Artificial Intelligence Support in the HiDALGO project

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HiPEAC 2021, 20.01.2021, Remote

Table of Content

AI Support in HiDALGO

- Evaluate suitable, existing AI methods
- Tailor AI methods to the HiDALGO environment
- Support the application execution workflows through
  - Efficient data pre- and post-processing
  - Data-driven estimation and modelling of simulation parameters
  - Model Complexity Reduction

AI Support in the Migration Use Case

- Refugee Movement Simulation with Agent Based Models
- Necessary Input: Graph structure with
  - Physical locations as nodes
  - Routes between physical locations as edges
  - Route distances as meta-information
- **AI Support:** Automatic Location Graph Construction

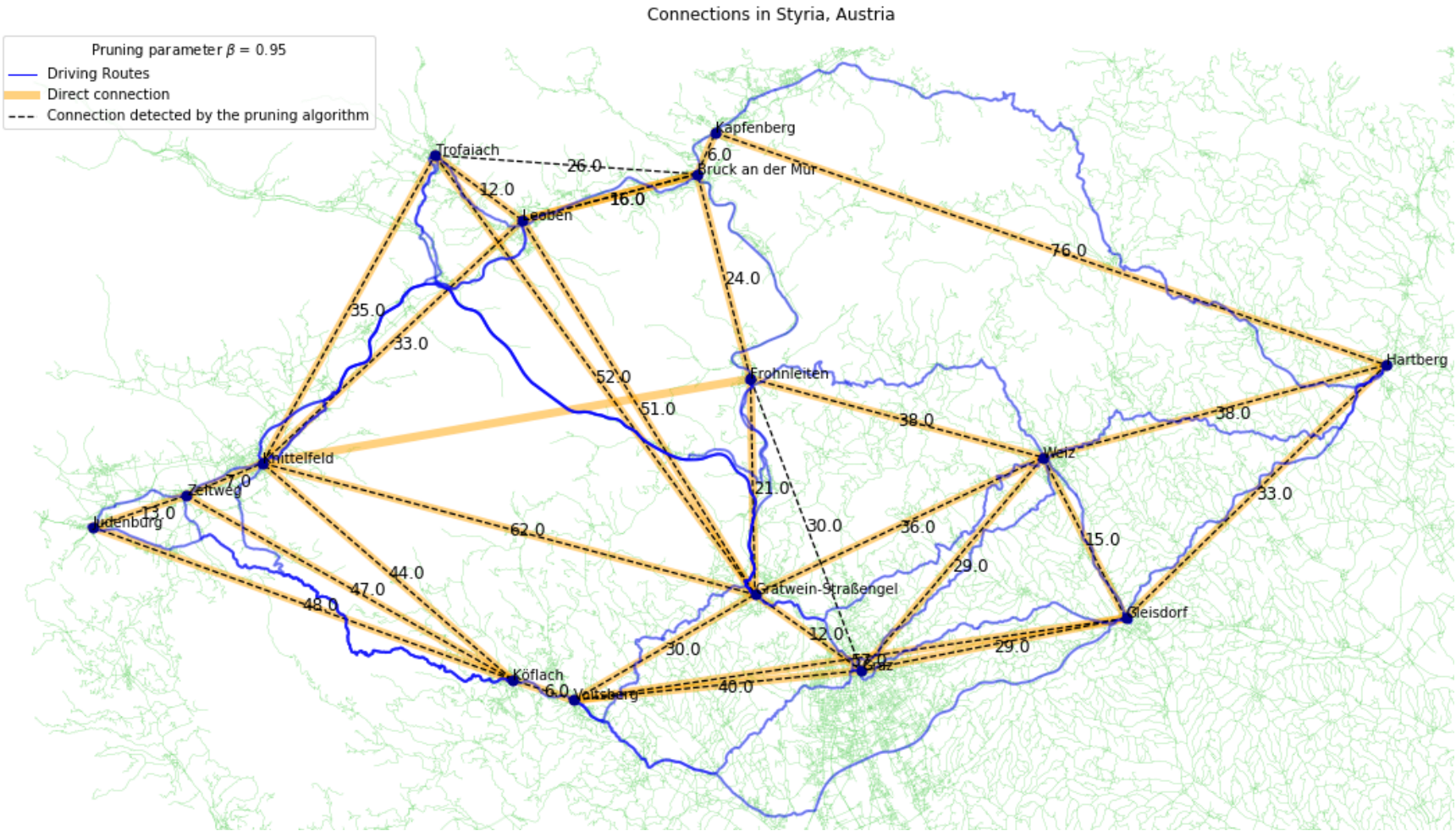
