Bias and Variance and Coefficients

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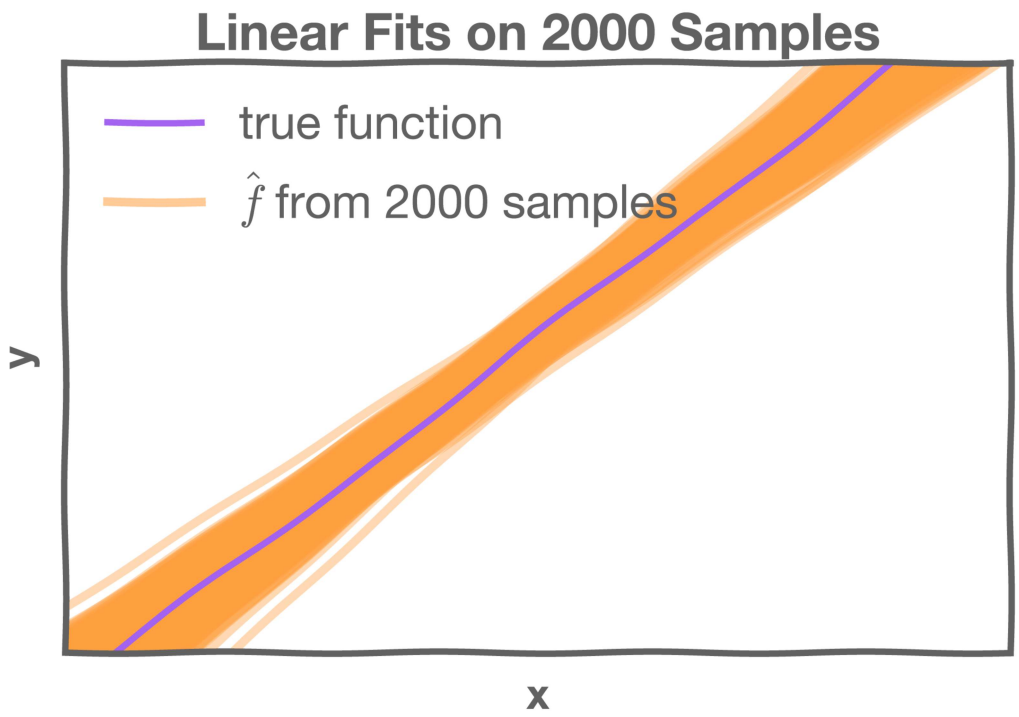
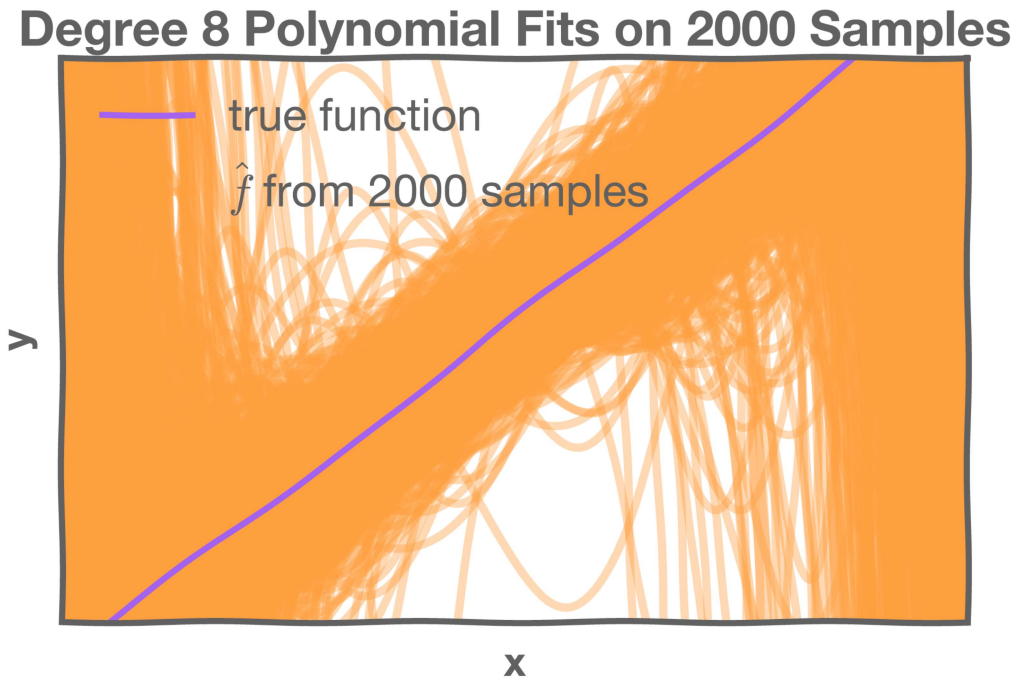
Bias vs Variance

Consider this plot of 2,000 best-fit simple linear regression models, each fitted on a different 20-point training set. Note that there is not much variation among the different fits' predictions.

