Final Review

CMPT 310
Review

What did we learn this semester?
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Search problems
  - methods for solving
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Logic and probability
  - logic can generalize, but not good for representing uncertainty
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Learning
  - how to build agents that learn from experience
What to do next?

♦ 411 - Knowledge Representation (Delgrande)
♦ 412/414 - Computer Vision (Funt, Drew, Li, Mori)
♦ 413 - Computational Linguistics (Sarkar, Popowich)
♦ 418 - Computational Cognitive Architecture (Hadley)
♦ 419 - Game Theory (Schulte)
♦ 419 - Machine Learning (Mori, Schulte, Sarkar)
Final Exam Format

Approximately 10 questions (with subparts)
- Same format as midterm, but longer
- Allowed cheat sheets, 2 single-sided pages (8.5” x 11” each)
- Bring a calculator

Two broad types:
- Apply algorithm A to problem P (denoted by $A$)
- Discuss tradeoffs / assumptions / relative merits of algorithms / problem formulations / models (short answer)

Exam is Sat. Dec. 6 12:00-15:00
- I will be away at a conference
- Prof. Richard Vaughan will proctor the exam
Intelligent Agents

- Definitions of AI
- Rationality
- Environment types
- Agent types
Search

♦ Understand different problem types and strategies for solving each of them

♦ Naive search algorithms, tradeoffs and advantages/disadvantages of each (A)

♦ Heuristic search algorithms, why and how they work, advantages/disadvantages (A)

♦ Iterative improvement algorithms (hill climbing)
Constraint Satisfaction Problems

♦ Relationship to search problems
♦ Heuristics for solving
♦ Apply heuristics to problems (A)
♦ Algorithm for arc consistency (¬ A)
Game Playing

- Minimax search (A)
- $\alpha-\beta$ pruning (A)
- Apply these algorithms to game trees
Propositional Logic

◊ Models and entailment

◊ Inference algorithms
  – Enumeration
  – Forward/backward chaining (¬ ∧ A)
  – Resolution proof

◊ Horn clauses
First Order Logic

◊ Models and interpretations

◊ Write sentences in FOL (A)

◊ Actions
  – Situation calculus
  – Frame problem
  – Successor-state axioms
Uncertainty

◊ Probabilities, conditional probabilities, random variables

◊ Normalization via $\alpha$ constant

◊ Independence and conditional independence: reducing size of joint probability distribution

◊ Bayes’ rule

◊ If you can do question 16.11 that’s all you need in terms of algorithms
Bayesian Networks

♦ Constructing Bayesian Networks
♦ Joint distribution represented by a BN
♦ How to represent conditional distributions: Gaussian, Linear Gaussian, Sigmoid
♦ Methods for inference: enumeration, stochastic simulation (¬ A)
Temporal Probability Models

♦ Hidden Markov Models
♦ Filtering (A)
♦ Most likely explanation (Viterbi) (A)
Rational Decisions

◊ Utilities

◊ Value of information ($A$, not really an algorithm, but a formula)

◊ Again, knowing how to solve problem 16.11 is enough
Learning

♦ Generalizing from a set of examples (inductive learning)
♦ Issues: consistency vs. simplicity (Ockham’s razor)
♦ What is a decision tree?
  – How do we build one from a set of examples? (A)