



National  
Technical  
University  
of Athens

# The NTUA Laboratory of Traffic Engineering School of Civil Engineering

February 2024



# Presentation outline

1. The NTUA Laboratory of Traffic Engineering
  2. Education
  3. Research
  4. Research Infrastructure
  5. Cooperations and Partners
  6. Research Areas
- 
- The background of the slide features a complex, abstract geometric pattern. It consists of numerous overlapping, semi-transparent hexagonal shapes in various shades of gray, white, and light blue. These hexagons are interconnected by a network of thin, white lines, creating a sense of depth and connectivity. The overall aesthetic is modern and technical, typical of a scientific or engineering presentation.

# The NTUA Laboratory of Traffic Engineering



Πτέρυγα Β  
• Εργ. Κυκλοφοριακής Τεχνολογίας  
• Εργ. Οδοστρωμάτων

# The NTUA Laboratory of Traffic Engineering

- The Laboratory of Traffic Engineering (LTE), established in 1998, is a **Center of Research and Innovation Excellence** in Traffic Engineering, with global recognition
- It belongs to the **Department of Transportation Planning and Engineering** ([www.transport.ntua.gr](http://www.transport.ntua.gr)) of the School of Civil Engineering ([www.civil.ntua.gr](http://www.civil.ntua.gr))
- Since its establishment, the LTE contributes to transportation science through numerous **academic and research activities**



# Mission

The Mission of the NTUA Laboratory of Traffic Engineering is:

- **educate** scientists engineers , and
- to promote **research**

in the field of traffic engineering

The Laboratory's educational and research activities are characterised by high **innovation**, excellent **organisation** and great **utility** for society



# Vision

The Vision of the NTUA Laboratory of Traffic Engineering is:

- the substantiated support for decisions on the **optimal operation of urban and interurban road traffic** in Greece and internationally,
- making use of the most modern scientific theories and **technological developments**,
- so as to ensure both the servicing of the traffic and the medium-term economic and environmental **sustainability of the mobility**



# Laboratory People

A dynamic team of more than 40 renowned scientists:

- Faculty **2**
- Post Doctoral Researchers **5**
- Ph.D. Candidates **22**
- Research Assistants **10**
- Information Systems Engineers **2**
- Administrative assistants **3**



