



UCD School of Mathematics and Statistics Colloquium Seminar

Title: AI Weather Forecasting: Assessing Extrapolation
Physical
Consistency

Speaker: Prof. Sebastian Engelke, Full Professor of Statistics (Research Center for Statistics, University of Geneva)

Date: Tue 6th October 2026 at 1:00PM

Location: N0.20 – Science North

Abstract: Recent AI weather models have demonstrated superior performance over traditional physics-based numerical weather prediction systems on a range of standard benchmarks. However, important limitations remain, particularly regarding their ability to extrapolate to extreme events and to produce physically consistent forecasts. In this work, we evaluate model performance on a benchmark dataset composed exclusively of record-breaking events and show that, in this regime, physics-based models continue to outperform leading AI models such as GraphCast and Pangu-Weather. We further introduce a novel Turing test for physical consistency in AI forecasts. The proposed framework leverages the predictive spread across an ensemble of pre-trained AI models and is calibrated using principles from conformal prediction. Through experiments on the Lorenz attractor, we demonstrate the effectiveness of the approach in detecting physically implausible dynamics. We apply the method to assess the physical consistency of outputs from state-of-the-art AI weather models.

Refreshments to follow in N3.20/N3.21 Science Centre North. If you plan to attend, please complete this brief form: https://docs.google.com/forms/d/e/1FAIpQLSeLm3lhhT0CIY2ewb_y6Enr3Q/viewform