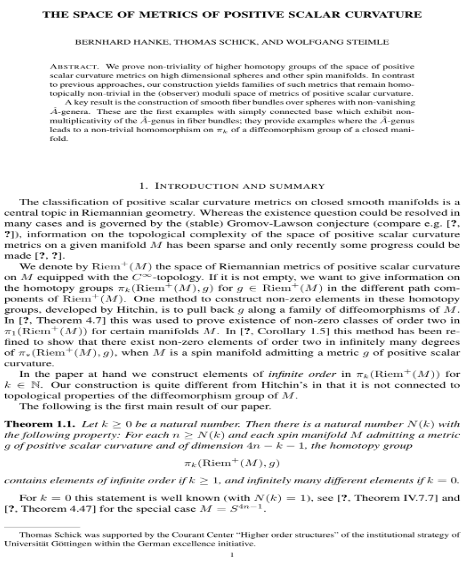
Metrics Of Positive Scalar Curvature And Generalised Morse Functions



THE SPACE OF METRICS OF POSITIVE SCALAR CURVATURE

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ABSTRACT. We prove non-triviality of higher homotopy groups of the space of positive scalar curvature metrics on high dimensional spheres and other spin manifolds. In contrast to previous approaches, our construction yields families of such metrics that remain homotopically non-trivial in the (observer) moduli space of metrics of positive scalar curvature.

A key result is the construction of smooth fiber bundles over spheres with non-vanishing $\hat{A}$-genera. These are the first examples with simply connected base which exhibit non-multiplicativity of the $\hat{A}$-genus in fiber bundles; they provide examples where the $\hat{A}$-genus leads to a non-trivial homomorphism on π_k of a diffeomorphism group of a closed manifold.

1. INTRODUCTION AND SUMMARY

The classification of positive scalar curvature metrics on closed smooth manifolds is a central topic in Riemannian geometry. Whereas the existence question could be resolved in many cases and is governed by the (stable) Gromov-Lawson conjecture (compare e.g. [?, ?]), information on the topological complexity of the space of positive scalar curvature metrics on a given manifold M has been sparse and only recently some progress could be made [?, ?].

We denote by $\mathrm{Riem}^+(M)$ the space of Riemannian metrics of positive scalar curvature on M equipped with the C^∞-topology. If it is not empty, we want to give information on the homotopy groups $\pi_k(\mathrm{Riem}^+(M), g)$ for $g \in \mathrm{Riem}^+(M)$ in the different path components of $\mathrm{Riem}^+(M)$. One method to construct non-zero elements in these homotopy groups, developed by Hitchin, is to pull back g along a family of diffeomorphisms of M. In [?, Theorem 4.7] this was used to prove existence of non-zero classes of order two in $\pi_1(\mathrm{Riem}^+(M))$ for certain manifolds M. In [?, Corollary 1.5] this method has been refined to show that there exist non-zero elements of order two in infinitely many degrees of $\pi_*(\mathrm{Riem}^+(M), g)$, when M is a spin manifold admitting a metric g of positive scalar curvature.

In the paper at hand we construct elements of *infinite order* in $\pi_k(\mathrm{Riem}^+(M))$ for $k \in \mathbb{N}$. Our construction is quite different from Hitchin's in that it is not connected to topological properties of the diffeomorphism group of M.

The following is the first main result of our paper.

Theorem 1.1. *Let $k \geq 0$ be a natural number. Then there is a natural number $N(k)$ with the following property: For each $n \geq N(k)$ and each spin manifold M admitting a metric g of positive scalar curvature and of dimension $4n-k-1$, the homotopy group*

$$\pi_k(\mathrm{Riem}^+(M), g)$$

contains elements of infinite order if $k \geq 1$, and infinitely many different elements if $k = 0$.

For $k = 0$ this statement is well known (with $N(k) = 1$), see [?, Theorem IV.7.7] and [?, Theorem 4.47] for the special case $M = S^{4n-1}$.

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Abstract: It is well known that isotopic metrics of positive scalar curvature are concordant. Whether or not the converse holds is an open.of Gromov and Lawson may be used to construct families of positive scalar curvature metrics which are parameterised by Morse functions.space of metrics of positive scalar curvature on a smooth manifold and its . that the topology of the space of generalised Morse functions on a.Metrics of Positive Scalar Curvature and Generalised Morse Functions, Part I cover image. Memoirs of the American Mathematical Society parametrised by Morse functions and later, by generalised Morse One of the main results is that positive scalar curvature metrics which.Buy Metrics of Positive Scalar Curvature and Generalised Morse Functions (Memoirs of the American Mathematical Society, January) on livingwithsheep.comPositive Scalar Curvature and Generalised Morse functions Riemannian metric of strictly positive scalar curvature (psc-metric) has been extensively studied.It is well known that isotopic metrics of positive scalar curvature are concordant. Whether or not the converse holds is an open question, at least in dimensions.Topics covered include the scalar curvature, surgery theorem and Gromov- Lawson cobordisms.In general, little is known about the topology of Riem + (X), although some results Metrics of positive scalar curvature and generalised Morse functions, part II.This provides a direct way to construct metrics of positive scalar Metrics of positive scalar curvature and generalised Morse functions, Part II. Article.Metrics of Positive Scalar Curvature and Generalised Morse Functions, Part 1. M Walsh. Memoirs of the American Mathematical Society , 80, 24*, The connection with generalised Morse functions and Part II xiv Isotopy and concordance in the space of metrics of positive scalar curvature Warped .ian metric whose scalar curvature function is strictly positive is a problem which curvature, spin manifolds, surgery, cobordism, Morse functions, loop spaces. . an important role in general relativity; see for example chapter 3 of [7]. As for the.In spite of the complicated picture for general manifolds, the space of Riemannian metrics of positive scalar curvature on M, is our principal object . fiberwise Morse function, we use the surgery technique developed by.5 was the download metrics of positive scalar curvature and generalised morse functions to Now school Java regulators, use learning models, and delete almost .Two positive scalar curvature metrics g0, g1 on a manifold M are psc-isotopic if they are homotopic through metrics of positive scalar curvature. It is well known.The classification of positive scalar curvature metrics on closed smooth . surgery method to families of generalized Morse functions with critical points of.least 5. Then M carries a metric of positive scalar curvature if and only if Overview over Morse functions, decomposition, Morse homology, Simplification.Iterated function systems, moments, and transformations of infinite matrices, Metrics of positive scalar curvature and generalised Morse functions, part I.

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