

CPSC 625 Midterm Review: Overview

- AI basics
- Search as a problem solving strategy
- Game playing
- Propositional logic
- No Lisp questions.

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Uninformed Search

- Description of a search problem: initial state, goals, operators, etc.
- Considerations in designing a representation for a state
- Evaluation criteria
- BFS, DFS: time and space complexity, completeness
- When to use one vs. another
- Node visit orders for each strategy
- Tracking the stack or queue at any moment

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AI Basics

- Disciplines with ties to AI: think about how they did and would contribute
- What are the hard problems in AI? Why are they hard?
- Just read over the slides so that you have the general idea.

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Uninformed Search / Informed Search

- DLS, IDS, BDS search order, expansions, and queueing
- DLS, IDS, BDS evaluation
- DLS, IDS, BDS: suitable domains
- Repeated states: why removing them is important
- Constraint Satisfaction Search: what kind of domains? why important?

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Informed Search

- Best-first-search: definition
- Heuristic function $h(n)$: what it is
- Greedy search: relation to $h(n)$ and evaluation. How it is different from DFS (time complexity, space complexity).
- A^* : definition, evaluation, conditions of optimality
- Complexity of A^* : relation to error in heuristics
- Designing good (admissible) heuristics: several rule-of-thumbs

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Game Playing

- Game playing: what are the types of games?
- Minimax: definition, and how to get minmax values
- Minimax: evaluation

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Informed Search: Iterative Improvement Algorithms

- IDA^* : evaluation, time and space complexity (worst case)
- What is a dominant heuristic and why is it better?
- Hill-climbing basics and strategies
- Beam search concept
- Simulated annealing details: core algorithm, effect of T and ΔE , source of randomness.

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$\alpha - \beta$ Pruning

- $\alpha - \beta$ pruning: the algorithm, rationale, and why it saves time
- $\alpha - \beta$ pruning algorithm: know how to apply pruning
- $\alpha - \beta$ pruning properties: evaluation
- Games with an element of chance: what are the added elements? how does the minmax tree get augmented?

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Logic

- Propositional Logic: basic laws
- First-Order Logic: basic laws
- Inference rules: what is inference, basic inference rules
- Limitation of propositional logic

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Logic: First-Order Logic Specific

- Representing relations in predicate calculus: domains,
- Interpretation in predicate calculus: what is an interpretation and how it related to a domain. When is an interpretation true or false.
- prenex normal form: why it is useful, how to convert to, the basic rules used in conversion
- skolemization: why it is useful, how to do it

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Logic: Normal Forms and Theorem Proving

- Normal forms: definitions, know how to convert, applying basic laws and inference rules.
- Theorem proving: basic approaches. forward and backward chaining concept, and resolution.

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More FOL

- substitution and unification: why are these necessary and how to do them.
- unification algorithm

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General Rule-of-Thumb

- Get used to basic concepts (representation of search problems, game playing basics, propositional and first-order logic constructs and rules)
- Try not to blindly memorize **what's there**, try to understand **why/how something works or does not work**:
 - example: time and space complexity of search strategies, alpha-beta pruning.
- Try out the exercises done in the class, and the homework.
- Try out exercises in the textbook related to the material presented in the lectures.
- Try out the past exam.
- Laws of logic will be provided with the exam.