

Riemannian Topology Meeting

Report of Contributions

Contribution ID: 1

Type: **not specified**

$Spin^c$ Dirac operators and the Kreck-Stolz s invariant.

Friday, November 9, 2018 10:40 AM (50 minutes)

We use the $Spin^c$ Dirac operator to generalize a formula of Kreck and Stolz for the s invariant of S^1 invariant metrics with positive scalar curvature. We then apply it to show that the moduli spaces of metrics with nonnegative sectional curvature on certain 7-manifolds have infinitely many path components. These include certain positively curved Eschenburg and Aloff-Wallach spaces. Furthermore, we use a $Spin^c$ version of the s invariant to discuss moduli spaces of metrics of positive scalar and twisted scalar curvature on $Spin^c$ manifolds.

Summary

Presenter: GOODMAN, Jackson (University of Pennsylvania)

Contribution ID: 2

Type: **not specified**

Orbifolds all of whose geodesics are closed

Thursday, November 8, 2018 4:30 PM (50 minutes)

Manifolds all of whose geodesics are closed have been studied a lot, but there are only few examples known. The situation is different if one allows in addition for orbifold singularities. In the talk we discuss such examples and their properties. In particular, we explain rigidity phenomena of the geodesic length spectrum and of metrics with all geodesics closed in dimension two.

Summary

Presenter: LANGE, Christian (University of Cologne)

Contribution ID: 3

Type: **not specified**

Scalar curvature and the multiconformal class of a direct product Riemannian manifold

Thursday, November 8, 2018 3:05 PM (50 minutes)

For a closed, connected direct product Riemannian manifold $(M, g) = (M_1 \times \dots \times M_l, g_1 + \dots + g_l)$ we define its multiconformal class $\llbracket g \rrbracket$ as the totality $\{f_1^2 g_1 + \dots + f_l^2 g_l\}$ of all Riemannian metrics obtained from multiplying the metric g_i of each factor by a function $f_i^2 : M \rightarrow \mathbb{R}_+$. In this talk we discuss how constant scalar curvature metrics in a multiconformal class are related with constant scalar curvature metrics on the factors.

Summary

Presenter: ROOS, Saskia (University of Potsdam)

Contribution ID: 4

Type: **not specified**

On the topology of the Teichmüller space of negatively curved Riemannian metrics

Thursday, November 8, 2018 11:35 AM (50 minutes)

This talk is a survey on results concerning the space $T^{<0}(M)$, which we call the Teichmüller space of negatively curved Riemannian metrics on M . It is defined as the quotient space of the space of all negatively curved Riemannian metrics on M modulo the space of all isotopies of M that are homotopic to the identity. This space was shown to have highly non-trivial homotopy when M is real hyperbolic by Tom Farrell and Pedro Ontaneda in 2009. Then in 2015, it was shown to be non simply connected in my thesis when M is a suitably chosen Gromov-Thurston manifold (which are examples of negatively curved non-locally symmetric spaces). In 2017, Tom Farrell and myself proved a similar result for M being a suitable complex hyperbolic manifold. In all these results, the dimension of M has to be $4k - 2$ for some $k \geq 2$. In this talk, I will explain this project, and talk about the tools we have used so far in unraveling it. I will also mention the cases that are still open in this project.

Summary

Presenter: SORCAR, Gangotryi (Einstein Institute of Mathematics, HUJI)

Contribution ID: 5

Type: **not specified**

Local flexibility of open partial differential relations

Friday, November 9, 2018 3:30 PM (50 minutes)

In his famous book on partial differential relations Gromov formulates an exercise concerning local deformations of solutions to open partial differential relations. We will explain the content of this fundamental assertion and sketch a proof.

We will illustrate this by various examples, including the construction of $C^{1,1}$ -Riemannian metrics which are positively curved “almost everywhere” on arbitrary manifolds.

This is joint work with Christian Bär (Potsdam).

Summary

Presenter: HANKE, Bernhard (Augsburg University)

Contribution ID: 6

Type: **not specified**

Positively curved manifolds with isometric torus actions

Friday, November 9, 2018 2:30 PM (50 minutes)

The classification of positively (sectional) curved manifolds is a long standing open problem in Riemannian geometry. So far it was a successful approach to consider the problem under the extra assumption of an isometric group action.

