Topology Mini-Conference

University of Regina

June 6, 2019

All talks are in room **ED 114** (Education Building).

9:30 - 10:00	*Welcome and registration*
10:00 - 11:00	Tony Bahri
11:00 - 11:30	*Coffee break*
11:30 - 12:30	Marzieh Bayeh
12:30 - 2:00	*Lunch break*
2:00 - 3:00	Robin Koytcheff
3:00 - 3:15	*Break*
3:15 - 4:15	Kristine Bauer
4:15 - 4:45	*Coffee break*
4:45 - 5:45	Alejandro Adem

Titles and abstracts

Alejandro Adem (University of British Columbia)

Free finite group actions on rational homology spheres

We use methods from the cohomology of groups to describe the finite groups which can act freely and homologically trivially on closed 3-manifolds which are rational homology spheres. We also discuss the related question of which finite groups can arise as fundamental groups of rational homology 4-spheres. This is joint work with I. Hambleton.

Tony Bahri (Rider University)

On the integral cohomology of orbifolds and toric varieties

The Danilov–Jurkiewicz and Davis–Januszkiewicz theorems tell us that the integral cohomology ring of a toric manifold has an elegant description in terms of the underlying fan or characteristic function. Orbifolds and singular toric varieties on the other hand, are generally not so nice. Even so, when certain accessible criteria are satisfied, their integral cohomology can have a characterization as satisfying as in the smooth case. The model we mimic is that of weighted projective space and the results are a significant improvement over previous criteria. This is a report of joint work with Dietrich Notbohm, Soumen Sarkar and Jongbaek Song.

Kristine Bauer (University of Calgary)

The Faa di Bruno formula in functor calculus

The Faa di Bruno formula is a concise way of writing the higher order derivatives of a composition of functions. With B. Johnson, C. Osborne, E. Riehl and A. Tebbe, I obtained a similar formulation for the higher order derivatives of a composition of functors of abelian categories (in the sense of functor calculus). This kind of structure is well-known to category theorists, in the form of categories with differentiation. In particular, R. Cockett and R. Seely proved that if a category X has differentiation, then there is an associated bundle $Faa(X) \to X$ which encodes the structure of higher-order differentiation.

In work in progress with Brenda Johnson and Sarah Yeakel, we establish a functor from Abelian categories to Cockett–Seely's "Faa" categories. This implies that there is an operad structure on the derivatives of functors of abelian functors, which appears to be an analog of results of G. Arone and M. Ching which establish operads for certain functors of topological spaces.

Marzieh Bayeh (Dalhousie University)

A new approach to topological complexity using transversals

The notion of topological complexity was introduced by M. Farber to estimate the complexity of a motion planning algorithm of a robot. When there is a symmetry on the robot or its configuration space, we may consider developing an equivariant version of topological complexity.

In this talk, we discuss a new approach to the equivariant topological complexity. We study the cases that the robot is symmetric or it has a symmetric configuration space for which a closed transversal exists.

Robin Koytcheff (University of Louisiana at Lafayette)

The Taylor tower for the space of knots and finite-type knot invariants

I will discuss the Taylor tower for the space of long 1-dimensional knots in Euclidean space, which comes from Goodwillie–Weiss functor calculus. When the codimension is at least 3, this tower converges to the space of knots, while in the classical case of codimension 2, all real-valued finite-type invariants factor through it. With Budney, Conant, and Sinha, we constructed a homotopy-commutative multiplication on each stage of the tower compatible with stacking long knots via the evaluation map. This helped us provide evidence for a conjecture that all abelian-group-valued finite-type invariants factor through the tower. Topics of ongoing and planned joint work include actions of the cactus operad and splicing operad on the tower, as well as computations in the homotopy spectral sequence of the tower.