DES535
Ubiquitous Computing

Dr. Pragma Kar
Assistant Professor
Department of Human-Centered Design

INDRAPRASTHA INSTITUTE *of*
INFORMATION TECHNOLOGY **DELHI**

Google Classroom Code : pcwnf5t

Location Sensing

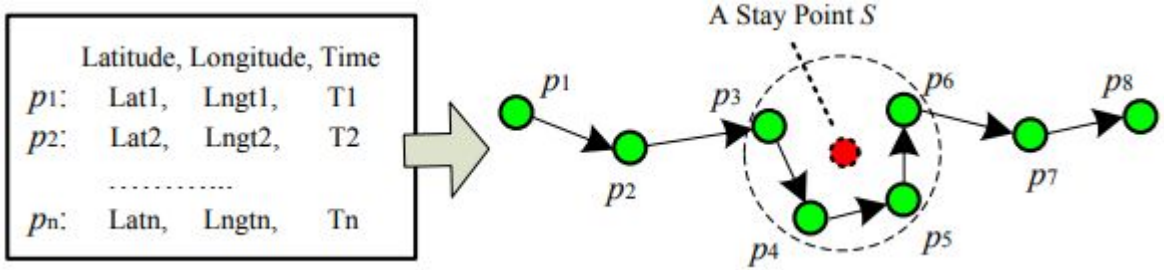
Module IV (Part II)

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories [Revision]

- Typically, people would desire to know which locations are the most **interesting places** in a geospatial region.
- Further, given these interesting locations in a geospatial region like a city, users might also wonder what the most **classical travel sequences** are among them.

https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-lbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZlIKrQ2H38hDSmCwXMpWs8

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories [Revision]

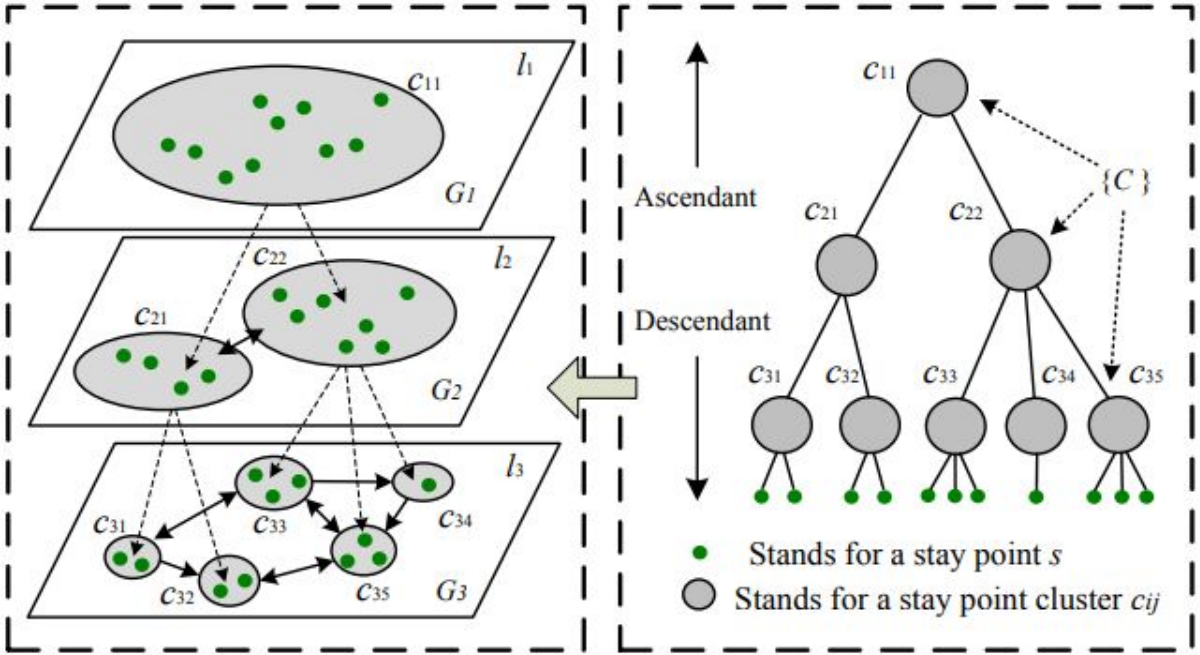


- **GPS log** is a collection of GPS points P={p1 , p2 , … , pn}
- On a two dimensional plane, we can sequentially connect these GPS points into a curve based on their time serials, and split this curve into **GPS trajectories**
- A **stay point** (S) stands for a geographic region where a user stayed over a certain time interval. The extraction of a stay point depends on two scale parameters, 4
  - a time threshold and
  - a distance threshold

https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-lbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZllKrQ2H38hDSmCwXMpWs8

