Titles and Abstracts

Jacek Brodzki

Title: TBA

Abstract: TBA

Matthew Burfitt

Title: Problems with multiparameter persistent homology

Abstract: Persistent homology is a powerful, well studied and widely applied tool throughout topological data analysis. Multiparameter persistence, the natural extension of persistent homology has the potential to extract even greater topological and geometric structure from data. Despite much detailed study however, there are multiple perspectives on where the problems lie and in general obtaining useful information form multiparameter persistence modules remains a major obtrusion.

In this talk I will set out the strengths and limitations of persistent homology in one parameter, present problems hindering progress on multiparameter persistence and give an overview of a variety of approaches taken within the field.

Tsuyoshi Kato

Title: Some development of Seiberg-Witten theory and related topics

Abstract: Lusztig?s method on Novikov conjecture for free abelian groups gave a strong influence on the subsequence development of non commutative geometry.In this talk we will explain a way to interpret such a vision on gauge theory. Concretely we will present an example of topological fiber bundles whose base, fiber and total manifolds are all smoothable, but they are not smoothable as fiber bundles. Then we explain a covering version of Bauer-Furuta theory and propose a conjecture which arose from an expected inequality plus Singer conjecture. The former is a joint work with H.Konno and N.Nakamura.

Daisuke Kishimoto

Title: Higher homotopy associativity in the Harris decomposition of Lie groups

Abstract: In 1962, Harris showed that for some pair of Lie groups (G, H) and a prime p such as $(SU(2n), Sp(n))$ and $p > 2$, the fibration $H \to G \to G/H$ splits p-locally such that there is a p-local homotopy equivalence

$$G \simeq_{(p)} H \times G/H.$$

I will show how this homotopy decomposition preserves the group structures of G and H in view of higher homotopy associativity. This is joint work with Toshiyuki Miyauchi.

Ian Leary

Title: TBA

Abstract: TBA

Ingrid Membrillo Solis

Title: The homotopy theory of gauge groups over $(2n+1)$-manifolds

Abstract: The homotopy theory of gauge groups and their classifying spaces over two and four dimensional manifolds has been extensively studied due its connections to Yang-Mills gauge theory in mathematical physics and algebraic geometry. Although there exist gauge theories defined over manifolds of odd dimensions, the homotopy theory of their associated gauge groups has been barely explored.

In this talk I will present some results and open questions related to the homotopy theory of gauge groups over odd dimensional manifolds. In particular, I will focus on the cases when the dimension of the manifold is 3 or 7.

Mariam Pirashvili

Title: Topology and geometry of molecular conformational spaces and energy landscapes.

Abstract: In this talk I discuss both our theoretical and data-driven approaches to the study of configuration spaces of molecules and their associated energy landscapes. In our mathematical approach, we define the graph permutation inversion group (GPI), a discrete group of symmetries associated to a molecule that, in some sense, generalises the complete nuclear permutation inversion group. We show that the topology of the internal configuration space might change after quotienting it out by the group action of the GPI group. We also make use of a variety of geometric and topological tools for data analysis to study the topology and geometry of the internal configuration spaces with and without discrete group actions. Our approach shows that local principal component analysis, persistent homology and discrete Morse theory provide the chemistry community with efficient methods to study the mathematical structures underlying the spaces of conformers and their energy landscapes.

Stephen Theriault

Title: The suspension of a 4-manifold and its applications

Abstract: Let M be an orientable, closed 4-manifold with a CW-structure and suppose that the fundamental group of M is a graph product of cyclic groups. We give a homotopy decomposition of the suspension of M in terms of spheres and Moore spaces if M is Spin, and in terms of spheres, Moore spaces and the suspension of $\mathbb{C}P^2$ if M is non-Spin. Applications are given to the K-theory of M and to current groups. This is joint work with Larry So.