CSCE 580: Intr AI/ Trusted AI Prof. Biplav Srivastava, Fall 2025

Quiz 3 / Nov 11, 2025/ Instructions

- All the responses should be in your Github before ***the end of the class***. Submission will be in a folder called "**Quiz3"**.
- For questions/ clarifications, ask Instructor biplav.s@sc.edu and TAs vishalp@email.sc.edu, kausik@email.sc.edu.

Total points = (10 + 70 + 20) = 100 points

Student Name:
Obtained =

The quiz is to test your understanding of concepts of search and CSP.

Q1: Search and Heuristics [2 + 2 + 2 + 4 = 10 points]
Instructions: Give your answers in bullet points.

a) What is an admissible heuristics ? [2 points]

b) Suppose you are given "h = 0" as the heuristics for a problem. Is it admissible ? [2 points]

c) Suppose you are given "h = k" as the heuristics for a problem, where k is any number e.g., k=1? Can you say it is admissible ? [2 points]

d) You are given 3 heuristics: h1, h2 and h3 of which you are sure that one is admissible. Will h = min (h1, h2, h3) be admissible ? What can we say about h = max (h1, h2, h3) as admissible ? [2 + 2 = 4 points]

Q2: Using search for a practical problem [10 + 30 + 30 = 70 points]

Consider the missionaries and cannibals problem. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side, without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.

- **States**: In one representation, a state consists of an ordered sequence of three numbers representing the number of missionaries, cannibals, and boats on the bank of the river from which they started. Thus, the start state is (3,3,1).

- **Operators**: from each state the possible operators are to take either one missionary, one cannibal, two missionaries, two cannibals, or one of each, across in the boat. Thus, there are at most **five** operators.

- **Goal test**: reached state (0,0,0).
- **Path cost**: number of crossings.

a) Review the sample code provided at: https://github.com/biplav-s/course-ai-f25/tree/main/sample-code/future/search-missionary-cannibal

Q2.1 What state representation does it implement – express goal in it ? What search strategy does it implement ? [5 + 5 = 10 points]

Q2.2 Now change it to code a different search strategy of your choice. [30 points]

Q2.3 Run it on all the 6 testcases shown in tester program: https://github.com/biplav-s/course-ai-f25/blob/main/sample-code/future/search-missionary-cannibal/MCTester.ipynb .
[6 * 5 = 30 points]

Show code, solution and time

Q3: Formulating a search problem [15 + 5 = 20 points]

a) Consider the cryptanalyst problem:

```
      T  W  O
+     T  W  O
----------------------
    F  O U  R
----------------------
```

Where each character stands for a unique number in the range (0-9). Formulate it as a CSP.

What are the variables, their domains and constraints? [5 * 3 = 15 points]

b) Implement any of the non-search methods to simplify the formulation. Can we try to solve / simplify using node, arc or path consistency discussed in class? Show the closest you can come to a solution via pseudo-code? [5 points]