EIT 寧波東方理工大學
EASTERN INSTITUTE OF TECHNOLOGY, NINGBO

数学科学学院
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Eastern Institute of Technology, Ningbo

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东方理工数学物理会议
EIT Workshop on Mathematical Physics
会议手册 Manual

中国 · 宁波
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CONTENT

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Meeting Affairs

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About EIT

Eastern Institute of Technology, Ningbo (EIT), with a high starting point, is poised to emerge as a new type of High-level, International, Research-oriented university initiated by social forces and highly supported by the governments of Zhejiang Province and Ningbo City, as well as other social forces. Chen Shiyi, a renowned educator and academician of the Chinese Academy of Sciences, serves as the Founding President of EIT.

EIT is committed to fostering social development through exceptional education, cutting-edge research, and a culture of innovation. At the heart of EIT’ s mission is the aspiration to advance economic and social progress of both the region and the nation. To achieve this, EIT emphasizes foundational and applied research, propelling advancements in engineering and technology, and highlighting interdisciplinary and impactful research in science, engineering, information technology and business management, supplemented by humanities and social sciences.

EIT aims to nurture innovative talents with ambitious aspirations and pragmatic mindsets, equipping them with a solid academic foundation, robust competencies, innovation skills, a sense of patriotism, and a global perspective.

Our Mission

EIT aims to become a new type of international, high-level, innovative research university that puts emphasis on the cultivation of top-notch innovative STEM scholar and the synthesis of foundational and applied research. EIT applies itself to interdisciplinary research in cutting-edge fields, with a view to contributing to the economic and social development of both the region and the nation.

About EIT Workshop on Mathematical Physics

The workshop on mathematical physics at Eastern Institute of Technology, Ningbo aims to bring together leading experts and active researchers working at the interface of topology, geometry, algebra, and mathematical physics. The workshop will highlight recent developments in low-dimensional topology, contact and symplectic geometry, Floer-theoretic invariants, knot homology and categorification, mirror symmetry, microlocal sheaf theory, and related algebraic and geometric structures arising from quantum topology and mathematical physics. As part of EIT Ningbo’ s continuing effort to build a vibrant mathematical research environment, this event will provide a platform for exploring modern interactions between topology and mathematical physics.

Attendees

Chris Brav
SIMIS

Qingtao Chen
Xi'an Jiaotong-Liverpool University

Wenzhao Chen
ShanghaiTech University

Zhechi Cheng
Wuhan University

Huijun Fan
Wuhan University

Bohan Fang
Peking University

Honghao Gao
Tsinghua University

Zhen Gao
Universität Augsburg

Ko Honda
UCLA

Mingyuan Hu
Syddansk Universitet

Mikhail Khovanov
Johns Hopkins University

Zhenkun Li
AMSS

Dexie Lin
Chongqing University

Lei Liu
Shandong University

Han Lou
Peking University

Jie Min
HIMIS

Yi Ni
Caltech

Yu Pan
Tianjin University

Yingdi Qin
SIMIS

Vivek Shende
UC Berkeley

Zhe Sun
USTC

Guozhen Wang
Fudan University

Enxin Wu
Shantou University

Weiwei Wu
Zhejiang University

Hang Yuan
BIMSA

Bingyu Zhang
Kyiv School of Economics

Melissa Zhang
UC Davis

Shuo Zhang
AMSS

Peng Zhou
UC Berkeley

MAP

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6 办公楼 EXECUTIVE BUILDING
7 行政楼 ADMINISTRATION BUILDING
8 人文社科楼 HUMANITIES AND SOCIAL SCIENCES BUILDING
9 郑坚·荆红楼 ZHENG JIAN AND GONG LIHONG BUILDING (ENGINEERING BUILDING)
10 生命科学楼 LIFE SCIENCES BUILDING
11 化学材料楼 CHEMISTRY AND MATERIALS SCIENCE BUILDING
12 公共科研楼 CENTRAL RESEARCH BUILDING
13 电子楼 ELECTRONICS BUILDING
14 数理楼 MATHEMATICS AND PHYSICS BUILDING
15 文博中心 UNIVERSITY CULTURAL CENTER
16 求真塔 QIUZHEN TOWER
17 教授之家 FACULTY CLUB
18 食堂 DINING HALL
19 学生活动中心 STUDENT CENTER
20 教师宿舍区 FACULTY HOUSING
21 学生宿舍区 RESIDENCE HALLS
22 综合体育馆 RECREATION CENTER
23 静园 SERENITY GARDEN
24 东区体育场 EAST STADIUM
25 垃圾收集中心 WASTE COLLECTION CENTER
26 动物实验中心 LAB
27 材料中心&危险品暂存中心 LAB

