Reminders

- Accept GitHub invitation
- Ask questions on Piazza!

Today

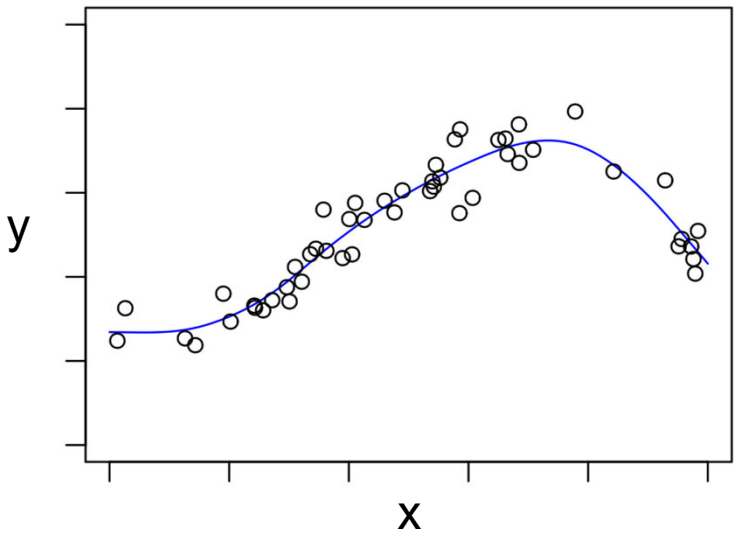
- Continue Cross-Validation (CV)
  - inference algorithm
  - pseudocode to R code
- Theory of bias-variance tradeoff

