

Reminders

- Accept GitHub invitation
- Ask questions on Piazza!

Today

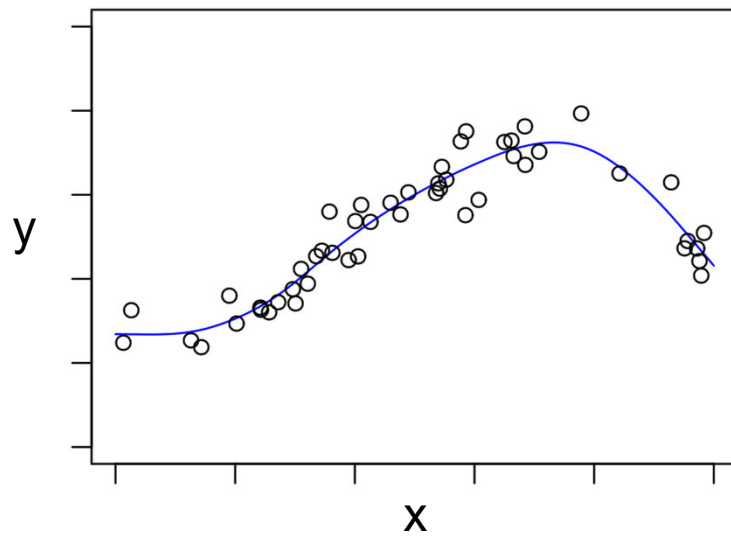
- Continue Cross-Validation (CV)
 - inference algorithm
 - pseudocode to R code
- Theory of bias-variance tradeoff