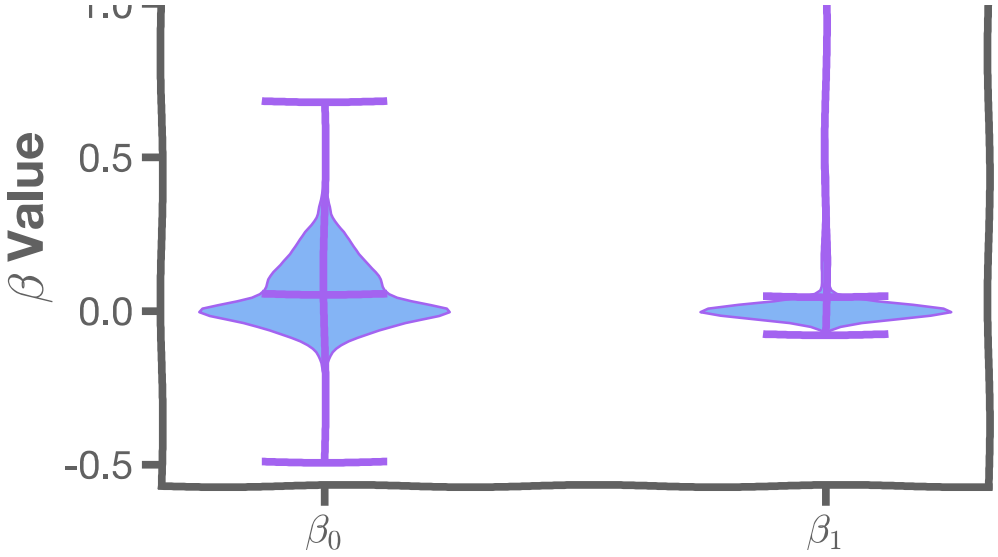


Now consider this plot of 2,000 best-fit degree-20 polynomial models, each fitted on a different 20 point training set. Note the wild variation among the predictions of the different model fits.

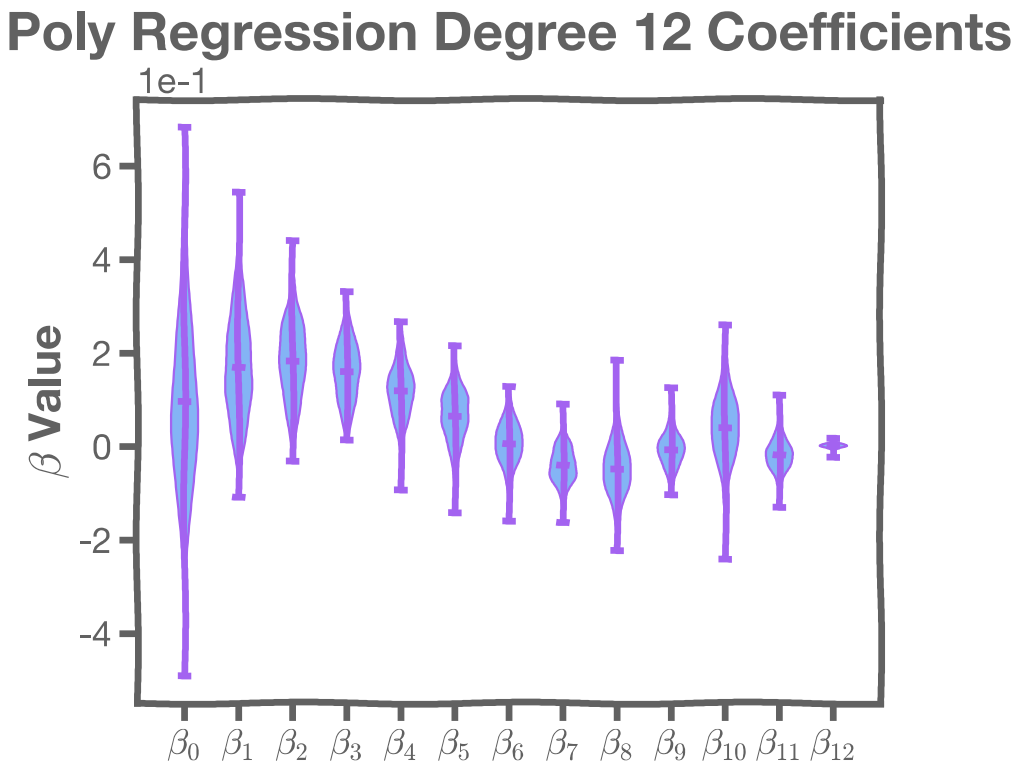


Bias vs Variance (coefficients)

Let's look at the range of the coefficient values for these different models. For the 2,000 different simple linear regression models, we see that there is some variability, but very little when compared to the polynomial fits.



These are the first 10 coefficient values for the 2,000 degree-20 polynomial fits. Be sure to notice the change in scale on the -axis between this plot and the last! The spread of 12 coefficients visualized here vary much more between fits than did those for the simple model. And some of the coefficient values become quite extreme. This means that small variation in the training data can make a huge change in the resulting model's coefficients and thus its predictions.



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