

**Automatic Sample-by-
sample Model Selection
Between Two Off-the-shelf
Classifiers**

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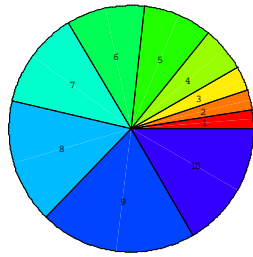
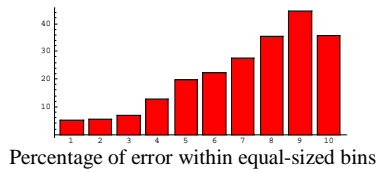
Model Selection by Predicting the Better Classifier

Idea:

- Two classifiers, "primary" and "secondary"
- Use confidence to predict which one is expected to perform best

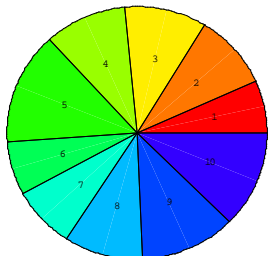
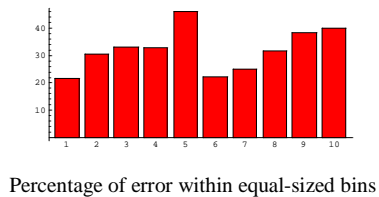
Pima Indian Diabetes

Primary classifier: Fisher LD



Fisher LD classifies over 70% of the data before half the total error is accumulated.

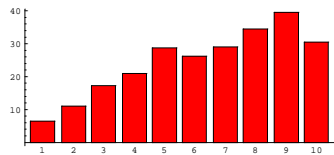
Secondary classifier: 1-Nearest Neighbor



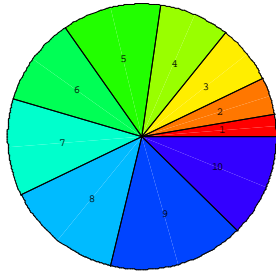
1-Neigh classifies about 50% of the data when half the total error is accumulated.

Ljubljana Breast Cancer

Primary classifier: Fisher LD

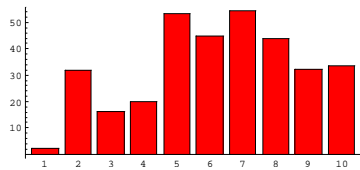


Percentage of error within equal-sized bins

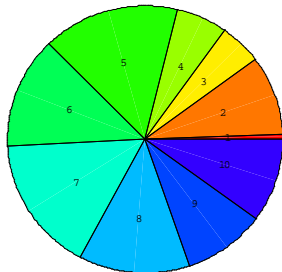


Fisher LD classifies over 60% of the data before half the total error is accumulated.

Secondary classifier: Nearest Unlike Nei.



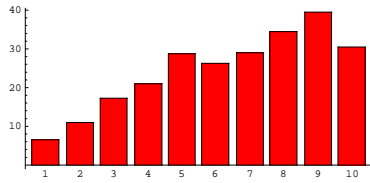
Percentage of error within equal-sized bins



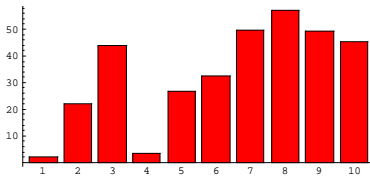
NUN classifies about 60% of the data before half the total error is accumulated.

Confidence measure profiles

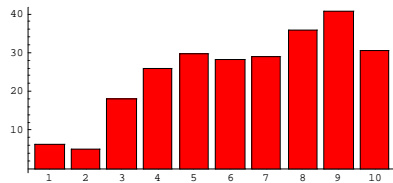
(Ljubljana Breast Cancer)



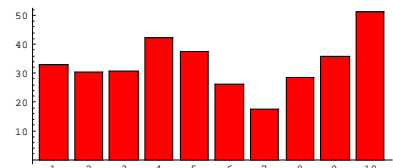
Fisher LD using $1/(w'x+s)$



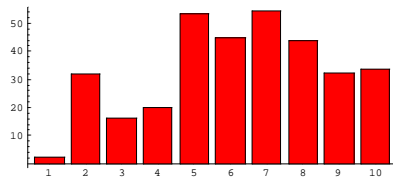
1-Nearest Neighbor using 1-Neighbor distance



MSE using Q



1-Nearest Neighbor using distance from centers

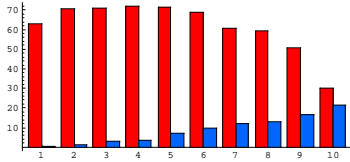


1-Neighbor using nearest unlike neighbor ratio

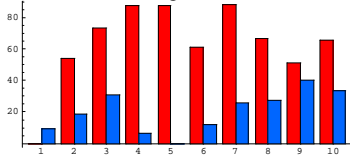
Differential error

(Ljubljana Breast Cancer)
30% class A, 70% class B

Fisher LD:



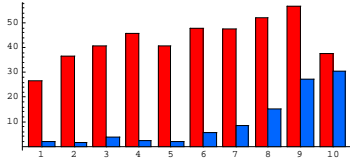
Nearest Unlike Neighbor:



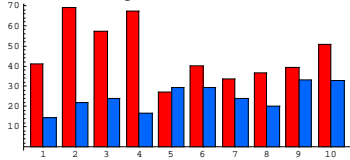
Differential error

(Pima Indian Diabetes)
35% class A, 65% class B

Fisher LD:



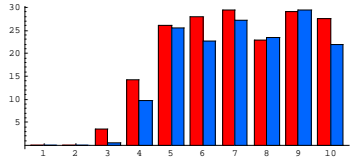
1-Nearest Neighbor:



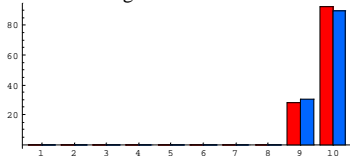
Differential error

(Synthetic Data)
50% class A, 50% class B

Fisher LD:

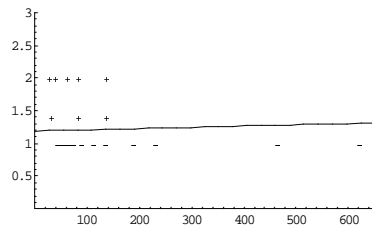


1-Nearest Neighbor:



Obstacles

- About 25% of the training data contributes to calculating the selection LD when combining linear discriminant and nearest neighbor classifiers.



Selection LD and data in q-space

- The different confidence measures have different ranges, which makes them difficult to compare with each other.