Geometric analysis and PDEs

Organiser: Peter Topping

Thursday 11 July 2024 - Friday 12 July 2024

- **Dan Ketover (Rutgers)**

  The Smale conjecture for $\mathbb{R}P^3$ *and minimal surfaces*

  Abstract: TBA

- **Ben Lambert (Leeds)**

  Alexandrov immersed mean curvature flow

  Abstract: In this talk I will introduce Alexandrov immersed mean curvature flow and extend Andrew's non-collapsing estimate to include Alexandrov immersed surfaces. This estimate implies an all-important gradient estimate for the flow and allows mean curvature flow with surgery to be extended beyond flows of embedded surfaces to the Alexandrov immersed case. This is joint work with Elena Mäder-Baumdicker.

- **Lucas Lavoyer (Warwick)**

  Ricci flow from spaces with conical singularities.

  Abstract: TBA

- **Man Chun Lee (CUHK)**

  Immortal solutions of the Kähler-Ricci flow

  Abstract: We investigate the collapsing behavior of immortal solutions of the Kähler-Ricci flow on compact Kähler manifolds. Assuming the Abundance Conjecture, we prove that the Ricci curvature of the evolving metrics remains locally uniformly bounded away from the singular fibers of the Iitaka fibration. Joint work with Hans-Joachim Hein and Valentino Tosatti.

- **Alessandro Pigati (Bocconi, Milan)**

  Topology of three-dimensional Ricci limits and RCD spaces

Abstract: In the class of n-dimensional complete Riemannian manifolds, a lower bound on the Ricci curvature is the essential ingredient in order to control the number of degrees of freedom at a metric level, allowing to compactify the subclass of manifolds obeying a Ricci lower bound. Spaces belonging to this compactification (Ricci limits) are special cases of a more general analytic notion (RCD spaces), and thus they also inherit a rich analytic structure, allowing to do calculus on them.

In this talk, based on joint work with Elia Bruè and Daniele Semola, we will review some previously known structural results for Ricci limits and RCDs in the non-collapsed case and we will see a new, more elementary proof that Ricci limits of dimension three are generalized manifolds, enjoying in particular uniform contractibility. Our tools, together with some results in geometric topology, give an alternative proof that they are in fact topological manifolds, which was first shown by Simon and Simon-Topping using deep results on the Ricci flow. We will also see a new result for tangent cones in higher dimension; the latter is based on a new topological regularity and stability theorem for RCDs in dimension three.

- **Felix Schulze (Warwick)**

  On the Hamilton-Lott conjecture in higher dimensions

  Abstract: We consider Ricci flows with non-negative Ricci curvature where the curvature is point-wise controlled by the scalar curvature and bounded by C/t, starting at metric cones which are Reifenberg outside the tip. We show that any such flow behaves like a self-similar solution up to an exponential error in time. As an application, we show that smooth n-dimensional complete non-compact Riemannian manifolds which are uniformly PIC1-pinched, with positive asymptotic volume ratio, are Euclidean. This confirms a higher dimensional version of a conjecture of Hamilton and Lott under the assumption of non-collapsing. It also yields a new and more direct proof of the original conjecture of Hamilton and Lott in three dimensions. This is joint work with A. Deruelle and M. Simon.

- **Ben Sharp (Leeds)**

  Low energy α-harmonic maps into the round sphere

  Abstract: We will show that all "low-energy" α-harmonic maps from non-spherical Riemann surfaces to the round two-sphere are either uniformly regular and of degree one, or close to a simple bubble tree (and of degree ± 1). In the latter case we will see that both the proximity of the bubble and its blow-up rate are fully determined by the holomorphic one-forms on the domain.