SCHEDULE

June 26th

Zhenhai Grand New Century Hotel, Ningbo
镇海开元名都酒店

TIME	PROGRAM
15:00-19:00	Registration

June 27th

Room 410, MATHMATICS AND PHYSICS BUILDING 数理楼, EIT

TIME	SPEAKER	PROGRAM	HOST
09:15-09:30		Opening Ceremony	
09:30-10:30	Ko Honda	The Giroux correspondence in arbitrary dimensions	Tianyu Yuan
10:30-11:00		Break	
11:00-12:00	Mikhail Khovanov	Diagrammatics of the Delannoy category	Tianyu Yuan
12:30-13:30		Lunch	

SCHEDULE

June 27th

Room 410, MATHMATICS AND PHYSICS BUILDING 数理楼, EIT

TIME	SPEAKER	PROGRAM	HOST
13:30-14:30	Yi Ni	Knot Floer homology and the monodromy of fibered knots	Jiajun Wang
14:30-15:00		Break	
15:00-16:00	Guozhen Wang	TBA	Jiajun Wang
16:00-16:30		Break	
16:30-17:30	Qingtao Chen	TBA	Jiajun Wang
17:30-20:00		Dinner Zhenhai Grand New Century Hotel, Ningbo	

June 28th

Room 410, MATHMATICS AND PHYSICS BUILDING 数理楼, EIT

TIME	SPEAKER	PROGRAM	HOST
09:00-10:00	Vivek Shende	TBA	Bohan Fang
10:00-10:15		Break	
10:15-11:15	Melissa Zhang	Quantum topology, 4-manifolds, and categorified projectors	Bohan Fang
11:15-11:30		Break	
11:30-12:30	Peng Zhou	Gluing in Heegaard-Floer theory	Jiajun Wang
12:30-13:30		Lunch	

KEYNOTE SPEECH

Ko Honda

UCLA

The Giroux correspondence in arbitrary dimensions

Around twenty years ago Emmanuel Giroux formulated the equivalence of contact structures and open book decompositions with Weinstein pages up to stabilization. We establish the Giroux correspondence in full generality using the recent developments in convex hypersurface theory. This is joint work with Joe Breen and Yang Huang.

Mikhail Khovanov

Johns Hopkins University

Diagrammatics of the Delannoy category

The Delannoy category, introduced by N.Harman and A.Snowden, comes from computing convolution of certain constructible functions by integrating over Borel-Moore Euler characteristic. We will explain the use of that category for categorification of shifted divided powers of a linear map and develop the diagrammatics of the Delannoy category. The talk is based on a joint work in progress with Noah Snyder.

Yi Ni

Caltech

Knot Floer homology and the monodromy of fibered knots

Knot Floer homology is an invariant of knots in closed 3-manifolds. This invariant captures a great deal of information about the topology of knot complements. In particular, when a knot is fibered, the information contained in knot Floer homology provides insight into the monodromy of the fibration. I will survey recent work on this topic, including results on bounding the number of fixed points and the characterization of right-veering monodromy.

Guozhen Wang

Fudan University

Periodicity in homotopy theory

One key feature of K theory is its 2-fold periodicity and the 8-fold periodicity in KO theory. There is a series of periodic generalized homology theories called Morava E theory which leads to chromatic homotopy theory. We will give an introduction to our recent work on determining the period of the higher chromatic analogues of KO theory and some applications in homotopy theory.

