Doctoral Dissertation Thesis Topics for academic year 2025/2026
Study program: Technology and Management in Transport

Research on artificial intelligence methods for solving the problem of delivering parcels in the last and penultimate mile
Supervisor: Assoc. Prof. Libor Švadlenka, Ph.D.
Supervisor specialist: Ing. Stefan Jovčić, Ph.D.
Form of study: full-time

Annotation
In the last decade, an annual growth of approximately 15% can be observed in the volume of e-commerce shipments that need to be delivered to end customers in the final stage. Especially in cities, this trend causes problems manifested mainly by congestion, air pollution, noise and other negative externalities. Therefore, it is necessary to look for and implement ways of long-term sustainable delivery of parcels within the last mile (use of e-cargo bikes, urban micro-depots, self-service delivery boxes, low-emission zones, etc.).

The resulting measures reflect the different expectations of the individual interested parties – specifically the city management, then the deliverers of the parcels (logistics companies), the final customers (recipients of the parcels) and, last but not least, the residents living in the city centers or the operators of shops in these areas.

Research in this area will aim to create a predictive and decision-making model using the potential of MCDM (multi-criteria decision-making) techniques, e.g. ARAS, VIKOR, WASPAS, CODAS, COPRAS, BWM, MARCOS, EDAS, AROMAN, FullEX, etc. For to create the model, AI techniques (machine learning, neural networks, etc.) and IoT elements (devices equipped with sensors, software and other technologies for mutual data exchange) will be applied. Employing the mentioned techniques in combination with the properties of IoT devices, it will be possible to comprehensively manage (especially) delivery/collection routes in city centers, the capacity of transshipment points, etc., about different means of transport or to different sizes of cities. To achieve the stated goal, the doctoral student will analyze the current state of the problem in the Czech Republic and abroad.

Various Models through Ensemble Learning for Transportation
Supervisor: Assoc. Prof. Jiří Křupka, PhD.
Supervisor specialist: will be specified
Form of study: full-time

Annotation
The dissertation deals with a process that combines different models for a selected prediction or classification problem. It is assumed that the problem is part of the Industrial Internet of Thinks or Industry 5.0.
The aim of the dissertation is to propose models using ensemble learning for a chosen problem in transportation. The model is designed based on a systems approach, machine learning and computational intelligence. Available information and methods that can handle uncertainty are summarised and analysed. The model will be validated by using a case study.

Decision Support System for Sustainable Mobility in Smart City Context
Supervisor: Assoc. Prof. Jiří Křupka, PhD.
Supervisor specialist: Ing. Monika Bartošová, Ph.D.
Form of study: full-time

Annotation

The aim of the dissertation is the development of models based on machine learning, soft computing or artificial intelligence to support decision making in the field of sustainable mobility in the context of Smart Cities. The models will reflect the relationships and changes in the public and private sectors. These changes in the city/regional infrastructure as well as changes in business activities, mainly due to Industry 5.0, are expected to have an impact on sustainable mobility in the city/region. This includes, for example, impacts on transport and land use planning, implementation of new smart systems, energy savings, human resource development, satisfaction of transport users or residents, safety, etc. The proposed models can work with data describing the positive and negative externalities of transport activities in relation to the sustainability of the territorial unit.