

Model Selection and Bias-Variance tradeoff

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Motivations - Training vs test error

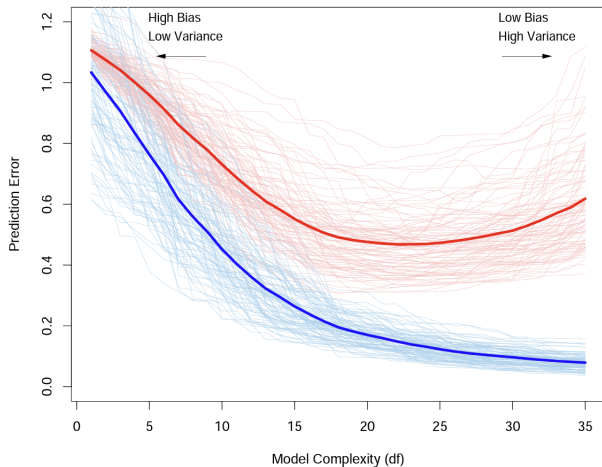


Figure: Training (blue) vs test (red) error as the model complexity varies.

Motivations - general idea

ML in one word: **generalization!**

Recall that we have to find a balance between fitting, on training data, and model complexity. Even though we limit the complexity of our model, training set does not provide a good estimate of test error.

In other words, generalization is compromised if we choose hyperparameters according to (only) training error.

Model selection and model assessment

Model selection: estimate the performance of different models trained with different hyperparameters.

Model assessment: after choosing a final model we evaluate its performance on *completely new* test data.

N.B. Model selection and model assessment must be kept separated. Once we have chosen a final model, we are done with the model selection phase and model assessment is needed only to test the model on new data.