EBERHARD KARLS UNIVERSITÄT TÜBINGEN

Mathematisch-Naturwissenschaftliche Fakultät

**Fachbereich Mathematik
AB Geometrische Analysis,
Differentialgeometrie und
Relativitätstheorie**

Oberseminar

Geometrische Analysis, Differentialgeometrie und Relativitätstheorie

Donnerstag, 14. November 2024 im Raum **S9 (C06H05) und über Zoom**

14:00 – 15:00 Uhr Vortrag

Dr. Leonhard Kehrberger
(MPI Leipzig)

Asymptotic properties at early times of solutions to Einstein's equations via scattering constructions

In the standard approaches to tackling the evolution of the Einstein equations in general relativity, one typically has to make an ad hoc assumption on the asymptotic behaviour on either the Cauchy data towards spacelike infinity, or the characteristic data towards future null infinity. By the nature of these asymptotic regimes, it is difficult to directly give any physical meaning to such assumptions. In this talk, I will explain why the scattering problem, with data posed at the infinite past, is a more natural starting point of dynamics from this perspective.

In particular, I will explain how data posed at the infinite past can be given physical motivation in a very straight-forward way, and how one then can dynamically derive the asymptotic properties towards spacelike infinity, future null infinity, and future timelike infinity. As a result of this analysis, we will prove that the typical assumptions placed on Cauchy data (Schwarzschild plus faster decay of $O\left(r^{-1-\varepsilon}\right)$) and on characteristic data (smoothness of null infinity) are too strong for capturing very basic physical situations, and that this slower initial decay also leads to -in principle observable- very slow decay at late times.

Finally, in view of the audience, I want to formulate an open problem concerning the possibility of detecting physically relevant assumptions purely at the level of Cauchy data.

15:00 -15:30 Uhr Kaffee im Hankelzimmer

15:30 – 16:30 Uhr Vortrag

Dr. Jan Sbierski
(University of Edinburgh)

Singularity structure of FLRW spacetimes at low regularities

This talk investigates the structure of the Big Bang singularity in a variety of FLRW spacetimes. It is straightforward to compute scalar curvature invariants to determine whether a curvature singularity is present which excludes a continuation as a strong solution to the Einstein equations. In this talk the focus is on capturing the singularity structure at the level of the connection and the metric itself, determining which geometric quantities blow up and in which regularity class the solution breaks down.

Den Zoom-Link erhalten Sie per E-Mail von Frau Martina Neu.

For participating online, please sign up by sending an email to Martina Neu.

Hierzu wird herzlich eingeladen.

Rodrigo Avalos, Carla Cederbaum, Gerhard Huisken, zusammen mit Jan Metzger (Potsdam)