Code

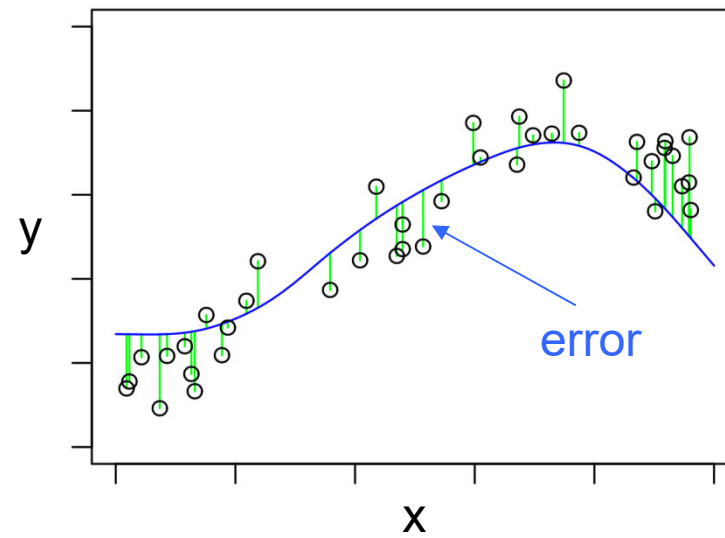
- 02_2_ants_cv_polynomial.R

Bias-variance tradeoff

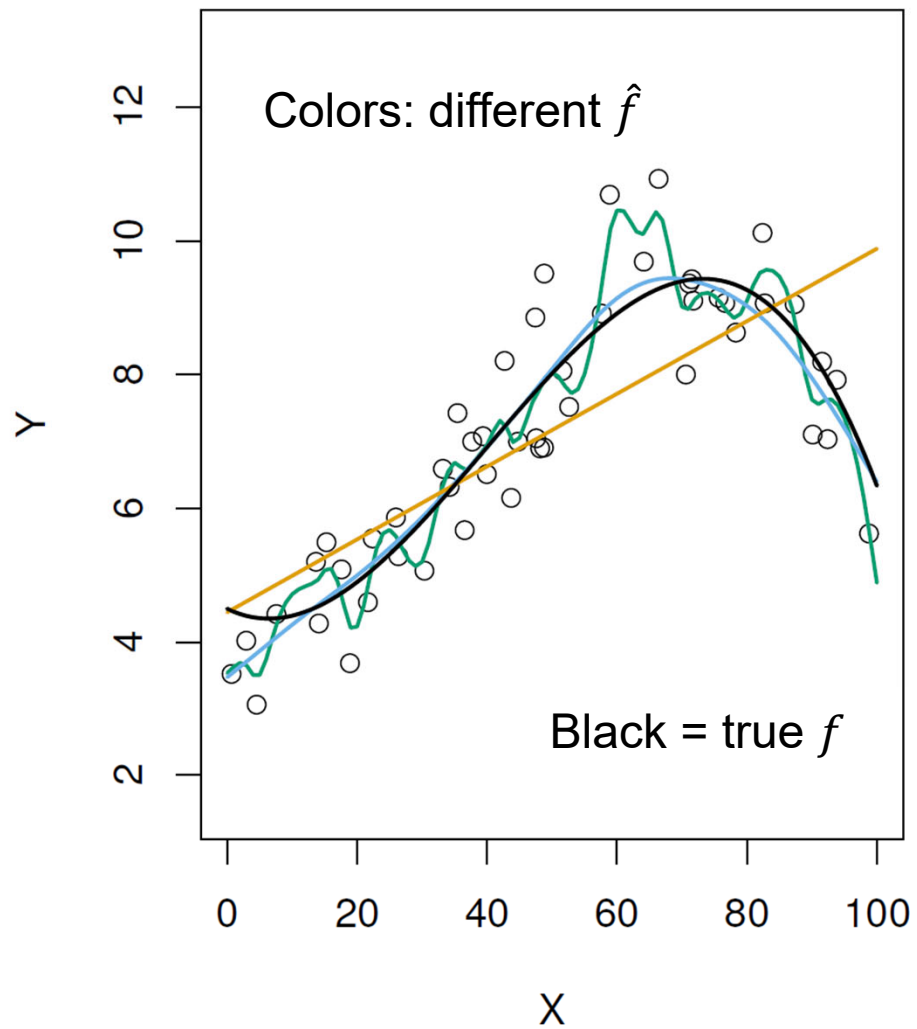
\hat{f} fitted on training data



