Digging Deep Into Urban Mobility Data Through Machine Learning Techniques

Abstract

Nowadays urban mobility is an integral part of citizens' lives. Different mobility services are widely used to move and to reach objectives, both under a professional perspective and a personal one. The key role that the mobility covers has earned it the attention of mobility planners and decision makers at different levels, to improve mobility services with the additional perspective of reducing its impact in terms of ecological footprint. Within this context, several objectives have been defined from global organization, like UN Climate Change Conference, whose aim is to accelerate the transition from coal to clean power, to protect and restore nature for the benefit of people and climate, and to accelerate the transition to zero emission vehicles. These objectives are clearly impactful for mobility systems, which need to change in order to accomplish also the eco-sustainability objectives. Aside to them, we can find several other problems indirectly linked to them and related to mobility services' characteristics able to change people habits that have been already studied.

Within this multi-faceted context, in this PhD thesis the urban mobility has been studied under different perspectives and with different objectives, with respect to the targeted thematics, the analysed data types, the proposed data analysis methodology, and the exploited machine learning techniques.

From the thematic point of view, three main contexts of analysis have been identified. Firstly, (i) the *Mobility-as-a-Service (Maas)* has been investigated through the definition of methodologies to analyse and predict vehicle availability within the urban area. Then, (ii) methodologies for physiological data analysis have been studied to enhance the *perception of the mobility service* for the subject within the vehicle. Specifically, the objective was the early identification of uncomfortable or dangerous physical conditions for the subject. Lastly, (iii) the possibility to exploit *mobility data as source of implicit users' interests* has been studied and compared with the explicit annotations made through Location Based Social Networks (LBSN).
Supplementary analyses have been conducted to characterise the urban air quality together with meteorological conditions and to automatically map items through taxonomies characterised by different granularities.