



Demand, behavior and network analytics and modelling using smart card data

Problem description

Metro operations are subject to recurrent disturbances ranging from planned works to unplanned disruptions, and from short-term and local failures to long-term closures and the pandemic crisis.

Rich datasets provided by the Washington DC Metropolitan Area Transit Authority (WMATA) contains passenger movement (smart card) data (tap in and tap out), rail movement data and planned and unplanned disruption files for the entire period covering August 2019 to December 2022. This combination of datasets facilitates a range of demand, behavior and network analysis and modelling studies that will support more evidence-based planning and operations of metro services. Examples of questions that can be addressed include how do delays propagate in time and space? can disruptions be automatically detected from the data? how do passengers adapt their travel plans in the event of a planned/unplanned disruption?

Objectives and assignment

Examples of related master thesis topics include but are not limited to the following:

- Understanding and modelling how delay propagates across the network
- Automated detection of service disruptions and generating related real-time information
- Understanding passenger route and mode choice behavior during (un)planned disruptions
- Analysing post-COVID demand recovery patterns
- Short-term travel demand predictions

Other ideas are also welcome.

Candidate background

You have completed CIEQ6232 and are interested in pursuing your thesis in the public transport domain. You have affinity with data analysis and mathematical modelling and do not shy away from working with large datasets and the associated programming skills.

Research group

Smart Public Transport Lab, the project is performed in cooperation with the Rail group in Washington Metropolitan Area Transit Authority (WMATA), a government agency that operates transit service in the Washington Metropolitan Area in the US.

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