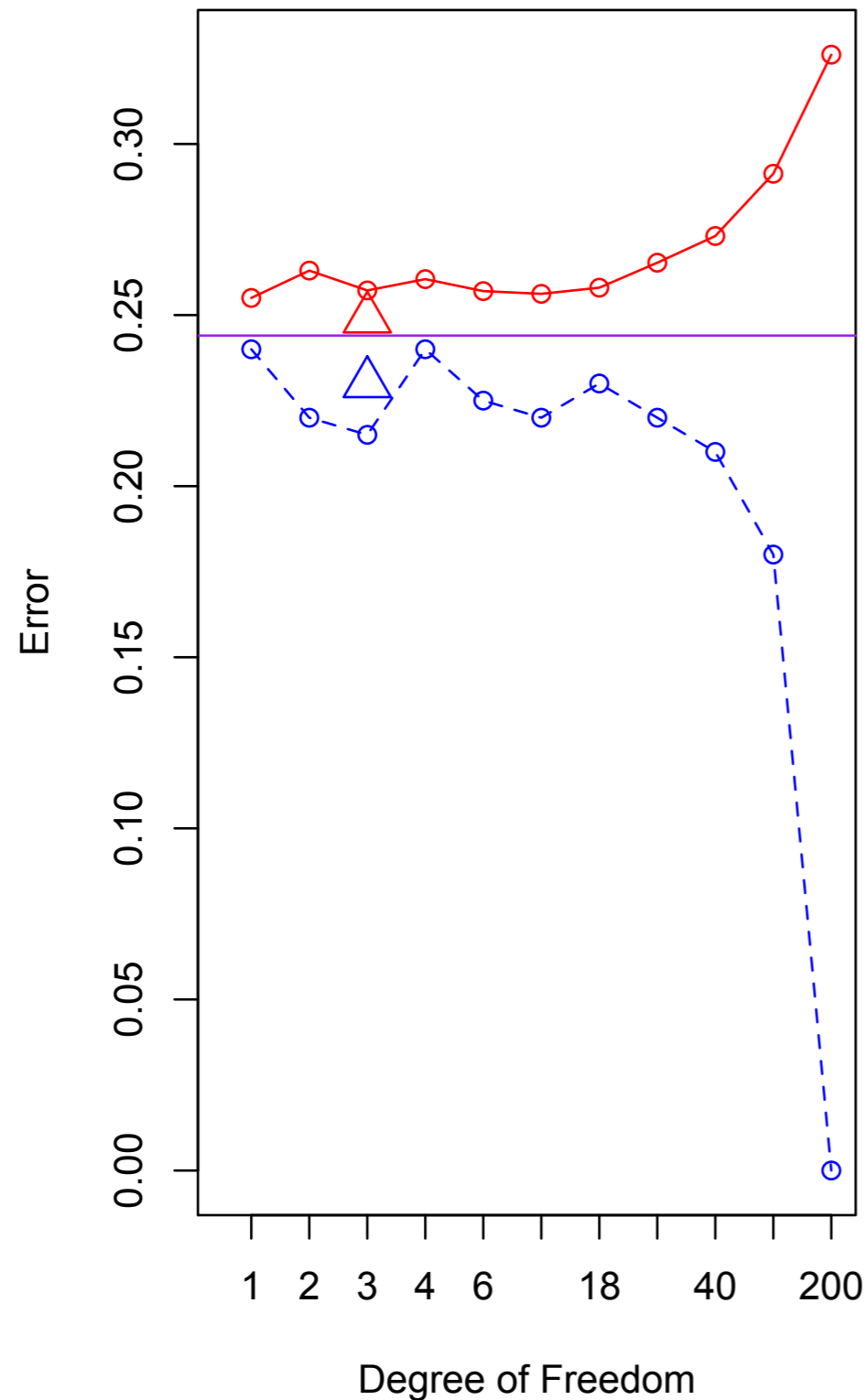
