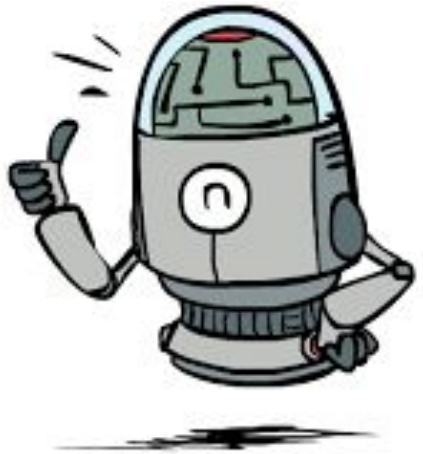
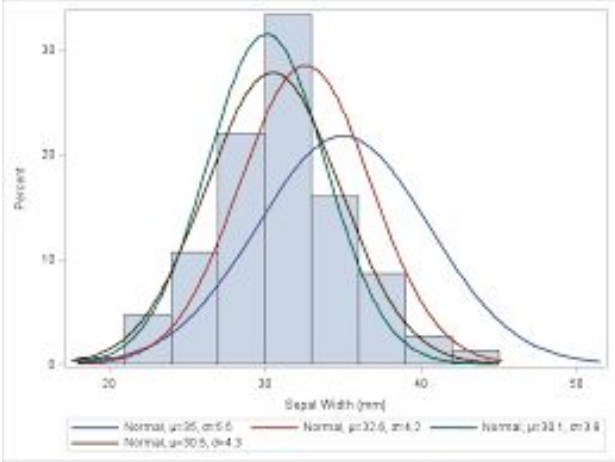
CS 188 Discussion 6b



MLE, Naive Bayes

Maximum Likelihood Estimation

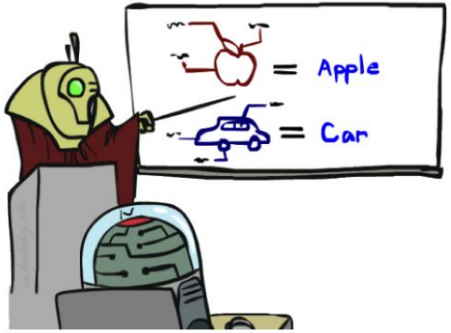
- What value *x* would give our observed sequence of values the highest probability of occurring?
    1. Compute likelihood function
    2. Take the natural log to simplify calculations
    3. Take the derivative
    4. Set derivative to 0 and solve for x



Surface Level Intro to ML

- Generally, ML is the field of constructing and/or learning the parameters of a specified model given some data
- Two main divisions of ML algorithms
  - Supervised Learning
    - Regression Models
      - Linear Regression
    - Classification Models
      - Logistic Regression
      - Naive Bayes
      - Perceptrons
      - Neural nets (usually)
  - Unsupervised Learning

Surface Level Intro to ML



(a) Training

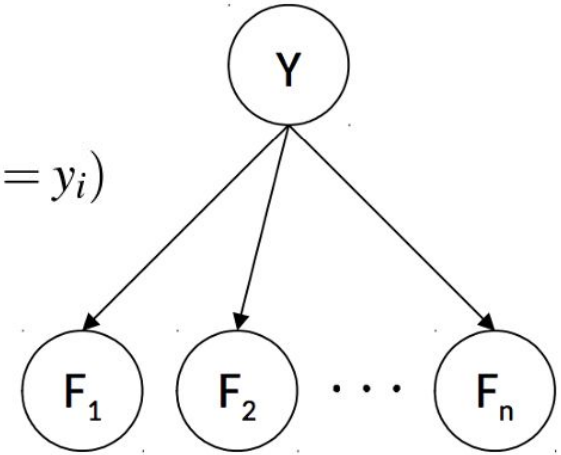
(b) Validation

(c) Testing

- Use feature engineering to create more predictive features
- Be careful of overfitting

Naive Bayes

- Basic classification model that assumes features are independent of each other given class label
- $prediction(F) = \underset{y_i}{\text{argmax}}\ P(Y = y_i) \prod_j P(F_j = f_j | Y = y_i)$
- $\theta = \frac{1}{N_h} \sum_{j=1}^{N_h} f_i^{(j)}$ $\quad \theta = P(F_i = 1 | Y = ham))$



- How do we deal with overfitting?
  - Laplace smoothing
    - with strength k, assumes having seen k extra of each outcome
    - $P_{LAP,k}(x|y) = \frac{count(x,y) + k}{count(y) + k|X|}$

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