

Exploit or devise machine learning forecasting models to best benefit the urban mobility

Challenge Owner: Kentyou

Website URL: <http://www.kentyou.com>

Kentyou is a startup company providing digital twin solutions to help cities improving their daily life in terms of mobility integrating AI and ML in its products.

Context

Several modern cities have pledged carbon neutrality by 2050. Mobility accounting for more than 25% of CO₂ emissions in urban areas, cities seek in making smarter decisions regarding traffic flow optimization, parking management, soft and active mobility usage encouragement, etc...

The vision is to exploit all available city data for better understanding, learning and predicting city's mobility behaviour.

Challenge

Mobility data have space and time dimensions. This challenge is specifically focused on adapting or devising forecasting techniques, which take into consideration both dimensions. The spatial characteristics should be carefully studied for revealing hidden patterns (e.g., bottlenecks, driving speed, bicycles flow) and use these insights to advance the results (e.g., bottlenecks can be an extra regressor for traffic forecast). The temporal dimension should be considered, addressing how data seasonality, trends, etc. may impact the accuracy of the forecasts.

The temporal dimension of IoT data strongly impacts the short and long-term forecasts. For instance, traffic congestions are characterized by high seasonality with patterns repeating periodically over a day, week or year. How this peculiarity can positively influence the forecast?

Data streams are collected with geographical signature, which in several cases, is updated at real-time. The geo-spatial characteristic usually carries hidden patterns differing between regions of the same city or different cities. Should each region of the city be modelled separately, or a single forecast can be applied?

The cities require forecasting intelligence on different domains, e.g., bicycle demand, traffic. Are the proposed techniques able to be adjusted on different data peculiarities and EU cities?

Expected demonstration:

The solution provider is expected to demonstrate the insights on the spatio-temporal characteristics of the given datasets. Any discovered patterns/correlations/insights should be shown with appropriate visualization means, e.g., using maps for the spatial data or time charts and heatmaps for the temporal data.

Similarly, the forecasting results should be demonstrated and properly evaluated. The demonstration should concern forecasts for historical, but also real-time data. The demonstration should also include, but not limited to, forecasts of different geographical areas, time periods and forecast windows. A performance evaluation (accuracy and time efficiency) of the forecast models is expected. The evaluation should be done periodically using retraining techniques, if necessary.

Kentyou solution is based on an open-source platform based on the Eclipse Public Licence (EPL). Solution providers are encouraged to deliver in a compatible permissive open-source Licence.

Available datasets:

The solution provider should choose at least one use case among three different forecasting possibilities: traffic flow, bicycle usage, parking availability forecast. Kentyou has access to several urban IoT data of different cities (e.g., Paris, Grenoble, Santander) and will give the possibility to Solution Providers to test their model on data of different peculiarities, i.e., various feature sets, missing data, varying sizes. Some of the data are open, some of them will require specific authorizations case by case.

Examples of datasets:

- a) Real time-series of bicycle usage and tracking. Historical data of bicycle flows between terminals.
- b) Historical traffic data including congestions, incidences, traffic length, delay, etc.

c) Historical and real-time status updates of parking availability per area in a city.