Code

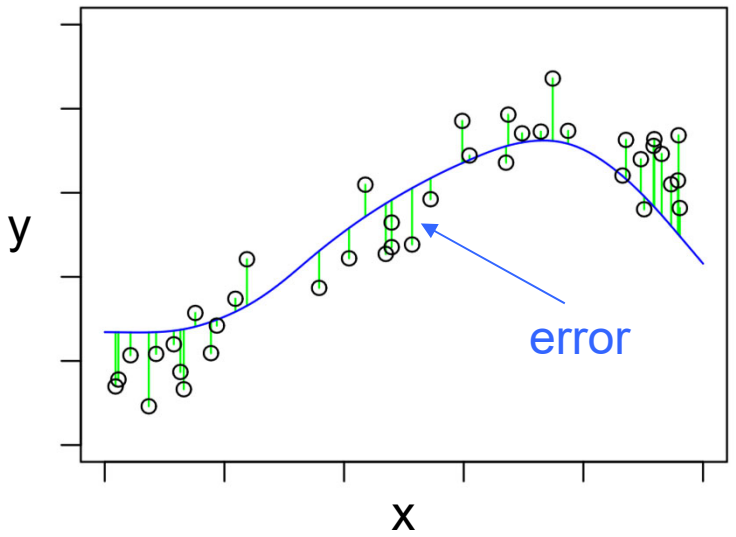
- 02_2_ants_cv_polynomial.R

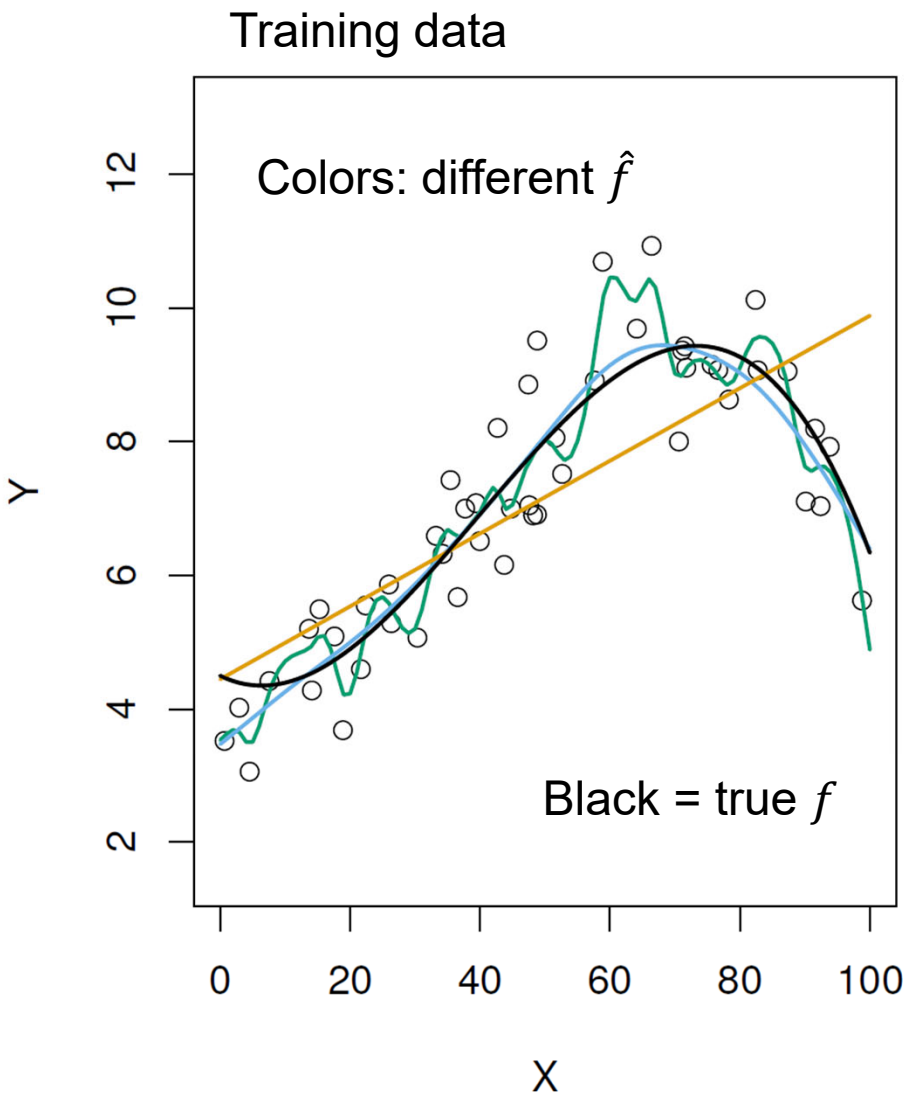
Bias-variance tradeoff

$\hat{f}$ fitted on training data

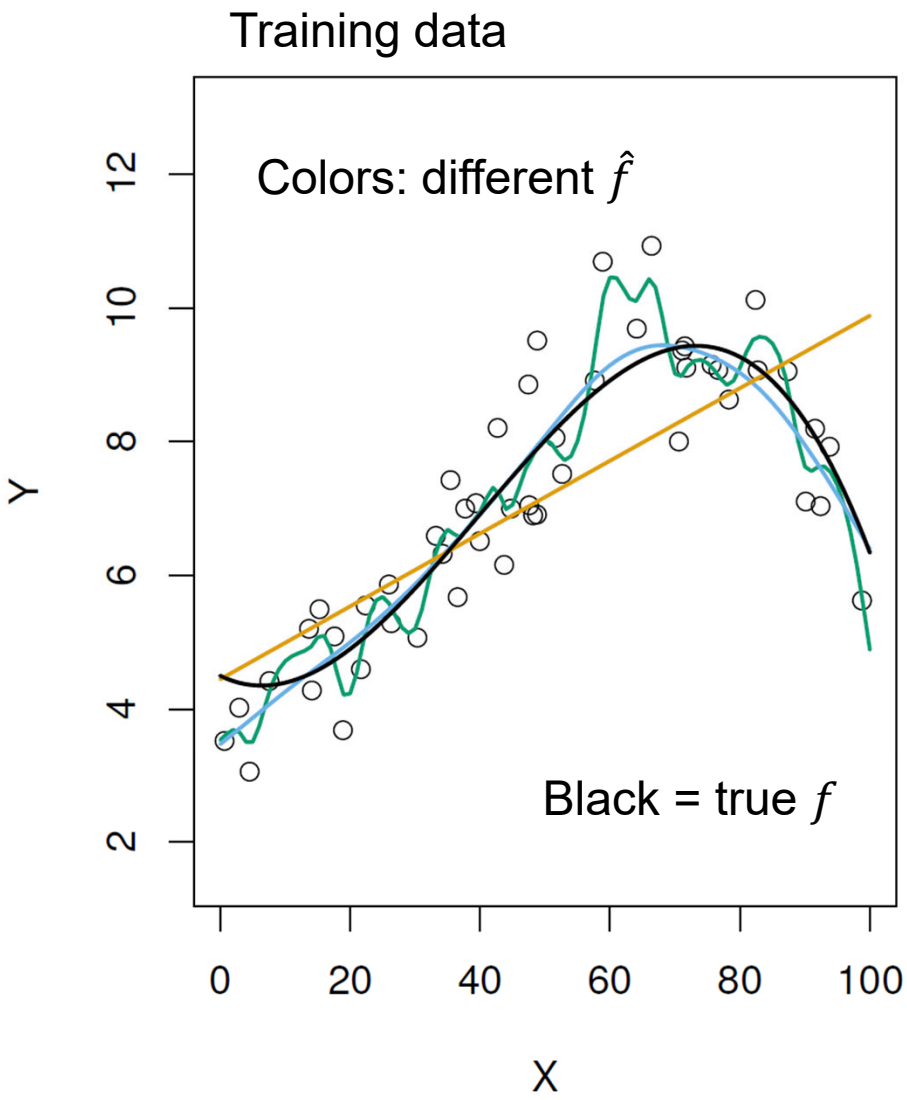


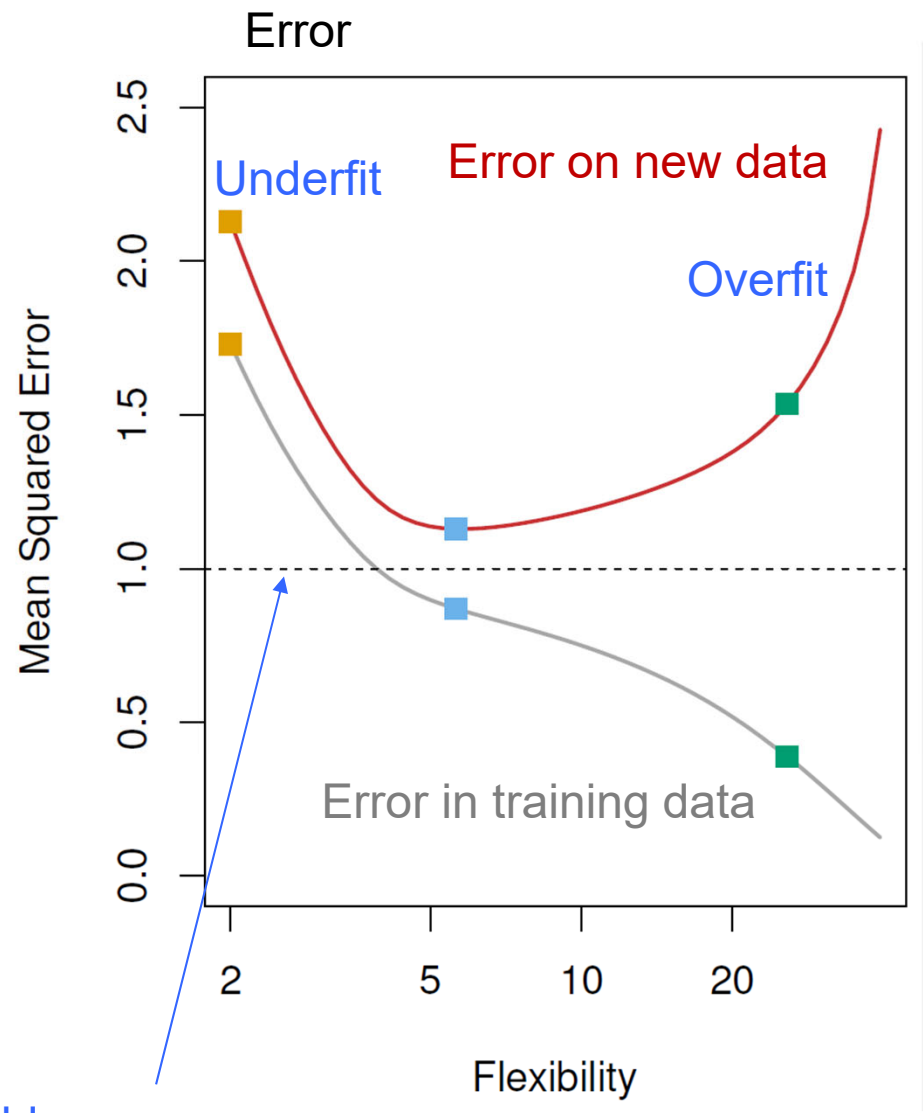
$\hat{f}$ predicting new data





Amount of "wiggliness" in $\hat{f}$





Goal: balance underfit and overfit

Bias-variance tradeoff