# Laboratory Faculty



**George Yannis**  
Professor, Department Director



**Eleni Vlahogianni**  
Professor





# Education



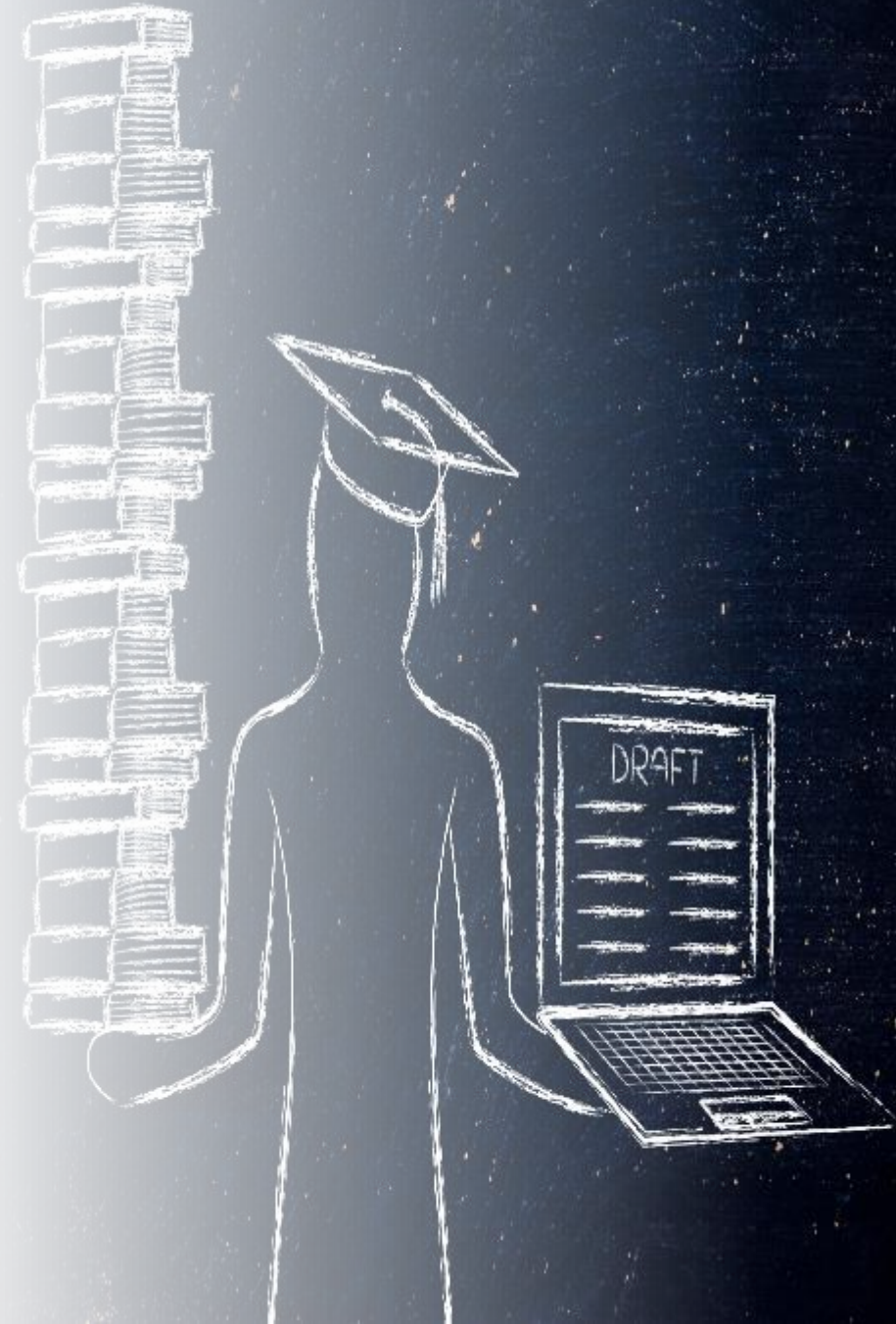
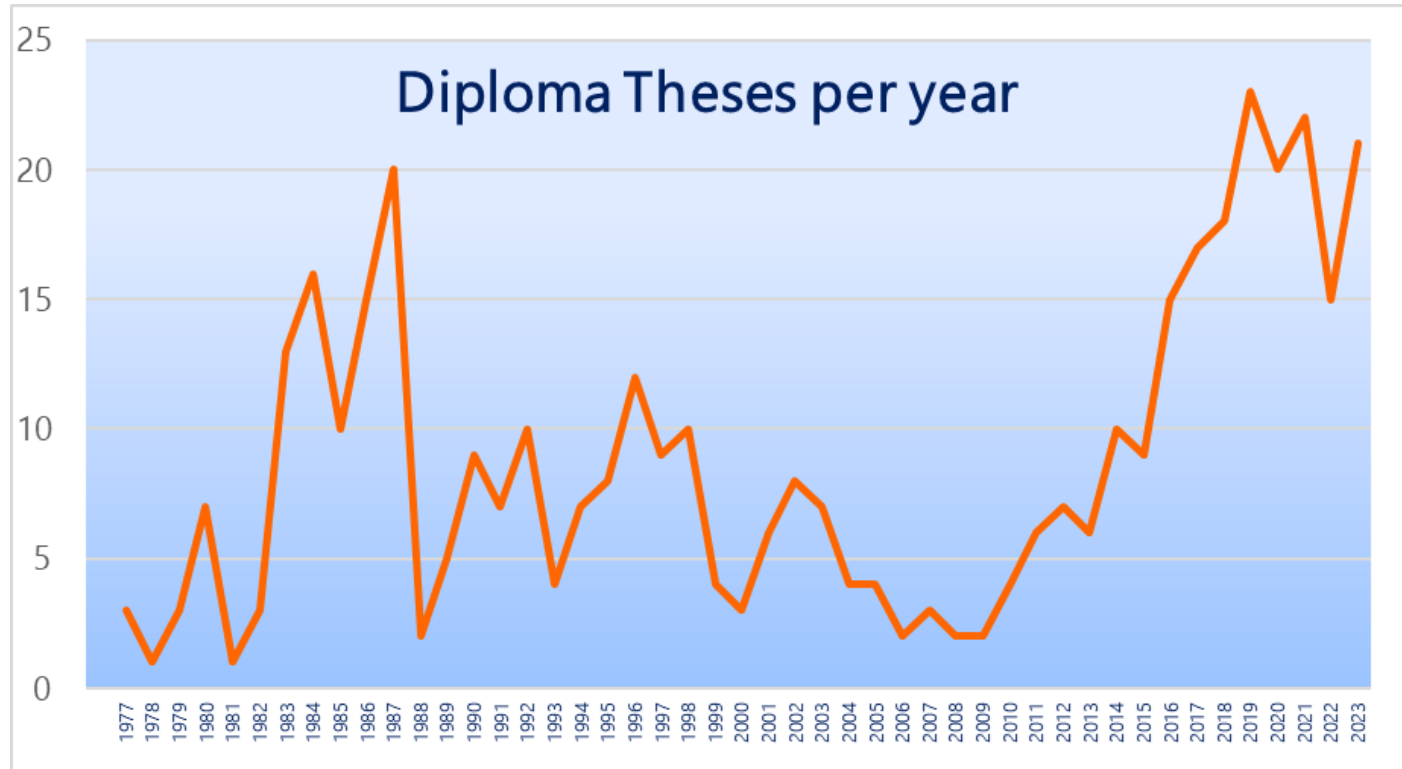
# Courses

