DATA 558 HW 3

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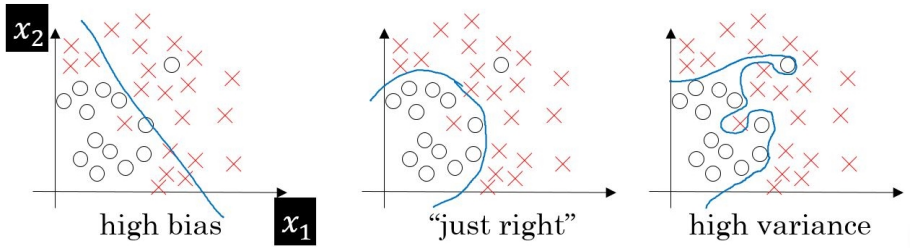
1 Exercise

To justify the answer, I will refer to the following diagram:



a)

As λ decreases from λ_{max} to 0, the misclassification error on the training set will

Steadily decrease

As we decrease λ, we also decrease the amount of bias in the model. As a result, the variance tends to increase. In the diagram, as a result, we are moving from left to right, thus we tend to overfit for the data.

Since this is the training data, the error rate will keep reducing as we overfit.

b)

As λ decreases from λ_{max} to 0, the misclassification error on the test set will

Decrease initially, and then eventually start increasing in a U shape

As we decrease λ, we also decrease the amount of bias in the model. As a result, the variance tends to increase. In the diagram, as a result, we are moving from left to right, thus we tend to overfit for the data.

Initially, there is too much bias in the data. As a result the error rate for the test data will be very high. As we decrease λ, we will hit a middle ground between bias and variance that will result in the minimum error rate for the model on the test data. As we further decrease λ, we will be overfitting, and thus the error rate will start to increase again.