**CSCI 3202**
**Midterm Study Guide**
**October 3, 2024**

**Overview**

- All work must be yours alone
- We will be logging your Canvas activity during the exam

**Structure**

- Exam is approximately 100 points and is 15% of your grade
- Consists of:
  - Definitions (5-10 questions)
    - Written out in Canvas
    - What is completeness?
  - Multiple choice questions (5-10 questions)
    - Similar to Quizzes
    - Many examples already
  - Short answer (5 questions)
    - Want 1-3 sentences
    - How does A* differ from UCS?
  - Work it out (5 questions)
    - Written on paper
    - For the following diagram, use BFS to create a path from the source to the destination. Show all of the steps in creating your path similar to how we did it in class, including your Frontier, Reviewed States and Nodes Expanded.
- You will need a calculator or other way to calculate numeric answers

**Topics**

- Agents
  - What are agents?
  - What do they do?
  - How do you completely specify an agent?
- States
  - What is a state space?
  - How do we store information about a state space?

    - How do we convert a state space into a decision tree?
- Uninformed Methods
    - What is an uninformed method?
    - What is the Frontier?
    - Why do we keep a Reviewed States List?
    - When do we expand a node
    - Breadth first search
        - Advantages and Disadvantages
        - Completeness, Optimality, Memory Usage, Time Used
        - Work an example on paper
    - Depth first search
        - Advantages and Disadvantages
        - Completeness, Optimality, Memory Usage, Time Used
        - How is the Frontier different from BFS?
    - Uniform cost search
        - Where does the cost come from?
        - Why do we use the path cost and not just the step cost?
        - When do we stop expanding nodes?
        - When do we replace a cost value in the frontier?
        - Advantages and Disadvantages
        - Completeness, Optimality, Memory Usage, Time Used
        - How is the UCS different from BFS?
        - What happens if all of the cost functions in UCS are equal?
        - Work an example on paper
- Informed Methods
    - What is an informed method?
    - Heuristics
        - What is a heuristic?
        - Why do we use one?
        - How do we create one?
        - What are the properties of a heuristic?
        - Consistency
        - Admissibility
    - Greedy search
        - What is it?
        - Advantages and Disadvantages
        - Consistency, Optimality, Memory Usage, Time Used
    - A* search

        - When do we use A*?
        - Advantages and Disadvantages
        - Consistency, Optimality, Memory Usage, Time Used
        - How is A* different from UCS?
        - What happens when we have a perfect heuristic?
        - Work an example on paper
- Bayes Networks
    - Bayes Rule
        - What is it
        - How do we use it
    - Conditional Independence
        - Compared to complete independence
    - Joint Probability Density Functions
        - Compared to conditional probabilities
    - Summing out a variable
        - How do we do it
        - Why do we do it
    - Setting up a Bayes Network
    - Solving a Bayes Network
        - Using conditional probabilities
        - Using enumeration
        - How is enumeration different from using conditional probabilities?
        - For inference
        - For diagnostics
        - With no constraints
        - With constraints
    - Solve an inference problem
    - Solve a diagnostics problem
    - Create a spam filter for E-Mail

**Strategies**

- Chapter Summaries in our text for Chapters 2, 3, 4, 13 are an excellent place to start
- Review the quizzes in Canvas
- Make sure you understand and can apply the algorithms listed above
- You will need to show how an algorithm works by going through it with a simple example. Go through the examples we constructed in class and make sure you understand them

- The exam is designed to take about 45 minutes to complete. You shouldn't have to rush, but you will need to work quickly.
- If you get stuck, move on to another question then come back when you have a chance. Spend more time on the questions worth a higher number of points

**Questions?**