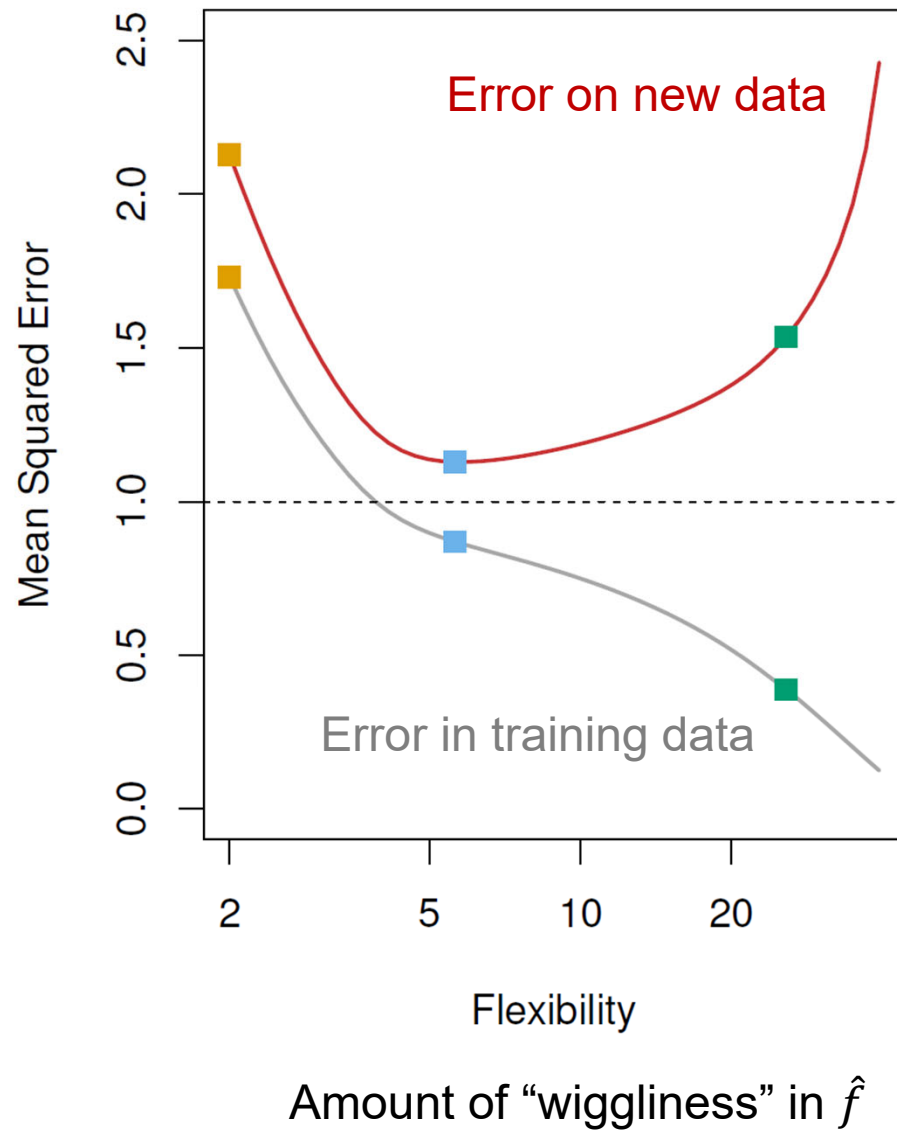
\hat{f} predicting new data

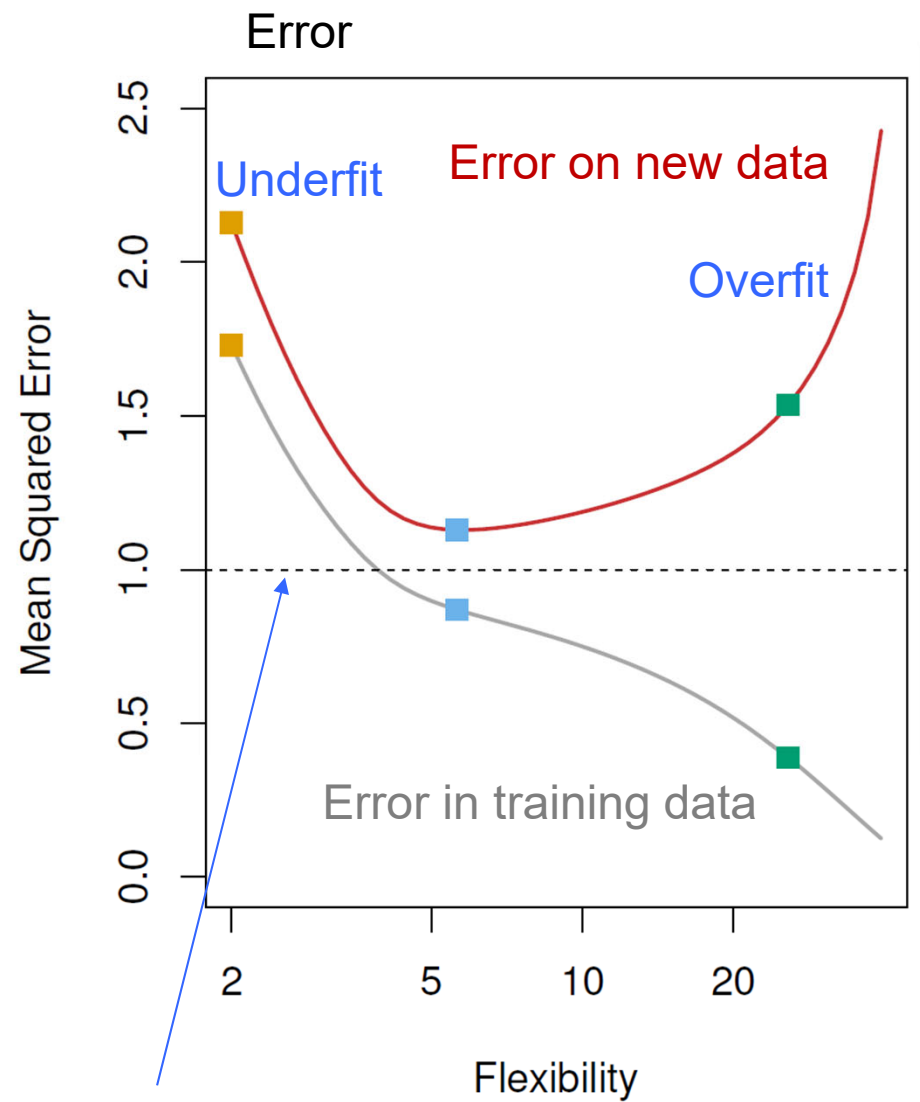
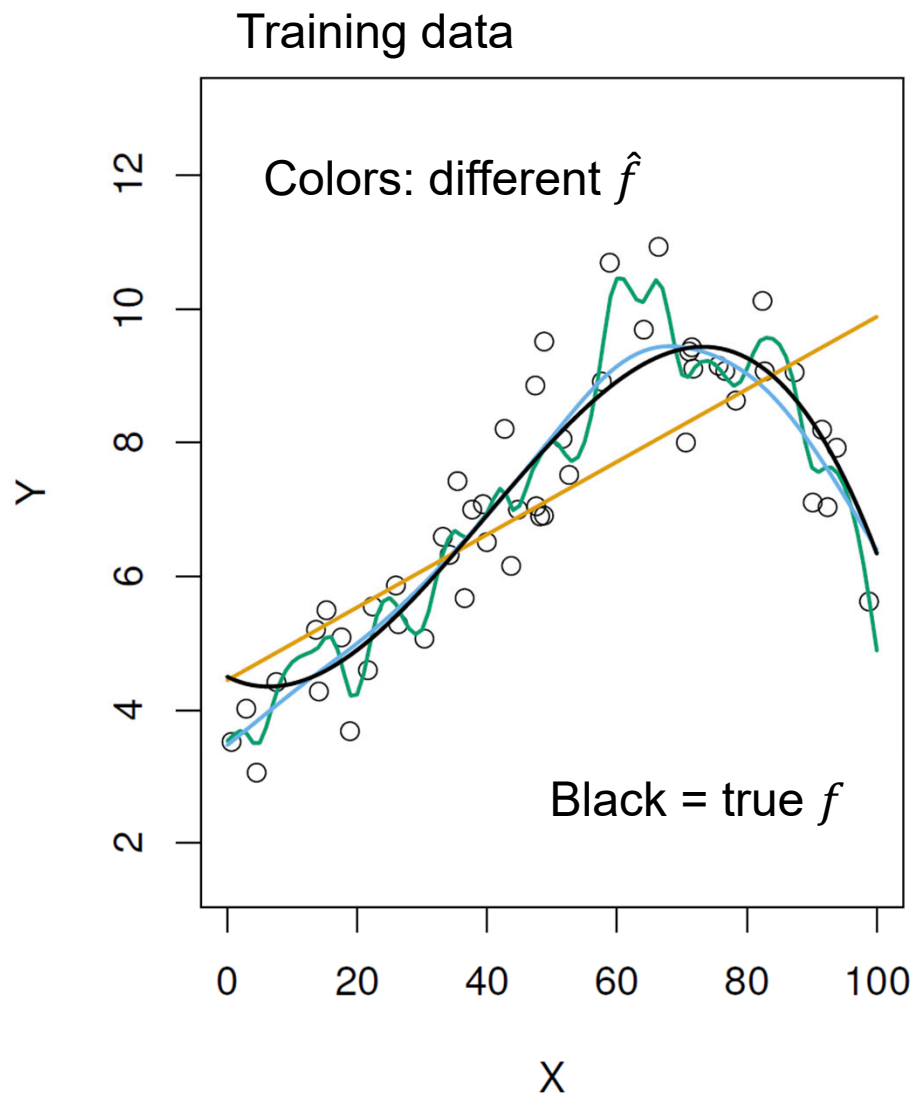