1. Traffic Flow theory  
7th Semester
2. Urban Road Networks  
8th Semester
3. Traffic Management and Road Safety  
9th Semester
4. Analysis Methods in Traffic Engineering  
9th Semester
5. Quantitative Methods in Transportation  
9th Semester
6. Integrated Project in Transportation  
Engineering  
9th Semester



# Diploma Theses

- 465 Diploma Theses since 1977
- 170 Diploma Theses since 2014
- 10 Diploma Theses per year



# PhD Theses Completed

- Eleni Mantouka (2022)
- Evangelos Mintsis (2022)
- Apostolos Ziakopoulos (2020)
- Dimitrios Tselentis (2018)
- Emmanouil Barmponakis (2017)
- Dimosthenis Pavlou (2016)
- Athanasios Theofilatos (2015)
- Panagiotis Papantoniou (2015)
- Eleonora Papadimitriou (2010)
- Eleni Vlahogianni (2006)



# PhD Theses Underway

- Nikos Karouzakis (2023)
- Stella Roussou (2023)
- Konstantinos Katzilieris (2021)
- Marios Giouroukelis (2021)
- Marios Sekadakis (2021)
- Maria Oikonomou (2021)
- Virginia Petraki (2020)
- Eva Michelaraki (2020)
- Panagiotis Fafoutelis (2019)
- Julia Roussou (2019)
- Armira Kontaxi (2019)
- Dimitris Nikolaou (2019)
- Alexandra Laiou (2019)
- Charis Chalkiadakis (2018)
- Eleni Chalkia (2017)
- Alexandros Papacharalampous (2017)
- Foteini Orfanou (2016)
- Emmanouil Kampitakis (2016)
- Aikaterini Stylianou (2015)
- Aikaterini Folla (2015)





