

## 1. OBJECTIVES

Understand correlations between human mobility and data demand.

### Objectives:

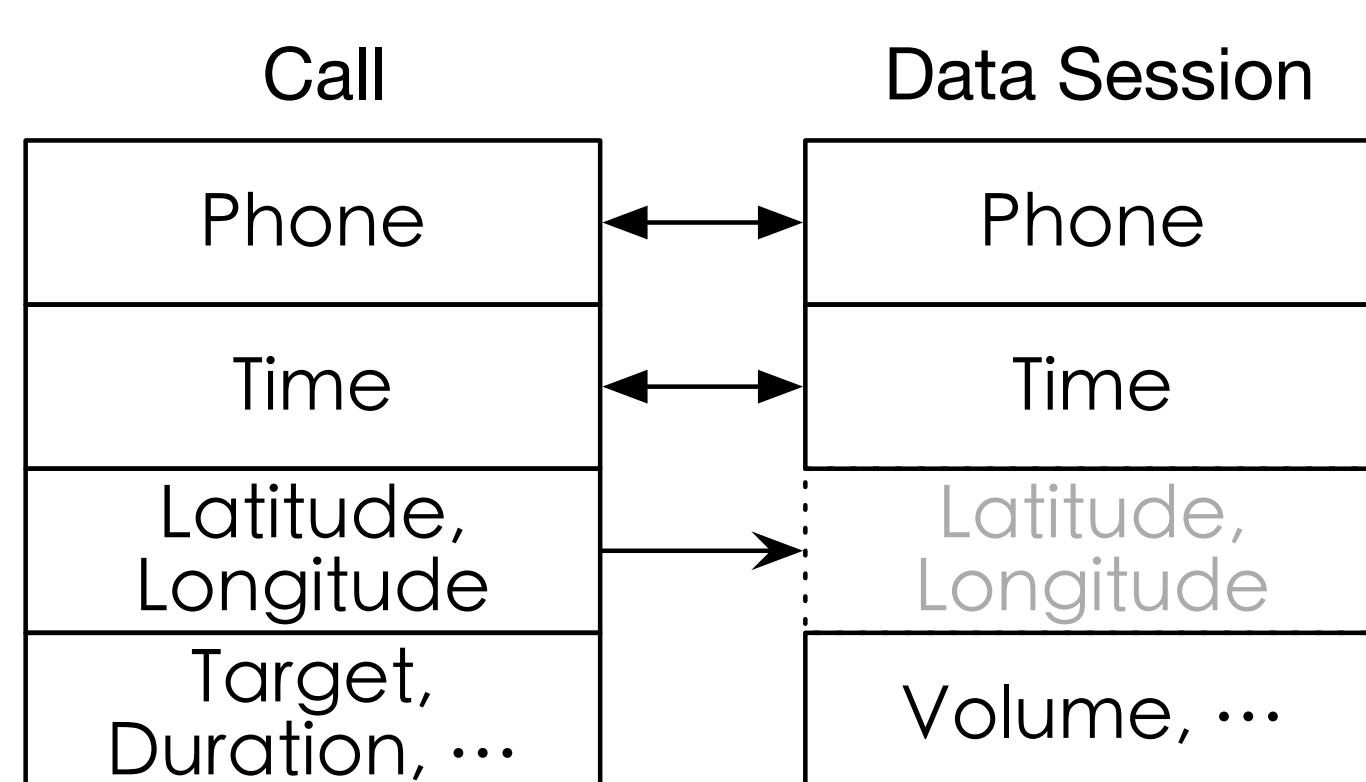
- Extract fully-featured dataset from cellular traces;
- Construct mobility: identify Home locations, and estimate trajectories;
- Characterize user behaviors in terms of time, space and volume (data).

