Graduate Research Day Abstracts

Fall 2023

Location: LILY 3118

Saturday, November 11, 2023

Coalgebraic Models for G-Spaces

Speaker: Sofía Martínez Alberga

Time: 11:00 am - 11:35 am

Title:

Abstract: Given a commutative ring R, a π_1-R-equivalence is defined to be a continuous map of spaces inducing an isomorphism on fundamental groups and an R-homology equivalence between universal covers. If R is the ring of integers then this notion coincides with that of a weak homotopy equivalence. When R is an algebraically closed field, Rivera and Raptis described a full and faithful (co)algebraic model for the homotopy theory of spaces up to π_1-R-equivalence by means of simplicial coalgebras considered up to a notion of weak equivalence created by the cobar functor. Their work extends previous algebraic models for spaces considered up to R-homology (Kriz, Goerss, Mandell) by including the information of the fundamental group in complete generality. In this talk, I will describe G-equivariant analogs of this statement obtained through generalizations of a celebrated theorem of Elmendorf.

Boundary rigidity results for MP-systems

Speaker: Sebastián Muñoz Thon

Time: 11:40 am - 12:15 pm

Abstract: Consider a compact Riemannian manifold with boundary. The boundary rigidity problem asks to what extent the boundary distance functions determine the metric in the interior of the manifold. A more general problem is to endow the Riemannian manifold with a magnetic field and ask if the boundary action function determines the metric and the magnetic field in the interior of the boundary.

In this talk, we will consider a compact Riemannian manifold with boundary endowed with a magnetic field and potential. This is called an MP-system. On simple MP-systems, we consider the boundary rigidity problem. We prove that the boundary action function at one energy level determines the metric, the magnetic field, and the potential, when we work on a conformal class, or on surfaces, or on analytic manifolds, or on a generic set of MP-systems.

F-pure Thresholds of Flag Varieties

Speaker: Justin Fong
Time: 12:20 pm - 12:55 pm

Abstract: The F-pure threshold is the prime characteristic analogue of the log canonical threshold of an ideal in characteristic zero. One of its uses is that it provides a measurement of the singularity of a variety. In this talk I will discuss the computation of F-pure thresholds for the homogeneous coordinate rings of flags, which are projective varieties whose points correspond to chains of subspaces of a fixed vector space. These coordinate rings have the structure of an ASL (algebra with straightening laws), where the generators of the ring are indexed by a poset. The computation of the F-pure threshold can be done using information on the underlying poset of the ring.

A Recipe for Almost Representations that are Far from Representations
Speaker: Forrest Glebe
Time: 2:00 pm - 2:35 pm

Abstract: A discrete group is said to be "stable" if every map from the group to unitary matrices that is "almost multiplicative" is "close" to a genuinely multiplicative map. Different notions differ on how to make "almost multiplicative" and "close" more formal. My talk will focus on matricial stability where these notions are defined in terms of the point-operator norm topology, and Frobenius stability, where they are defined in terms of the point-Frobenius topology. I will explain how one can get an "almost multiplicative map" from a 2-cohomology class in operator norm, and use a similar technique to show that finitely generated nilpotent groups are Frobenius stable if and only if they are virtually cyclic.

Restricted digits and the Goldbach Conjecture: An Exceptional Set Result
Speaker: James Cumberbatch
Time: 2:40 pm - 3:15 pm

Abstract: The Goldbach conjecture, that all even numbers greater than 2 can be represented as the sum of two primes, is currently unsolved. We examine what the exceptions might look like if it is false and show that almost all digitally restricted integers obey the Goldbach conjecture.

When groups produce topologically zero-dimensional C*-algebras?
Speaker: Iason Moutzouris
Time: 3:20 pm - 3:55 pm

Abstract: By Gelfand duality, every unital and commutative C*-algebra is the algebra of continuous functions on some compact and Hausdorff space. So, it is natural to generalize existing notions in topology to C*-algebras. Brown and Pedersen introduced the notion of real rank, as a non-commutative analog of the covering dimension. Just like zero-dimensional spaces have an abundance of clopen sets, C*-algebras of real rank zero are characterized by having an abundance of projections. For every group G, we can associate its full group C*-algebra C*(G), which arises as a universal completion of its group algebra. Locally finite groups yield full group C*-algebras of real rank zero. The converse is an open problem for discrete, amenable groups. In this talk, we will present obstructions in the group G that prevent C*(G) from having real rank zero.