

## **Abstract**

In the context of the evolution of road transport, simulation models and tools are playing an increasingly important role in analyzing the impact of new technologies and changes in the mobility system on users' choices and vehicular traffic on road networks. In this scenario, this research focuses on the development and application of modeling and simulation tools aimed at understanding, analyzing, and reproducing in a virtual environment user behavior, both in terms of individual choices among a set of alternatives affecting mobility and driving behavior that have an impact on traffic performance. The aim of this work is to develop methodologies and tools to support the modeling and analysis of user choices in the context of transport systems. The study is divided into two main lines of research, with a common approach to the processing and analysis of mobility data to achieve acceptable consistency in the models developed. The first part of the work concerns the use of discrete choice models to analyze user decisions related to vehicle electrification. Both the adoption processes of electric vehicles and the use of charging infrastructure have been modeled, with the aim of identifying the main factors that influence user preferences and choices. The models are estimated from data collected through surveys designed to realistically represent the decision-making situations analyzed. The second research line focuses on the construction and management of traffic simulation scenarios based on observed data. The central objective is to develop a comprehensive and transferable methodology for generating realistic traffic scenarios in a virtual microsimulation environment. Using observed vehicle trajectory data and iterative calibration procedures, scenarios are developed that can consistently reproduce the characteristics of the traffic system and support comparative analysis within the scenario. The goal of this work is to develop effective, transferable methodologies for modeling user choices and simulating vehicle traffic.