Fall 2024 Colloquia

- Speaker: Daniel Kaplan (UMass Boston)
  Title: A Meandering Introduction to Quiver Waves
  Date: Wednesday, September 18, 2024, 4:00pm - 5:00pm

- Speaker: Carl Lian (Tufts University)
  Title: How to (Not) Count Curves
  Date: Wednesday, October 9, 2024, 3:00pm - 4:00pm

  Given a geometric space X, how many curves of a certain shape lie in X? For instance, Euclid knew that there is a single line in the plane passing through two points. In the 1990s, Kontsevich, using ideas inspired from string theory, generalized Euclid's count to determine the number of rational plane curves of degree d through 3d-1 points. This was the birth of Gromov-Witten (GW) theory, which offers a robust framework to think about counting curves, and which has seen an explosion of progress in the last three decades. However, the GW machine comes with a serious caveat: it often spits out a count that includes unwanted "excess" contributions that are less geometrically meaningful, and that are hard to control. I will outline a broad program to confront this problem in a particular class of examples, which forms a bridge between classical and modern enumerative geometry. The story is largely complete in the case of curves on projective spaces, but there are many interesting directions which lie beyond.

- Speaker: Thomas Massoni (MIT)
  Title: Taut Foliations Through a Contact Lens
  Date: Wednesday, October 16, 2024, 3:00pm - 4:00pm

  In the late '90s, Eliashberg and Thurston established a remarkable connection between foliations and contact structures in dimension three: any co-oriented, aspherical foliation on a closed, oriented 3-manifold can be approximated by both positive and negative contact structures. Additionally, if the foliation is taut then its contact approximations are tight.

  In this talk, I will present a converse result on constructing taut foliations from suitable pairs of contact structures. While taut foliations are rather rigid objects, this viewpoint reveals some degree of flexibility and offers a new perspective on the celebrated L-space conjecture. A key ingredient is a generalization of a result of Burago and Ivanov on the construction of branching foliations which might be of independent interest.

- Speaker: Jose Perea (Northeastern University)
  Title: The Underlying Topology of Data
  Date: Wednesday, October 30, 2024, 3:00pm - 4:00pm

  Topology is the branch of mathematics concerned with shapes and their spatial properties. In this talk I'll show how several ideas from classic algebraic topology – like cohomology, classifying spaces and vector bundles – can be used in machine learning tasks such as dimensionality reduction, time series analysis and data alignment.

- Speaker: Harm Derksen (Northeastern University)
  Title: Invariants of Matrices
  Date: Wednesday, November 6, 2024, 3:00pm - 4:00pm

  In invariant theory, an invariant is a polynomial function that remains unchanged under group symmetries. For example, if we consider the action of GL(n) on the set of nxn matrices by conjugation, then the trace and the determinant are polynomial invariants for this action. I will discuss invariants for m-tuples of matrices and connections with tensors and complexity theory.

- Speaker: Filip Zivanovic (Stony Brook University)
  Title: Floer Theory for Symplectic C*-Manifolds
  Date: Wednesday, November 13, 2024, 3:00pm - 4:00pm

  I will talk about a series of joint papers with Alexander Ritter, where we examine a large class of non-compact symplectic manifolds, including semiprojective toric varieties, conical symplectic resolutions, Higgs moduli spaces, etc. These manifolds admit a Hamiltonian circle action which is part of a pseudo-holomorphic C-action. The symplectic form on these spaces is typically non-exact at infinity, yet we can make sense of Hamiltonian Floer cohomology for functions of the moment map of the circle action. We showed that these Floer cohomologies induce filtration by ideals on quantum cohomology, computable using certain Morse-Bott-Floer spectral sequences. Time permitting, I will mention also our recent progress on equivariant Floer cohomology for these spaces, in which case we obtain a filtration on equivariant quantum cohomology.*