Gauge Theory & Low-dimensional Topology

April 8-12, 2024
Royal Palm Hotel, Miami Beach, FL
Organized by Nikolai Saveliev and Christopher Scaduto

This workshop will be held in connection with the FRG project supported by the NSF Grant DMS-1952762 "FRG: Collaborative Research in Gauge Theory". It will host the principal investigators and several invited researchers and will cover topics in low-dimensional topology, gauge theory, and Floer homology. Each day, breakfast will be available in "The Studio" at 9:00am, and talks are held in the same room.

Program

	9:30-10:20	10:30-11:20	1:00-1:20	1:30-2:20
Mon	Zhenkun Li	Steven Sivek	Malcolm Gabbard	Hokuto Konno
Tue	John Baldwin	Jen Hom	Haochen Qiu	Danny Ruberman
Wed	Irving Dai	Ciprian Manolescu		
Thu	Nikolai Saveliev	Tom Mrowka	Zedan Liu	Ali Daemi
Fri	Dave Auckly	Chris Scaduto		

Participants

David Auckly – Kansas State University

John Baldwin – Boston College

Ali Daemi – Washington University St. Louis

Irving Dai – University of Texas at Austin

Joshua Drouin – Florida Polytechnic University

Malcolm Gabbard – Kansas State University

Jennifer Hom – Georgia Institute of Technology

Hokuto Konno – University of Tokyo

Tom Leness – Florida International University

Zhenkun Li – University of South Florida

Zedan Liu – University of Miami

Ciprian Manolescu – Stanford University

Tom Mrowka – MIT

Minh Nguyen – Washington University St. Louis

Steven Munoz Ruiz – University of Miami

Jesse Osnes – Kansas State University

Haochen Qiu – Brandeis University

Andres Ramirez – University of Miami

Daniel Ruberman – Brandeis University

Nikolai Saveliev – University of Miami

Chris Scaduto – University of Miami

Steven Sivek – Imperial College London

Matt Stoffregen – Michigan State University

Abstracts

Dave Auckly

Surfaces separated by many Whitney moves

We'll show that there are topologically isotopic surfaces separated by many Whitney moves.

John Baldwin

Torus knots and SL(2,C) representations

The A-polynomial of a knot is defined in terms of SL(2,C) representations of the knot group, and encodes information about essential surfaces in the knot complement. In 2005, Dunfield-Garoufalidis and Boyer-Zhang independently proved that it detects the unknot using Kronheimer-Mrowka's work on the Property P conjecture. I'll describe work with Sivek in which we use more recent instanton Floer results to prove that the A-polynomial distinguishes torus knots from all other knots. We further prove that it detects T_{a,b} if and only if a=2 or b=2 or ab has exactly two prime divisors.

Malcolm Gabbard

Equivariantly Double Slice Knots

In this talk, we define a notion of equivariant double slice genus for strongly invertible knots. Our main result allows us to obstruct large families of strongly invertible knots from being equivariantly doubly slice by decomposing the strongly invertible knot into component pieces which must be doubly slice. Using this result, we construct strongly invertible knots which are doubly slice and equivariantly slice but have arbitrarily large equivariantly double slice genus.

Jen Hom

Ribbon concordance and posets

In 2022, Agol proved that ribbon concordance is a partial ordering, answering a 40 year old question of Gordon. We will discuss some questions and some partial results about this partial order. This is joint work in progress with Jung Park and Josh Wang.

Hokuto Konno

Infiniteness of 4-dimensional mapping class groups and characteristic classes

We present a new special phenomenon in dimension 4 from the point of view of infiniteness of mapping class groups and characteristic classes of fiber bundles. The proof uses a new series of characteristic classes obtained from Seiberg-Witten theory for families.

Zhenkun Li

Framed instanton Floer homology and Dehn surgery

Instanton Floer homology was introduced by Floer in 1980s. It is a powerful invariant for 3-manifolds and knots and links inside them. In this talk, I will present a surgery formula for instanton theory, which describes the framed instanton Floer homology of 3-manifolds coming from Dehn surgeries along knots. Time permitting, I will also present some applications of this formula. This is a joint work with Fan Ye.

Zedan Liu

A Casson-Lin type invariant for links

The Casson--Lin invariant of a knot is a signed count of the conjugacy classes of irreducible SU(2) representations of the knot group with a fixed trace. It is known to equal half the equivariant signature of the knot. In 2019, Bénard and Conway generalized the Casson--Lin invariant to links of any number of components. For 2-component links of linking number 1, they proved a formula expressing their invariant in terms of the Cimasoni--Florens link signature. In this talk, we will generalize the Bénard--Conway formula to 2-component links with arbitrary linking numbers.

Ciprian Manolescu

Heegaard Floer stable homotopy types

I will describe an ongoing project of constructing hat Heegaard Floer stable homotopy types for 3-manifolds. In particular, I will compute the polarization class and show it agrees with the one in Seiberg-Witten theory. This is joint work with Mohammed Abouzaid.

Nikolai Saveliev

Instanton homology and Milnor fibers

The following question was asked by Atiyah in the early days of instanton Floer theory: Is there a Milnor fiber description of the Floer homology of the links of singularities? In the late 1990s, I proved a closed form formula for the instanton Floer homology of Brieskorn homology spheres, which could be viewed as an answer to Atiyah's question for the links of Brieskorn singularities. In this talk, we will revisit that formula in light of the progress in gauge theory of the past twenty years. We obtain several new formulas for the instanton Floer homology of Brieskorn homology spheres, including one exclusively in terms of the monodromy of the Milnor fiber. This is a joint project with Kyoung-Seog Lee and Anatoly Libgober.

Chris Scaduto

Connected sums in mod 2 instanton homology

I'll talk about connected sums of 3-manifolds in the setting of SO(3) equivariant instanton homology with mod 2 coefficients. Joint work with Ali Daemi and Mike Miller Eismeier.

Steven Sivek

Knot traces and L-spaces

For knots K, the n-trace implies
Their surgeries' Heegaard Floer size
And therefore we'll see
That each T(a,b)
Has 0-trace characterize.

Joint work with John Baldwin.