# Objective and subjective safety mapping for urban cyclists

**Summary**

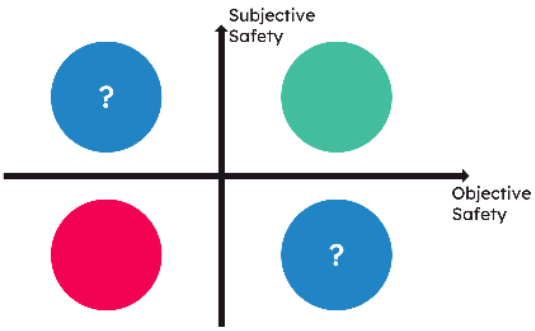
Today, cities are seeking to transition to more sustainable transportation modes. Cycling is critical in this shift, including first-and-last-mile links to transit. However, cyclists are exposed to many hazardous circumstances or environments (which can result in accidents, injuries, and deaths), and are exposed to perceptions of such risks. Thus, analysing cyclists' safety is critical for planners and decision-makers to improve cycling uptake and reduce the risk to those who cycle.

This thesis explores cycling safety and, more specifically, the effects of the urban environment on cyclists' safety. It uses a new framework based on scalable solutions and tools to analyse three components of cycling safety: objective safety (analysing cycling accidents and their outcomes), subjective safety (exploring perceptions of cycling accidents), and the relation between the two. Its main objective is to "Combine authoritative and volunteered geographical data to automatically and continuously identify, understand, and draw recommendations to improve urban objective and subjective cycling safety."

Analyses explored a broad range of methodologies that make use of traditional methods and newer machine learning endeavours to uncover complex relations between urban elements, various built environment typologies, other risk factors and cycling accidents or perceptions of such accidents. Ultimately, the findings highlight the ability to capture heterogeneity in different urban settings, which allows for more direct countermeasures to risky situations or policies to be designed, simulated, and targeted. Additionally, results showed how such an approach facilitates the continuous assessment of changing cycling environments and its use in efficiently assessing different locations with the growing amount of openly available data. In practice, researchers, urban planners, and authorities can employ such methods to actively monitor and identify urban characteristics that either increase or decrease cycling safety at both a micro and macro level.

**Keywords**

Cycling safety, objective safety, subjective safety.




**PhD student**
Miguel Nobre da Costa

**PhD program**
Transportation Systems (IST, University of Lisbon)

**Supervisor**
Filipe Moura (CERIS, IST, University of Lisbon)

**Co-supervisors**
Manuel Marques (ISR, IST, University of Lisbon) and Carlos Lima Azevedo (DTU, Technical University of Denmark)

**Period**
2018-2024

**Funding**
FCT scholarship (PD/BD/142948/2018)