**Research**

# Research Projects

More than **170 Research Projects**

> **90 International**

> **80 Greek**

With more than **350** national and international organizations

More than **100** through highly competitive procedures



# Scientific Publications

More than **1.100** Scientific Publications

Scientific Journals >400

Conference Proceedings >600

Conferences Presentations >700





# Research Infrastructure



# Research Infrastructure

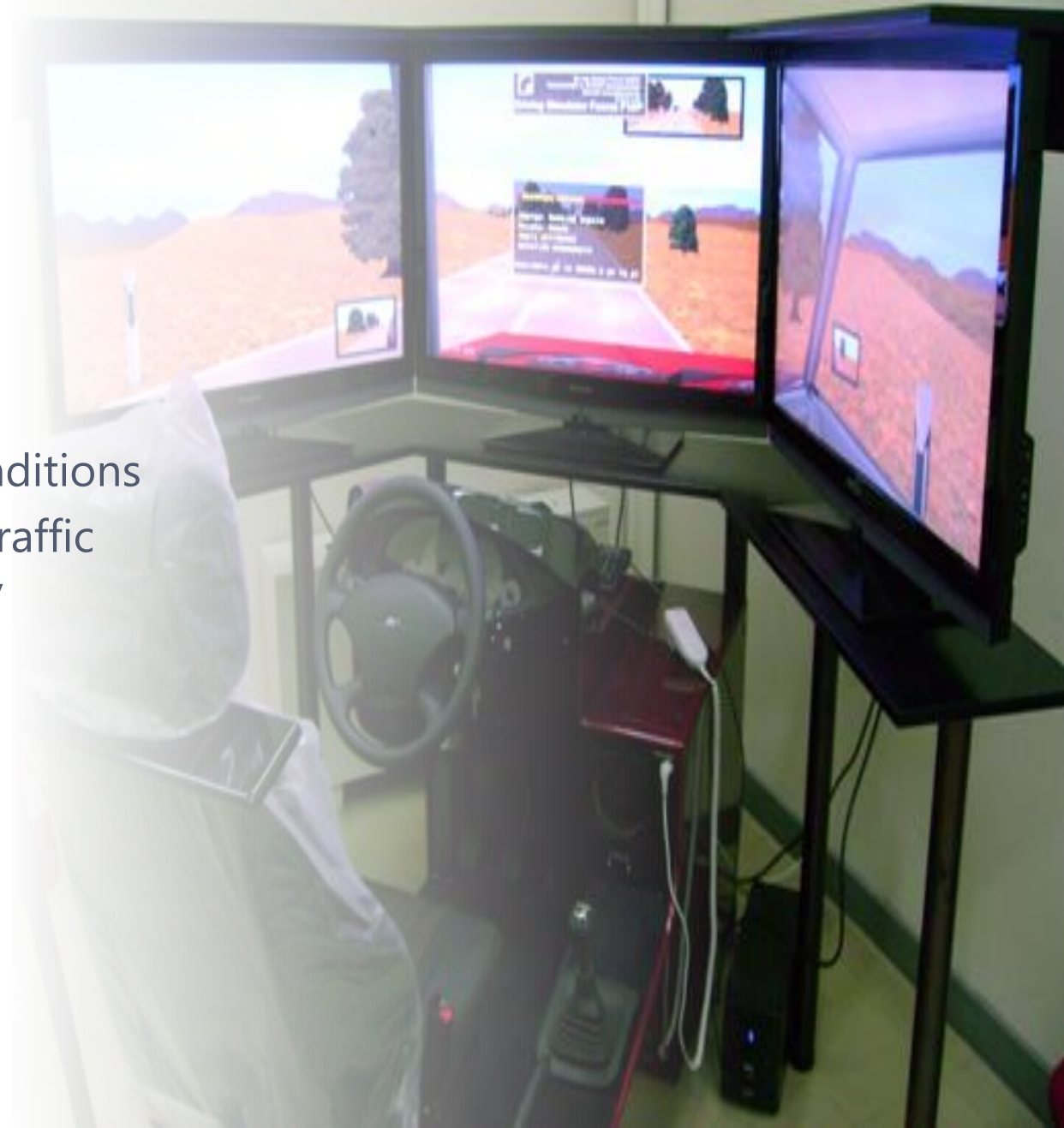
1. Driving Simulator
2. Unmanned Aerial Vehicles (UAV)
3. On-Board Monitoring Devices
4. Traffic Counts Devices
5. Data Bases
6. Data and Knowledge systems
7. NTUA Road Safety Observatory
8. Software



# Driving Simulator

## Foerst Driving Simulator FPF 1/4 cab

- Motion Base
  - 2 degrees of freedom
- Programming **Software Tool**
  - Programming driving scenarios in different conditions
  - Investigation of driver's behaviour in extreme traffic conditions and conditions of difficult geometry
- Driver Behaviour **Data**
  - Kinematic characteristics
  - Speed, acceleration, headways, time-headways
  - Time To Collision
  - Track of the vehicle
  - Reaction Time



