



IEEE ITSC 2025

## Invited Session Proposal

- **Title:**

Traffic Control and Connected Autonomous Vehicles: benefits for efficiency, safety and beyond (3 edition)

- **Modality:**

Half-day (1 session of 2 hour)

- **Motivation and general scope**

Mobility is facing a transformation in terms of connectivity, allowing vehicles to communicate with each other, with the smart road infrastructure, and with other road users. Such knowledge, gained via the adoption of advanced sensing/communication technologies, has the potential to fundamentally shift the mobility paradigm towards mobility as a service, contributing to more efficient, safe, and comfortable ground transportation systems.

Indeed, on the one hand, such continuous awareness about mobility conditions lets the smart infrastructure regulate the traffic flow at macroscopic level by limiting the flows entering a road section (ramp metering), by regulating the flows already present in the mainstream (mainstream control) or by routing traffic flows on alternative paths of a network (route guidance).

On the other hand, the information provided by the smart infrastructure combined with the one received by other communicating entities along the road (i.e. autonomous vehicles, human-driven vehicles, pedestrians) can support, at microscopic level, autonomous vehicles in taking the proper control decision in different traffic scenarios to guarantee a safe, smooth, comfortable and sustainable driving experience, e.g. by avoiding strong accelerations / decelerations or by avoiding hazardous maneuvers. Besides road vehicles, this new emerging mobility concept is nowadays gaining momentum in the railway research field, where cooperation among autonomous trains and radio Block Centers (RBC) plays a key role in increasing rail line capacity while reducing traffic congestion.

Thus, coordination and cooperation allow traffic and mobility control at an entirely new level. This new mobility paradigm, also known as Cooperative, Connected and Automated Mobility (CCAM) enables and provides an ITS service that offers better quality and an enhanced service level, compared to the same ITS service provided by only one of the ITS sub-systems (personal, vehicle, roadside and central, infrastructures), hence improving traffic management, reducing congestion, and contributing to sustainable and eco-mobility. Indeed, all the traffic information, available on-board of vehicles, can be exploited for improving the planning, the decision, and the control of the autonomous connected vehicles (including autonomous trains) moving in this smart environment. This brings to a new traffic management system which, by acting on CAVs, aims to achieve numerous goals, such as the optimum use of energy, reliable journeys, as well as the reduction of accidents, costs, environmental pollution, and traffic congestion. Finally, since the great amount of information shared could be compromised by cyber-attacks, resilient control algorithms are also required to achieve the control goals. In this



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perspective, this Invited Session aims at exploring how to design new control solutions for traffic and vehicle control systems able to face CCAM challenges in a resilient and sustainable way, also in the transition phase where a good co-existence of conventional and connected vehicles is needed in mixed traffic environments.

### ● **Relevance to the ITS community**

All the topics covered in this Special Session are very relevant for the ITS community. Control of CAVS, with all the impacts in terms of performance improvement, safety and sustainability guarantees, represents a very hot topic for the ITS community, which is more and more interested in developing efficient control algorithms for smart mobility systems. It is important to underline that this research area can be very relevant for the ITS community not only for the development of new methodologies, but also for the technological challenges involving control systems, communication, sensing and information technologies, as well as cyber-security topics and sustainability-related issues.

### ● **Topics**

The Special Session will include the following topics:

- Development of safe and secure Cooperative-ITS (C-ITS) services for traffic management;
- Autonomous Connected Vehicles;
- Results from experimental systems, testbeds, and pilot studies;
- Networked information processing, decision making, and intelligent control;
- Energy-oriented C-ITS;
- Modeling approaches for mixed traffic;
- Analysis of the impact of C-ITS in mixed traffic flow;
- Benefits of C-ITS for road safety and traffic efficiency.

### ● **Organizers:**

**Angelo Coppola**, University of Napoli Federico II, [angelo.coppola@unina.it](mailto:angelo.coppola@unina.it)

**Short Bio:** He received the M.Sc. degree in transportation science engineering and the Ph.D. in Information Technology and Electrical Engineering at the University of Naples Federico II. His research interests include the design and testing of CCAM and C-ITS services and the testing of automated road vehicle functions.

**Cecilia Pasquale**, University of Genova, [cecilia.pasquale@edu.unige.it](mailto:cecilia.pasquale@edu.unige.it)

**Short Bio:** She received the bachelor degree in Civil Engineering in 2009 from the Polytechnic University of Torino, Italy, the Master degree in Transports and Logistics Engineering and the Ph.D. degree in Monitoring of Systems and Environmental Risk Management from the University of Genova, Italy, in 2012 and 2016, respectively. Currently she is Assistant Professor at the University of Genova. Her research interests include modelling, optimization, and control methods applied to the field of



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transportation systems. She has served as AE for the Open IEEE Open Journal on Intelligent Transportation Systems and for IEEE Transactions on Intelligent Vehicles. Presently, she serves as Associate Editor for Control Engineering Practice. She is currently the Chair of the IEEE ITS TC on “Decision and Control in Transportation Systems.”

