Model selection

- Two basic approaches
  - Hypothesis tests
    - Forward selection, backward selection
  - Predictive performance
    - emphasized in machine learning
    - basis for xIC (AIC, BIC, DIC, WAIC, etc)
- Code for the ant dataset

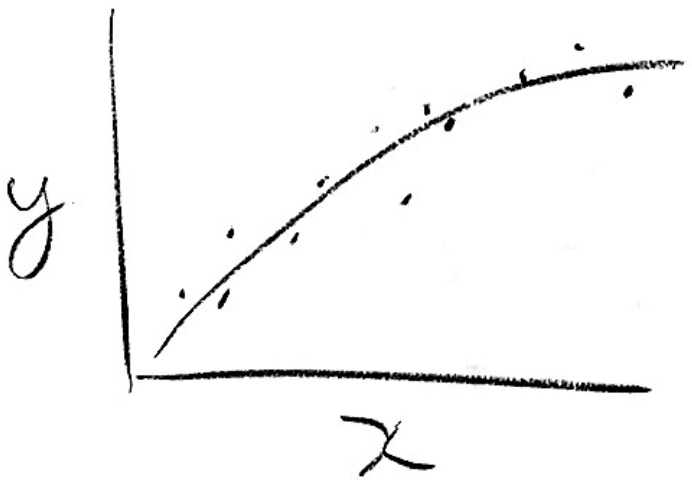
  14_2_ants_modselect.R

  14_2_ants_modselect.md

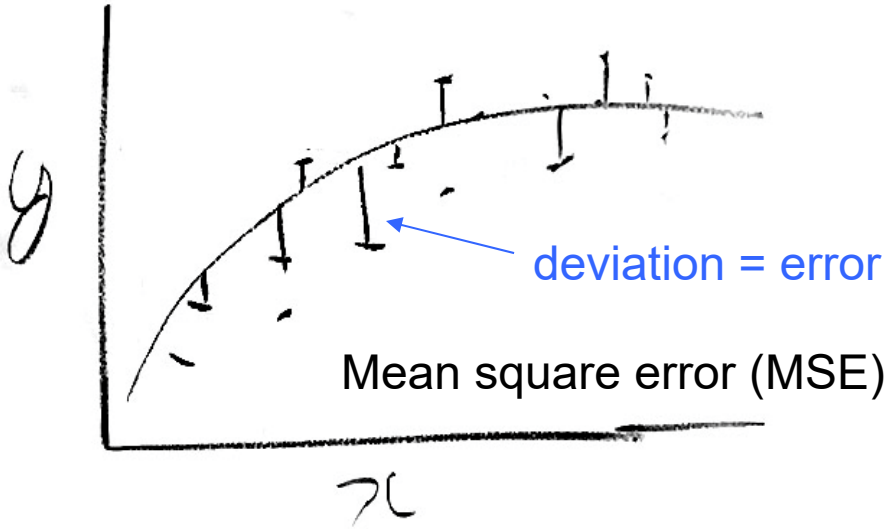
Predictive performance

Basic idea: out-of-sample validation

Fit model to training dataset

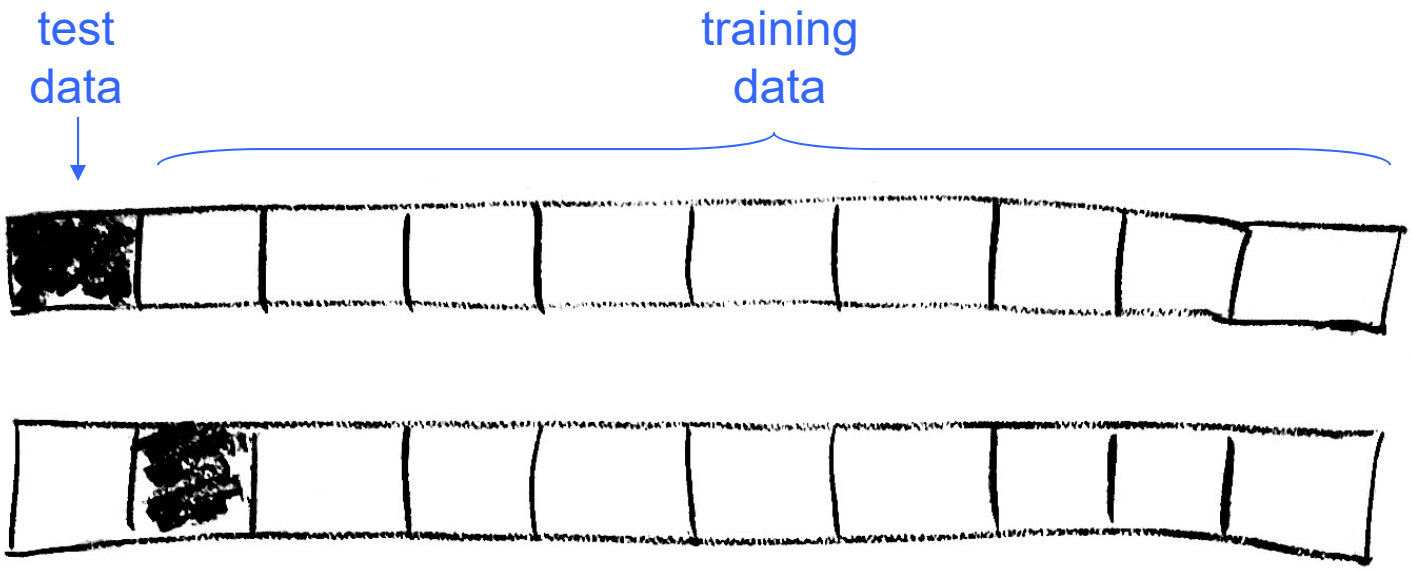


Test model on validation dataset



k-fold cross validation (CV)

Divide dataset into k parts (preferably randomly)



... repeat with each test subset

Leave-one-out cross validation

- LOOCV
- = k-fold CV for k = n

Algorithm

for each data point