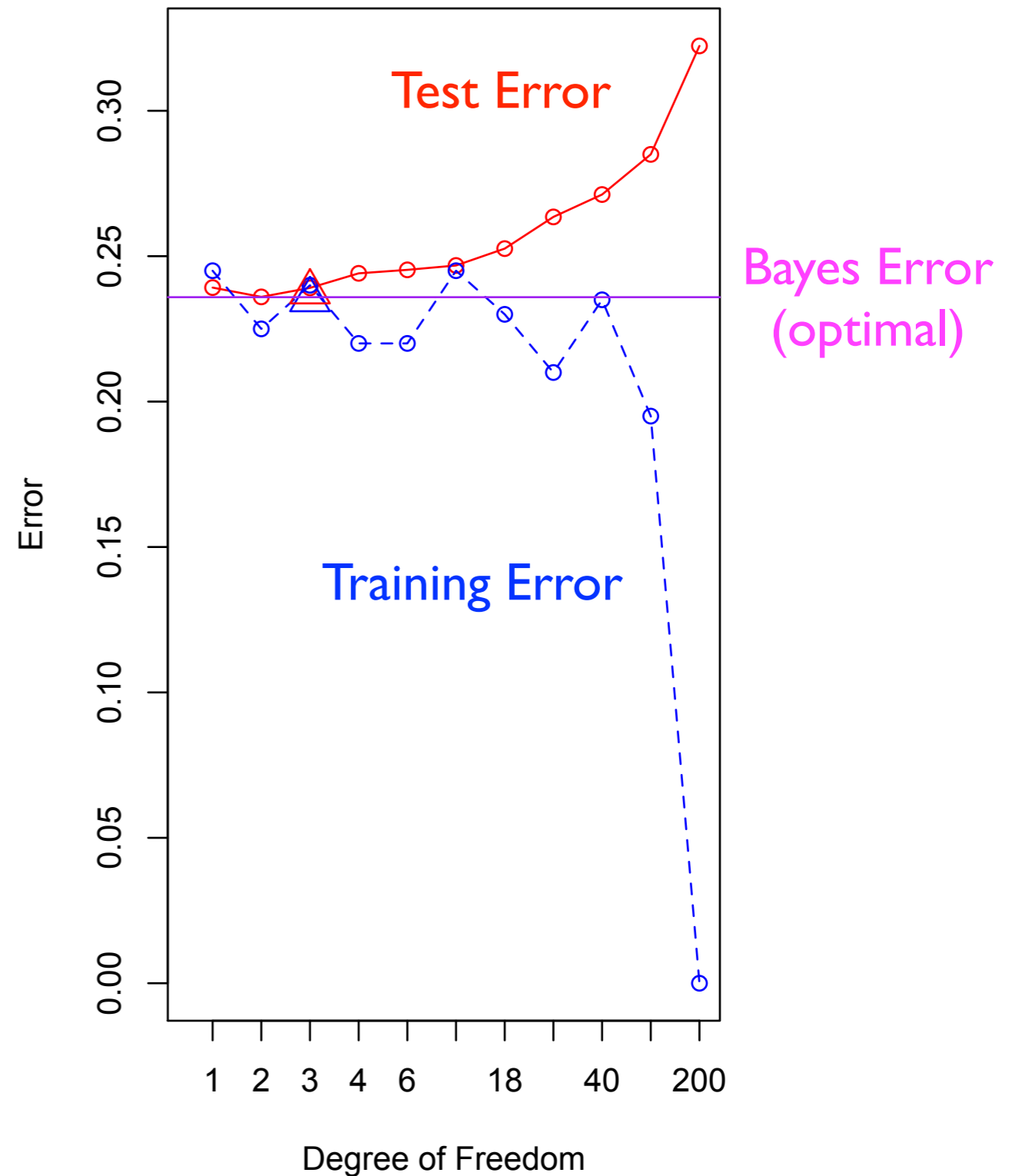


