

Research master internship

Location of electric vehicle charging stations under uncertainties

Key words

Operations Research, Facility location, Electric vehicle charging stations, Stochastic programming, Mixed Integer Programming

Content

In order to reduce the CO₂ emissions caused by road transport, drivers are encouraged to use Electric Vehicles (EVs). However, one of the major barriers towards the large-scale adoption of EVs is their limited range, i.e. the maximum distance that a fully charged vehicle can travel before its battery runs empty.

A key element in making EVs more attractive is thus to deploy charging infrastructures consisting of stations where drivers can quickly recharge their battery. Nevertheless, building a station requires large capital expenditures. The locations of charging stations should thus be carefully selected to simultaneously maximize the coverage of EV trips and limit the investment costs.

The student will develop models and tools to help decision-makers in optimizing the design of EV charging infrastructures. Most existing works on this problem consider that all parameters are perfectly known at the time when the decisions have to be made (see e.g. [1] and [2]). However, there are many uncertainties related to the demand for electric vehicles and to the vehicle range. One of the objectives of this internship is thus to explicitly incorporate uncertainties into the problem modeling so as to improve the practical relevancy of the obtained deployment plans. This will lead to the formulation of a large-size stochastic facility location problem. Developing a solution approach capable of solving it within a reasonable computation time will be another objective of this work.

Context

This project will be a collaboration between LRI (Laboratoire de Recherche en Informatique www.lri.fr) at University Paris Sud and the college of Business and Economics at UAEU (United Arab Emirates University <http://www.uaeu.ac.ae/en/>). The student will be based on the Paris Sud campus (at the LRI) and will work under the joint supervision of Dr. Céline Gicquel (LRI) and Dr. Mouna Kchaou-Boujelben (UAEU). Therefore, frequent Skype meetings will be scheduled.

Desired qualifications

Student at Master's degree level (last year of engineering school or research master):

- Strong background in applied mathematics.
- Good knowledge in Operations Research: linear programming, integer programming, if possible stochastic programming.
- Interest in computer programming (C++ language) and algorithmic.

Practical information

Location: Université Paris Sud - Campus d'Orsay - 91405 ORSAY Cedex
Start date : Between February and May 2017
Duration: 6 months
Payment: Around 500€ net per month

Contact

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References

- [1] An efficient formulation of the flow refueling location model for alternative-fuel stations, Capar, I. and Kuby, M., IIE Transactions 44 (2012) 622-636.
- [2] Locating road-vehicle refueling stations, Wang, Y. W. and Lin, C. C., Transportation Research Part E (2009) 821-829.