# Unmanned Aerial Vehicles (UAVs)

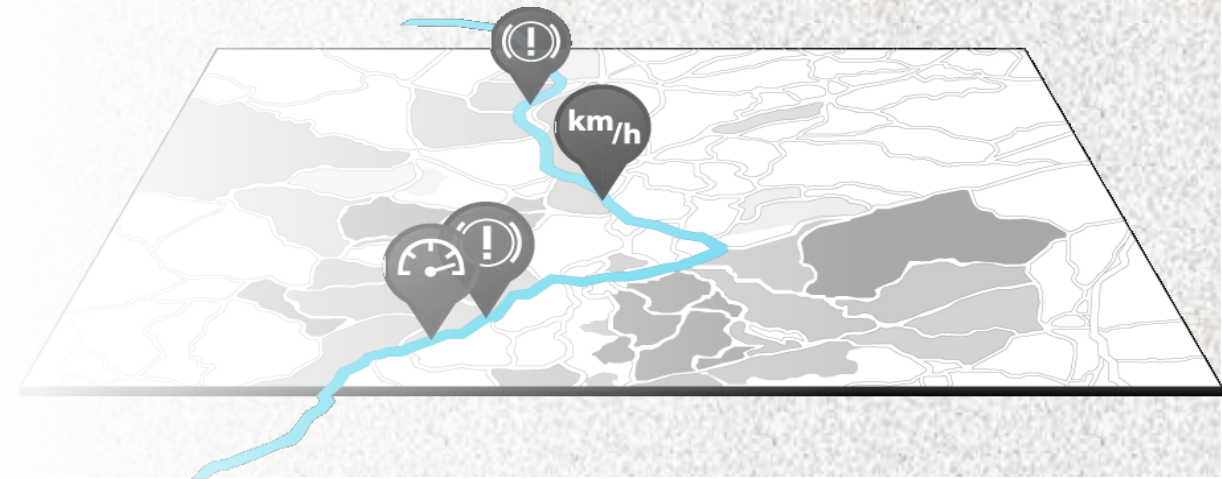
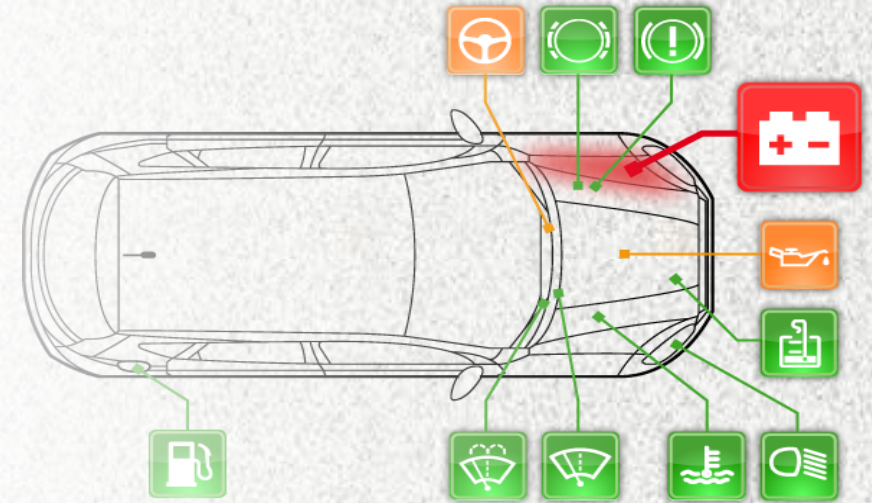
- **Traffic** monitoring
- **Trajectory** data collection of vehicles and pedestrians
- Detection of critical traffic and **roadway** conditions



# On-Board Monitoring Devices



- Vehicle **performance** monitoring data collection
- **Driving** performance monitoring and data collection
- **Fuel consumption** data collection



# Traffic Counts Devices

- **Manual** traffic counters
- Counters of turning templates traffic
- Automatic traffic counters sectional road (**ADR**)
- Radar speed detection (**Laser**)
- Device for measuring and analyzing traffic to **junction**
- System for recording and analyzing real-time traffic (**Autoscope**)
- Device road traffic **noise** levels
- **GPS** devices log position information



# Data Bases

- [SANTRA](#) - Greek Road Accident Database with disaggregated data (1985 - 2019, 1,3 million recordings)
- [CARE](#) - European Road Accident Database with disaggregated data (1991 - 2020, 40 million recordings)
- [IRTAD](#) - International Road Accident Database with aggregated data
- Databases of International Organisations ([WHO](#), [IRF](#), [ERF](#), [UITP](#))
- Databases with [Aggregated Data](#) (Vehicle fleet, veh-km, driver behavior, etc.)
- [Digital Road Safety Library](#) > 6.500 key Reports