Training data



Error





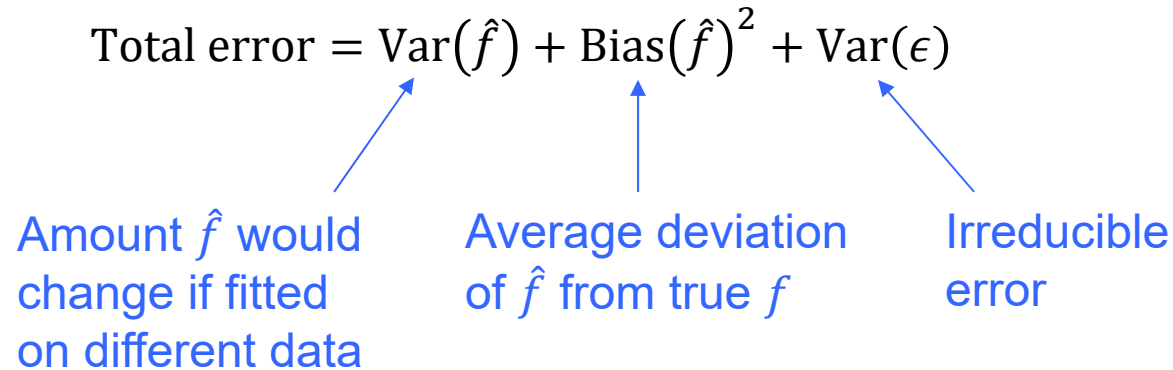
Irreducible error

Goal: balance underfit and overfit

Bias-variance tradeoff

$$\text{Total error} = \text{Var}(\hat{f}) + \text{Bias}(\hat{f})^2 + \text{Var}(\epsilon)$$

