数论-代数-组合青年学者论坛

程序册

哈尔滨工业大学数学研究院

2019 年 1 月 19-21 日

会议地点：哈尔滨工业大学明德楼 201 室

会议特邀嘉宾：Ngô Bảo Châu（吴宝珠）

邀请报告人员：

程舒扬 University of Michigan

迟敬人 Université Paris-Sud

崔沛仪 IMJ and Université Rennes 1

房　欣 Köln University

李鹏辉 The Institute of Science and Technology Austria

李文威 Peking University

刘春晖 Kyoto University

刘永强 Basque Center

裴　度 Caltech

单　芃 Tsinghua University

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王好武 University of Lille

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会议日程

1 月 19 日 上午

08:45-08:50	欢迎致辞 （许全华）	
主持人：张毅超		
08:50-09:30	单芃	Center of G1T-modules and affine Springer fibre
09:35-10:15	苏桃	Counting augmentations associated to Legendrian knots/tangles
10:15-10:35	茶歇	
10:35-11:15	房欣	Global geometry of linear degenerate flag varieties
11:20-12:00	刘永强	Perverse sheaves on semi-abelian varieties
12:10-14:00	午餐：西苑宾馆	

1月19日　下午

主持人：　董志杰		
14:00-14:40	李鹏辉	Derived Category of character sheaves
14:45-15:25	余红杰	Counting l-adic local systems over a curve
15:30-15:50	茶歇	
15:50-16:30	刘春晖	Counting rational points in arithmetic varieties by the determinant method
16:35-17:15	王好武	Theta block conjecture for paramodular forms of weight 2
18:00-19:30	晚餐：西苑宾馆	

1 月 20 日　上午

主持人： 臧经涛		
08:40-09:20	李文威	Contragredient representations over function fields
09:25-10:05	孙哲	McShane identities for higher Teichmuller theory and Goncharov-Shen potential
10:05-10:35	合影、茶歇	
10:35-11:15	崔沛仪	Modular l representations of p-adic groups and Bernstein decomposition
11:20-12:00	迟敬人	Geometric approach to non-Archimedean orbital integrals
12:00-14:00	午餐：西苑宾馆	

1月20日 下午

主持人： 王智拓		
14:00-14:40	裴度	Modular tensor categories from the Coulomb branch
14:45-15:25	程舒扬	Mirabolic Trace Formula
15:30-15:50	茶歇	
主持人： 许全华		
15:50-16:50	吴宝珠	TBA
16:50-18:00		
18:00-19:30	晚餐：西苑宾馆	

1月21日

自由讨论

Abstracts

Center of G1T-modules and affine Springer fibre

Peng Shan

Tsinghua University

We will explain a link between center of the category of G1T-modules and cohomology of certain affine Springer fibre.

Counting augmentations associated to Legendrian knots/tangles

Tao Su

ENS, Paris - CNRS

Associated to Legendrian knots/tangles in the contact three-space, the Legendrian Contact Homology (LCH) DGAs are Legendrian isotopy invariants which satisfy a co-sheaf property. The "(rank 1) representations" of a LCH DGA form an variety, called augmentation variety. Such an variety, in particular its mixed Hodge structure, is a Legendrian isotopy invariant up to a normalization. This can be viewed as some analogue of wild character varieties on a projective line with one marked point, by the "augmentations are sheaves" result of L.Ng, D.Rutherford, V.Shende, S.Sivek, E.Zaslow.

The point-counting E-polynomial of the augmentation variety is given by the ruling polynomial, the Legendrian analogue of Jones polynomial. The tangle approach also leads naturally to a ruling decomposition of the variety into simple pieces, inducing a spectral sequence converging to the MHS. In particular, it shows that the variety is of Hodge-Tate type, and allows some example-computations.

Global geometry of linear degenerate flag varieties

Xin Fang

Köln University

In this talk I will introduce the flat family of linear degenerate flag varieties, and will explain how Motzkin combinatorics come into the picture to encode the cohomology variation in the family. (joint work with Markus Reineke)

Perverse sheaves on semi-abelian varieties

Yongqiang Liu

Basque Center

Jan 19
11:20am

We give a complete (global) characterization of complex perverse sheaves on semi-abelian varieties in terms of their cohomology jump loci. Our results generalize Schnell's work on perverse sheaves on complex abelian varieties, as well as Gabber-Loeser's results on perverse sheaves on complex affine tori. We apply our results to the study of cohomology jump loci of smooth quasi-projective varieties and to the topology of the Albanese map. This is a joint work with Laurentiu Maxim and Botong Wang.