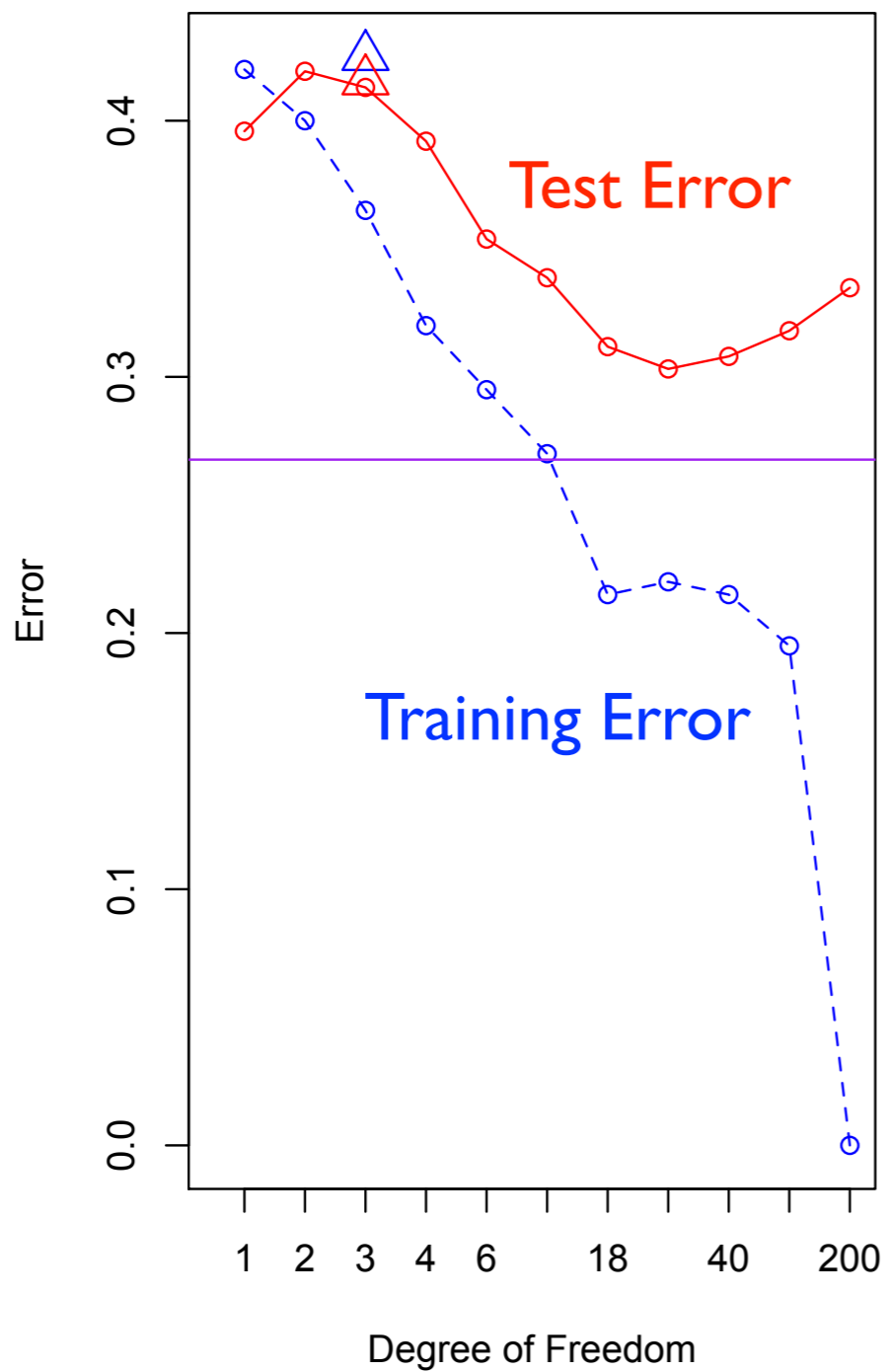
DF for  $k$ NN =  $n/k$ . For example, DF for 1NN is  $n$ , and  $n$ NN is 1.



