BOKU
Institute of
Transport Studies

Invitation to the IVe-Seminar "Artificial Intelligence for Climate Adaptation: Reinforcement Learning for Climate Change-Resilient Transport"

Seminar by Miguel Costa
Technical University of Denmark

Date: Monday, 20.04.2026, 10:00 to 11:00
Location: Universität für Bodenkultur, Ilse-Wallentin-Haus, Room ILWA-SR 29
Peter-Jordan-Straße 82, 1190 Wien & Online (via Zoom)
Zoom-Meeting https://bokuvienna.zoom.us/j/63021418614

Speaker

Miguel Costa is a postdoctoral researcher at the Technical University of Denmark (DTU), where he develops AI-driven decision-support tools for climate adaptation policymaking. His research sits at the intersection of transportation science, machine learning, and climate resilience, with a particular focus on bridging objective measurements and subjective human experiences in urban mobility contexts.

Miguel's current work within the MAAT project (Maximising wellbeing with AI under deep climate turmoil) uses reinforcement learning and simulation to identify optimal climate adaptation pathways under deep uncertainty. By integrating climate projections, flood modeling, transport accessibility, and wellbeing metrics, his framework reveals how different adaptation strategies (and their spatial and temporal distribution) affect long-term societal outcomes. This work has been recognized with the Best Proposal Award at the ICLR 2025 workshop on Tackling Climate Change with Machine Learning.

He completed his PhD (summa cum laude) at Instituto Superior Técnico, University of Lisbon, where he developed geospatial machine learning methods for mapping both objective cycling accident risk and subjective safety perceptions. His doctoral research bridged the gap between data-driven objective safety assessment and human experiences and perceptions. Miguel's work has been presented at flagship machine learning conferences (NeurIPS, ICLR, EMNLP) and leading transportation venues.

Topic

Climate change is expected to intensify rainfall and, consequently, pluvial flooding, leading to increased disruptions in urban transportation systems over the coming decades. Designing effective adaptation strategies is challenging due to the long-term, sequential nature of infrastructure investments, deep

climate uncertainty, and the complex interactions between flooding, infrastructure, and mobility impacts. We propose a novel decision-support framework using reinforcement learning (RL) for long-term flood adaptation planning. Formulated as an integrated assessment model (IAM), the framework combines rainfall projection and flood modelling, transport simulation, and quantification of direct and indirect impacts on infrastructure and mobility. Our RL-based approach learns adaptive strategies that balance investment and maintenance costs against avoided impacts. I will present results from our Copenhagen case study where we evaluate the framework through a case study of Copenhagen's inner city over the 2024-2100 period, testing multiple adaptation options, and different belief and realized climate scenarios. Results show that the framework outperforms traditional optimization approaches by discovering coordinated spatial and temporal adaptation pathways and learning trade-offs between impact reduction and adaptation investment, yielding more resilient strategies. Overall, our results showcase the potential of reinforcement learning as a flexible decision-support tool for adaptive infrastructure planning under climate uncertainty. I will discuss how such a framework can support policymakers in making informed decisions and ongoing extensions of this work and opportunities for broader application, including optimization for non-economic impacts (e.g., quality of life, wellbeing), other case studies, and climate impacts.

The event will take place in person at BOKU (see map below) but can also be accessed online via Zoom (see link on top).

Map