STT3851 Homework 3

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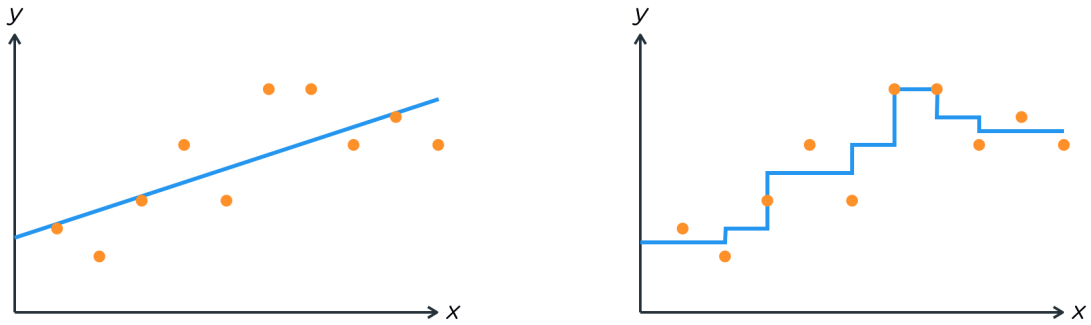
Due – February 3

1) Provide a sketch of typical (squared) bias, variance, training error, test error, and irreducible error curves, on a single plot, as we go from less flexible statistical learning methods towards more flexible approaches. The x-axis should represent the amount of flexibility in the method, and the y-axis should represent the values for each curve. There should be five curves. Make sure to label each one.

b) Explain why each of the five curves has the shape displayed in part (a)

2) Consider the following model fits.



Which model is more flexible? **Why**? Discuss how interpretability is related to the flexibility.

3) Group the following methods based on their interpretability and flexibility.

Methods: Bagging, Lasso, Boosting, Subset selection, LS, Regression Tree, Classification Tree.

Less flexible, more interpretable	Moderately flexible and interpretable	More flexible, less interpretable

4) Consider the relationship between a response variable Y and an explanatory variable x and the following statements. Answer **TRUE** or **FALSE.** If you choose that the statement is **TRUE**, no explanation is needed. If you choose that the statement is **FALSE**, EXPLAIN WHY.

$$Y = f(x) + \epsilon$$

i) This is an unsupervised learning problem.

ii) $f(x)$ captures the systematic part of Y.

iii) This is a regression problem only if x is quantitative.

iv) For a parametric method, assuming a form for f with more free parameters generally leads to a more flexible fit.

v) A disadvantage to using a parametric method rather than a non-parametric one is that many observations are needed to estimate f decently.