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

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

Average deviation of $\hat{f}$ from true f

Irreducible error

Bias-variance tradeoff

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

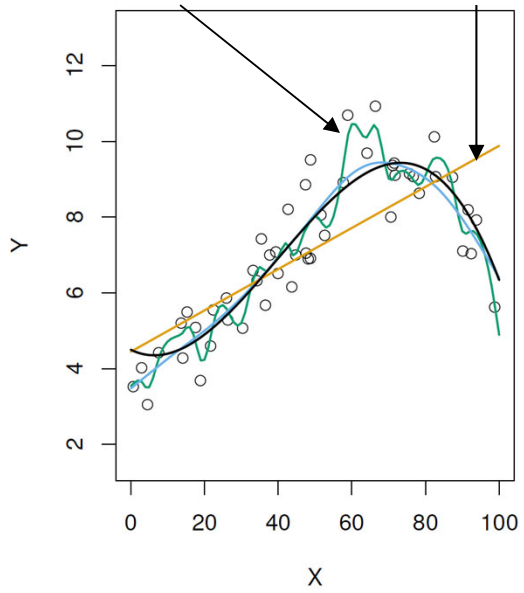
Amount $\hat{f}$ would change if fitted on different data

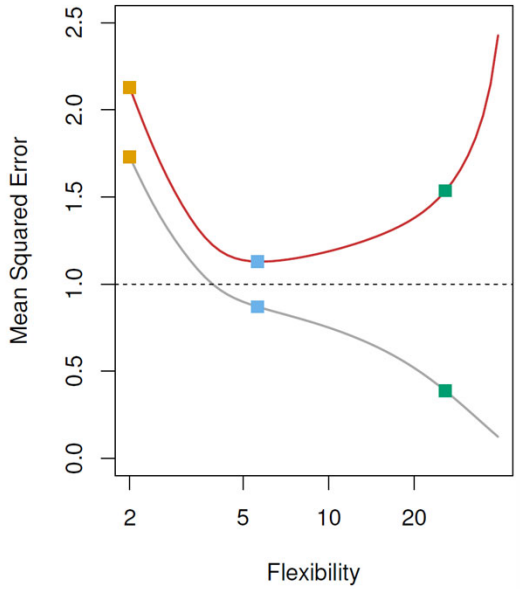
