Advanced Traffic Management

Prof. Eleni I. Vlahogianni

Dean of the School of Civil Engineering

dsait



Department of Transportation Planning and Engineering National Technical University of Athens

> Artificial Intelligence for Road Safety and Mobility Workshop

> > 8th UN Global Road Safety Week

Athens, 15 May 2025





Streets for Life MakeCyclingSafe Overview

- ➤ Traffic operations, AI and EU experience
- The importance of thinking beyond accuracy
- Trustworthy AI for mobility management







Traffic operations, Al and EU experience

Urban Traffic Operations

Complex and multilevel decision making (strategic, tactical and operational level)

- > Multimodality
- > Technology, Connectivity and Automation
- Multi-stakeholders' environment
- Extreme events and disruptions
- > Covid-19 related phenomena
- Cascade effects and interactions





Traffic Management: Challenges

Integration of transportation modes to ensure seamless and efficient use of the network

- Smart physical and digital infrastructure
- Effective use of high-quality multi-source data
- > Dynamic multi-objective decision making
- Stakeholders' consensus building

European Climate, Infrastructure and Environment Executive Agency





Network and Traffic Management: Our Scientific Advancements

AI dominates the field of

Cooperative Connected and Automated Mobility (CCAM) applications

Distributed network wide traffic control for mixed traffic scenarios

Connected intersections

Dynamic space allocation









AI-assisted decision-support tools

Demand-Responsive Mobility and Freight Services

Intelligent transit operations



Reality Check

- Low automatization in traffic operations (action, prioritization, communication)
- Lack of trust on data driven insights and decisions
- Fragmented decision-making
- Difficulty on reaching consensual decisions due to lack of data share and joint objectives



Eleni Vlahogianni, Advanced Traffic Management

Thinking Beyond Accuracy (our Lab's approach)

- Causality matters
- > (Traffic) theory inspired AI matters
- Quantification of uncertainty matters
- Problem representation and elegance matters: from lab to society/market







Trustworthy AI for Mobility Management

- Trustworthiness of AI-based systems: To which extent our solutions can be relied upon to perform accurately, ethically, and safely in managing real-world traffic scenarios?
- We are just getting started with AI: The importance of governance in data, policies and AI based decisions



EU AI Act: first regulation on artificial intelligence, a risk-based approach



Concluding Remarks (1/2)

- The new transport landscape offers:
- Unimaginable opportunities to affect users' mobility
- Unpreceded challenges for large scale traffic management in cities





Concluding Remarks (2/2)

- ML, AI, and GenAI are poised to alter mobility and the transport sector
- The new transportation era will foster intelligent solutions, but not necessarily complex ones
- The proper blend of data science and transportation intuition can deliver meaningful and scalable solutions
- Intelligence should go all the way from users to systems and processes for efficient management
- Education and learning for bridging skills gap
- > Intelligence should go hand in hand with trust





Advanced Traffic Management

Prof. Eleni I. Vlahogianni

Dean of the School of Civil Engineering

dsait



Department of Transportation Planning and Engineering National Technical University of Athens

> Artificial Intelligence for Road Safety and Mobility Workshop

> > 8th UN Global Road Safety Week

Athens, 15 May 2025





Streets for Life MakeCyclingSafe