Quantitative Methods and Machine Learning

Events and Probabilities

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Conditional Probabilities

- Recap: what is a probability?
- What is a probability distribution?
- Vs joint probabilities
- Events that depend on each other, independence assumption

Bayes Rule

- Derivation of Bayes rule, starting from conditional probabilities
- Significance of Bayes Rule
- Instantiations of Bayes in NLP: speech recognition, tagging, machine translation (…)

Naïve Bayes

- Classification based on Bayes Rule
- What exactly is naïve about it?
- Independence of events
- Breaks down easily, since real-world events are related quite often
- Similar, in NLP: markov assumption

Chain Rule for Probabilities

- Again, derive from conditional probabilities
- Does this work for events that are not independent?
- Work through example

Sampling, Maximum Likelihood Estimation

- Why MLE to estimate parameters of a model?
- Assumptions about the distribution of the whole population / data set
- Work through NLP example

Sparse Data

- Representativeness of Samples, relationship with sample size
- Sparseness
- Zipf's law
- How to guard against potential problems with the resulting model