AI Support in the Migration Use Case

Automatic Location Graph Construction

- **Input:** Set of L locations with GPS coordinates
- Computation of the weighted Fully Connected Location Graph
- Pruning of indirect routes between locations with a modified Triangle Inequality
- **Output:** Undirected weighted location graph of direct routes

AI Support in the Migration Use Case

Automatic Location Graph Construction Visualisation



AI Support in the Social Networks Use Case

- Simulation of the spread of synthetic messages in a synthetically created social network graph
- Necessary Input: Retweet probability of a tweet posted by a user to start the simulation
- **AI Support:** Data driven estimation of retweet probabilities

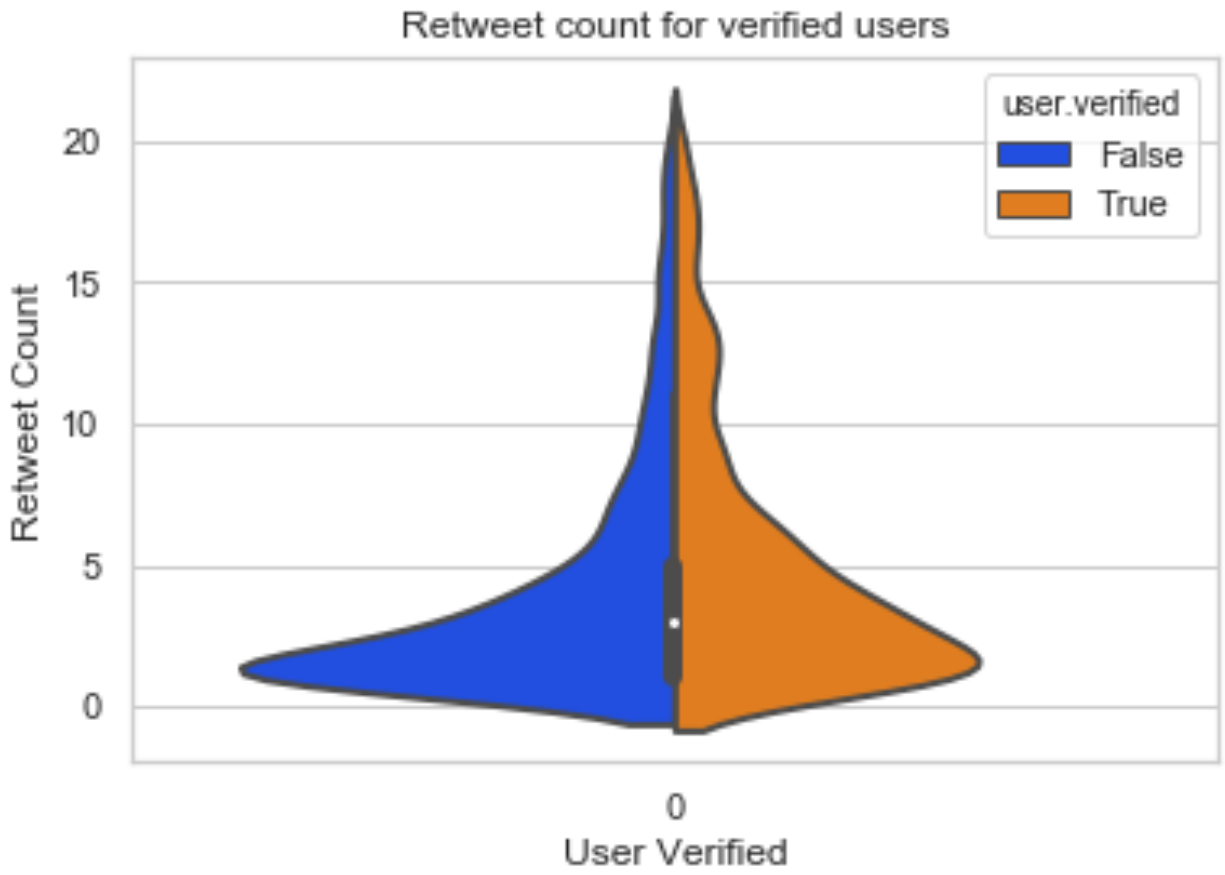
AI Support in the Social Networks Use Case

