

CPSC 625 Midterm Review: Overview

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

1

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

3

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.

2

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?

4

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

5

Game Playing

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

7

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.

6

$\alpha - \beta$ 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?

8

Logic

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

9

Logic: Resolution

- Given a theorem to prove, know how to convert it into a form suitable for resolution.
- Know how to do resolution in propositional logic
- Know how to do resolution in first-order logic

11

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.

10

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.

12