

Explainable AI in Cosmology.

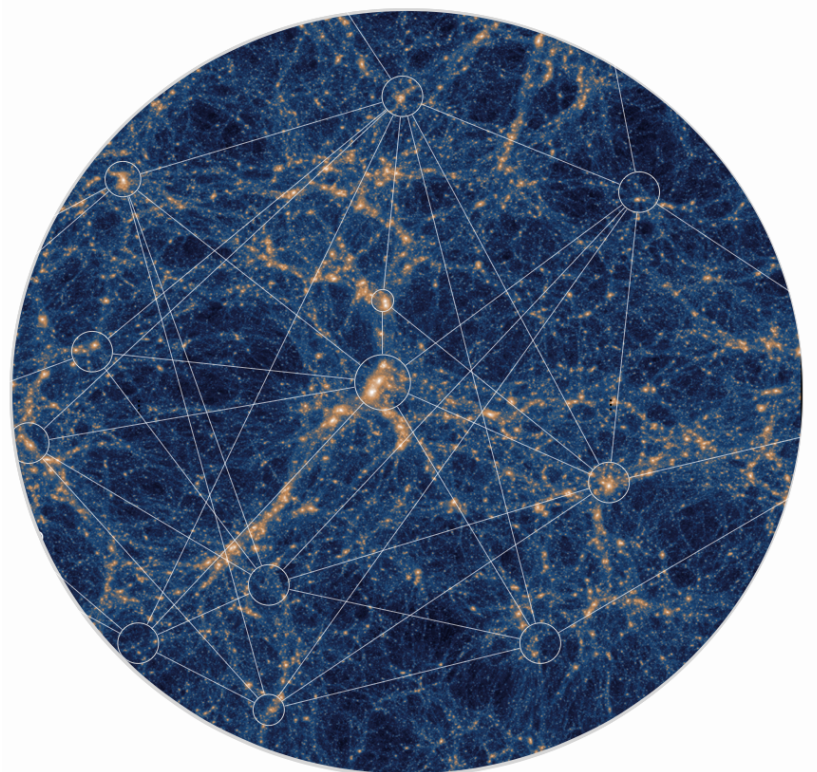
Tuesday, 1st July 2025

Auditorium & Webcast 16:00 h

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Precision cosmology is entering a new golden era, with current and upcoming surveys mapping the distribution of galaxies to an unprecedented level of detail. However, uncertainties in the theoretical modelling of the Universe on small, non-linear scales remain a major roadblock to interpreting these cosmological measurements. While machine learning has greatly enhanced our ability to analyze large datasets, its "black box" nature often limits physical interpretability and trust in their results.

In this talk, I will present explainable deep learning frameworks designed to extract a minimal set of physically meaningful parameters that describe the underlying physics of interest. I will first discuss applications to dark matter halos, showing how these neural networks can model their final properties — such as density profiles — and connect them to the physics that determines those properties. I will then present applications to the cosmic microwave background, revealing to which parameters the temperature power spectrum is sensitive in the context of early dark energy models.



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