Estimation of retweet probabilities

- Extraction of influential features on retweeting
  - Binary Tweet Features (e.g., Tweet contains a Hashtag)
  - Binary User Features (e.g., User is verified)
- Estimation of retweet probability with a trained feed-forward Neural network
  - 3 hidden layers
  - 16 nodes per hidden layer
- **Output:** Retweet Probability for a tweet

AI Support in the Social Networks Use Case

Estimation of retweet probabilities: Violin Plot for retweet count for verified users and non-verified users (limited to 20 retweets)



AI Support in the Urban Air Pollution Use Case

- Simulation of Air Pollution Dispersion with Computational Fluid Dynamics based models
- Necessary Input: Traffic data to enable air pollution forecast
- **AI Support:** Traffic forecasting

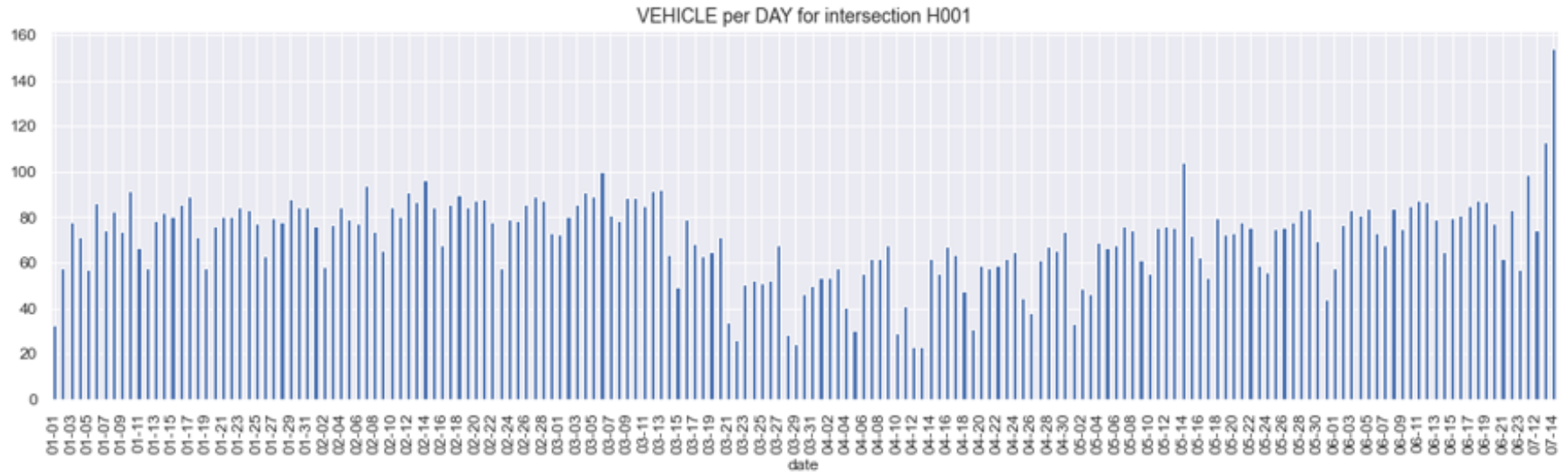
AI Support in the Urban Air Pollution Use Case

Traffic Prediction

- Ideas:
  - Forecast traffic data based on historical records and weather data
  - Separation of historical data into day types (e.g., weekday, holiday, etc.) and time periods (e.g., rush hour, night times)
- **Output:** Traffic forecast for a certain time period

AI Support in the Urban Air Pollution Use Case

Number of vehicles per day at intersection H001 in Győr, Hungary



THANK YOU !

QUESTIONS ?