Goals of CSE 150

- Probabilistic reasoning under uncertainty
- How to discover compact representations of complex world?
- Balance power/expressiveness of model vs computational tractability

1. Noisy-OR CPT
   ![Noisy-OR CPT diagram]

2. Naive Bayes (doc. classification)
   ![Naive Bayes diagram]

3. Markov models of language
   \[ w_2 = l^{th} \text{ word in sentence} \]
   - Unigram
     \[ w_1 \rightarrow w_2 \rightarrow w_3 \rightarrow \ldots \]
   - Bigram
     \[ w_1 \rightarrow w_2 \rightarrow w_3 \rightarrow \ldots \]
   - Trigram
     \[ w_1 \rightarrow w_2 \rightarrow w_3 \rightarrow \ldots \]

4. HMMs for speech recognition
   ![HMMs for speech recognition diagram]

5. MDPs for planning
   ![MDPs for planning diagram]

- What are efficient algorithms for automated forms of intelligence:
  - reasoning, decision-making, ...

1. Conditional independence tests
   via \( d \)-separation
   ![Conditional independence tests via \( d \)-separation diagram]

2. Polytree algorithm for inference
   ![Polytree algorithm diagram]

3. EM algorithm for maximum likelihood estimation w/ guarantees of monotonic convergence
   ![EM algorithm diagram]

4. Dynamic programming in HMMs
   - Viterbi alg.
   - Forward/backward alg.

5. Algorithms in MDPs
   - Policy iteration
   - Value iteration