

CZ4079 Final Year Project

A Machine Learning-Based Approach to Time-Dependent Shortest Path Queries

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Agenda

1 Introduction

2 Data



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Introduction: Problem

- A **dynamic road network** $G = (V, E)$ with a time-dependent weight function $w : E, t \rightarrow \mathbb{R}$



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Introduction: Problem

- A **dynamic road network** $G = (V, E)$ with a time-dependent weight function $w : E, t \rightarrow \mathbb{R}$
- A **query** $Q(u, v, t)$ that asks for a shortest path from u to v departing at time moment t



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Introduction: General Approach

- Traditional **Bellman-Ford or Dijkstra's algorithm** do not work with dynamic edge weights (“the curse of traditionality”)



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- The new **machine learning-based approach** draws on collective wisdom of thousands of taxi drivers



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- **Unsupervised learning** is employed to figure out the time-dependent edge costs



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- **Unsupervised learning** is employed to figure out the time-dependent edge costs
- A modified Dijkstra's algorithm calculates a shortest path on the fly



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Introduction: Challenges

- Arbitrary u and v



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Introduction: Challenges

- Arbitrary u and v
- Sparse sample points



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Introduction: Challenges

- Arbitrary u and v
- Sparse sample points
- Limited GPS accuracy



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Introduction2



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