier

Classifier	Parameters	Test Error Rate
SVC	C: 1 , gamma: 0.01 , kernel: rbf	0.02310
SVC	C: 10 , gamma: 0.01 , kernel: rbf	0.016700
SVC	C: 100 , gamma: 0.01 , kernel: rbf	0.0175999
SVC	C: 1 , gamma: 0.001 , kernel: rbf	0.05830
SVC	C: 10 , gamma: 0.001 , kernel: linear	0.068999
SVC	C: 100 , gamma: 0.01 , kernel: linear	0.074200

SVC	C: 1 , gamma: 0.01 , kernel: sigmoid	0.15680
SVC	C: 10 , gamma: auto , kernel: rbf	0.0385999
SVC	C: 100 , gamma: auto , kernel: poly	0.046499
SVC	C: 1 , gamma: scale , kernel: poly	0.02290
SVC	C: 10 , gamma: auto , kernel: poly	0.1129
SVC	C: 1 , gamma: scale , kernel: rbf	0.0208
SVC	C: 10 , gamma: scale , kernel: rbf	0.016299

Error Metrics for MLP classifier

Classifier	**Parameters**	**Test Error Rate**
MLP	solver: sgd , activation: tanh , hidden_layer_size: (128, 64) , max_iter: 50 , alpha: 0.001	0.049599
MLP	solver: sgd , activation: tanh , hidden_layer_size: (128, 64) , max_iter: 100 , alpha: 0.001	0.03410
MLP	solver: sgd , activation: tanh , hidden_layer_size: (128, 64) , max_iter: 100 , alpha: 0.1	0.03810
MLP	solver: sgd , activation: relu , hidden_layer_size: (128, 64) , max_iter: 50 , alpha: 0.01	0.036699
MLP	solver: sgd , activation: relu , hidden_layer_size: (128, 64) , max_iter: 100 , alpha: 0.001	0.0259
MLP	solver: sgd , activation: tanh , hidden_layer_size: (128, 64) , max_iter: 200 , alpha: 0.01	0.0249000
MLP	solver: sgd , activation: relu , hidden_layer_size: (128, 64) , max_iter: 500 , alpha: 0.001	0.0219000
MLP	solver: sgd , activation: tanh , hidden_layer_size: (512, 128, 64) , max_iter: 100 , alpha: 0.01	0.02859
MLP	solver: sgd , activation: relu , hidden_layer_size: (512, 128, 64) , max_iter: 100 , alpha: 0.001	0.02090
MLP	solver: sgd , activation: relu , hidden_layer_size: (512, 128, 64) , max_iter: 500 , alpha: 0.001	0.02190

MLP	solver: adam , activation: tanh , hidden_layer_size: (128, 64) , max_iter: 50 , alpha: 0.001	0.01929
MLP	solver: adam , activation: relu , hidden_layer_size: (128, 64) , max_iter: 50 , alpha: 0.001	0.018800
MLP	solver: sgd , activation: relu , hidden_layer_size: (1024, 512, 128, 64) , max_iter: 50 , alpha: 0.001	0.02270
MLP	solver: adam , activation: relu , hidden_layer_size: (1024, 512, 128, 64) , max_iter: 500 , alpha: 0.1	0.017900
MLP	solver: adam , activation: relu , hidden_layer_size: (512, 128, 64) , max_iter: 50 , alpha0.01	0.01439

Note: these results are a subset of the results obtained by trying all possible combinations of parameters. For more information/results refer to the results folder.

The above algorithms and codes are tried and tested on the UTD server for faster implementation

Best error metrics for K-Nearest Neighbor classifier: 0.0282999
Parameters: *Algorithm: kd_tree , n_neighbors: 3 , p: 2 , weights: distance*

Best error metrics for SVM classifier: 0.016299
Parameters: *C: 10 , gamma: scale , kernel: rbf*

Best error metrics for MLP classifier: 0.01439
Parameters: *solver: adam , activation: relu , hidden_layer_size: (512, 128, 64) , max_iter: 50 , alpha: 0.01*