

Configuration Manual

MSc Research Project
Master of Science in Data Analytics

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MSc Project Submission Sheet
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This document constitutes the Configuration Manual for the research project “Prediction of Delivery and Pickup Times and Routes in Urban Areas Using Spatio-Temporal Neural Networks and Basic Reinforcement Learning”, developed as part of the MSc Research Project in the Master of Science in Data Analytics programme at the National College of Ireland.

The purpose of this manual is to provide the necessary information to replicate the experimental environment, ensuring the correct installation of libraries, configuration of variables, project directory structure, and execution of scripts and notebooks. The document is organised into sections that detail the hardware and software used, critical dependencies, project organisation, and the practical steps required to reproduce the experiments and results.

1 Environment Overview

- Operating System: macOS 15.5
- Hardware: Apple Silicon M3, 36 GB RAM
- Virtual Environment: stnn_rl_env (Python virtual environment)

2 Software and Tools

2.1 Programming Environment

- Python Version: 3.10
- IDE/Editor: Visual Studio Code (VSCode)
- Execution Format: Jupyter Notebooks (.ipynb)

2.2 Installed Libraries

2.2.1 Core Data Handling and Computation

- numpy, pandas, os, random, json, logging, pickle, collections, typing

2.2.2 Visualization

- matplotlib, seaborn

2.2.3 Geospatial Processing

- geopandas, shapely, pyproj, folium, geopy

2.2.4 Graph and Network Processing

- networkx, scipy (KDTree module)

2.2.5 Progress Monitoring

- tqdm

2.2.6 Machine Learning and Preprocessing

- scikit-learn (LabelEncoder, OneHotEncoder, StandardScaler, RobustScaler, MinMaxScaler, SelectKBest, f_regression, metrics, and model selection utilities)

2.2.7 Deep Learning

- torch, torch.nn, torch.optim, torch.utils.data

2.2.8 Graph Neural Networks

- torch-geometric (GATConv, GCNConv, from_networkx)

2.2.9 Utilities

- pathlib, joblib, warnings

3 Critical Configurations

3.1 Data Format

- Input Data: CSV format
- Internal Processing: Converted to .parquet or .joblib formats as required
- Encoding: UTF-8

3.2 Environment Variables and Settings

- Visualization style: `sns.set(style="whitegrid")`
- Pandas display: `pd.set_option("display.max_columns", None)`
- Warnings suppressed: `warnings.filterwarnings("ignore")`

4 Experimental Setup Reproduction

4.1 Experimental Setup Reproduction

```
python3 -m venv stnn_rl_env
source stnn_rl_env/bin/activate # macOS/Linux
```

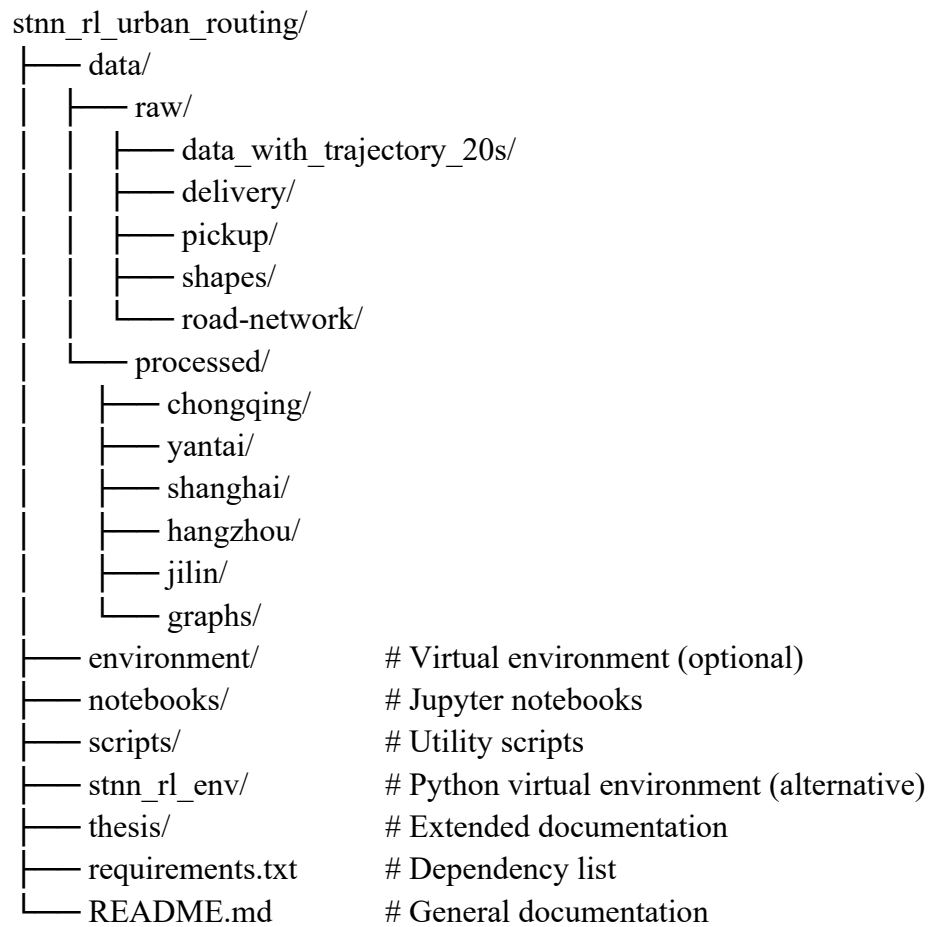
4.2 Install Dependencies

Install the required packages using pip or a **requirements.txt** file:

```
pip install -r requirements.txt
```

4.3 Project Structure

Recommended folder organization:



4.4 Run Experiments

- Activate the virtual environment.
- Open VSCode and load the .ipynb notebooks.
- Execute the cells in order; the notebook scripts handle all preprocessing and model training steps.

5 Notes

- No external APIs or live databases are required.
- All scripts are designed for local execution without cloud dependencies.
- Ensure enough memory allocation for large graph datasets (≥ 16 GB RAM recommended).