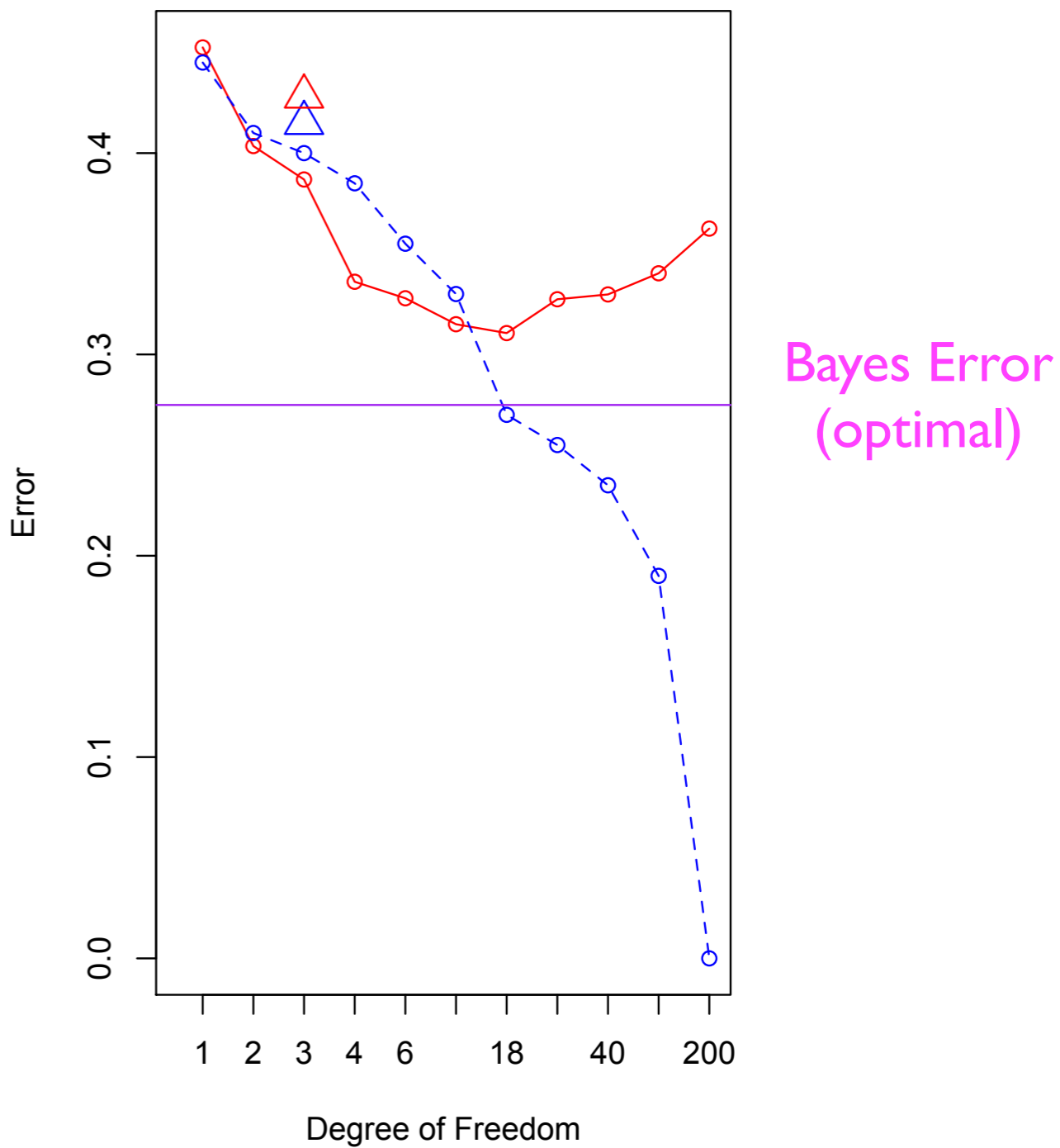
One simulation result



Another simulation result



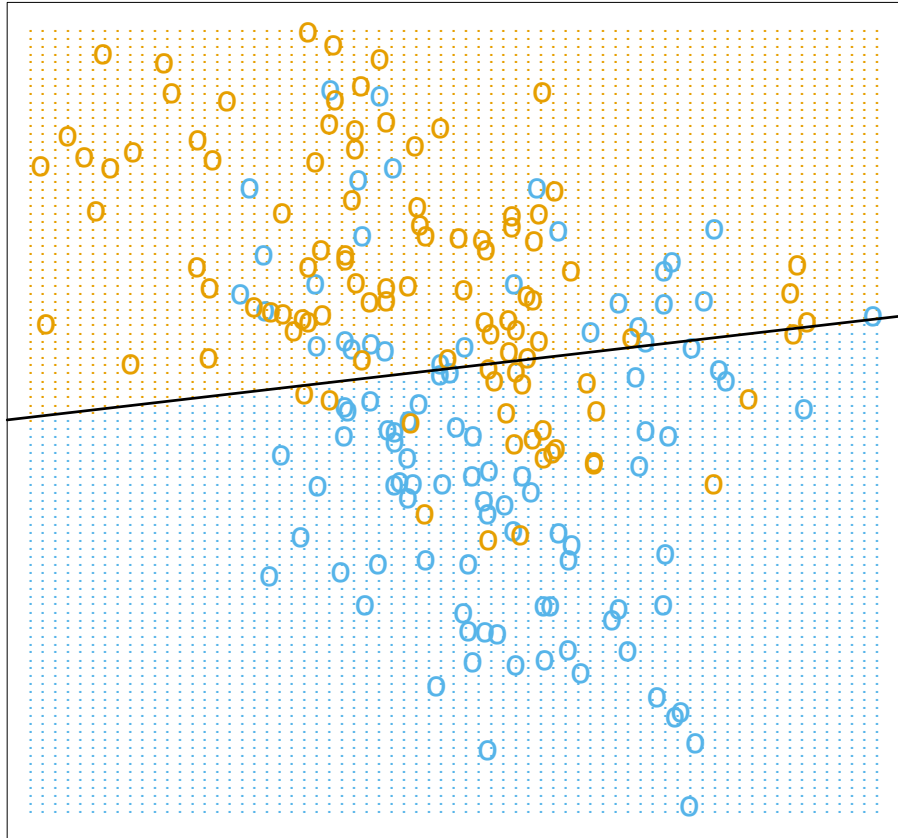
