Ph.D. in Information Technology
Thesis Defense

November 27th, 2026
At 11:00 a.m.
On Teams

Sumit CHOURASIYA – 37th Cycle

INPUT-OUTPUT LINEARIZATION FOR SINGLE-TRACK VEHICLE MODEL WITH STEERING ACTUATOR DELAYS
Supervisor: Prof. Luca Bascetta

Abstract:

The work proposes a robust lateral control architecture for autonomous vehicles with Ackermann-like steering. While input-output linearization helps handle vehicle nonlinearities, unmodeled actuator dynamics and actuation delays often degrade its performance, leading to oscillations or instability at higher speeds. To overcome these limitations, this research proposes a hierarchical control framework that integrates an extended input-output linearization law with an Advanced Gain Scheduling strategy based on approximate Linear Parameter-Varying models using Linear Matrix Inequalities. By compensating for residual nonlinearities, time delays, and parametric uncertainties within an inner loop, the architecture yields an almost decoupled Linear Time-Invariant system, to potentially simplify the design of the outer trajectory tracking controller. Extensive simulations across three vehicle models of increasing complexity demonstrate enhanced effectiveness across a given range of operating velocities compared to predecessor linearization techniques.

PhD Committee

Prof. Matteo Corno, **Politecnico di Milano**
Prof. Alessandro Casavola, **Università della Calabria**
Prof. Paolo Falcone, **Chalmers University of Technology**