

University of Zilina
Faculty of Management Science and Informatics
**Department of Mathematical Methods
and Operations Research**

Univerzitná 8215/1, 010 26 Žilina, Slovakia

PhD project

Thematic area ²⁾

Data-centric modelling and optimisation of electric vehicles charging

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Problem description:

If more electric vehicle drivers share the same set of public charging stations, then the need arises to coordinate them in space and time to prevent queues and delays. Another need is to match the demand of users with the time varying network capacity (e.g. due to the presence of the renewable sources of energy). In practice, the coordination may be facilitated by a booking system, social networks (social charging) or it can be self-organized. Another option is to incentivise the behaviour of users by introducing a dynamical pricing scheme that helps matching the demand and supply of electricity.

The goal of the project is to propose a method to coordinate charging of a fleet of electric vehicles in order to match available network capacity with the charging demand in time and/or space.

The proposed method will be informed by available datasets such as, dataset describing large public charging network serving users of electric vehicles.

Expected scientific contributions:

- new methods/algorithms to support decision making in the area of charging electric vehicles.

Recommended methods of scientific research:

- formulation of mathematical models,
- design of optimisation algorithms,
- design of simulation models,
- validation of proposed models by simulation and computational experiments.

Compulsory PhD Courses:

Mathematical foundations of informatics
Theory and methodology of applied informatics
Course selected according to the specialisation

Type of research:

Basic research

Related research projects:

VEGA 1/0463/16 Economically efficient charging infrastructure deployment for electric vehicles in smart cities and communities

VEGA 1/0342/18 Optimal dimensioning of service systems

Previous publications of the department where the training will take place:

1. R. Carvalho, L. Buzna, F. B. F, M. Masera, D. K. Arrowsmith, and D. Helbing, Resilience of natural gas networks during conflicts, crises and disruptions, PLoS ONE 9, e90265 (2014).
2. R. Carvalho, L. Buzna, R. Gibbens, and F. Kelly, Critical behavior in charging electric vehicles, New J. Phys. 17, 095001 (2015).
3. M. Cebecauer, K. Rosina, L. Buzna: Effects of demand estimates on the evaluation and optimality of service centre locations, International Journal of Geographical Information Science, Vol. 30, Issue 4, 2016.
4. M. Cebecauer, L. Buzna A versatile adaptive aggregation framework for spatially large discrete location-allocation problems, Computers & Industrial Engineering , Vol. 111, p. 364-380, 2017

We are looking for a PhD candidate having strong background in at least one of the following areas: computer science, software engineering, geoinformatics or operations research.

The expected start: September 1, 2018

For more information please email us to Lubos. Buzna@fri.uniza.sk