One simulation result



Another simulation result

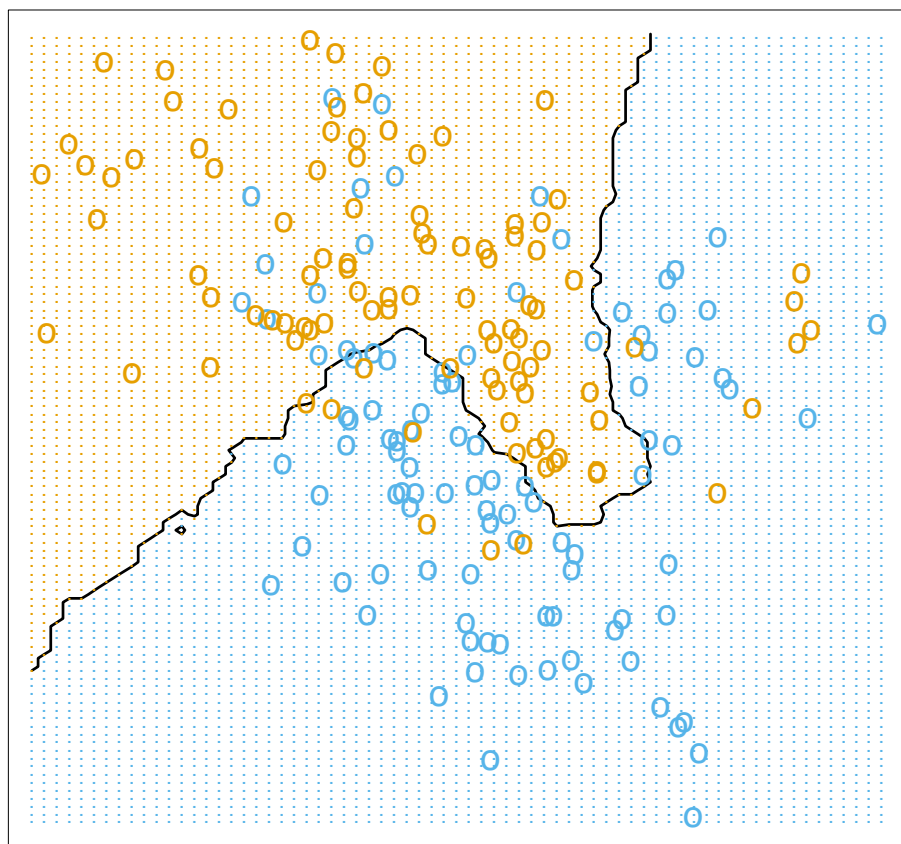
Bayes Error  
(optimal)

