A-Fri-Ka Riemannian Topology Research Seminar

Meeting, March 4th 2021 (online)

2:00 - 3:00 pm (CET)

Highly connected manifolds and intermediate curvatures

Speaker:
David Wraith (Maynooth)

Abstract:
It is known that up to connected sum with a homotopy sphere, essentially all highly connected manifolds in dimensions 4k+3 admit a positive Ricci curvature metric. In this talk we consider the curvature of highly connected manifolds in dimensions 4k+1. It turns out that proving an analogous positive Ricci curvature result is out of range at present. However the problem becomes tractable if we consider curvatures which are intermediate between positive scalar and positive Ricci curvature. This is joint work with Diarmuid Crowley.

3:15 - 4:15 pm (CET)

On the geometry of smooth structures: Prescribing scalar curvature on fiber bundles

Speaker:
Leonardo Cavenaghi (Fribourg)

Abstract:
Since the discovery of exotic spheres in the seminal work of John Milnor, i.e, manifolds that are homeomorphic but no diffeomorphic to standard spheres, a lot has been questioned about the admissible geometries of these manifolds. It is known, for instance, that every exotic sphere of dimension 7 carries a metric of non-negative sectional curvature and a lot has been done concerning metrics of positive Ricci curvature on these manifolds. On the other hand, it its not known if there is an exotic sphere with a metric of positive sectional curvature and Hitchin proved that there are exotic spheres that do not even admit metrics of positive scalar curvature. This raises the question: *to which extent do smooth structures determine geometry?* In this presentation we discuss the problem of prescribing scalar curvature on the total space of general fiber bundles with compact structure group. As applications we discuss which smooth functions are realizable as scalar curvature functions on some exotic spheres and bundles over exotic spheres, as well as on tori and Calabi-Yau bundles. This is a joint work with Llohann Sperança. We also sketch some in progress results concerning the possibility of realizing G-invariant functions (where G is a compact and connected Lie group) as the scalar curvature of G-invariant Riemannian metrics, being natural generalizations of the classical Kazdan–Warner work, in collaboration with Prof. João Marcos Bezerra do Ó.

5:00 - 6:00 pm (CET)

Spaces of metrics of positive scalar curvature on manifolds with boundary

Speaker:
Christian Bär (Potsdam)

Abstract:
Unlike for closed manifolds, the existence of positive scalar curvature (psc) metrics on connected manifolds with nonempty boundary is unobstructed. We study and compare the spaces of psc metrics on such manifolds with various conditions along the boundary: $H \geq 0$, $H = 0$, $H > 0$, $\mathrm{II} = 0$, doubling, product structure. Here H stands for the mean curvature of the boundary and II for its second fundamental form. "Doubling" means that the doubled metric on the doubled manifold (along the boundary) is smooth and "product structure" means that near the boundary the metric has product form. We show that many, but not all of the obvious inclusions are weak homotopy equivalences. In particular, we will see that if the manifold carries a psc metric with $H \geq 0$, then it also carries one which is doubling but not necessarily one which has product structure. This is joint work with Bernhard Hanke.