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories [Revision]

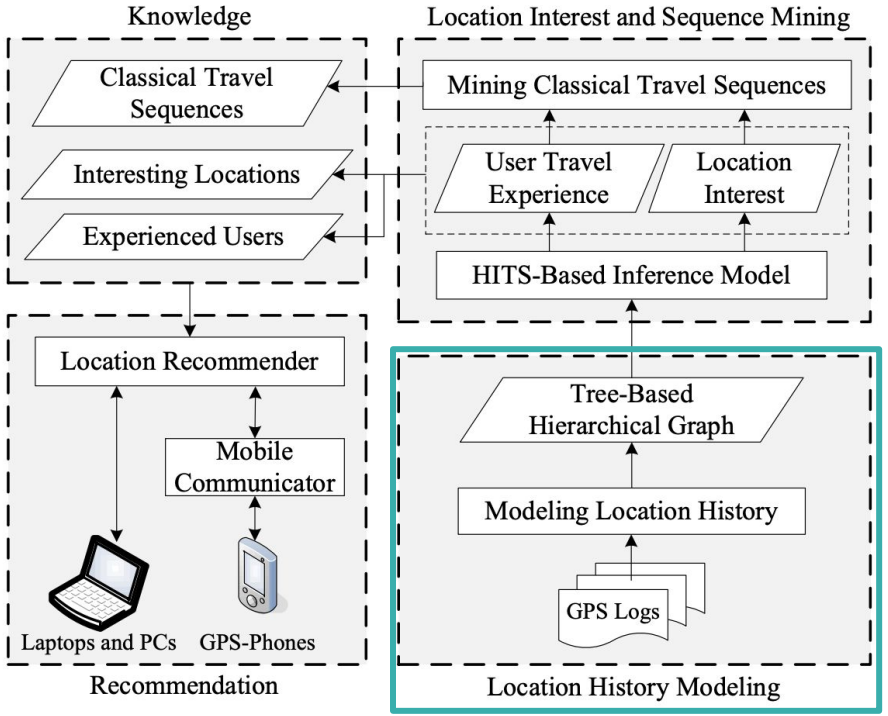
- A **location history** is a record of locations that an entity visited in geographical spaces.
- A **Tree-based hierarchical graph** is a collection of stay point-based clusters C with a hierarchy structure L



https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-IbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZlIKrQ2H38hDSmCwXMpWs8

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories

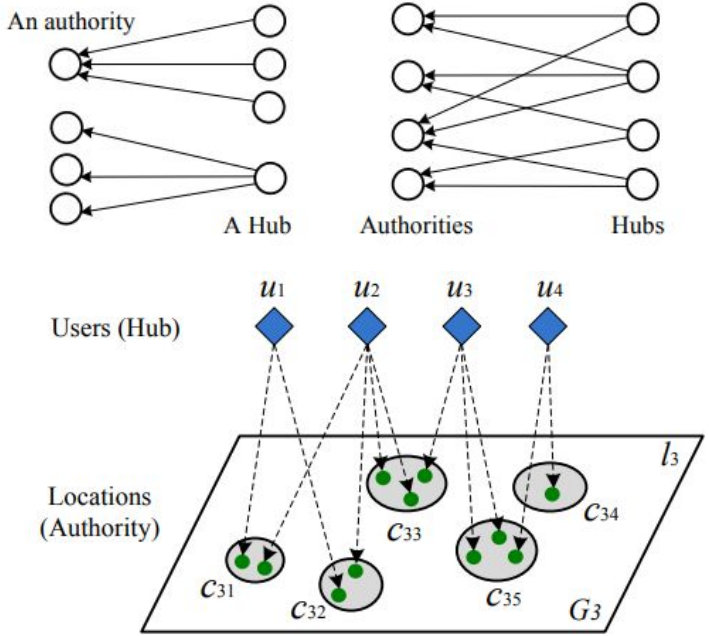
- **Location history modeling**:
  - Given multiple users' GPS logs, TBHG is constructed offline.
  - In this structure, a graph node stands for a cluster of stay points, and a graph edge represents a directed transition between two locations (clusters).
  - These clusters denote the locations visited by multiple users, hence would carry more semantic meanings, such as culturally important places and commonly frequented public areas.

