3rd Dutch Mathematical Relativity Day

31 March 2026, Utrecht University

Abstracts

Raphaela Wutte (University of Southampton)

Title: *On holographic and hyperbolic mass*

Abstract: The question of the boundedness of mass from below in general relativity with a negative cosmological constant is wide open. I will review the definition of mass and its positivity and discuss recent progress. Based on work in progress with P. T. Chruściel.

Dejan Gajic (Leipzig University)

Title: *Late-time tails for geometric wave equations: from Huygens to Price and beyond*

Abstract: The energy radiation of dynamical, isolated gravitational systems is governed by nonlinear geometric wave equations. For dynamical black hole spacetimes, the precise late-time tails of energy radiation are closely linked to the late-time dynamics of the event horizon and the nature of singularities that can arise inside black holes. The story of late-time tails begins in the 17th century with Christiaan Huygens. I will describe the relation between "Huygens' principle" for the standard wave equation and the presence of inverse-polynomially decaying tails on stationary black hole spacetimes—a phenomenon first predicted in the physics literature and now known as "Price's law". I will then discuss recent work with Lionor Kehrberger on departures from Price's law when considering dynamical spacetimes and nonlinear equations. If time permits, I will also mention new phenomena that arise when adding charge to the wave equation, which are intimately connected to the existence of instabilities on so-called "extremal" black holes.

András Vasy (Stanford University)

Title: *Microlocal analysis of the non-relativistic limit of the Klein-Gordon equation*

Abstract: The non-relativistic limit for a Klein-Gordon equation, with electric and magnetic potential terms on a Lorentzian manifold, corresponds to a family of Lorentzian metrics for which, with respect to an appropriate spacelike foliation of the manifold, the speed of light tends to infinity. Concretely, we consider decaying, both in spacetime and as $c \to \infty$, perturbations of the Minkowski metric, $-c^2dt^2 + dx^2$, with spacetime decaying electric and magnetic potentials on $\mathbb{R}^{1,d}$; this is interesting already if the metric is just the c-dependent Minkowski metric. We give a complete and unified phase space analysis of the solution operators for the inhomogeneous wave equation as $c \to \infty$. In some regimes these tend to the Minkowski Klein-Gordon propagators, but in others (spatially low frequency) two copies of the Schrödinger propagator emerges, with electric and magnetic potentials, but on flat space, as expected from the standard physical treatment. Joint work with Andrew Hassell, Qiuye Jia and Ethan Sussman; the talk will emphasize the microlocal ingredients of the project, as in arXiv:2509.09518, see arXiv:2511.08724 for the applications.