Titles and abstracts

Alix Deruelle:
"Stability of non compact Steady and Expanding gradient Ricci solitons"
The Ricci flow, introduced by Hamilton, can be interpreted as a dynamical system on the set of Riemannian metrics of a fixed manifold modulo the action of diffeomorphisms and homotheties. The fixed points of such dynamical system are called Ricci solitons. There are three types, according to the sign of curvature (at least heuristically) : shrinking, steady, and expanding solitons. We investigate the stability of steady and expanding (gradient) non compact solitons : we give various sufficient geometric conditions to ensure the convergence of the Ricci flow to the same fixed Ricci soliton. This a work in progress based on the work of Schulze, Simon and Schnurer.

Ezequiel Rodrigues:
"Upper Bounds for the Width of Compact Riemannian Manifolds"
The existence of a closed minimal hypersurface in every compact Riemannian n-manifold, $2\leq n\leq 6$, can be obtained using a min-max construction. Associated with the min-max construction, we have the notion of width. Hence, similarly to other types of min-max construction (such as eigenvalues), is interesting to find optimal bounds for the width. In this talk, we will discuss some preliminary results about it.

Shiwu Yang:
"The geodesic hypothesis in general relativity"
In this talk, I am going to give a rigorous derivation of Einstein's geodesic hypothesis in general relativity. We use small material bodies governed by a class of nonlinear Klein-Gordon equations to approximate the test particle. Given a vacuum spacetime, we consider the initial value problem for the Einstein-scalar field system. For such particles with sufficiently small amplitude and size, we prove that the Einstein-scalar field system can be solved up to any given time. Moreover, the energy of the particle is concentrated along a time-like geodesic and the gravitational field produced by the particle is negligibly small in C^1, that is, the spacetime metric is C^1 close to the given vacuum metric.

Brian Krummel:
"Structure of branch sets of harmonic functions and minimal submanifolds"
I will discuss some recent results on the structure of the branch set of multiple-valued solutions to the Laplace equation and minimal surface system. It is known that the branch set of a multivalued solution on a domain in $\mathbb{R}^n$ has Hausdorff dimension at most $n-2$. We investigate the fine structure of the branch set, showing that the branch set is countably $(n-2)$-rectifiable. This follows from asymptotics near branch points, which we establish using a modification of the frequency function monotonicity formula due to F. J. Almgren and an adaptation to higher-multiplicity of a "blow-up" method due to L. Simon that was originally applied to "multiplicity one" classes of minimal submanifolds satisfying an integrability hypothesis. This is joint work with Neshan Wickramasekera.

Heudson Mirandola:
“The ADM mass for graphical manifolds”
By elementary methods we will give explicit formulae for the ADM mass for graphical manifolds of arbitrary dimension and codimension. This will allow us to conclude the positive mass theorem and Penrose inequality for a class of graphical manifolds which include, for instance, the ones with flat normal bundle. This is a joint work with Feliciano Vitorio.

Panagiotis Gianniotis:
"Boundary estimates for the Ricci flow"
Shi's higher order estimates for the curvature and Hamilton's compactness theorem are essential tools in the study of the singularities of the Ricci flow on complete manifolds. In this talk I will consider the Ricci flow on manifolds with boundary and present some new higher order estimates valid near the boundary. Then, I will discuss a compactness result for sequences of Ricci flows, in which the mean curvature and the conformal class of the boundary are appropriately controlled.

Ben Sharp:
"Interior and free boundary regularity for Dirac-harmonic maps, harmonic maps and related PDE”
Since Hélein's celebrated proof of the regularity of weakly harmonic maps from surfaces to Riemannian manifolds there have been huge improvements and generalisations to the theory, with applications in many areas of analysis and geometry. Notably the work of Tristan Rivière has provided analytical insight to these problems leading to suitable generalisations. In this talk we will give an overview of some of these ideas and present new theorems leading to proofs (and hopefully some insight) for both new and classical results. Some of the work presented is joint with Peter Topping (Warwick), Miaomiao Zhu (MPI Leipzig) and Tobias Lamm (KIT).