Public Lecture

By Visiting PICAIS Academic

capt. Ing. David Sládek, PhD.

25. March 2026, 14:00

Dr.-Hans-Kapfinger-Straße 14b, SR 008

Dr. David Sládek is a PICAIS Fellow at the University of Passau and a faculty member at the University of Defence, Brno. A recognized expert in data-driven forecasting, his career includes a Fulbright Fellowship at the University of Utah and a Helmholtz Research Fellowship at the German Aerospace Center (DLR). Dr. Sládek is the author of a textbook on Python for geographical systems and currently specializes in environmental modelling and aviation meteorology. His research focuses on bridging human expertise with machine learning to advance AI interpretation and automation.

Representing 4D Dynamics in Machine Learning

Duration: 40' talk, 20' Q&A + discussion

The grand challenge in modelling environmental and complex physical systems lies in navigating the Information Bottleneck: how can we compress vast, 4D spatiotemporal dynamics into the representations suitable for Machine Learning (ML) models without sacrificing critical predictive power? This seminar addresses this fundamental trade-off. We will discuss the strategies for Encoding high-resolution data (e.g., using autoencoders or local feature extraction) and assess methods for principled Dimensionality Reduction (such as advanced PCA or manifold learning) to combat the curse of dimensionality. Crucially, the talk will focus on moving beyond black-box predictions by emphasizing model Interpretation and leveraging Physics Understanding to ensure the compressed feature space is not only efficient but physically meaningful, leading to models that are both accurate and trustworthy.