Amount \hat{f} would
change if fitted
on different data



The diagram illustrates the bias-variance tradeoff equation. At the top, the equation is written: Total error = Var(f-hat) + Bias(f-hat)^2 + Var(epsilon). Below the equation, three blue arrows point upwards to the components of the equation. The first arrow points from the text 'Amount f-hat would change if fitted on different data' to the Var(f-hat) term. The second arrow points from the text 'Average deviation of f-hat from true f' to the Bias(f-hat)^2 term. The third arrow points from the text 'Irreducible error' to the Var(epsilon) term.

Average deviation
of \hat{f} from true f

Irreducible
error

Bias-variance tradeoff

$$\text{Total error} = \text{Var}(\hat{f}) + \text{Bias}(\hat{f})^2 + \text{Var}(\epsilon)$$

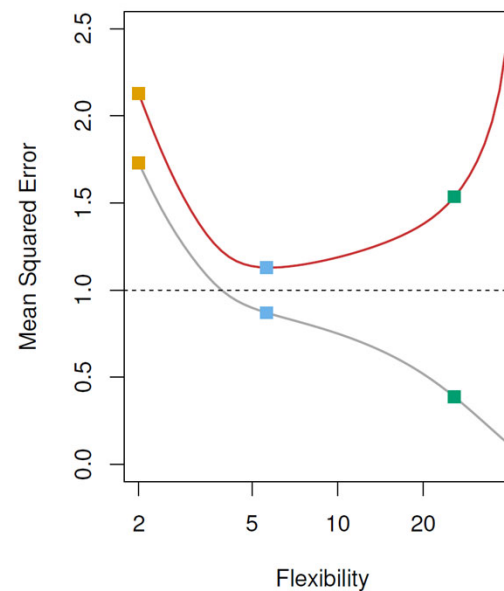
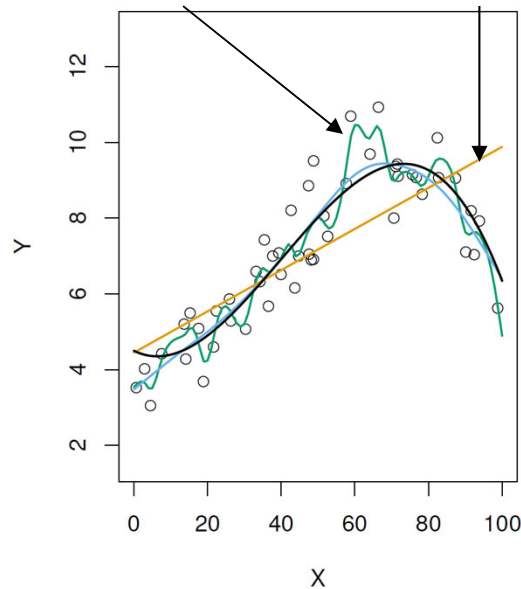
Amount \hat{f} would
change if fitted
on different data

Average deviation
of \hat{f} from true f

Irreducible
error

High variance

High bias



Bias-variance tradeoff

$$\text{Total error} = \text{Var}(\hat{f}) + \text{Bias}(\hat{f})^2 + \text{Var}(\epsilon)$$

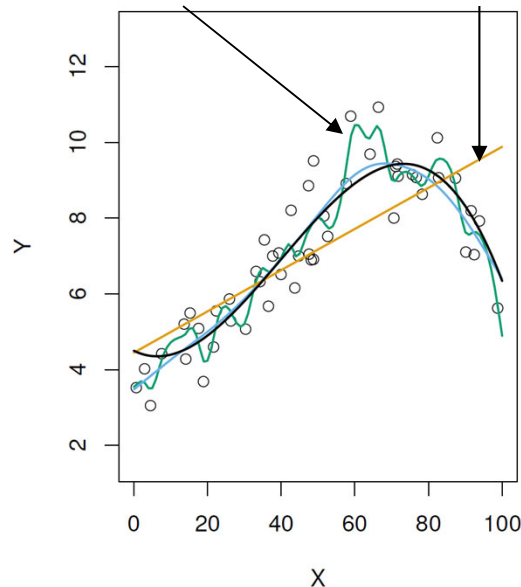
Amount \hat{f} would
change if fitted
on different data

Average deviation
of \hat{f} from true f

Irreducible
error

High variance

High bias



High bias

High variance

