Artificial and Computational Intelligence

Assignment 1

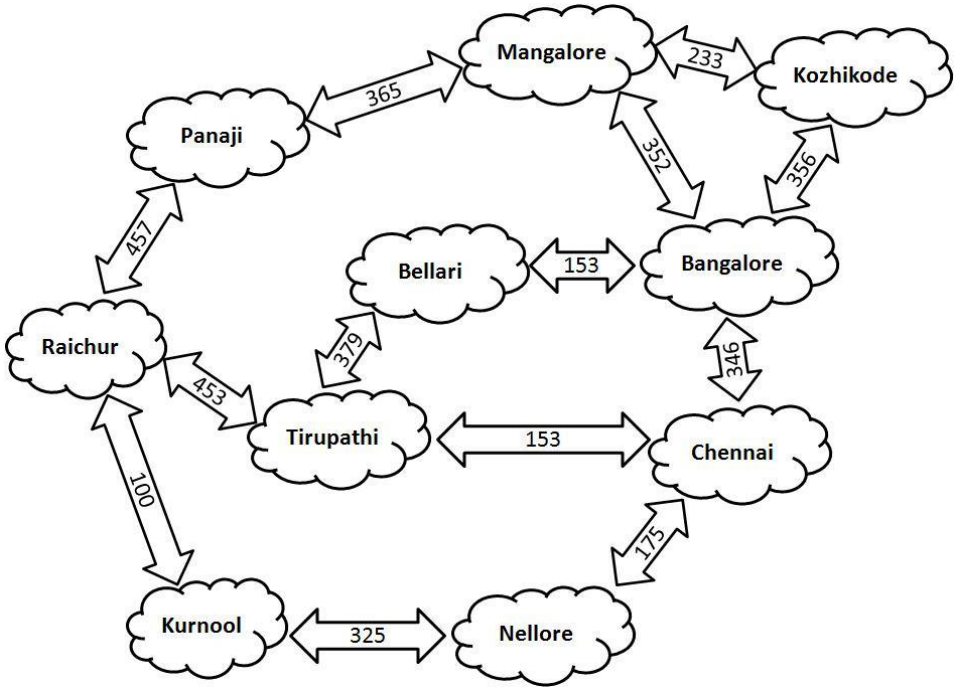
GPS Agent

Problem Statement:

Vyuha is a software engineer working in a MNC at Chennai, but she availed WFH option and, she is working from her native place, Panaji. Since the management issued a circular stating that all the employees have to work from the office. Now, she needs to come back to Chennai.

However, due to a mass movement of public, all flights from Panaji have been booked and she is left with the only option of road transport. Matters have been further complicated by some technical issue with Google maps making them unavailable for the time being.

Help her using your knowledge of informed search strategies. Create a search agent to find the most optimal path to reach Chennai. Below is a map of road connectivity between various cities.



Use the following algorithms to solve the problem:

1. **IDA***
2. **Hill Climbing Algorithm**

Answer the following:

1. Explain the environment of the agent [20% weightage]

2. Define the heuristic and or fitness function for the given algorithms and the given problem.

   You decide to use the 'haversine' formula to calculate the great-circle distance between two points – that is, the shortest distance over the earth's surface between two points. Using the below latitude and longitude data for the cities, create a function which calculates the heuristic distance from each city to the destination city (refer link https://www.movable-type.co.uk/scripts/latlong.html for more information on Haversine formula). [20% weightage]

City	Latitude	Longitude
Panji	15.4909° N	73.8278° E
Raichur	16.2076° N	77.3463° E
Mangalore	12.9141° N	74.8560° E
Bellari	15.1394° N	76.9214° E
Tirupati	13.6288° N	79.4192° E
Kurnool	15.8281° N	78.0373° E
Kozhikode	11.2588° N	75.7804° E
Bangalore	12.9716° N	77.5946° E
Nellore	14.4426° N	79.9865° E
Chennai	13.0827° N	80.2707° E

3. Use appropriate data structures and implement search algorithms (informed and local search) to find the path that covers all the city/node/ with shortest distance/cost in the city as provided in the graph. Your output should contain the path taken by the agent (e.g. Panji, Raichur, Kurnool, Nellore, Chennai) and the total cost incurred in taking that path. [40% weightage]

4. Find and print space and time complexity using code in your implementation. [20% weightage]

NOTE:

- You are provided with the python notebook template which stipulates the structure of code and documentation. Use well intended python code.
- Use separate MS word document for explaining the theory part [PEAS]. Do not include theory part in the Python notebook except Python comments.
- The implementation code must be completely original and executable.
- Please keep your work (code, documentation) confidential. If your code is found to be plagiarized, you will be penalized severely. Parties involved in the copy will be considered equal partners and will be penalized severely.