## 2. DATASET DESCRIPTION

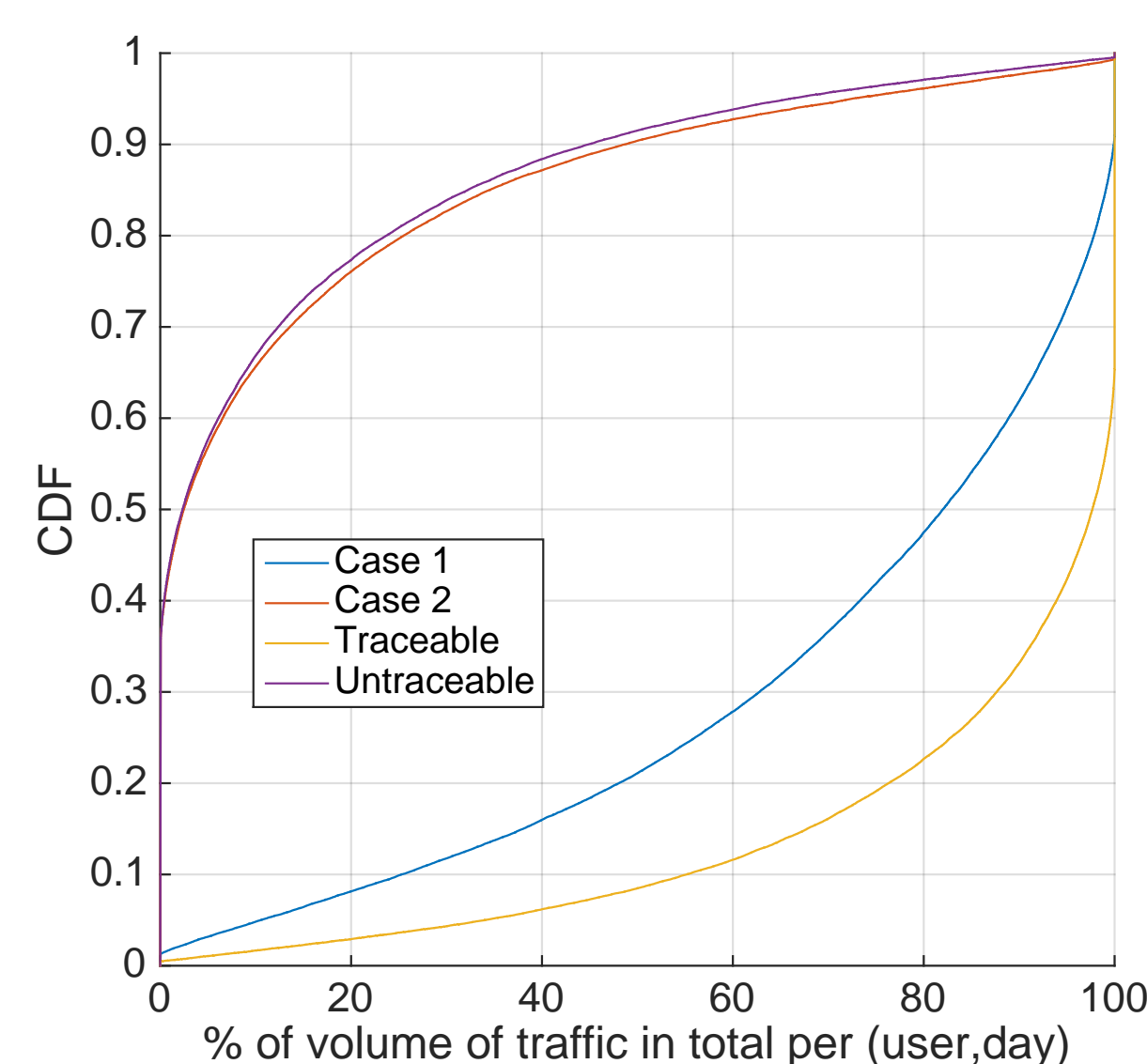
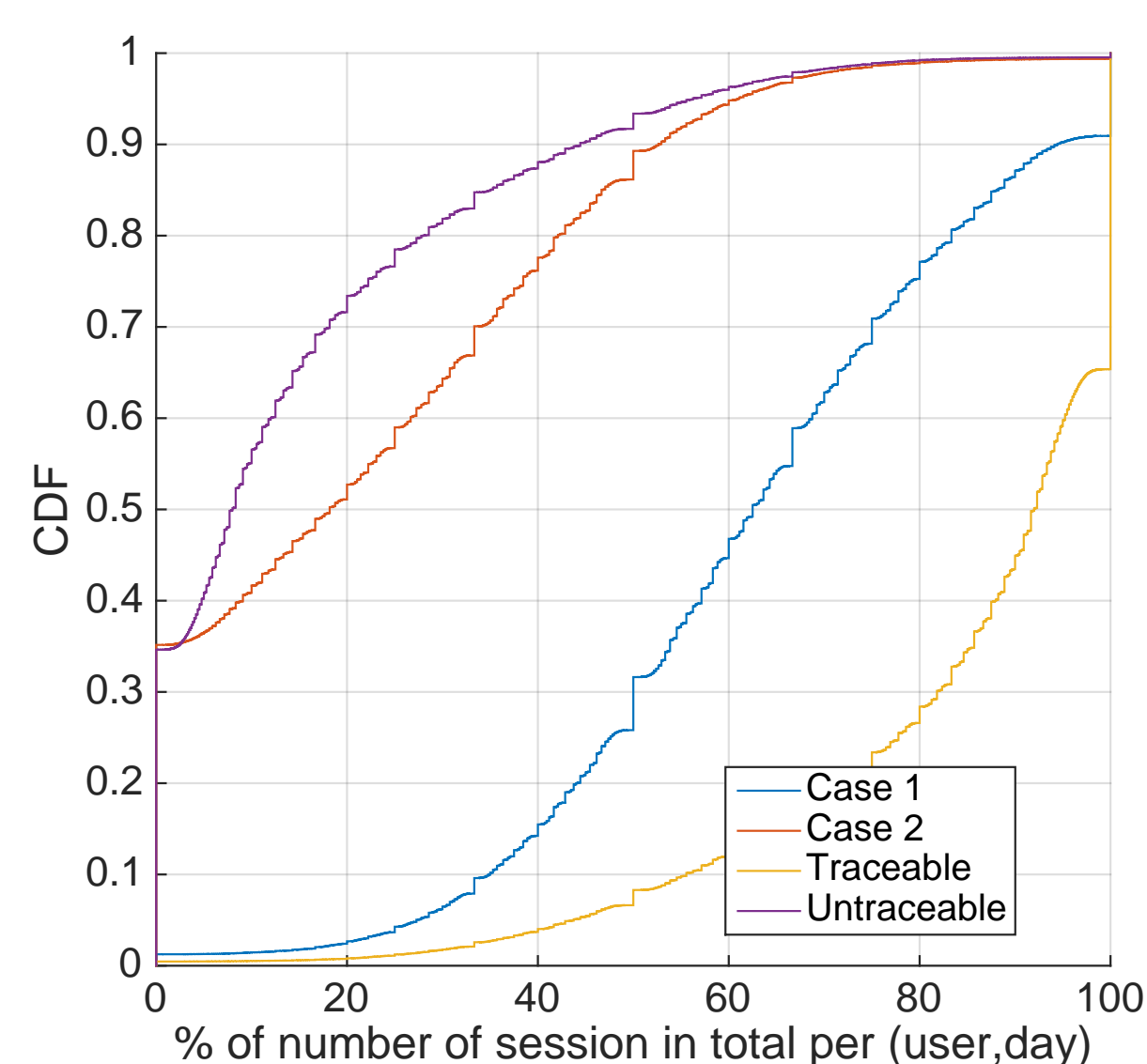
**17,366 subscribers** are extracted by applying a series of filters on cellular traces, consisting of 2,398,392 calls and 954,737 sessions in 4 weeks.

