The Analytics Edge FALL 2020

Model selection concepts

In class exercise: Week 5

1. Which of the following is correct when comparing LASSO to an ordinary least squares linear regression:

   (a) It is more flexible and hence will give improved prediction accuracy when its increase in bias is less than its decrease in variance.

   (b) It is more flexible and hence will give improved prediction accuracy when its increase in variance is less than its decrease in bias.

   (c) It is less flexible and hence will give improved prediction accuracy when its increase in bias is less than its decrease in variance.

   (d) It is less flexible and hence will give improved prediction accuracy when its increase in variance is less than its decrease in bias.

2. Which of the following is correct when comparing a non-linear regression method to an ordinary least squares linear regression:

   (a) It is more flexible and hence will give improved prediction accuracy when its increase in bias is less than its decrease in variance.

   (b) It is more flexible and hence will give improved prediction accuracy when its increase in variance is less than its decrease in bias.

   (c) It is less flexible and hence will give improved prediction accuracy when its increase in bias is less than its decrease in variance.

   (d) It is less flexible and hence will give improved prediction accuracy when its increase in variance is less than its decrease in bias.

3. Suppose we estimate the regression coefficients in a linear regression model by minimizing

$$\sum_{i=1^n} \left(y_i - \beta_0 - \sum_{i=1}^{p} \beta_j x_{ij} \right)^2 \quad \text{subject to} \quad \sum_{i=1}^{p} |\beta_j| \leq s$$

   for a particular value of s. For parts (a) to (d), indicate which of (i) through (v) is correct and justify your answer.

   (a) As we increase s from 0, the *training* RSS will:

   (b) As we increase s from 0, the *test* RSS will:

   (c) As we increase s from 0, the variance will:

   (d) As we increase s from 0, the (squared) bias will:

The options that you can choose from are:

(i) Increase initially, and then eventually start decreasing in an inverted U shape.

(ii) Decrease initially, and then eventually start increasing in a U shape.

(iii) Steadily increase.

(iv) Steadily decrease.

(v) Remain constant.