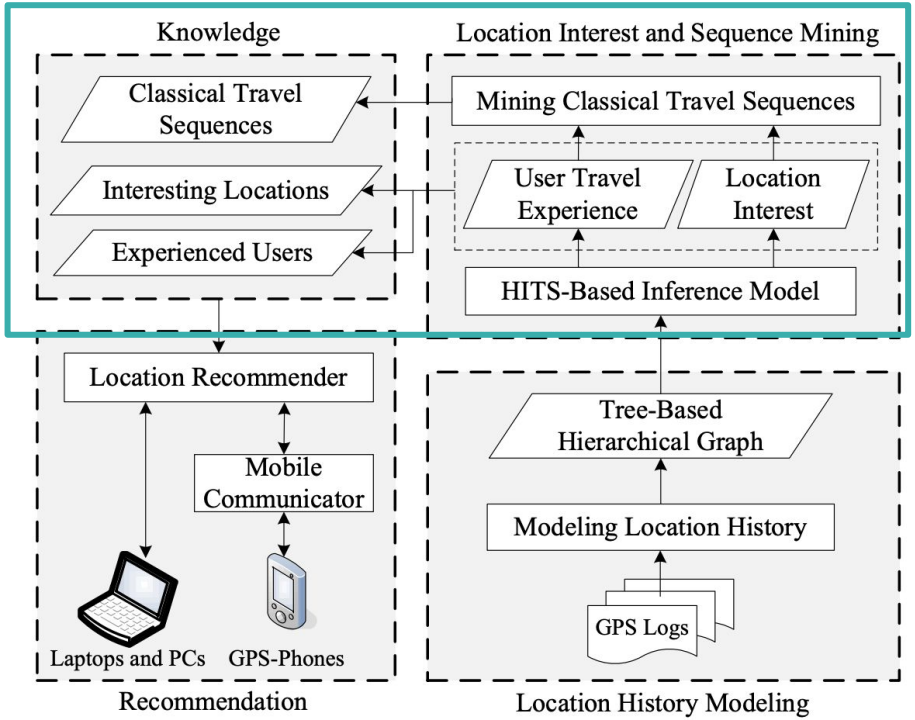


https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-lbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZlIKrQ2H38hDSmCwXMpWs8

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories

- **HITS-Based Inference**





https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-lbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZlIKrQ2H38hDSmCwXMpWs8

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories

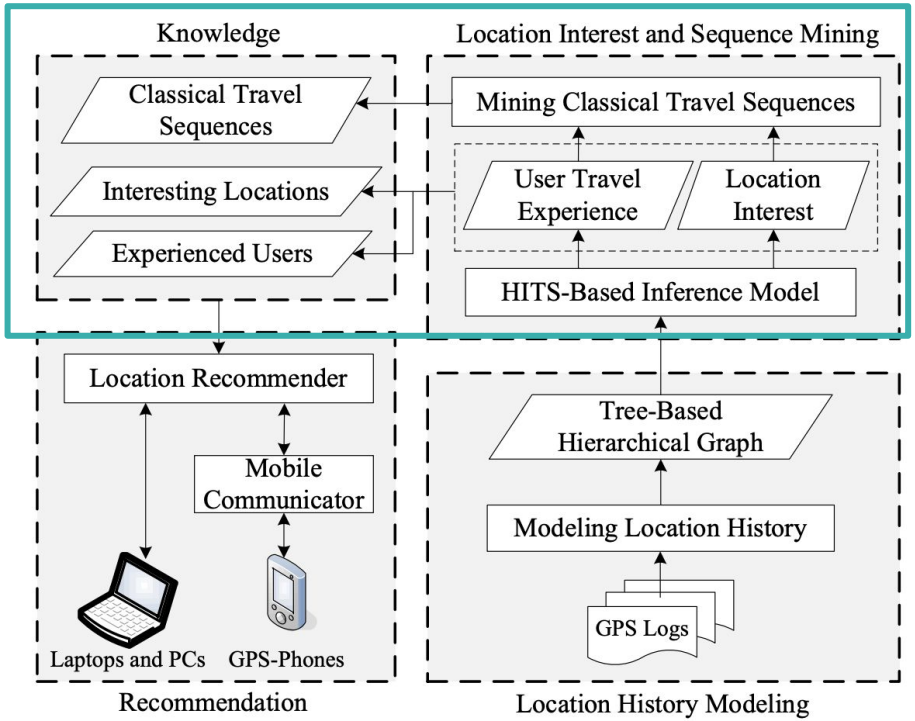
- **Mining Classical Travel Sequences**

With users' travel experiences and the interests of locations, the classical score for each location sequence within the given geospatial region is calculated. The classical score of a sequence is the integration of the following three aspects.

1) The sum of hub scores of the users who have taken this sequence.

2) The authority scores of the locations contained in this sequence.