# Data and Knowledge Systems

- [Erso](#) - The European Road Safety Observatory
- [SaferAfrica](#) - The African Road Safety Observatory
- [SafetyCube](#) - European Road Safety Decision Support System
- [SafeFITS](#) - Global Road Safety Model
- [Pract](#) - The CEDR Road Safety APM and CMF Repository
- [SmartMaps](#) - Smart Mapping Tool for Safer and Eco Driver Behaviour
- [NRSO](#) - The NTUA Road Safety Observatory





# NTUA Road Safety Observatory

An international reference website  
- information system since 2004, with  
*state-of-the art road safety data and knowledge*

[www.nrso.ntua.gr](http://www.nrso.ntua.gr)

- since 2004 with more than **2.220 items**
- more than **30.000 visits** per month
- **138 electronic newsletters** since 2007
- **tens of tweets** and social media posts annually
- network of more than **5.500 road safety experts** in Greece (1.500+) and worldwide (4.000+)



The NTUA Laboratory of Traffic Engineering – February 2024

The screenshot shows the website's header with the NTUA logo and navigation links (Home, About, Knowledge, Data, Conferences, News, Links). The main content area features a 'Systems' sidebar with logos for European Road Safety Observatory, SafeFITS, pract-repository, levitate, and smartmaps. The central banner is titled 'Road Safety: Focus on Distraction' and includes statistics and countermeasures. Below this is a 'Cooperations' section with logos for Europe, Mobility and Transport, Research & Innovation, European Investment Bank, European Transport Safety Council (ETSC), CEDR, and FEHRL. The main text area highlights the 'CTS 2024' symposium and the 'New SafeRoadsMap Tool'. A right sidebar contains a search bar, a '2023 Road Safety Research Challenges' banner, a 'www.transport.ntua.gr' link, a 'George runs 30 marathons in 30 months' image, a 'Road Safety Update' newsletter sign-up, and an 'Upcoming Events' section with various congress and conference posters.

# Software

- Traffic Flow Analysis
  - HCM, Synchro, TSIS
- Macroscopic and Microscopic Traffic Flow Simulation
  - AIMSUN, Saturn, Contram, Simtraffic, Corsi
- Statistical Analysis
  - SPSS, R, MLWIN, MATLAB, LIMDEP, Python
- Traffic Flow Forecast, Traffic Flow distribution network
  - CUBE



# Cooperations & Partners



# Cooperations - Greece



# Cooperations - Europe

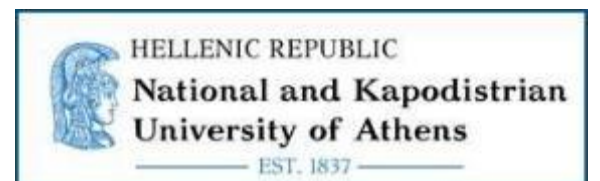
 <p>MOBILITY AND TRANSPORT Road Safety</p>	 <p>RESEARCH &amp; INNOVATION Transport</p>	
 <p>INEA Innovation and Networks Executive Agency</p>	 <p>European Investment Bank <i>The EU bank</i></p>	 <p>UNECE</p>
 <p>European Committee for Standardization</p>	 <p>Conférence Européenne des Directeurs des Routes Conference of European Directors of Roads</p>	
 <p>FERSI Road Safety Research</p>		
 <p>EUROPEAN UNION ROAD FEDERATION ERF</p>	 <p>POLIS EUROPEAN CITIES AND REGIONS NETWORKING FOR INNOVATIVE TRANSPORT SOLUTIONS</p>	 <p>ETSC European Transport Safety Council</p>



# Cooperations - Worldwide



# Partners - Universities



# Partners - Research Institutes





An aerial, top-down view of a multi-lane highway. The road is filled with a variety of vehicles, including cars, vans, and several large white buses. The lanes are separated by white dashed lines, and there is a central median. The overall scene depicts a dense flow of traffic.

