Assignment 2

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***Abstract*—This assignment is mainly based on the knowledge of Attention Mechanisms and Graph Neural Networks (GNN). The dataset is generally based on a pedestrian trajectory recorded in a mall. The models trained in the assignment predict the positions of the pedestrians. This assignment first trains a GNN model according to a tutorial, but reimplemented with PyTorch. After training, the model is evaluated with the main squared error (MSE), the mean Euclidean distance, and the plot graphs. Next, the model is reexamined by tuning hyperparameters, trying a deeper embedding, and replacing the learned attention mechanism. This report shows the results of the model evaluation and discusses them.**

I. Result and Evaluation

Task 1

This task preprocesses the data, defines the classes for layers and training logic, trains the model, and evaluates it by calculating the mean squared error (MSE) and visualizing the differences between prediction and real future positions. This step follows the tutorial [1] and rewrites the code using PyTorch, another deep learning library which is more compatible with the experiment environment.

The hyperparameters for the training is as follows:

```
hidden_units=100,
num_heads=8,
num_layers=3,
output_dim=2,
num_epochs=100,
learning_rate=1e-3,
```

After training the model with 100 epochs, the training MSE is **0.4717**, and the test mean Euclidean distance is **0.1763**. In addition, one of the scenes is randomly chosen from the test set to perform evaluation by visualizing the coordinates. The result is shown in Figure 1.

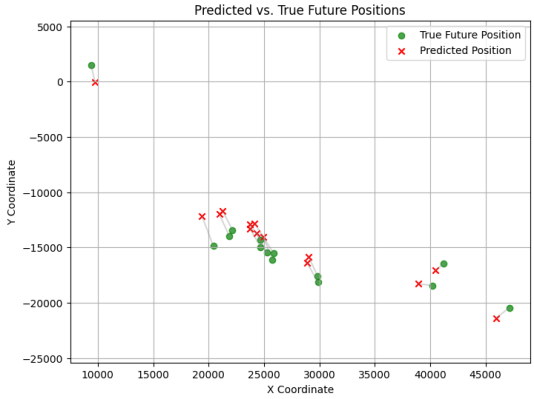

Fig. 1. Visualization on the Original Model

Task 2

This task consists of two parts: performing hyperparameter tuning of the number of attention heads, and trying a deeper embedding of the node features.

References

[1] A. Kensert, "Graph attention network (GAT) for node classification," 2021, Keras. [Online]. Available: https://keras.io/examples/graph/gat_node_classification/