IMAGE PROCESSING
USING KNN CLASSIFIERS

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Load the dataset fisheriris

```
load fisheriris
```

Specify the X and Y axis

```
X = meas;
Y = species;
```

Define the KNN Classifier

```
rng(1)
Mdl = fitcknn(X,Y,'OptimizeHyperparameters','auto',...
    'HyperparameterOptimizationOptions',...
    struct('AcquisitionFunctionName','expected-improvement-plus'))
```

```
|
=====================================================================================
| Iter | Eval    | Objective  | Objective  | BestSoFar  | BestSoFar
  | NumNeighbors |    Distance |
|      | result |             | runtime     | (observed)  | (estim.)
  |            |              |             |
|
=====================================================================================
|    1 | Best    |   0.026667 |    0.13978 |   0.026667 |
 0.026667 |         30 |       cosine |
|    2 | Accept  |      0.04 |    0.10281 |   0.026667 |
 0.027197 |          2 |    chebychev |
|    3 | Accept  |   0.19333 |     0.1165 |   0.026667 |
 0.030324 |          1 |      hamming |
|    4 | Accept  |   0.33333 |    0.14766 |   0.026667 |
 0.033313 |         31 |     spearman |
|    5 | Best    |      0.02 |    0.11522 |      0.02 |
 0.020648 |          6 |       cosine |
```

Iter	Eval	Objective	Objective	BestSoFar	BestSoFar	NumNeighbors	Distance
	result		runtime	(observed)	(estim.)		
6	Accept	0.073333	0.12964	0.02	0.023082	1	correlation
7	Accept	0.06	0.12094	0.02	0.020875	2	cityblock
8	Accept	0.04	0.1389	0.02	0.020622	1	euclidean
9	Accept	0.24	0.12366	0.02	0.020562	74	mahalanobis
10	Accept	0.04	0.13026	0.02	0.020649	1	minkowski
11	Accept	0.053333	0.099202	0.02	0.020722	1	seuclidean
12	Accept	0.19333	0.11943	0.02	0.020701	1	jaccard
13	Accept	0.04	0.11813	0.02	0.029203	1	cosine
14	Accept	0.04	0.11828	0.02	0.031888	75	cosine
15	Accept	0.04	0.10056	0.02	0.020076	1	cosine
16	Accept	0.093333	0.11522	0.02	0.020073	75	euclidean
17	Accept	0.093333	0.10879	0.02	0.02007	75	minkowski
18	Accept	0.1	0.11799	0.02	0.020061	75	chebychev
19	Accept	0.15333	0.1376	0.02	0.020044	75	seuclidean
20	Accept	0.1	0.1207	0.02	0.020044	75	cityblock

Iter	Eval	Objective	Objective	BestSoFar	BestSoFar	NumNeighbors	Distance
	result		runtime	(observed)	(estim.)		
21	Accept	0.033333	0.10913	0.02	0.020046	75	correlation
22	Accept	0.033333	0.10393	0.02	0.02656	9	cosine
23	Accept	0.033333	0.11145	0.02	0.02854	9	cosine
24	Accept	0.02	0.099408	0.02	0.028607	1	chebychev
25	Accept	0.02	0.12034	0.02	0.022264	1	chebychev
26	Accept	0.02	0.11056	0.02	0.021439	1	chebychev
27	Accept	0.02	0.10539	0.02	0.020999	1	chebychev
28	Accept	0.66667	0.10901	0.02	0.020008	75	hamming

```
| 29 | Accept |      0.04 |   0.12459 |      0.02 |
 0.020008 |          12 |  correlation |
| 30 | Best   |  0.013333 |   0.11085 |  0.013333 |
 0.013351 |           6 |    euclidean |
```

```
_____
```

Optimization completed.
MaxObjectiveEvaluations of 30 reached.
Total function evaluations: 30
Total elapsed time: 43.5247 seconds.
Total objective function evaluation time: 3.5259

