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Joint Geometric Analysis Seminar

(Part of MIST program)

Short Pulse Method and the Formation of Trapped Surfaces

Dr. Jingbo, Wan
Sorbonne University in Paris

Abstract

This lecture series introduces the geometric and analytic foundations necessary to understand the formation of trapped surfaces in vacuum spacetimes. Due to Penrose's incompleteness theorem, it is essential to ask whether a trapped surface can form dynamically from regular initial data. We address this question through Christodoulou's short pulse method, which provides a framework for solving a semiglobal evolution problem for the Einstein vacuum equations with large characteristic initial data. To control the nonlinearities of the system, we introduce the notions of signature and scale-invariant norms, and develop weighted energy estimates for curvature components along with a special hierarchy to control the Ricci coefficients. These tools allow us to construct a spacetime region large enough to contain a trapped surface, thereby establishing a rigorous mechanism for black hole formation in vacuum.

Date: 8, 13 Aug 2025
Time: 09:30 am-12:00 am
Venue: Room 222, LSB

All are Welcome