Université du Littoral Côte d'Opale – ULCO, TVES

Call for a PhD scholarship applications

Transportation modelling under environmental constraints and technological innovations: the case of the region Hauts-de-France

Moez Kilani   Daniel de Wolf

1 Qualifications

The required technical skills for this research are:

- familiarity with microeconomic modelling, optimization and transportation economics

- data collection and management using database tools similar to POSTGRESQL, MYSQL or SQLITE ;

- ability to use a traffic simulator, including network and transport demand construction; modelling transport mode choice; analysis of simulation output

The PhD duration is 3 years. The candidate should have a master degree in economics, management, applied mathematics or computer science with a strong interest in questions related to transportation policies and modeling.

2 Short description of the research

The objective of this research is to develop a multimodal transportation model for the Hauts-de-France region. The model will be used to explore several scenarios of transportation policies and reforms.

The first set of scenarios will focus on transportation pricing. This step will be useful to ameliorate the calibration of the model and tune its responsiveness to changes in travel costs. At the same time, it will bring useful insights with respect to road pricing and public transportation reforms. Some economic analysis have considered both modes simultaneously [Kilani et al., 2014] and the usual objective of urban transportation reforms is the reduction of external costs [Prud'homme et al., 2012]. In France, there have been some applications related to large agglomerations, including Paris and Lyon Metropolitan areas, but transportation models for the region of the Hauts-de-France remain limited [L'Hostis and Liu, 2014, Hammadou and Papaix, 2015].

At a second stage we will focus on two other sets of scenarios related to recent technological innovations and environmental constraints. Electric vehicles, which are the focus of a great attention, have potential benefits for urban transportation. But, there are some doubts about their global environmental impact, in particular when the whole life cycle of the vehicles and

the batteries is taken into account (from the production to end of life). It is then important to explore other alternatives like the hydrogen cars.

The first application will consider new information technologies and their impact on transportation. Intelligent systems like autonomous vehicles will lead to an important change in the users' choice. At first sight, this new mode is expected to attract new users and generate new transportation flows leading to an increase in the level of congestion. But, at the same time, it will allow to build smaller vehicles reducing the space occupied on the roads. Also, these vehicles may use a smarter route choice system, avoiding most congested routes. So, the overall impact on the average travel speed is not clearly signed. The development of smaller and more efficient batteries will also benefit to lighter modes like bikes and scooters which seem to be convenient for many urban trips. Our objective is to include these alternatives in the same framework and evaluate their impact on urban transportation.

The second application will focus on energy transition and compare hydrogen and electric cars by exploring the possibility of a large scale deployment of these modes. We will take into account the development of the required infrastructure, i.e. energy transportation and deployment of charging stations. The hydrogen car has indisputable advantages, but hydrogen transportation requires specific technologies that meet tough security constraints [André et al., 2014, André et al., 2013].

With respect to the results, this research will bring useful insights for urban transportation policies. We will elaborate reforms of public transportation and road pricing schemes which can reduce the external costs. By taking into account autonomous vehicles and new energy forms (hydrogen) we will be able to discuss medium and long-term urban transportation policies related to the trends in innovation. The dissemination of the results, including participation and publications in international conferences and journals, will be highly prioritized.

3 Application, schedule and contacts

- Documents to send to Moez Kilani and Daniel De Wolf (one PDF file):
    - A resume (indicate academic honors)
    - A letter of motivation (no more than two pages)
    - A copy of document stating the latest academic diploma
    - At least one recommendation letter

- Deadline for application: August 22nd, 2018

- Selection procedure: end of August/September

- Start of the PhD : October/November 2018

- For more information on the scientific project:
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  Daniel De Wolf daniel.dewolf@univ-littoral.fr

References

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