    fit model without point

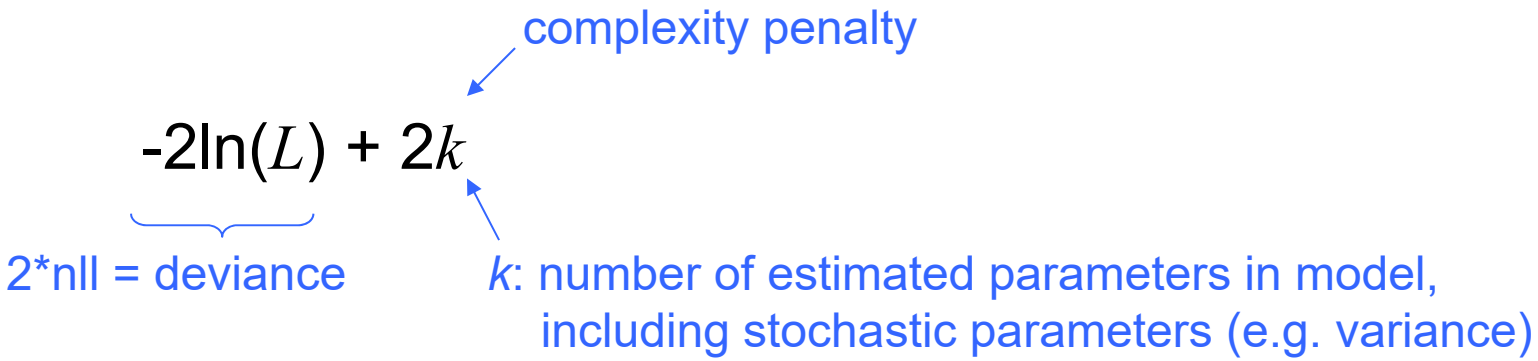
    predict for that point

    measure prediction error (compare to observed)

CV_error = mean error across points

Information criteria

- AIC
  - frequentist LOOCV asymptotically



Information criteria

- AICc
  - finite sample correction

$$\mathrm{AIC}_c = \mathrm{AIC} + \underbrace{\frac{2k(k+1)}{n-k-1}}_{\text{finite sample correction}}$$

n: number of data points
k: number of estimated parameters (including stochastic, e.g. variance)

Information criteria

- WAIC
  - widely applicable information criterion
  - Bayesian LOOCV asymptotically
- LOOIC
  - leave-one-out information criterion
  - Bayesian LOOCV for finite samples
  - loo() function (knows what to do with rstanarm objects)