Machine Learning for Predicting Travel Purposes in GPS Travel Diaries

Master's Thesis of Soumya Chatterjee

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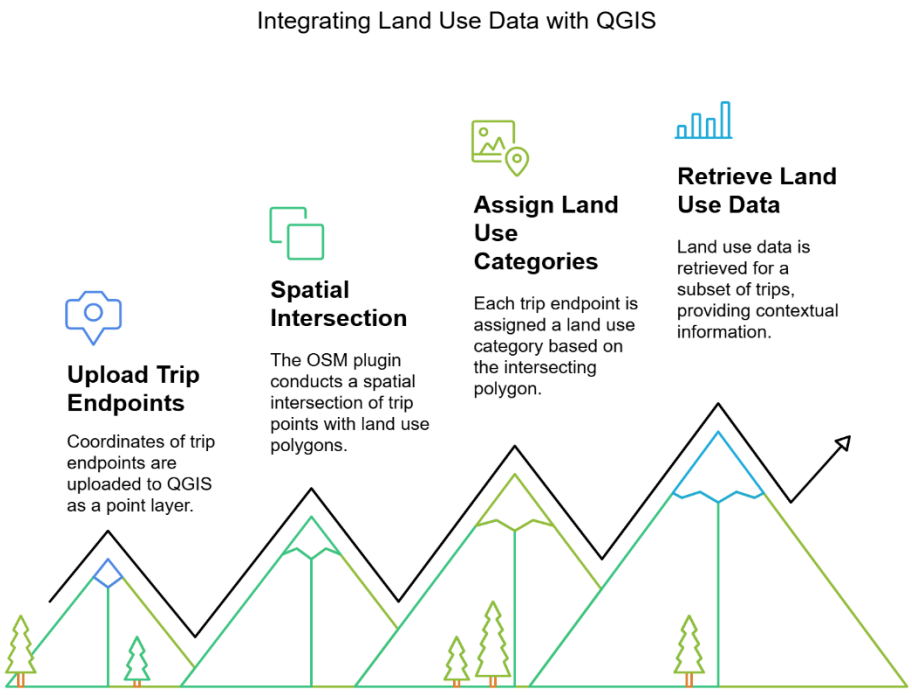
Introduction

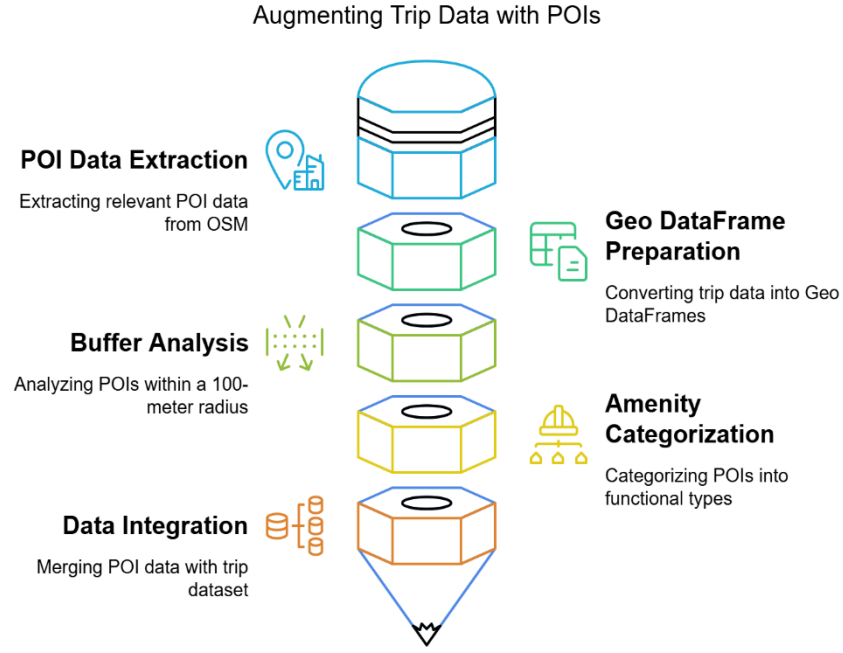
Understanding trip purposes is essential for effective urban planning and transportation management. GPS-based travel diaries offer precise trip data but lack context regarding trip purposes. This research integrates machine learning and rule-based models to enhance trip purpose prediction using GPS data. The study area is Munich Metropolitan area.

Research Objectives

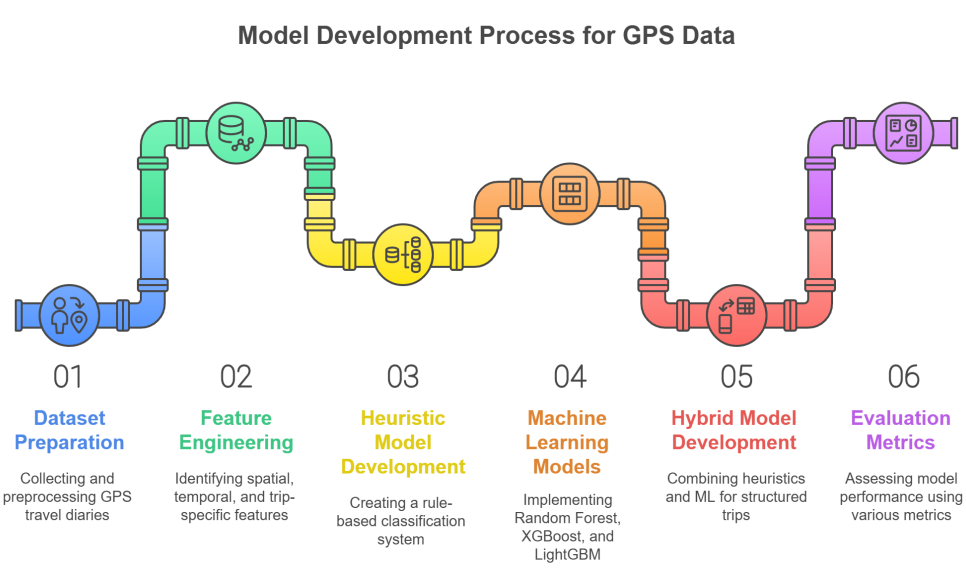
- Develop trip purpose prediction models using the Mobilität.Leben dataset.
- Integrate external data sources (land use, POI data) for improved accuracy.
- Compare heuristic, machine learning, and hybrid approaches.
- Balance model interpretability and prediction accuracy.

External Data Integration





Methodology



Results & Conclusions

- **Heuristic Model:** High accuracy for structured trips (Home: 79.48%, Shopping: 76.85%), but poor for flexible trips (Medical: 25.71%).
- **LightGBM Model:** Improved classification (Overall Accuracy: 72.63%), better recognition of commuting patterns, but challenges with overlapping categories.
- **Hybrid Model:** Best performance (Overall Accuracy: 83.15%), significantly improved non-routine trip classification.
- Hybrid model successfully balances accuracy and interpretability.
- Incorporate real-time mobility data and address ethical considerations in GPS data analysis.

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