

FIM

Nachdiplomvorlesung

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The geometry and analysis of black holes in general relativity

September 25 - December 18, 2013
Wednesdays, 10:00 - 12:00
HG G 43, ETH Zürich, Rämistrasse 101

Abstract

These lectures will begin by introducing the fundamental notion of „black hole“ in general relativity, as exemplified by two elementary families of explicit solutions to the Einstein vacuum equations, the celebrated Schwarzschild and the more complicated Kerr metrics. The lectures will then turn to the problem of studying the propagation of waves on these backgrounds. A recurring theme will be the close connection between the analysis of hyperbolic equations and well known geometric/physical features of the underlying spacetime, for instance the red-shift effect, the photonsphere, and the ergo-region. These considerations are of crucial importance for the question of the nonlinear stability of the black hole spacetimes themselves as solutions to the Einstein vacuum equations, a great open question in the subject.

The lectures only assume basic differential geometry and analysis. Specifically Lorentzian geometric notions, as well as the most basic well-posedness statements for the wave equation, will be developed from the beginning.

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