Lecture 30: Revision Lecture (Part 3)

A Min-Max Guide to the Third Part of Inf-2D

AKA: "What skills should you now have?"

Can you Represent a JPD?

- Independence
  - Absolute Independence
  - Conditional Independence (At the extreme? Naive-Bayes)
  - Context-Specific Independence (e.g., the "Noisy-OR" assumption)
- Bayesian Networks
  - Definition and Representation
  - Numerical Representation (CPDs, Factoring a Joint Query)
  - Toplogical Represenation (The DAG, Non-Descendants, Markov Blanket)

Can you Do Probabilistic Inference?

- Probability, Bayes Rule, Kolmogorov's Axioms
- Exact Methods
  - Inference by "Looking up the Table"
  - Inference By Enumeration (Marginalization and Normalization)
  - Variable Elimination Algorithm
- Approximate Methods
  - Why do we need them? (Complexity)
  - Rejection Sampling
  - Likelihood Weighting
  - (A rough idea of...) Markov Chain Monte-Carlo / Gibb's

Can you deal with Time?

- What is a temporal model?
  - Graphical Representation
  - Assumptions (Stationary Process, Markov Assumption)
  - HMM Matrix Representation
- Query Types
  - Filtering/Monitoring
  - Prediction
  - Hindsigh/Smoothing
  - Most Likely Explanation
  - Evidence Likelihood
- Forward-Backward Algorithm (Message Passing)
- Dynamic Bayesian Networks
  - Representation
  - Inference
  - Modelling "Failure"

Can you make a Decision under uncertainty?

- Axioms of Preference
- What is a Utility Function
- The Expected Utility Equation
- Planning the best action using a Decision Network

Can you make a sequence of decisions under uncertainty?

- What is an MDP?
- Difference between reward $R(s)$, utility of a sequence $U_h(s_0, s_1, \dots)$ and "value" of a state $U^\pi(s)$.
- How does changing R / γ, T, etc., affect the optimal π?
- Value Iteration...maybe

Exam: Format and Qs

⟨ Switch to paper ⟩