**Attainment Chart- Spatial Trajectory Generator**

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**Abstract**

Datasets of the same geographic space at different scales and temporalities are increasingly abundant, paving the way for new scientific research. These datasets require data integration, which implies linking homologous entities in a process called data matching that remains a challenging task, despite a quite substantial literature, because of data imperfections and heterogeneities. In this paper, we present an approach for matching spatial networks based on a hidden Markov model (HMM) that takes full benefit of the underlying topology of networks. The approach is assessed using the heterogeneous dataset, showing that the HMM algorithm is robust in regards to data heterogeneities and imperfections and adaptable to match any type of spatial networks. It also has the advantage of requiring no mandatory parameters, as proven by a sensitivity exploration, except a distance threshold that filters potential matching candidates to speed-up the process.

Keywords: spatial networks, data matching, data integration, topology, Hidden Markov model, HMM

**Problem Statement**

With the increase in geographical technology, the number of spatial networks is gradually increasing. So, it becomes more and more difficult for researchers, cartographers, historians to pinpoint the exact location and to work on such network topologies. The moment from one transition state to another is easy when the exact co-ordinates of the next transition states are provided. But, what about Traverse to the next location if the location is encoded? This project deal with such cases of transition in spatial networks.

**Objective**

It's time-consuming to find the traversing probability of a location from another location as there can be a single transition or multiple transitions from a state. So, using mathematical calculation we create a model to find an efficient way of transition between such states/locations.

4.1 Sub- Objectives: -

1. Design the Markov chains.

2. Find the Transition probabilities and matrix.

3. Find Emission probabilities.

4. Matching the spatial networks with the

5. Implement the Hidden Markov Model to find the next feasible transition.

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| **Steps:** | **Description** | **Finding** | **Objective Achieved** |
| 1 | Implementation of Markov Chains. | In this, we have created a 2D Array that stores the encoded states codes in the Row/Column Matrix. | Yes |
| 2 | Implementation of Forward algorithm. | According to the given sequence, the probability of likelihood is calculated. All the individual probabilities are summed and resultant probability is returned. | Yes |
| 3 | Implementation of Viterbi Algorithm | The initial, transition, emission probability are calculated using Viterbi. Unlike forward, it doesn't add up the probability instead it finds the maximum among the multiplication results and assigns to the Viterbi variable. | Yes |
|  | **Mentor Remarks** | | **Marks** |
| Roll Number 30 |  | |  |
| Roll Number 40 |  | |  |
| Roll Number 51 |  | |  |
| Roll Number 52 |  | |  |