Advanced Data Analytics in Transport

Advanced Data Analytics in Transport (ADAIT) is a generic distributed computing platform being developed by the ADAIT team of Data61. The platform integrates and fuses existing transport data across different modes, with extension to future data sources. The fused data is processed by the platform to provide situational awareness and predictive analytics of the transport network intended to inform transport congestion management.

From Data to Insight

Data analytics derives patterns from a large quantity of unprocessed data to develop predictive capability from the dominant patterns. Data analytic capability is important to demand forecasting, incident management and prediction, and congestion management in general. Machine learning techniques are the basis for data analytics development.

Machine learning is a subfield of computer science. It constructs systems that can learn from data, rather than follow explicitly programmed instructions. The general procedure of machine learning includes:

- **Data Collection**: collect the observed data and corresponding labels as the training data
- **Model Learning**: Learn model structures and parameters for the specified type of the model.
- **Prediction**: Use the learned model to predict the label for a new observation.
- **Feedback loop**: Present the prediction results to domain experts and get feedback regarding the prediction results.

For transport industry, data analytics leverages ubiquitous data generated from surveys, traffic control system, transit system and telecommunication systems to build insight into the transport systems. This allows the transport authorities, operators and travellers to make the most informed decisions as soon as patterns emerge from the real-time data. In particular, data analytics build valuable insights into:

- **Demand**: how is demand generated and distributed temporally and spatially.
- **Behaviour**: how is travel behaviour being influenced by congestion, pricing and public transport accessibility.
- **Supply**: whether the supply of capacity from infrastructure meets demand; what is the impact of incident and planning on the demand and behaviour.
Predicting into the Future using AI

Short-term future traffic conditions on multi-modal transport networks are key to manage congestion in urban areas. The two examples below first show how an AI engine is used to predict transport network conditions 30 minutes into the future, and then how to use the predicted outcome to infer the impact to end-to-end, multi-modal journey makings in the transport networks, i.e. Isochrones.

Part 1. Predict 30 minutes to the Future

- Conventional approach to predict future traffic conditions relies on meso or microscopic simulation models that are resource intensive for model building, calibration and maintenance.
- Under the PII program, ADAIT of Data61 uses the latest technologies in AI to build a data-driven prediction model that is capable of not only predicting recurrent traffic conditions, such as peak-hour congestion, but also non-recurrent traffic conditions, like those induced by traffic incidents.
- ADAIT works with TfNSW to meeting the operation objective of predicting for the next 30 minutes and act in 5 minutes.

Part 2. End-to-End, Multi-Modal Transport Journeys: Isochrones

- Transport agencies often regard customer journey experience as their top operation priorities. This requires the capabilities to model and management the end-to-end journey experience of customers.
- Under the PII program, ADAIT of Data61 develops the Isochrones analytics platform to model individual traveller’s end-to-end, multi-modal journey making using historical and real-time data, including walking from home address to nearest public transport stop, transit at interchanges and walk to the final destination.
- Isochrones visualize the travel radius in colour contours for the next 60 minutes at 10min intervals.