Linear Regression of 0/1 Response



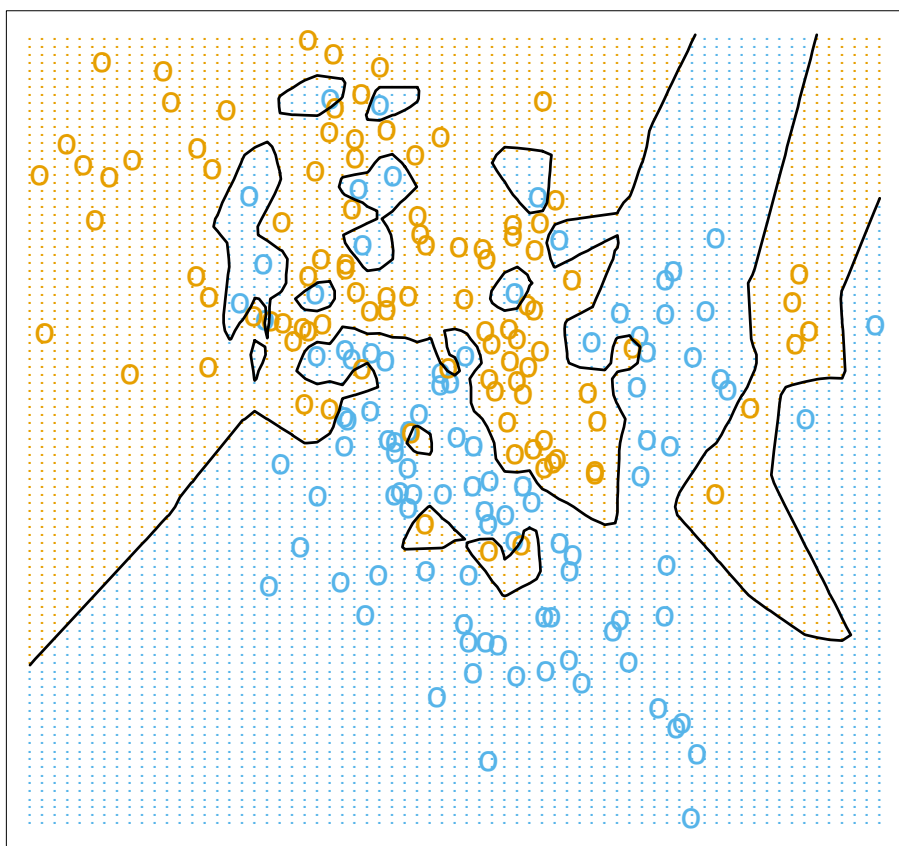
**FIGURE 2.1.** A classification example in two dimensions. The classes are coded as a binary variable (BLUE = 0, ORANGE = 1), and then fit by linear regression. The line is the decision boundary defined by  $x^T \hat{\beta} = 0.5$ . The orange shaded region denotes that part of input space classified as ORANGE, while the blue region is classified as BLUE.