**Alberto Petrillo**, University of Napoli Federico II, [alberto.petrillo@unina.it](mailto:alberto.petrillo@unina.it)

**Short Bio:** He received the Ph.D. degree in control systems engineering from the University of Napoli Federico II, Naples, Italy, in 2019. He is an Assistant Professor of Systems and Control Engineering at University of Napoli Federico II. His research activity concerns both theoretical and application topics in the automatic control field and combines the methodological aspects with experimental validation. Specifically, it focuses on the design of distributed control system for multiagent Systems in the presence of communication impairments and security vulnerabilities with application to the vehicular networks in automotive and railway sector, ITS, and energy. He also serves as Associate Editor of IEEE Transactions on Intelligent Transportation Systems and as Vice-Chair of the ITSS TC on “Decision and Control in Transportation System”.

**Simona Sacone**, University of Genova, [simona.sacone@unige.it](mailto:simona.sacone@unige.it)

**Short Bio:** She is Professor of Automatic Control at the Department of Informatics, Bioengineering, Robotics and Systems Engineering of the University of Genova in Italy, where she teaches Systems Theory, Identification and Estimation Techniques, and Sustainable Systems Modelling and where she acts as the coordinator of the PhD Course on Systems Engineering. Her research activity is devoted to the optimization and control of complex physical processes by means of discrete-event and hybrid modelling and control approaches. The main application fields are freeway traffic control and logistic networks planning. She has authored and co-authored more than 150 papers published in international journals, international books, and international conference proceedings. From 2019 to 2024 she has been a member of the Board of Governors of the IEEE Intelligent Transportation Systems Society. Presently she serves as the Editor-in-Chief of the IEEE Transactions on Intelligent Transportation Systems.

**Stefania Santini**, University of Napoli Federico II, [stefania.santini@unina.it](mailto:stefania.santini@unina.it)

**Short Bio:** She is Professor of Systems and Control Engineering (Automatica) with the University of Naples Federico II. She leads the Distributed Automation Systems Laboratory, a Research Group in the field of Distributed Automation and its applications. Her research interests include nonlinear control of nonlinear and cyber-physical systems, time-delayed systems, networked control, and multiagent systems, with applications to automotive engineering, transportation technologies, and more recently to the application domains of smart manufacturing, information technology, and energy.

She serves as Senior Editor of IEEE Transactions on Intelligent Transportation Systems and Associate Editor of IEEE Transactions on Control Systems Technology. She is also the Vice-Chair IEEE ITS Italian Chapter. She was and is a Principal Investigator of many national and international research projects, also in cooperation with industry, including small- and medium-sized enterprises.

**Silvia Siri**, University of Genova, [silvia.siri@unige.it](mailto:silvia.siri@unige.it)



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**Short Bio:** She received the Ph.D. degree in information and communication technologies from the University of Genova, Italy, in 2006. She is currently an Associate Professor of Automatic Control with the University of Genova. She is the coauthor of more than 130 papers in international journals, chapters, and conference proceedings. Her research interests include modelling and control of freeway traffic systems, optimal management of electric mobility systems, optimization and planning of freight logistic systems. Currently, she is Senior Editor of the IEEE Transactions on Intelligent Transportation Systems and Associate Editor of the IEEE Control Systems Letters. She is Chair of the IEEE ITSS Italian Chapter.

- **Intended audience and expected attendance of the invited session**

This Special Session aims to gather researchers of different areas and with different backgrounds but with the same research interest related to the development of control algorithms for Connected Autonomous Vehicles, with specific focus on traffic efficiency, road safety and energy management. It is expected that the presentations of the Special Session will represent an opportunity for different research groups to discuss, share new ideas and show experimental results, testbeds and pilot studies. This will increase the awareness and the knowledge of the ITS community on the main challenges related with traffic control and management of Autonomous Connected Vehicles.

Therefore, this session is intended for a broad spectrum of audience, i.e.:

- Academic researchers in Decision and Control for ITS and transportation engineering.
- Scientists and engineers seeking to apply control methods to ITS challenges.
- Industry practitioners involved in MaaS, C-ITS, traffic management, and smart city solutions.

Based on the number of attendees at previous editions of this invited session in ITSC 2023-ITSC2024, we estimate an attendance of about 40-60 people.

- **Contact details of the main proposers:**

**Angelo Coppola**, Assistant Professor of Transportation Engineering, University of Naples Federico II, mail: [angelo.coppola@unina.it](mailto:angelo.coppola@unina.it)

**Cecilia Pasquale**, Assistant Professor of System and Control Engineering, University of Genova, mail: [cecilia.pasquale@edu.unige.it](mailto:cecilia.pasquale@edu.unige.it).

**Alberto Petrillo**, Assistant Professor of System and Control Engineering, University of Naples Federico II, mail: [alberto.petrillo@unina.it](mailto:alberto.petrillo@unina.it).



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