Dat.mobility

VACANCY INTERNSHIP PROJECT

We are looking for students interested in carrying out their internship or master thesis project at DAT.Mobility

Data driven and synthetic gravity modelling

Problem description

As described in (Brederode et al., 2019), the gravity model (Wilson, 1969) may be used as a tool for both fusion of observed data on mode- and destination choices as well as modelling mode and destination choice behavior. In the approach proposed in (Brederode et al., 2019), in the data fusion model instance, constraints from the different data sources are imposed onto the (multi-proportional) gravity model (Brethouwer, 2018), whereas in the descriptive model instance, a synthetic (bi-proportional) gravity model is fitted to the fused data from the data fusion instance using a parameter estimation method as described in e.g. (Pots, 2018; van Genderen et al., 2020).

Even though the data fusion instance is a data driven approach, it still needs some (assumed) some distribution function to be able to use the multi proportional gravity model. This implies some sort of bilevel problem in which parameter estimates are dependent on the fused data whilst the fused data are dependent on the parameter estimates. Ideally, the descriptive gravity model instance turns out to have the same distribution function parameters as the initially assumed function for the data fusion model instance. However, it is unknown what kind of problem the combined data fusion and choice modelling problem represents in terms of game-theory. Furthermore, as only recently DAT.Mobility conducted the first project applications in which both the data fusion and choice modelling stage where combined, it is unknown to what extent assumed and estimated parameter values where similar and what the consequences of potential differences are.

Master thesis assignment

The goal of this research is to develop and test a method that reduces (or eliminates) differences between gravity model parameters used in the data fusion model instance and the descriptive model instance. Roughly the following research questions are posed:

1) How do differences between parameters of the fusion and descriptive model instance affect application properties of both models? Both from a practical as well as from a game-theoretical perspective;
2) What are the maximum parameter differences for responsible model applications per type of model application?
3) How can differences between both model instances be reduced or eliminated within acceptable computational cost?
4) (if time allows) how could a methodology to reduce or eliminate parameter differences be extended from gravity models using a single continuous distribution function to gravity models using multiple non-continuous distribution functions (as proposed in (van Genderen et al., 2020))

Research group

DAT.mobility Deventer

Daily supervisors: Luuk Brederode, Mark Pots and/or Tim van Genderen

When interested in this Masters thesis assignment, please contact Ir. Luuk Brederode (lbrederode@DAT.nl, +31 (0) 627369830)

Literature

Brederode, L., Pots, M., Fransen, R., Brethouwer, J.-T., 2019. Big Data fusion and parametrization for strategic transport demand models. Presented at the 6th International Conference on Models and Technologies for Intelligent Transportation Systems, Krakow, Poland.

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van Genderen, T., Brederode, L., Skopalik, A., Walter, M., Uetz, M., 2020. Solving the trip based transport model using iterative optimization algorithms. University of Twente, Enschede.

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