15-Nearest Neighbor Classifier

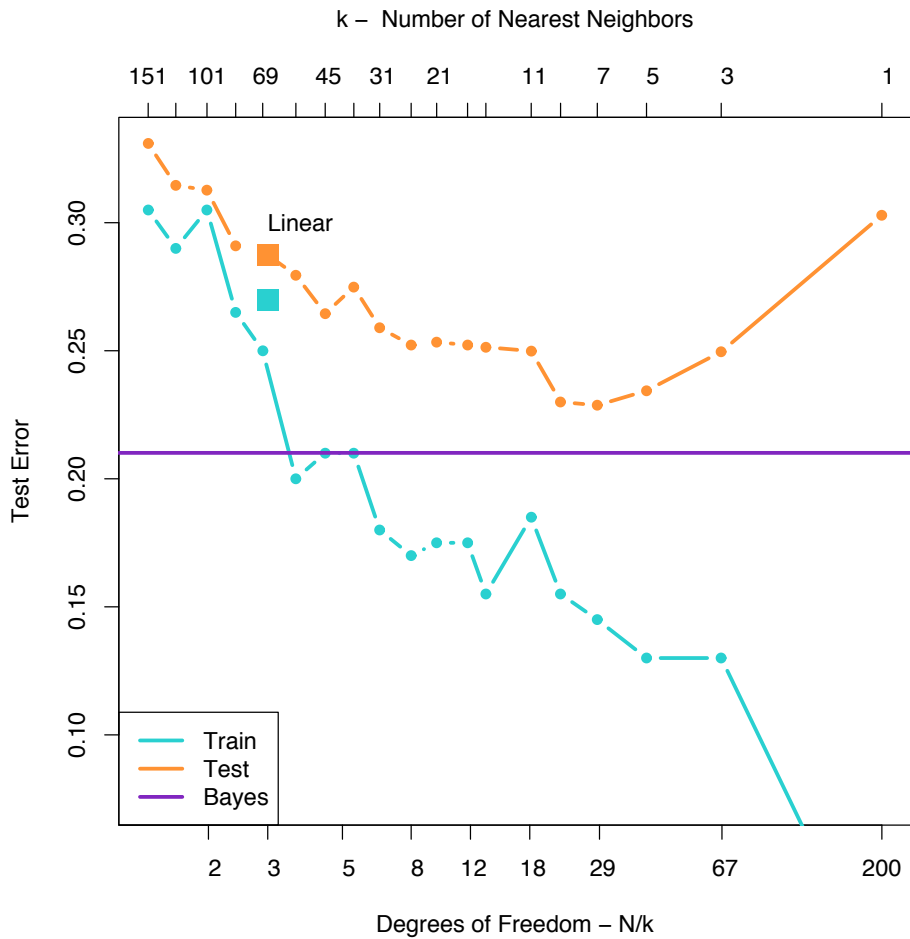


**FIGURE 2.2.** *The same classification example in two dimensions as in Figure 2.1. The classes are coded as a binary variable (BLUE = 0, ORANGE = 1) and then fit by 15-nearest-neighbor averaging as in (2.8). The predicted class is hence chosen by majority vote amongst the 15-nearest neighbors.*

1-Nearest Neighbor Classifier



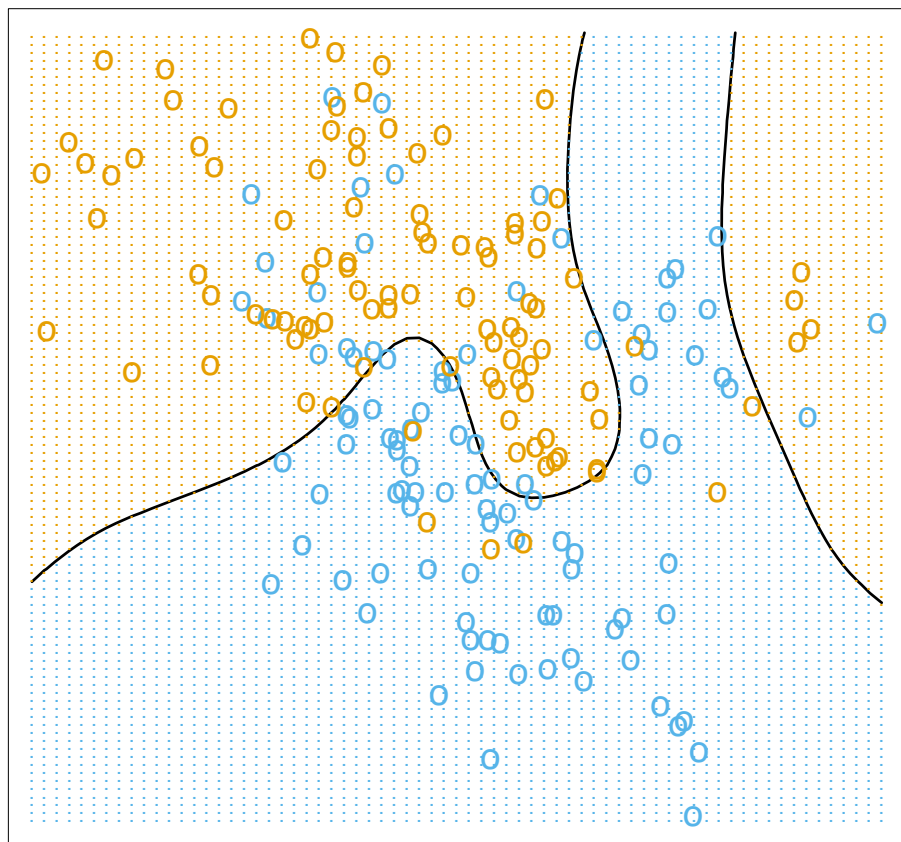
**FIGURE 2.3.** *The same classification example in two dimensions as in Figure 2.1. The classes are coded as a binary variable (BLUE = 0, ORANGE = 1), and then predicted by 1-nearest-neighbor classification.*