KEYNOTE SPEECH

Qingtao Chen
Xi'an Jiaotong-Liverpool University

Recent progress of various Volume Conjectures

The original Volume Conjecture of Kashaev-Murakami-Murakami predicts a precise relation between the asymptotics of the colored Jones polynomials of a knot in S^3 and the hyperbolic volume of its complement, which can be generalized in two different directions.
The first direction concerns different quantum invariants of knots. There is a subtle relation between cyclotomic expansion and the original Volume Conjecture for colored Jones polynomials of knots. This subtle relation can be generalized to the colored SU (n) polynomial (with the colored Jones polynomial corresponding to the case n = 2) of knots. We then formulate cyclotomic expansion Conjecture and Volume Conjecture for the colored SU(n) polynomial and we also proved several nontrivial cases, which is a joint work with K. Liu and S. Zhu. We also extend this point of view to superpolynomials.
In another direction, we formulated Volume Conjecture for the asymptotics of the Witten-Reshetikhin-Turaev and the Turaev-Viro invariants of 3-manifolds evaluated at certain roots of unit, which is a joint work with T. Yang. Interestingly, this conjecture uses roots of unity that are different from the one usually considered in literature. Understanding of this new phenomenon may require new physical and geometric interpretations that go beyond the usual quantum Chern-Simons theory. I will also introduce a work on the relation between Krillov-Reshetikhin's quantum 6j-symbol and hyperbolic tetrahedron done by J. Murakami & me.
In the past ten years, a combination of Poisson summation formula and Saddle Point method, pioneered by Kashaev and further developped by Yokota, and finalized by Ohtsuki, is gradually become a standard to tool to deal with all kinds of Volume Conjectures. Finally I will explain the following two progress on various Volume Conjectures by using such methods.
1. proof of original Volume Conjecture for twist knots (1st time that original Volume Conjecture has been proved for infinite many hyperbolic knots)
2. proof of the Volume Conjecture of Turaev-Viro invariants for the surgery of one cusp of the Whitehead link (1st time that Chen-Yang Volume Conjecture of the Turaev-Viro invariants has been proved for cusped manifolds which are not knot complements in S^3)
These are recent joint works with S. Zhu.

Vivek Shende
UC Berkeley

TBA

Melissa Zhang
UC Davis

Quantum topology, 4-manifolds, and categorified projectors

Khovanov skein lasagna modules describe a smooth 4-manifold in terms of the surfaces embedded within; these surfaces have 0-dimensional singularities, thought of as "inputs", in the following way: the boundary of a B^4 neighborhood of each singularity is an S^3 which the surface intersects at a link; Khovanov homology is used here to label these links at these singularities. This invariant has been used to study questions related to the Smooth Poincaré Conjecture in Dimension 4; the focus of these questions is on `exotic behavior' in 4-manifolds, i.e. the difference between being homeomorphic and diffeomorphic. While the original skein lasagna modules with 0-dimensional inputs can in some cases be computed for 4-manifolds built with only 0-, 2-, and 4-handles, it is currently not computable for 4-manifolds with 1-handles. Nevertheless, many of our known examples of exotic pairs of 4-manifolds involve 1-handles, and so there has been much interest in either finding a "1-handle formula" or developing a 1-handle-friendly version of skein lasagna modules.
In this talk I will describe joint work with Qiuyu Ren, Ian Sullivan, Paul Wedrich, and Michael Willis, where we define a new version of skein lasagna modules from gl_2 link homology, with 1-dimensional inputs, which is more amenable to 4-manifolds with 1-handles. The strategy is to use an isomorphism discovered in previous joint work with Ian Sullivan, where we related the skein lasagna module of $S^2 \times D^2$ to Rozansky-Willis homology, a version of Khovanov homology for links in connected sums of $S^2 \times S^1$. I will begin with introductions to the relevant ingredients, such as Khovanov homology, functoriality, skein lasagna modules, and the categorified projectors that are used in Rozansky-Willis homology.

Peng Zhou
UC Berkeley

Gluing in Heegaard-Floer theory

Heegaard-Floer theory is about Fukaya categories of symmetric product of surfaces. If the surface can be glued from smaller pieces along strips, we give a gluing formula of the corresponding categories. This is joint work with Vivek Shende.