

# IT Talks

A SEMINAR SERIES FOR PHD STUDENTS  
IN INFORMATION TECHNOLOGY

## Presentation 1

**Emanuele Frizzi: Advanced Guidance, Navigation, and Control Architectures for Reusable Launch Vehicle Booster Stages.**

Launch vehicle reusability is crucial for reducing space access costs, presenting a major challenge for the European space sector. In this context, this PhD research aims at developing novel Guidance, Navigation and Control (GNC) solutions for the booster stage of a Vertical Take-off Vertical Landing Two-Stage-To-Orbit reusable launcher.

Spanning all return phases from MECO to touchdown, the primary goal is pinpoint landing accuracy. The research involves advanced sequential convex optimization techniques for multi-phase guidance, Model Predictive Control formulations for vehicle control, and filtering strategies for state estimation, prioritizing real-time viability.

The algorithms are validated in a high-fidelity 6DOF simulator, proving the system can safely manage strict flight constraints, structural limits and fuel margins.

## Presentation 2

**Simone Gabrielli: Advanced Camera and LiDAR Localization Methods for Automotive Scenarios.**

With the rapid advancements in autonomous vehicle technologies and the latest Advanced Driver Assistance Systems (ADAS), precise and reliable localization has become critical, particularly in challenging environments where traditional GNSS-based solutions fall short. This research project focuses on developing innovative 3D localization solutions to address these challenges using different sensor modalities, offering complementary approaches to achieve the same goal. The first method investigates LiDAR map-based localization, aiming to design a highly accurate algorithm focusing on efficiency that integrates with an Extended Kalman Filter, forming a robust localization stack for real-time vehicle positioning in GNSS-denied environments. The second method explores camera-based localization, presenting a more easily implementable solution that excels in compact and feature-scarce settings. This method supports a broader range of applications, including Augmented Reality for in-vehicle systems, and is developed with the goal of enhancing ADAS capabilities for drivers.

## Presentation 3

**Luca Pirolo: Optimal Location of E-bike Chargers on Touristic Cycleway Networks.**

With the rise of e-bikes in cycling mobility, charging infrastructure planning has become a strategic element for cycling tourism. In this context, cycling tourism can act as a driver of territorial regeneration for marginal areas in Italy. My PhD research proposes optimization models to identify the optimal location of e-bike charging stations along cycling routes and networks characterized by small towns, villages, and tourist attractions, so that charging points can serve as catalysts for new micro-economies. The objective is to ensure adequate territorial coverage while minimizing the number of stations, accounting for battery range, budget constraints, and local socioeconomic potential. The developed algorithm reduces computational complexity and improves performance. Preliminary results show that optimized infrastructure can support sustainable development policies and enhance less central territories.

## Pitch

**Mario Talarico, Giuseppe Bavaresco, Yushan Li.**

The event will open with a networking reception.

14th May  
11:30 am - 1:00 pm  
Emilio Gatti  
Conference Room,  
Building 20



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