# Research Areas

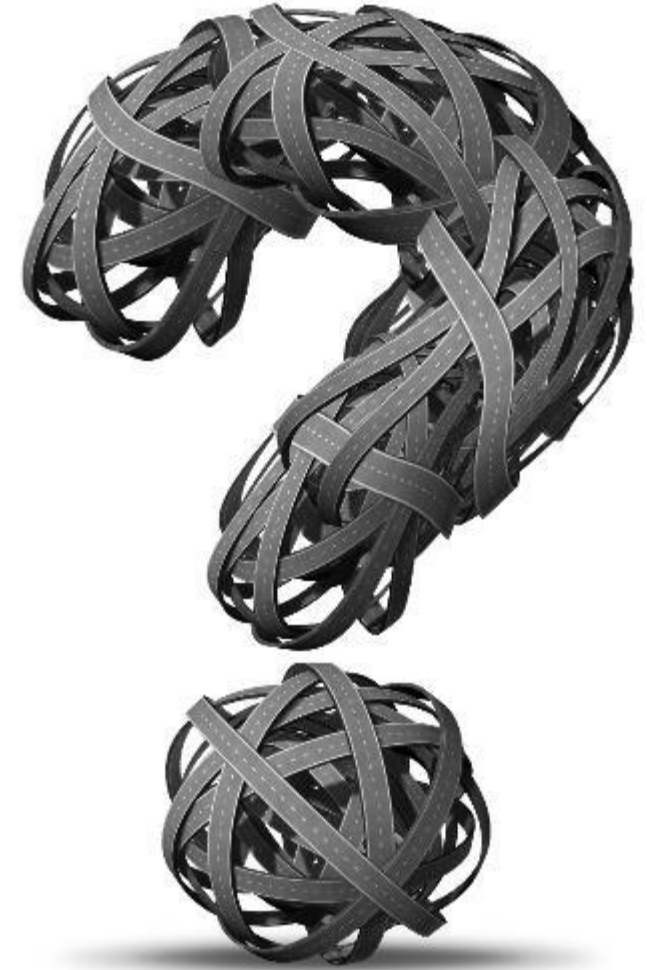
# Traffic Management - Topics

- Data driven traffic flow analysis and forecasting
- Simulation for automated traffic
- Mobility as a service, electromobility, connected and shared mobility
- UAV based traffic monitoring and analysis
- Traffic and safety of PTW, cyclist and pedestrians
- Network level traffic prediction and management
- Evidence based mobility optimization and policy making
- Design and implementation of traffic management systems
- Design and operation of parking systems



# Traffic Management Research Questions

- How to improve traffic monitoring using [crowdsourcing](#)?
- How ICT, social networks and [smartphone sensing](#) can be used for traffic monitoring control and management?
- Can [UAVs](#) be used for monitoring traffic and identifying congestion in urban areas?
- What is the impact of [smart mobility](#) services to large scale network traffic?
- How to manage the [cooperative](#) and automated traffic?
- Can [intelligent parking services](#) reduce traffic congestion in cities?



# Traffic Safety - Topics

- Driver Safety Behaviour & [Telematics](#)
- Road [Infrastructure](#) Safety
- Traffic Safety [Analysis](#)
- Road Safety [Data](#) & Knowledge Systems
- Road Safety [Management](#)



SAFETY  
FIRST



# Traffic Safety Research Questions

- How to improve driver safety **behaviour** with focus on speeding, drink-and-drive and distraction?
- Which are the best solutions for safe traffic of **Vulnerable Road Users**?
- How to integrate safety into **urban mobility** planning and operation?
- How to identify and assess the most appropriate **road safety measures**?
- How to exploit **big data** to support better traffic safety decision making but also driver behavior?
- How are **automation and connectivity** going to improve traffic safety?



# ITS and Automation - Topics

- **Smartphone sensing** and analytics, insurance telematics, driving analytics
- **C-ITS** applications
- Traffic **Automation**
- Impact assessment of **ITS**, c-ITS and CAV on mobility, environment and safety



# ITS and Automation Research Questions

- Can we accurately predict demand in future cooperative and connected **smart city** context?
- What will be the impact of **automation** in future road networks?
- How to develop efficient individualized systems for managing **personal mobility**?
- How to accurately forecast traffic evolution in the era of autonomous, **connected** and shared mobility?





Pavement Engineering Laboratory



Railways and Transport Laboratory

# [www.transport.ntua.gr/traffic-engineering-laboratory/](http://www.transport.ntua.gr/traffic-engineering-laboratory/)

Traffic Engineering Laboratory



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## Mission

The Mission of the NTUA Laboratory of Traffic Engineering is to provide scientists engineers with **high level of education**, and to **promote research** in the field of traffic engineering. The Laboratory's educational and research activities are characterized by high **innovation**, excellent **organisation** and great **utility** for society.

## Transport Tools



Department of Transportation  
Planning and Engineering



Department of Transportation  
Planning and Engineering





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