Lab 3: Predicting the Next Area of Interest based on GPS Trajectory Data Using Recurrent Neural Networks

In this lab, you will build RNN models yourself to predict the next area of interest (AOI) of an individual based on the existing AOIs that this individual has visited so far. The data we will be using is from GeoLife (but the trajectories are generated by another individual different from what we have demoed in the class).

Task 1: Trajectory Data Exploration and Visualization (20 pts). Download the trajectory data from UBLearns, and save it in your Google Drive so that it can be accessed by Colab. Visualize nine trajectories (nine files) randomly selected from the data.

Task 2: AOI detection using DBSCAN (20 pts). Apply DBSCAN to this trajectory dataset to detect AOI. Here, you will consider an AOI as a person has stayed in an area with a radius of 200 meters for at least 6 min (This will change the value of the minPts parameter we showed in the class demo! What would be the minPts value under 6 min?) Save your result in two separate files, namely "sequence.txt" and "aoi_center.txt". How many AOIs and trajectory sequences have you detected? Note that the process of applying DBSCAN to the dataset can take longer than 10 min due to the large data size.

Task 3: Prepare training and test data for RNN models (20 pts). Based on your "sequence.txt" file, generate trajectory data with one, two, three, and four existing AOIs and their next AOI label. Divide your data into 80% training and 20% test for each group.

Task 4: Build RNN models for predicting next AOI (40 pts). Build a SimpleRNN and a model of your choice (e.g., a LSTM, a GRU, or a hybrid model) for predicting next AOI. Evaluate the performance of the two models on the test data.

To submit:

- Put your Google Colab link in UBLearns and then submit