DA221: Introduction to Artificial Intelligence – Assignment 1

Submission Deadline: February 20th, 2025

Task: Read the research paper provided on the A* search algorithm and implement it in Python.

Paper Link: https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4082128

Your submission should include the following components:

(1) Code [6 marks]:
- **(a)** Implement the A* search algorithm following the structure described in the research paper. Your implementation should:
  - Be well-documented with comments explaining key steps.
  - Follow best coding practices (modular functions, clear variable names, appropriate error handling).
- **(b)** Construct a state-space graph for testing the algorithm:
  - The graph should have a minimum of 5 nodes and a maximum of 20 nodes.
  - Nodes should have meaningful connections with weighted edges.
  - The heuristic function should be well-defined and relevant.

(2) Visualization of Results [6 marks]:
- **(a)** Create a visual representation of the search process:
  - Show how the algorithm explores the search space step by step. Clearly illustrate the pathfinding process and the final optimal path.
  - Use appropriate visualization tools (networkx, matplotlib, etc.).
  - If possible, provide an animated representation of the search process.

(3) Two-Page Report [6 marks]: Prepare a well-structured two-page report that includes:
- **(a)** A brief overview of the A search algorithm* (concept, key properties).
- **(b)** A description of the heuristic function used in your implementation.
- **(c)** An example graph representation with nodes and edges.
- **(d)** The solution path found using A* search, illustrated with a diagram.

(4) Submission Guidelines [2 marks]:
- **(a)** Submit your Python code in a .ipynb (Jupyter Notebook) file.
- **(b)** Submit your report in PDF format (maximum two pages).
- **(c)** Clearly label all sections in both the code and report to enhance readability.
- **(d)** Cite any references used, including textbooks, research papers, or online resources.

Plagiarism & AI Usage Policy

- Plagiarism is strictly prohibited and will be checked using a plagiarism detection tool.
- AI-assisted tools (e.g., ChatGPT, Copilot, Copilot X, etc.) are not allowed for code generation.
- You may use documentation, books, and class materials for guidance, but ensure originality in your work.
- Any external sources used must be properly cited in the report.

Best of Luck!

Course Instructor: Teena Sharma, Ph.D.