CSC384h: Intro to Artificial Intelligence

- Course Review for Final Exam
  - Search
    - Uninformed search UCS, BFS, DFS, IDS
      - Understand how they are implemented and their properties.
      - The tradeoffs between them (which one should be used in which context)
      - e.g., if we want shortest length paths, lowest cost paths, when we are worried about space more than time.
    - Cycle Checking—path vs. full cycle checking
    - Heuristic search, greedy and A*.
      - Properties of A* and heuristics. E.g., admissible heuristics, admissible heuristics imply that A* will find an optimal solution.
  - No proofs on the final (except for resolution refutations)

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Review

- Game Tree Search.
  - min-max strategies, and computing them with the alpha-beta algorithm
  - how alpha-beta helps to reduce the size of the search tree.
  - how alpha-beta can be used with depth-limited search and heuristics
  - Expectimax search

Review

- CSPs and backtracking search algorithms for solving them
  - Understand the CSP representation
    - Variables, constraints.
    - intuitions about how a problems can be represented in the CSP formalism
  - Backtracking search
    - How it works.
    - How constraint propagation works in Forward Checking.
    - How constraint propagation works in GAC.
      - Know how to enforce GAC on a set of constraints.
    - How heuristics like MRV can be used to improve the efficiency of search
      - Variable and Value ordering.

Review

- Uninformed Search, Heuristic Search, Game Tree Search, and Forward Checking were tested on the midterm. So these topics will be slightly less weighted than the topics covered after the midterm.
  - However, there will be some questions on these topics so if you want to get a good mark on the final you need to be familiar with these topics.

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Review

- Bayes Nets
  - Understanding of the probability model
    - Atomic event are the set of instantiations to all of the variables
    - How independence and conditional independence work in this model ("variable independence" over all values of the variables).
    - Using the values of a variable in the summing out rule.
    - How probabilities can be used to compute expected utilities.
  - The Bayes Net model and its product decomposition
  - Using Variable elimination to compute the probability distribution of a query variable given a set of evidence (i.e., vectors of the form P(Q|E1 = a, E2= b, ...)

Review

- Bayes Nets
  - How different ordering of the variables determine the complexity of VE.
    - The idea of elimination width—the complexity of the best possible ordering of the variables
    - The min-fill heuristic for selecting the variable ordering for VE
    - How multiple queries can be made more efficient by using similar variable orderings and thus reusing computed factors.
  - How relevance marking can be used to improve the efficiency of VE.
  - Independence in a Bayes net.
    - The fundamental independence: Every variable is independent of its non-descendants given its parents.
    - D-separation and how we can it to compute variable independencies implied by a Bayes-Net structure
      - The notion of explaining away
  - How to generate samples in a Bayes net using a table of random numbers drawn from the uniform distribution over [0,1]
    - Both rejection and likelihood weighting

Review

- Hidden Markov Models
  - The update rules and the intuition behind the update rules.
  - How particle filtering works—the elapse time and observe evidence using weighting and resampling

Review

- Knowledge Representation
  - Intuition about the meaning of logical sentences.
    - Translating English to Logic.
    - Translating Logic to English.
  - Converting to clausal form
  - Computing MGUs
  - Doing Resolution Refutation proofs
    - With the proper notation, e.g.,
      4. R[1a,2b]{X=a}
      ➔ clause #4 is produced by resolving a'th literal of clause #1 against the b'th literal of clause #2 using the MGU {X=a}
    - To answer yes/no questions
    - To answer questions involving answer extraction.