### Session Location Estimation

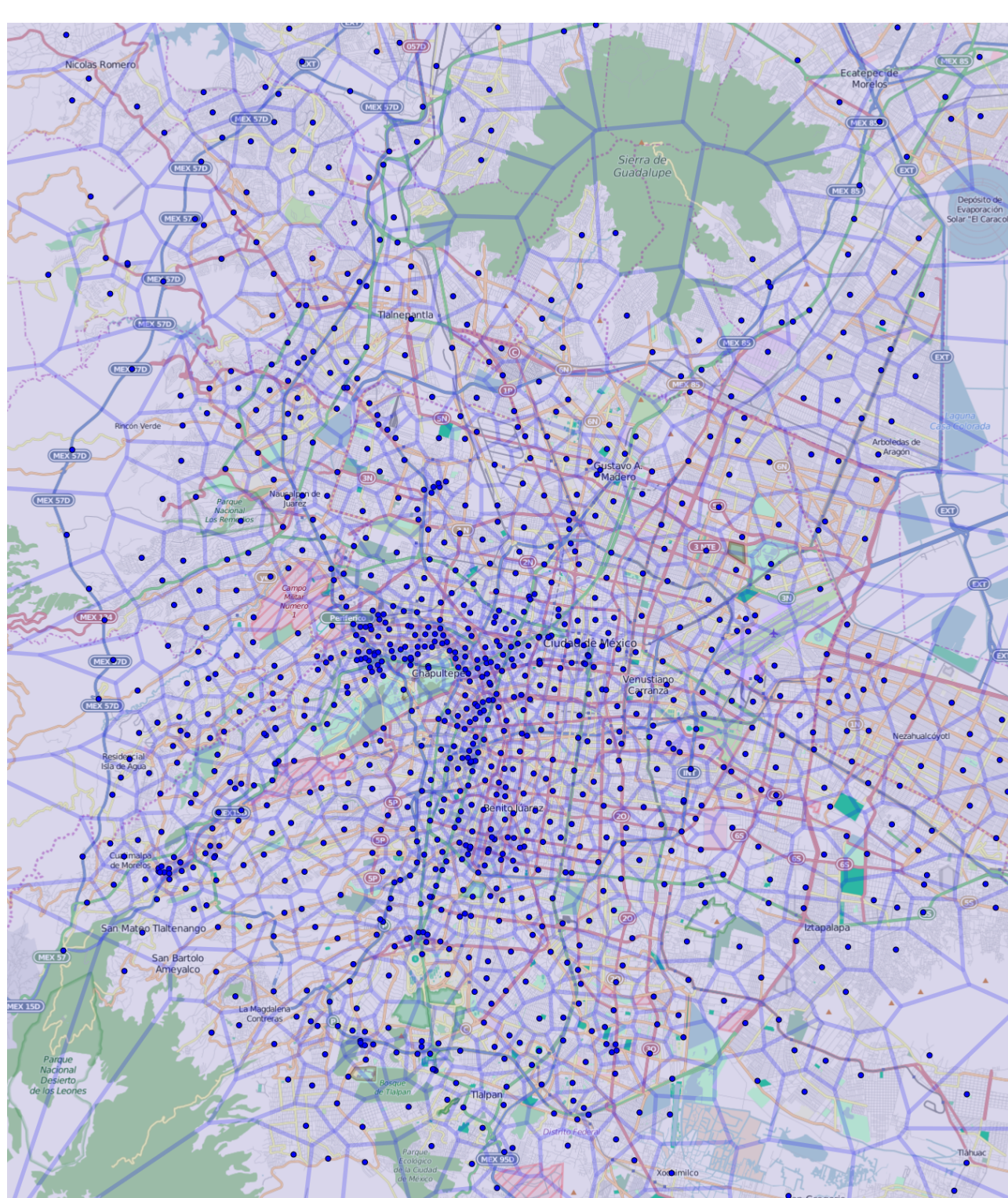
Using call detail records, we infer users' locations for data sessions.



Based on trajectory estimation, at least 70% of sessions (80% of volume) are traceable for 80% of subscribers.



