GEOMETRIC ANALYSIS SESSION (FRI 9/1/26)

ROOM S212 (12.45-15.35)

Toni Ikonen (University of Fribourg)
***Comparison geometry and isoperimetric inequalities* (12.45-13.05)**

A Cartan–Hadamard space is a complete geodesic metric space that satisfies a 'slimness' condition on geodesic triangles. These spaces naturally occur in geometric group theory (e.g. as Cayley graphs of hyperbolic groups) or in Riemannian geometry as universal covers of complete Riemannian spaces with sectional curvature bounded from above by zero. The slimness condition is also stable under gluing along a totally geodesic subset, and many examples of interest, such as infinite-dimensional Hilbert spaces, are non-proper.

The slimness condition is often difficult to verify directly. Indeed, this essentially requires the analysis of all the geodesics in the metric space. However, a Euclidean isoperimetric inequality is at times easier to verify, and in the proper case, equivalent to the slimness condition by a seminal theorem by Lytchak and Wenger (2018). We discuss recent progress in the non-proper case.

Based on joint work with Stefan Wenger.

Jonathan Pim (University of Helsinki)
***Nodal resolution of quasiregular curves via bubble trees* (13.15-13.35)**

I will discuss normal and quasinormal families of quasiregular curves, and in particular how studying the latter leads to a version of Gromov' compactness theorem for quasiregular curves into manifolds of bounded geometry via bubbling of the domain. Though I will restrict to the special case of mappings between closed manifolds. This bubbling process transforms the domain into a bubble tree over the original manifold and our procedure for extending quasiregular curves over bubbles requires us to pass to a more general class of mappings which are only asymptotically quasiregular. However, after the inductive bubbling process terminates, the sequence which has been extended to the bubble tree, converges locally uniformly to a true quasiregular curve on the bubble tree. On one hand, this limiting curve may be interpreted as a weak and non-unique replacement for the classical locally uniform limit of the original sequence. On the other hand, the measure it induces may be seen as a resolution of the singular parts of the limiting measure of the original sequence. As a corollary we obtain a normality criterion for families of quasiregular curves.

Quasiregular curves are a class of mappings between non-equidimensional oriented Riemannian manifolds which includes both the classical quasiregular mappings and Gromov's pseudoholomorphic curves. They are defined with respect to a calibration i.e. a smooth closed form with unit comass. This calibration is used to define a replacement for the distortion inequality and the mapping induces a measure on its domain via the pullback of this calibration. The calibration gives, in some sense, the allowed directions for the curve, while the distortion constant controls both the curve's deviation from these allowed directions and the classical distortion.

Zofia Grochulska (University of Jyväskylä)
***Attempt at interpolating Sobolev spaces on arbitrary planar domains* (13.45-14.05)**

A normed space A is an interpolation space between A_0 and A_1 if, roughly, it is contained in between these spaces and a certain additional desirable property holds. By means of the real interpolation method (introduced by Peetre), we will see that interpolation is closely related to density. I will discuss what is known and interesting about interpolating Sobolev spaces, especially Sobolev spaces on planar domains.

This is work in progress with Pekka Koskela and Riddhi Mishra (both from University of Jyväskylä).

Akseli Jussinmäki (Aalto Unviersity)
Radial and nonradial minimizers of the p-harmonic energy and its variants **(14.15-14.35)**

In nonlinear elasticity, one studies existence and properties of minimizers of various energy integrals. One of the most commonly studied energies is the p-harmonic energy. In this talk I will study this energy between planar and higher-dimensional annuli and give conditions to guarantee that the minimizer is found within the class of radial mappings, as well as providing examples of nonradial minimizers. This talk is based on a joint work with my advisor Aleksis Koski.

Nikolai Kuchumov (Åbo Akademi)
Limit shapes and harmonic tricks **(14.45-15.05)**

The talk will present an application of a novel method — the tangent plane method — for analyzing a particular class of variational problems motivated by a statistical physics model, the so-called dimer model. The talk will consist of three parts. In the first part, we will briefly introduce the dimer model and the necessary concepts, including the associated variational problem and the limit shape phenomenon. The second part will focus on the use of harmonic and conformal coordinates in the analysis. In the third part, we will consider two specific examples of limit shape: the Aztec diamond with a hole, and a hexagon with a hexagonal hole.

Riku Anttila (University of Jyväskylä)
Heat kernel estimates on metric spaces **(15.15-15.35)**

The heat kernel is, by definition, the fundamental solution to the heat equation. On general metric spaces, heat kernels and many related PDE techniques can be developed using the theory of abstract Dirichlet forms. This approach provides tools to understand functional inequalities, such as Poincaré inequalities and Harnack inequalities, through the properties of the heat kernel.

In this talk, I will introduce some basic concepts related to heat kernels and their applications to analysis on metric spaces.