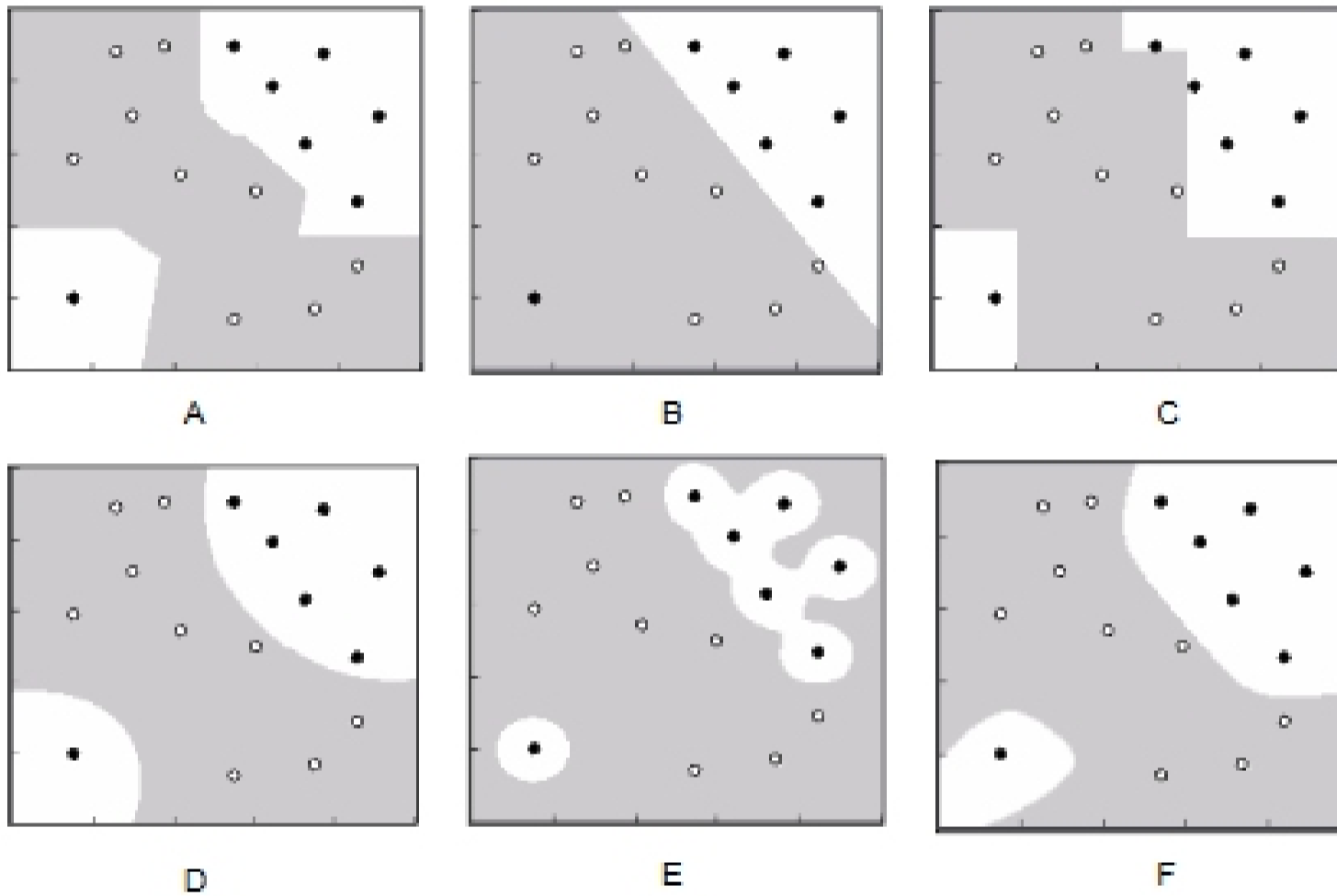


5f Learning hypothesis f classes (16f points) f

Consider f a classification problem f with f two f real-valued f inputs. f For f each f of f the f following f algorithms, f specify f all f the f separators f below f that f it f could f have f generated f and f explain f why. f If f it f could f not f have f generated f any f the f separators, f explain f why f not. f



1. f1-nearest fneighbor f

2. fdecision ftree f on f real-valued f inputs f

3. standard perceptron algorithm

4. SVM with linear kernel

5. SVM with Gaussian kernel ($\sigma = 0.25$)

6. SVM with Gaussian kernel ($\sigma = 1$)

7. neural network with 2 hidden units and 2 sigmoidal but put limit, run until convergence training error

8. neural network with 3 hidden units and 2 sigmoidal but put limit, run until convergence training error

6 Perceptron (8 points)

The following table shows a data set and the number of times each point is misclassified during a run of the perceptron algorithm, starting with zero weights. What is the equation of the separating line found by the algorithm, as a function of x_1 , x_2 , and x_3 ? Assume that the learning rate is 1 and the initial weights are all zero.

| x_{10} | x_{20} | x_{30} | y_0 | times misclassified |
|----------|----------|----------|-------|---------------------|
| 2 | 3 | 1 | +1 | 12 |
| 2 | 4 | 0 | +1 | 0 |
| 3 | 1 | 1 | -1 | 3 |
| 1 | 1 | 0 | -1 | 6 |
| 1 | 2 | 1 | -1 | 11 |