### Decomposition of Cells in Mexico City



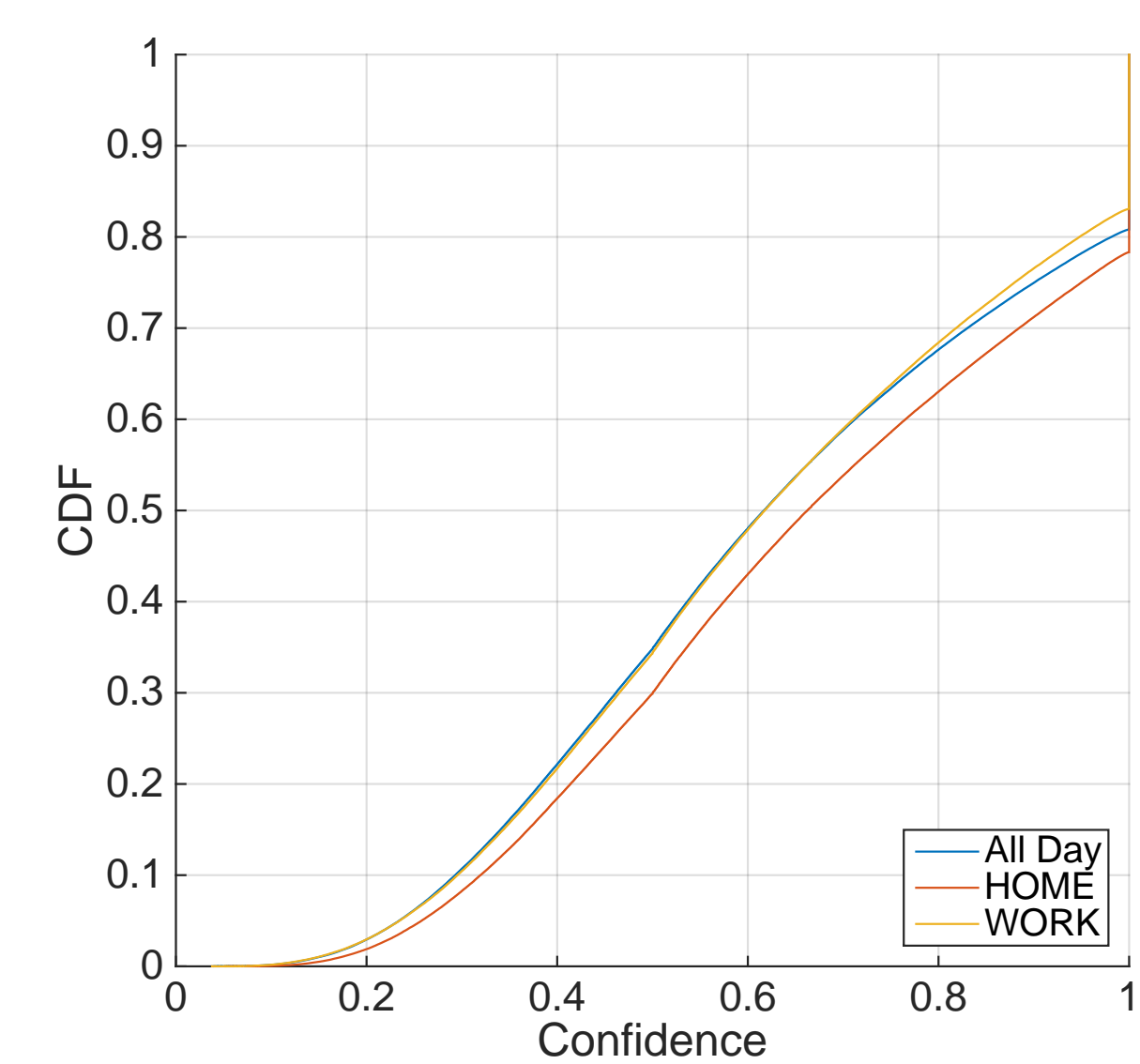
Cellular Cells (Voronoi)

