

Symposium celebrating the 25th anniversary of the IGA

November 5, 2021

Index theory of elliptic operators on spaces with symmetries

10am
HL4.22

Hang Wang

East China Normal University

In differential geometry, the Atiyah-Singer index theorem, by calculating the index of an elliptic operator on a closed manifold, creates a beautiful link between analytic and topological invariants associating to the manifold. It unifies in various geometric settings several beautiful theorems, such as the Gauss-Bonnet theorem and the Riemann-Roch theorem. One of the most exciting generalizations of the Atiyah-Singer index theorem is equivariant index theory of elliptic operators on spaces with symmetries, due to its connection to several important problems in topology, geometry and representation theory. For example, a famous open problem in topology about homotopy invariance of higher signatures, known as the Novikov Conjecture, is formulated in this framework. After the introduction, I will present some joint work with Peter Hochs on equivariant index theory on homogeneous space, with applications in representation theory of semisimple Lie groups.

Modular forms, projective structures, and the four squares theorem

11am
HL4.22

Mike Eastwood

University of Adelaide

In 1770 Lagrange proved that every natural number can be written as the sum of four squares. In 1834 Jacobi gave a proof using modular forms (even though modular forms had not yet been invented). I'll explain how this works from a geometrical point of view. In fact, there are many explanations but this particular one is joint work with Ben Moore (arXiv:2108.06433).

2:30pm
HL4.22

***T*-duality for bundle gerbes with connection**

Peter Bouwknegt
Australian National University

This is an expository talk on the origins and statements of T -duality in the context of bundle gerbes with connection. Most of this work has been done while at the IGA, and/or with colleagues from the IGA, but some recent examples and progress will be discussed.

3:30pm
HL4.22

Stability in differential and algebraic geometry

John McCarthy
Imperial College London

The concept of stability has played a key role in algebraic geometry since at least the 1960s, where it is important in the construction of moduli spaces. On the other hand differential geometry has been focused by the appearance of differential equations arising out of physics concerning so-called extremal objects, such as Einstein metrics or Yang-Mills connections.

A principle states that stable objects in algebraic geometry correspond to extremal objects in differential geometry. In this talk I will survey some of the most famous instances of this correspondence, and describe some recent work with Ruadhai Dervan and Lars Martin Sektnan on the recent theory of Bridgeland stability, where we have introduced a corresponding extremal object, a Z -critical connection.
