30 min talks

- **Annegret Burtscher**
  - Title: *Riemannian manifolds of low regularity*
  - Abstract: Whenever the regularity of a Riemannian metric is sufficiently high (e.g., twice continuously differentiable), then the standard theory implies local existence and uniqueness of geodesics, that the exponential map is well defined and a local diffeomorphisms and so on. In this talk we focus on Riemannian metrics of lower regularity where these results are not available. For continuous Riemannian metrics we show that the induced metric space structure still behaves as desired. For example, the arc-length of absolutely continuous curves is equal to the length induced by the corresponding distance function. To compensate for the lack of differentiability we use approximation of continuous Riemannian metrics by smooth ones and techniques from the analysis of metric spaces.

- **Marcos Petrúcio Cavalcante**
  - Title: *L^2-harmonic 1-forms on submanifolds with finite total curvature*
  - Abstract: Let $x : M^m \to \bar{M}$, $m \geq 3$, be an isometric immersion of a complete noncompact manifold M in a complete simply-connected manifold $\bar{M}$ with sectional curvature satisfying $-k^2 \leq K_{\bar{M}} \leq 0$, for some constant k. Assume that the immersion has finite total curvature in the sense that the traceless second fundamental form has finite L^m-norm. In this talk we prove that the space of the L^2 harmonic 1-forms on M has finite dimension, under an interesting condition between the first eigenvalue of M, the mean curvature and the constant k. This condition is always true if the ambient space is flat. The results in this talk are part of a joint work with H. Mirandola and F. Vitório.

- **Sung-Hong Min**
  - Title: *Optimal isoperimetric inequalities for complete proper minimal submanifolds in the Poincaré ball model of hyperbolic space*
  - Abstract: A k-dimensional complete proper minimal submanifold in the Poincaré ball model, we consider it as a subset of the unit ball in Euclidean space. Then we can measure the Euclidean volumes of the minimal submanifold and the ideal boundary. Using this concept, we prove an optimal linear isoperimetric inequality. Furthermore, under some geometric assumption, that gives the classical isoperimetric inequality. By proving the monotonicity theorem for such a minimal submanifold, we also obtain a sharp lower bound for the Euclidean volume, which is an extension of Fraser–Schoen and Brendle's results to hyperbolic space. Lastly, we introduce the Möbius volume to prove an isoperimetric inequality via the Möbius volume.

- **Ernani Ribeiro Jr**
  - Title: *Some sphere theorems for compact almost Ricci solitions.*
  - Abstract: The study of an almost Ricci soliton was introduced in a recent paper [Pigola, S., Rigoli, M., Rimoldi, M. and Setti, A.: *Ricci Almost Solitons.* Ann. Scuola Norm. Sup. Pisa Cl. Sci. (5) Vol. X (2011), 757-799.] due to Pigola, Rigoli, Rimoldi and Setti. This structure represents a generalization to Einstein metrics and Ricci soliton, they appear as special solutions of the Ricci flow. Here, we treat of the characterization of compact almost Ricci solitons. Firstly, we need some structure equations for almost Ricci solitons which generalize the equivalent for Ricci solitons. As a consequence of these equations we derive an integral formula for the compact case which enables to show that a compact nontrivial gradient almost Ricci soliton is isometric to a sphere, provided either it has constant scalar curvature or its associated vector eld is conformal, for more details see [Barros, A. and Ribeiro Jr., E.: *Some characterizations for compact almost Ricci solitons.* Proc. Amer. Math. Soc. 140, (2012) 1033-1040] and [Barros, A.; Batista, R. and Ribeiro Jr, E.: *Rigidity of gradient almost Ricci solitons.* To appear in Illinois J. of Math. (2012)].

Next, we prove that any compact almost Ricci soliton (without gra- dient assumption) with constant scalar curvature is isometric to a Euclidean sphere. As a consequence we obtain that every compact almost Ricci soliton with constant scalar curvature is gradient, which was proved in [Barros, A., Batista, R. and Ribeiro Jr., E.: *Compact almost Ricci solitons with constant scalar curvature are gradient.* arXiv:1209.2720 [math.DG], (2012)]. This result answers a problem proposed by Pigola-Rigoli-Rimoldi-Setti, see [5]. Moreover, we show that a complete almost Ricci soliton with Ricci Codazzi tensor has constant sectional curvature, see [Barros, A., Gomes, J. and Ribeiro Jr, E.: *A note on rigidity of the almost Ricci soliton.* To appear in Archiv der Math. (2013).]. Finally, we shall comment some open problems (sphere theorem) related with the critical point equation on compact manifolds.

- **Irene Ortiz Sánchez**
  - Title: *The first stability eigenvalue for compact CMC surfaces into Killing submersions.*
  - Abstract: Constant mean curvature surfaces (CMC) are characterized as critical points of the area functional restricted to those variations which preserve certain volume function. For such critical points the stability is given by the Jacobi operator J, then a surface is said to be strongly stable if the rst stability eigenvalue associated to the mentioned operator is non negative. Up to now, in di erent papers the study of this eigenvalue has been carrying out for compact hypersurfaces which are immersed into the Euclidean sphere, including the minimal and the constant mean curvature cases. Throughout this work, we study the same problem in a more general context: compact CMC surfaces immersed into Killing Riemannian submersions. Our aim is to nd out upper bounds for the rst stability eigenvalue of J, which are the sharpest ones in some cases since they are attained giving us a characterization of certain Hopf tori. As an application, we can derive results in particular spaces such as Berger spheres and some products. This is a joint work with Miguel A. Meroño [Meroño M. A.; Ortiz, I. *First stability eigenvalue characterization of CMC Hopf tori into Riemannian Killing submersions.* Preprint (2012)], motivated by

a previous one with Luis J. Alías [Alías, L. J.; Meroño, M. A.; Ortiz, I. *On the first stability eigenvalue of constant mean curvature surfaces into homogeneous 3-manifolds.* Preprint (2012)].

- **Keomkyo Seo**
  - Title: L^2*-harmonic* 1*-forms and first eigenvalue of complete minimal submanifolds in a Riemannian manifold*
  - Abstract: We study the spectrum of the Laplace operator on stable minimal hypersurface in a negatively curved manifold. We also derive various vanishing theorems for L^2-harmonic 1-forms on minimal hypersurfaces. The sufficient conditions for complete minimal submanifolds to have one-end will be discussed as well.