In this talk I will report on recent joint work with Lee Kennard and Burkhard Wilking in this direction. Among other things we show the following: Let M be a simply connected positively curved n -dimensional manifold with $H^{odd}M, \mathbb{Q}) = 0$ and an isometric T^8 -action. Then the rational cohomology ring of M is isomorphic to the rational cohomology of one of the CROSSes S^n , $\mathbb{C}P^{n/2}$ and $\mathbb{H}P^{n/4}$.

Summary

Presenter: WIEMELER, Michael (WWU Münster)

Contribution ID: 7

Type: **not specified**

Extra twisted connected sums and their ν -invariants

Thursday, November 8, 2018 2:10 PM (50 minutes)

Joyce's orbifold construction and the twisted connected sums by Kovalev and Corti-Haskins-Nordström-Pacini provide many examples of compact Riemannian 7-manifolds with holonomy G_2 . We would like to use this wealth of examples to guess further properties of G_2 -manifolds and to find obstructions against holonomy G_2 , taking into account the underlying topological G_2 -structures.

The Crowley-Nordström ν -invariant distinguishes topological G_2 -structures. It vanishes for all twisted connected sums. By adding an extra twist to this construction, we show that the ν -invariant can assume all of its 48 possible values. This shows that G_2 -bordism presents no obstruction against holonomy G_2 . We also exhibit examples of 7-manifolds with disconnected G_2 -moduli space. Our computation of the ν -invariants involves integration of the Bismuth-Cheeger η -forms for families of tori, which can be done either by elementary hyperbolic geometry, or using modular properties of the Dedekind η -function.

Summary

Presenter: GOETTE, Sebastian (University of Freiburg)

Contribution ID: 8

Type: **not specified**

Moduli spaces of non-negatively curved metrics on homotopy RP^5 s

Friday, November 9, 2018 11:40 AM (50 minutes)

The goal of this talk is to discuss the following result: for a manifold homotopy equivalent to RP^5 , the moduli space of metrics with non-negative sectional (resp. with positive Ricci) curvature has infinitely many path connected components. The proof involves various elements such as Brieskorn spheres, Grove-Ziller metrics, reduced eta-invariants and fixed point formulas. This is joint work with Anand Dessai.

Summary

Presenter: GONZÁLEZ ÁLVARO, David (University of Fribourg)

Contribution ID: 9

Type: **not specified**

Non-negative Ricci curvature and harmonic maps

Friday, November 9, 2018 9:20 AM (50 minutes)

Taking as our starting point the classic paper of Eells and Sampson, we use harmonic maps as a tool to investigate spaces and moduli spaces of Ricci non-negative metrics, and also to study concordances between such metrics. In the first case, among other things, we recover some recent results of Tuschmann and Wiemeler. In the second case, we uncover an interrelationship between concordance, isotopy and isometry for Ricci non-negative metrics, which stands in contrast to the situation for positive scalar curvature.

Summary

Presenter: WRAITH, David

Contribution ID: 10

Type: **not specified**

A rigidity theorem for the action of the diffeomorphism group on spaces of psc metrics

Thursday, November 8, 2018 9:20 AM (50 minutes)

For a closed, simply connected d -dimensional manifold M , we study the action of the (spin) diffeomorphism group of M on the space $\mathcal{R}^+(M)$ of psc metrics on M . Our main result is that the homotopy class of the map $f^* : \mathcal{R}^+(M) \rightarrow \mathcal{R}^+(M)$ only depends on the cobordism class in $\Omega_{d+1}^{\text{Spin}}$ of the mapping torus of f . When properly formulated, the same result is true for manifolds with nontrivial fundamental group.

Summary

Presenter: EBERT, Johannes

Contribution ID: 11

Type: **not specified**

Spaces of riemannian metrics satisfying surgery stable curvature conditions

Thursday, November 8, 2018 10:40 AM (50 minutes)

We will introduce spaces of riemannian metrics on a smooth manifold satisfying a curvature condition given by a subset in the space of algebraic curvature operators. Provided this condition is surgery stable, which is a notion based on the work of S. Hoelzel guaranteeing the condition can be preserved under surgeries of a certain codimension, we can generalize several theorems from positive scalar curvature geometry to this setting. Notably, we will comment on a generalization of a theorem of V. Chernysh on the homotopy type of the space of psc metrics and point to cases where we can distinguish connected components using invariants from spin geometry.

Summary

Presenter: KORDASS, Jan-Bernhard (Karlsruhe Institute of Technology (KIT))