Best observed feasible point:
    NumNeighbors   Distance

    _____   _____

        6   euclidean

Observed objective function value = 0.013333
Estimated objective function value = 0.013351
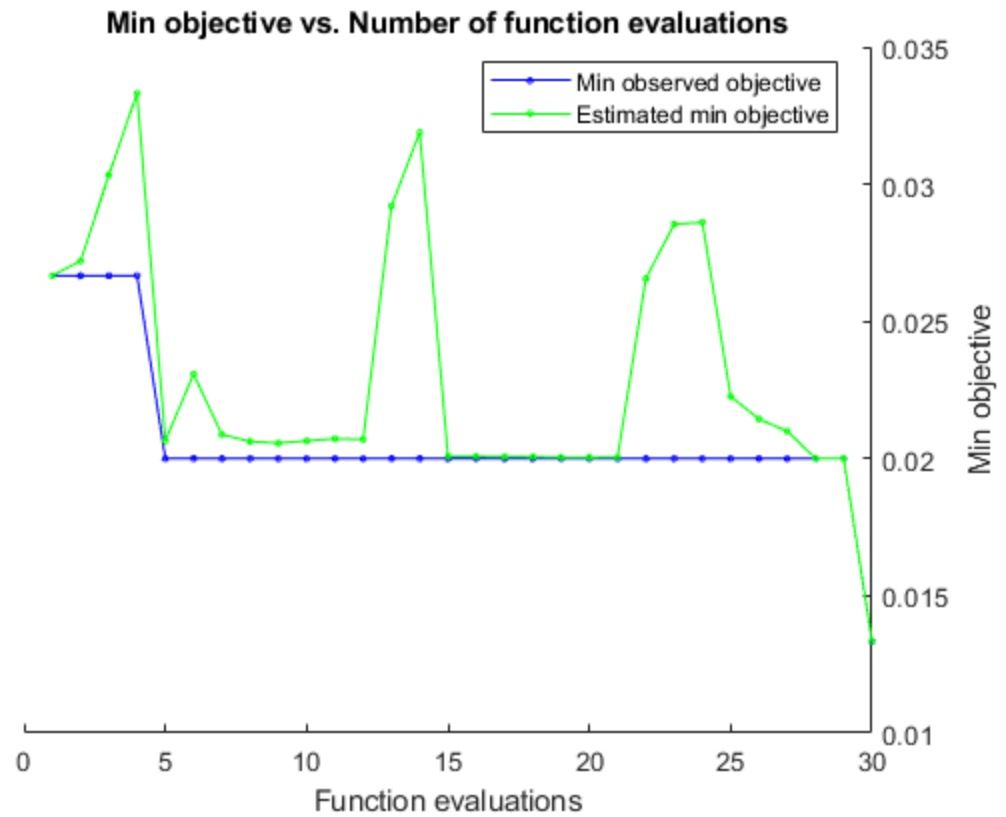*Function evaluation time = 0.11085*
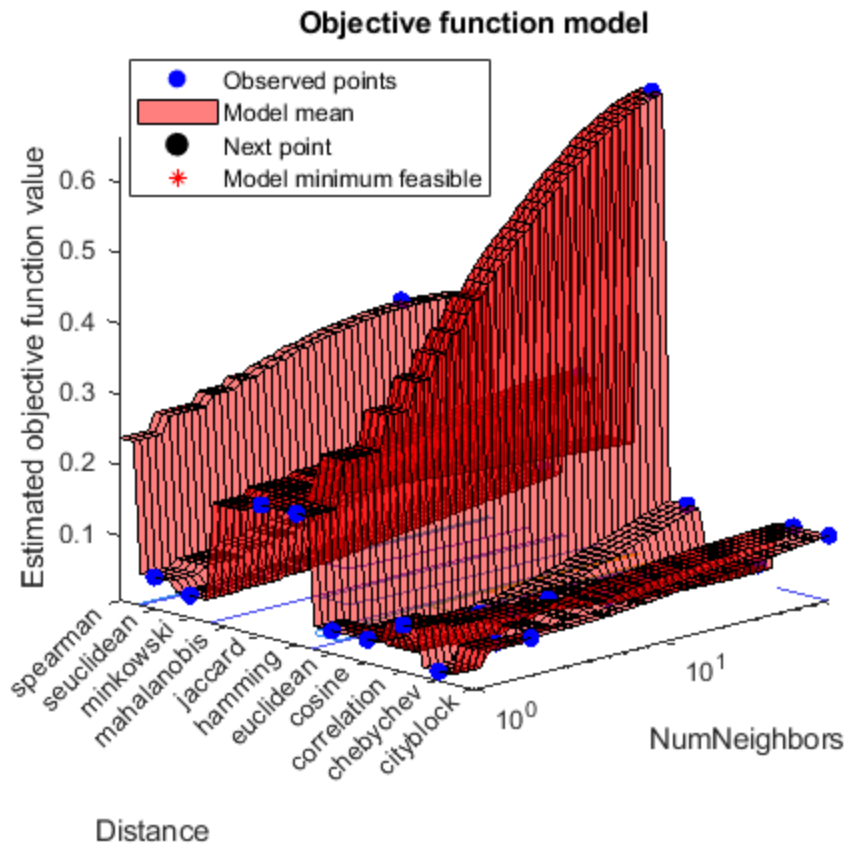

Best estimated feasible point (according to models):
    NumNeighbors   Distance

    _____   _____

        6   euclidean

Estimated objective function value = 0.013351
Estimated function evaluation time = 0.1154

Mdl =

  ClassificationKNN
                          ResponseName: 'Y'
             CategoricalPredictors: []
                           ClassNames: {'setosa' 'versicolor'
 'virginica'}
                      ScoreTransform: 'none'
                    NumObservations: 150
   HyperparameterOptimizationResults: [1×1 BayesianOptimization]
                            Distance: 'euclidean'
                       NumNeighbors: 6

Min objective vs. Number of function evaluations

Objective function model

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