



Vienna School
of Mathematics

PhD Colloquium

Marta Sálamo Candal

Curvature in non-smooth spacetimes

Abstract: In recent years, there have been many developments in the field of Lorentzian geometry motivated by the introduction of Lorentzian length spaces by Kunzinger-Sämman (2017). This led to a new formulation of the geometry of general relativity, providing a framework that allows the study of nonsmooth spacetimes, including those that present singularities or with a discrete structure. An important development, in particular, is the characterisation of Ricci curvature bounds by the convexity of an entropic functional, firstly developed by McCann (2018) and Mondino-Suhr (2018) in the smooth setting, and taken into the synthetic setting by Cavalletti-Mondino (2020). In this talk, I will review the basics of this new geometry for Einstein's theory of relativity, and I will discuss some of the research directions that are currently being developed.

In particular, I will discuss an approach to the characterisation of Ricci curvature bounds based on optimal transport. I will introduce the associated problem and explore classical aspects such as Kantorovich duality. I will then explain how these costs lift to the space of probability measures, inducing a spacetime structure and, in particular, a notion of geodesics. Finally, I will address in detail how these objects are used to characterise Ricci curvature bounds in a smooth spacetime. If time allows, I will outline current lines of research in this direction.

March 16, 2026, 15:00-16:30

SR 5, Faculty of Mathematics, Universität Wien
(Oskar-Morgenstern-Platz 1)