Population Density

## 3. ANALYSIS

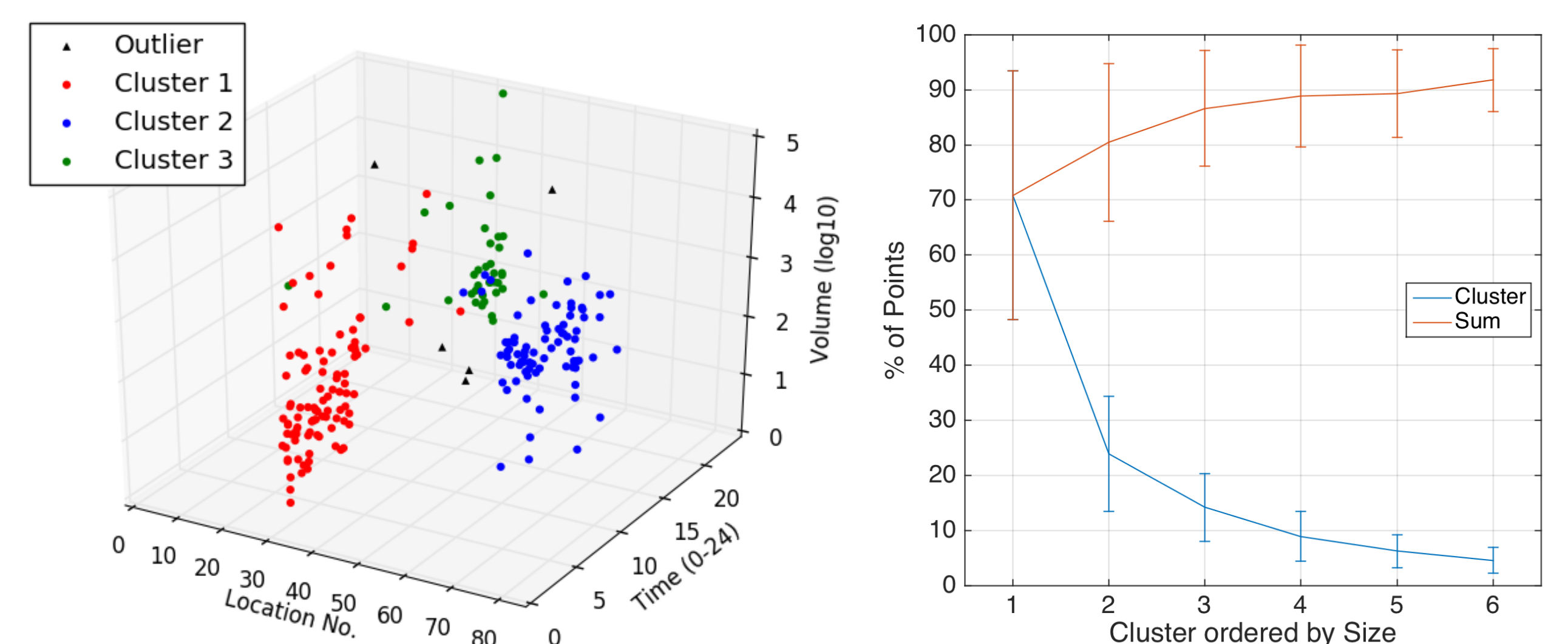
### Home Location Identification

For each user, the most visited cell between 10pm and 7am is identified as his/her *HOME*.