Average deviation of $\hat{f}$ from true f

Irreducible error

High variance

High bias





Bias-variance tradeoff

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

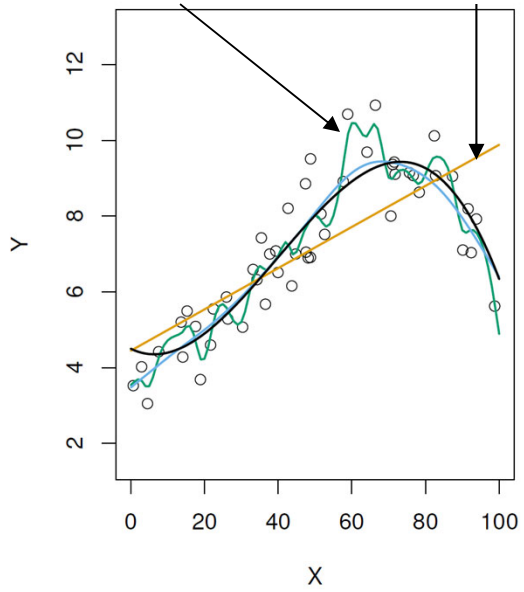
Amount $\hat{f}$ would change if fitted on different data

Average deviation of $\hat{f}$ from true f

Irreducible error

High variance

High bias



High bias

High variance

Sweet spot:
low variance
low bias