CIS 630 Midterm Review Sheet

Scope of Midterm exam:

The midterm covers the following chapters

$$[1 - -7]$$

plus several handouts in lectures. As we mentioned in the early beginning of the class, it is very important to follow the lectures and take notes for materials studied in blackboard.

The midterm exam consists of two parts.

The first part is about 10 short questions of multiple choices. This is to test some key concepts. The multiple choices are often designed to compare various similar concepts or algorithms. Therefore it is a good idea to have a comprehensive study of the theories and algorithms beyond memorizing the materials.

The second part may have 3 long questions that test some in-depth understanding of the problems and algorithms. The questions will be similar to those in homeworks.

Key Concepts that you need to master

1. Introduction and problem formulation

    - What are the AI definitions along the two dimensions? what are the weak and strong positions of AI?
    - What are intelligent behaviors?
    - What are physical symbol system hypothesis? sub-symbolic processing? symbol grounding problem? embodiment problem?
    - What are the three levels of AI study by David Marr?
    - What is a Turing test?
    - Be familiar with terminology: search space, objects/states, operators, goals, metric. This leads to graph representation.
    - Terminology with a search graph: tree, branching factor, depth, path, parents, children.

2. Uninformed Search

    - How to maintain Open and CLosed lists?

- How to operate the two lists to search on a graph (not a tree) and to extract the found path?
- What are DFS, BFS, Iterative deepening search?
- How to measure the time and space complexities of these algorithms?
- What is it meant to be asymptotically optimal in time or space?

3. Heuristic Search

- What are $f(), g(), h()$?
- How to operate an A^* algorithm?
- What is the relationship between heuristic search and uninformed search etc. A big diagram of algorithms.
- What are definitions for admissibility? being more informed?
- What are the sufficient conditions for these properties? respectively?

4. Adversarial Search

- What are MIN and MAX nodes? What do they represent?
- What are static and backed-up values? MIN and MAX values?
- What are the α and β values?
- What are the α and β cuts?
- What are the MIN-MAX search and $\alpha - \beta$ search?
- How much does a $\alpha - \beta$ search improves in space and time complexity in general?

5. Optimization Search

- What is the goal and problem formulation here?
- What are local and global optima respectively?
- What is a hill-climbing (gradient) search?
- What is a genetic algorithm? a generation? a genotype?
- What are the steps in a genetic algorithm?
- The Gibbs sampler is optional (see lab2).

6. Propositional Calculus

- What is the goal of inference ?

- What are perfect and imperfect knowledge?
- What the three components in propositional calculus?
- What are the two normal (canonical forms) for well formed formula?
- What is a proof procedure?
- What are the definition of SOUND and COMPLETE for a set of inference rules?