Institute of Automative Technology
TUM School of Engineering and Design
Technical Univercity of Munich

#SMARTMOBILITY

Bachelor-/Semester-/Master-Thesis/IDP

GeoAI with OSM: Harmonizing POI Categories + Measuring Tag Fragmentation

OSM POI tags are open, inconsistent, and region-dependent: the same place type is tagged differently across cities/countries, and different place types can share similar tags. This creates noisy labels for GeoAI pipelines (e.g., neighborhood embeddings, land-use inference, urban function classification) and reduces comparability between study areas.

The goal of this thesis is to harmonize heterogeneous OSM POI tags into a clean set of canonical POI classes ("POI bundles") and to quantify how fragmented the original tagging is across regions.

Possible methods include (i) rule/ontology-based mapping (tag normalization + synonym tables), (ii) geographical context-aware ML using multi-scale spatial neighborhoods around each POI (e.g., ring-based context features) to reclassify into canonical classes, and (iii) semi-supervised clustering/embeddings with a small labeled set to calibrate clusters to the taxonomy. Evaluation focuses on mapping coverage, cross-region robustness, and fragmentation metrics per class and region.

Workpackages

- Literature review on OSM POI harmonization and POI classification
- Extract and preprocess POIs for multiple study areas; normalize tags
- Define a canonical POI taxonomy (flat or hierarchical)
- Implement a harmonization pipeline
- Evaluate harmonization (coverage, cross-region generalization)
- Quantify and visualize tag fragmentation (per class, per region)
- Discuss results and deliver a reusable schema + dataset export

Prerequisites

- Programming skills in Python
- Structured and independent working style

Variations of the topic and additional research questions proposed on your own initiative are always welcome. The thesis can be written in German or English. If you are interested, please send an email including your CV, transcript, and a short explanation of why you are particularly well-suited for this topic.

The write-up should document the individual work steps in a clear and structured manner. The candidate commits to completing the semester project independently and to properly citing the scientific resources and tools used.

The submitted work will remain with the department/chair as part of the examination records.

Prof. Dr.-Ing. M. Lienkamp

Supervisor: Till Zacher, M. Sc.

Ausgabe:_____

Abgabe: _____