### Clustering Sessions

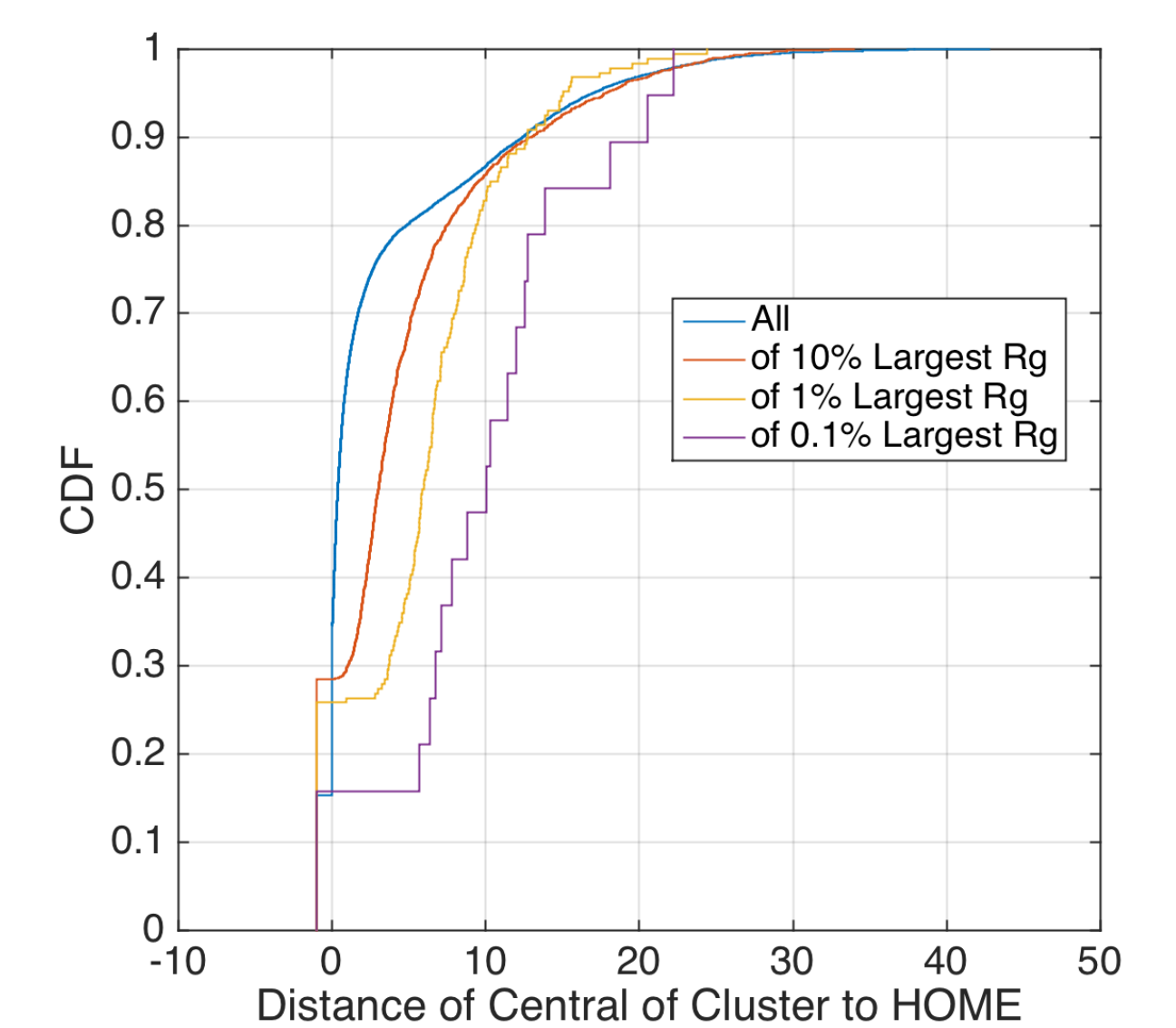
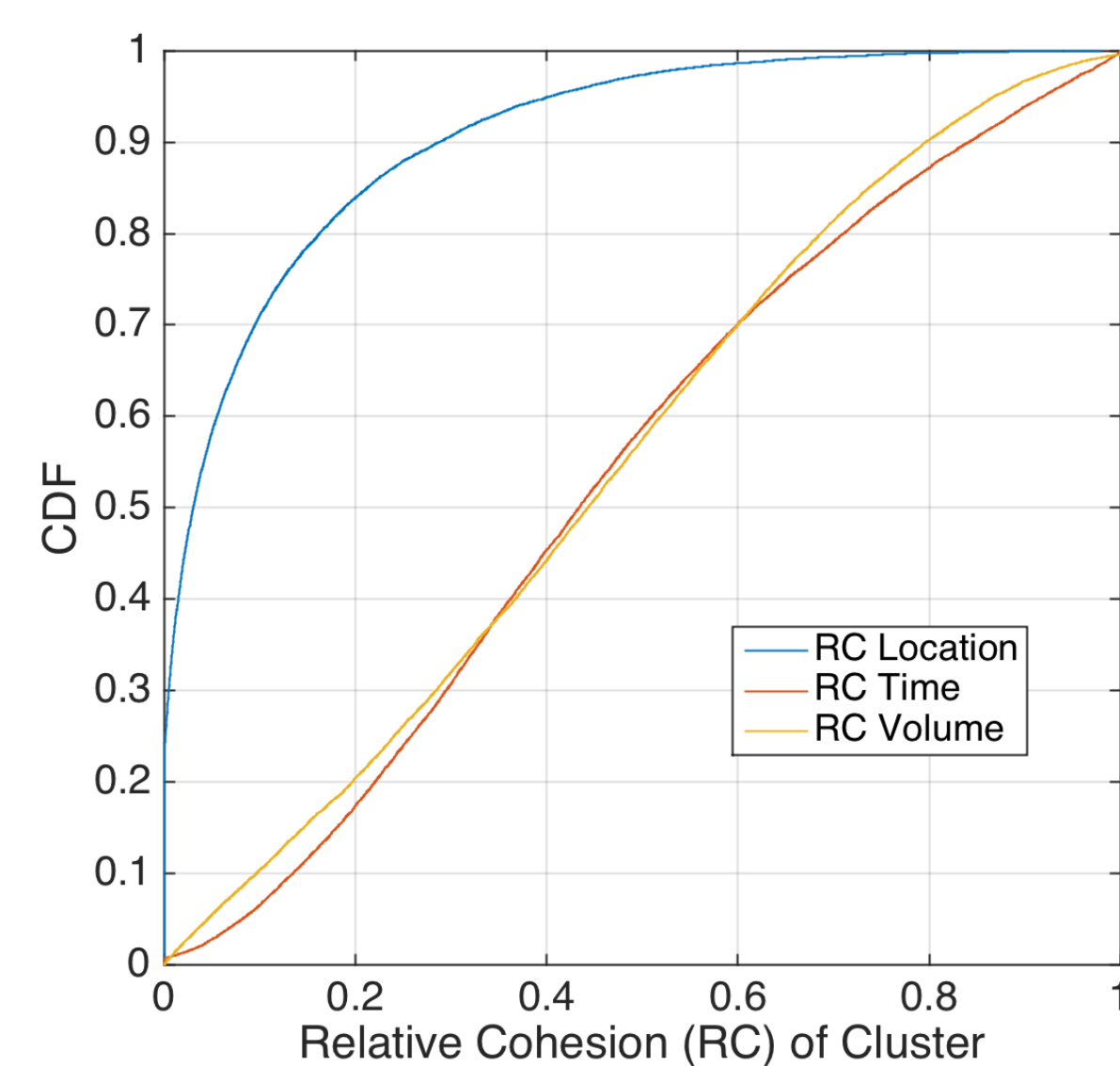
Sessions (space, time, volume) are clustered by DBScan.



For each cluster, **Relative Cohesion** is calculated as a function of time, space or volume, respectively.

$$RC^{(*)} = \frac{\sum_{p \in C} dist^{(*)}(p, c)^2}{\sum_{p \in C} dist(p, c)^2} \quad (1)$$

$$RC^{(loc)} + RC^{(time)} + RC^{(vol)} = 1 \quad (2)$$



## 4. FUTURE WORKS

- Estimate trajectories' incomplete information;
- Model volume demand;
- Characterize content demand;
- Link and predict mobility (important locations) and volume/content demand simultaneously.