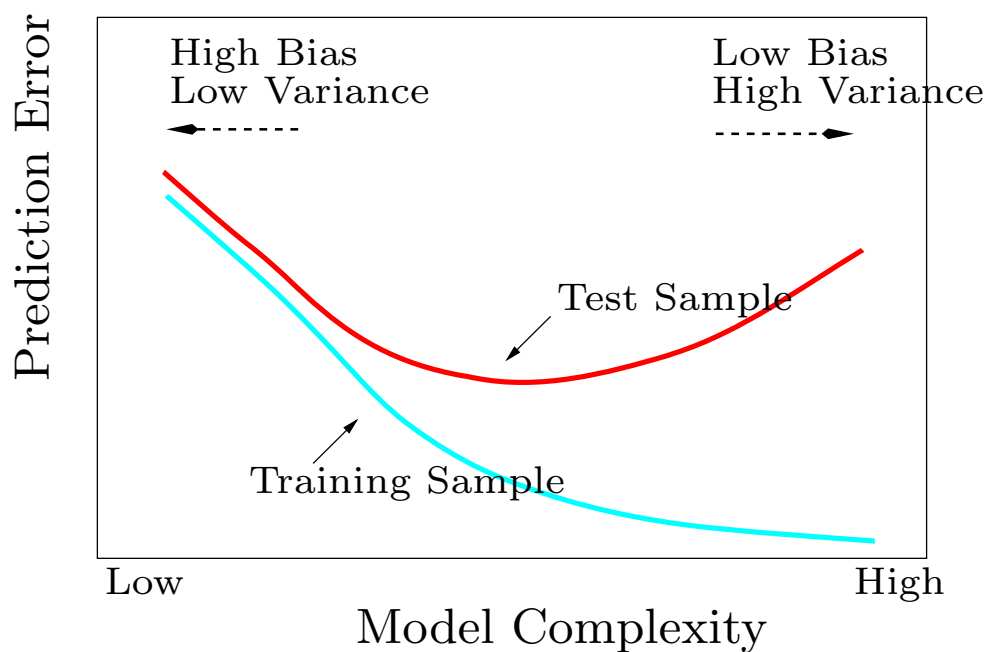
**FIGURE 2.4.** *Misclassification curves for the simulation example used in Figures 2.1, 2.2 and 2.3. A single training sample of size 200 was used, and a test sample of size 10,000. The orange curves are test and the blue are training error for  $k$ -nearest-neighbor classification. The results for linear regression are the bigger orange and blue squares at three degrees of freedom. The purple line is the optimal Bayes error rate.*



Bayes Optimal Classifier



**FIGURE 2.5.** *The optimal Bayes decision boundary for the simulation example of Figures 2.1, 2.2 and 2.3. Since the generating density is known for each class, this boundary can be calculated exactly (Exercise 2.2).*



**FIGURE 2.11.** *Test and training error as a function of model complexity.*