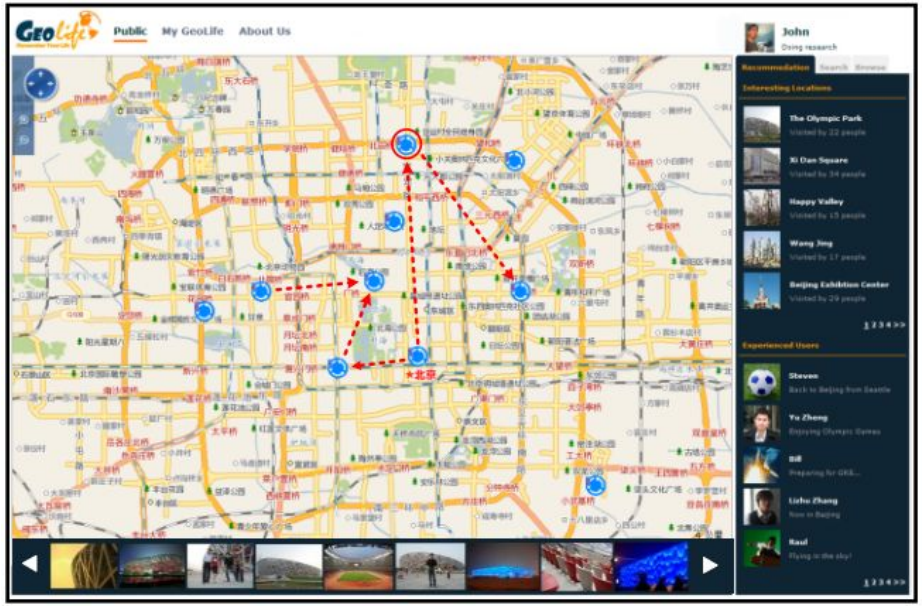
3) These authority scores are weighted based on the probability that people would take a specific sequence.

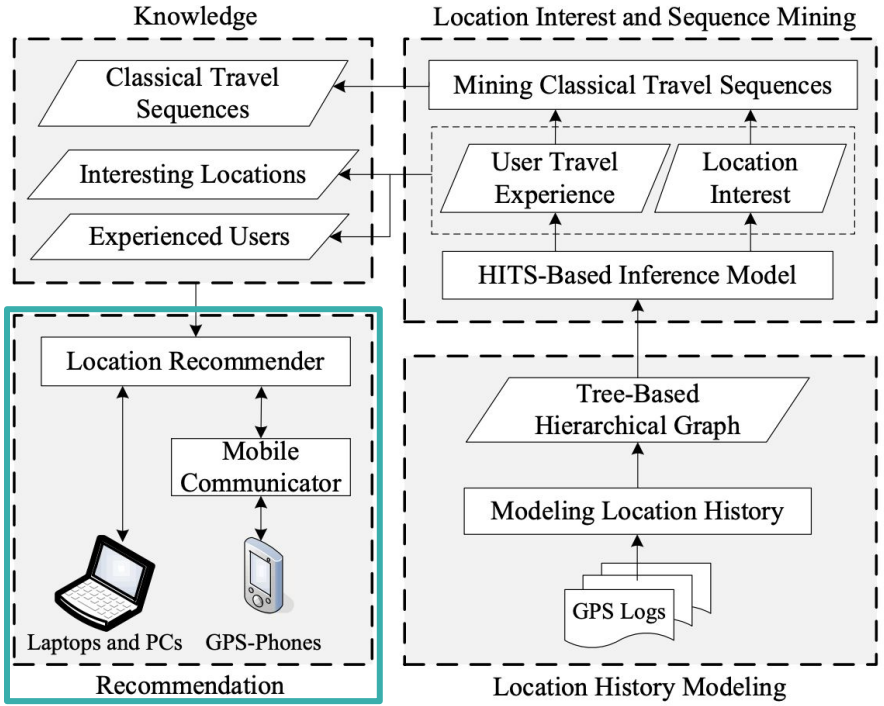


https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-lbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZllKrQ2H38hDSmCwXMpWs8

Usage of GeoLife: Mining Interesting Locations and Travel Sequences from GPS Trajectories

- **Recommendation**





https://dl.acm.org/doi/pdf/10.1145/1526709.1526816?casa_token=fGeySXvYYNYAAAAA:pO-lbvLKW-sXezCIVkPFFnywFOstVW09sWiEMtQsoSTFbumd230cXZllKrQ2H38hDSmCwXMpWs8

Graded Activity 5 [CO2]

You are to design an Ubiquitous Computing System that allows users with a history of clinical leg injuries track their location trajectories and recommend alternate/optimal travel routes. Submit a write-up that mentions the conceptual design of the system (a **concept sketch** of the interface, 2 **use cases**, 2-4 **stakeholders**, 2-4 **feature list**, a list of **sensing modalities** with justification)