

IT Talks

A SEMINAR SERIES FOR PHD STUDENTS IN INFORMATION TECHNOLOGY

Presentation 1

Xiong Xiong: Autonomous Recharging and Safety-Critical Coordination for Multi-Agent Coverage in Uncertain Environments.

Multi-agent coverage missions-essential for modern agriculture and infrastructure inspection-face the dual challenge of operating in partially observable environments and adhering to strict physical limits, such as battery life and kinodynamic feasibility. This talk presents an online planning framework that enables a fleet of UAVs/UGVs to achieve efficient coverage while autonomously managing their energy levels. Our approach integrates Control Barrier Functions (CBF) with a library of short-horizon motion primitives to ensure collision avoidance and seamless docking at charging stations. We introduce a hybrid coordination strategy that switches between decentralized exploration and proximity-aware cooperation via Distributed Model Predictive Control (DMPC). To prevent the "greedy" pitfalls of local planning, we further incorporate an auxiliary navigation and recovery mechanism. Simulation results in complex 2D and 3D environments demonstrate that this framework significantly improves coverage coherence and mission longevity compared to traditional baselines.

Presentation 2

Bohao He: Protecting Global Seagrass Meadows to Support Climate Change Mitigation.

Seagrass meadows are among the most efficient natural carbon sinks in the world. Despite their importance, spatially resolved global estimates of ongoing annual carbon sequestration rates in seagrass sediments have yet to be established, limiting the integration of these ecosystems into national climate accounting. Here, we combine ensemble species distribution models with 382 field measurements and machine learning to produce a global map of seagrass carbon accumulation rates and their associated economic value. We estimate a global mean carbon accumulation rate of $26.81 \text{ g C m}^{-2} \text{ yr}^{-1}$, which contributes $53.99 \text{ Tg C yr}^{-1}$ to global blue carbon sequestration. This service generates approximately US\$36.65 billion annually in climate mitigation value. However, we reveal profound global inequality in the distribution of this blue carbon wealth, with just five nations accounting for 45.36% of the global total. Crucially, our analysis exposes a severe governance mismatch: 27.8% of the total economic value of seagrass carbon lies in countries with high carbon assets but low adaptation readiness, particularly small island developing states and least developed nations. Realizing the full climate mitigation potential of seagrass ecosystems under the Paris Agreement will require targeted international investments to build institutional capacity and ensure equitable climate governance for highly vulnerable nations.

Presentation 3

Luca Crotti: From MaaS to Streets: Urban Motion Planning for Autonomous Driving.

Mobility-as-a-Service (MaaS) aims to deliver reliable and efficient urban mobility through integrated, on-demand services. Autonomous driving can be a key enabler, but operating in cities requires handling complex interactions and uncertainty. This seminar highlights why motion planning is central to making urban autonomy practical. The discussion links these concepts to MaaS performance and overall user experience.

Pitch

Federico Terenziani, Marco Dottor.

The event will open with a networking reception.

8th April
11:30 am - 1:00 pm
Emilio Gatti
Conference Room,
Building 20



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