Derived Category of character sheaves

Penghui Li

The Institute of Science and Technology Austria

Jan 19
2:00pm

We give a block decomposition of the dg category of character sheaves on a simple and simply-connected complex reductive group G, similar to the one in generalized Springer correspondence. As a corollary, we identify the category of character sheaves on G as the category of quasi-coherent sheaves on an explicitly defined derived stack $\widehat{G}$.

Counting ℓ-adic local systems over a curve

Hongjie Yu

The Institute of Science and Technology Austria

Jan 19
2:45pm

In 1981, Drinfeld has counted the number of rank 2 irreducible ℓ-adic local systems over a curve and found a curious phenomenon. In this talk, I will explain this problem and give the strategy of the proof for generalising Drinfelds work to higher ranks.

Counting rational points in arithmetic varieties by the determinant method

Chunhui Liu

Kyoto University

Jan 19
3:50pm

By the slope method in Arakelov geometry, we can construct a family of hypersurfaces which cover the rational points of bounded height on an arithmetic variety but don't contain the generic point of this variety. By estimating some invariants of Arakelov geometry, we can control the number and the maximal degree of this family of auxiliary hypersurfaces explicitly. In this talk, I will explain the method of studying the problem of counting rational points by the approach of Arakelov geometry.

Theta block conjecture for paramodular forms of weight 2

Haowu Wang

University of Lille

Theta blocks are special automorphic products which are holomorphic Jacobi forms. Paramodular forms are Siegel modular forms with respect to the paramodular groups of polarization (1,t) and genus 2. In this talk, we construct an infinite family of paramodular forms of weight 2 which are simultaneously Borcherds products and additive Jacobi liftings (i.e. identities of type 'infinite product=infinite sum'). This proves the conjecture of Gritsenko-Poor-Yuen (2013) for the known infinite series of theta blocks of weight 2. The talk is based on joint work with Valery Gritsenko.

Contragredient representations over function fields

Wenwei Li

Peking University

Jeffrey Adams, David Vogan and Dipendra Prasad conjectured independently that for a connected reductive group over a local field, the L-parameter of the contragredient of an irreducible admissible representation equals the original parameter post-composed with Chevalley involution. This is previously known for real groups, classical groups in characteristic zero and for certain supercuspidals of p-adic groups constructed by compact induction. In this talk, I will explicate the case of local fields of positive characteristic, using the semi-simplified Langlands parameterization due to Genestier-Lafforgue. This turns out to be an easy application of Lafforgue's theory together with a local-global argument.

McShane identities for higher Teichmüller theory and Goncharov-Shen potential

Zhe Sun

Luxembourg university

We obtain a family of Mcshane-type identities for simple root length on positive surface (with open boundary or cusp) group representations into $PGL(n, R)$. Our technique is based on a family of Landau-Ginzberg partial potentials on the Fock-Goncharov $\mathcal{A}_{SL_n, S_{g,m}}$ moduli space introduced by Goncharov and Shen, where they interest in geometric representation theory. (They used these potentials to define the positive integral tropical points $\mathcal{A}_{G,S}^+(\mathcal{Z}^t)$ in order to parametrise a canonical basis of $Loc_{G^L, S}$ (they prove for $S = D_k$ with mixed type), and formulate a holomogical mirror symmetry picture which provides a compactification of $Loc_{G^L, S}^*$.) We propose to use the ratio of it to study the geometry of higher Teichmüller space. Moreover, we also find boundedness of triple ratio in mapping class group orbit, Fuchsian rigidity for triple ratio and Fuchsian rigidity for edge function. As applications, we find generalized collar lemmas which involve λ_i/λ_{i+1} length spectral, discreteness of that

length spectral and higher rank Thurston-type metric (which may provide an interesting compactification). This is a joint work with Yi Huang. In further research, I would like to ask how can we integrate to obtain the generalized Mirzakhani's topological recursion with Wn constraint?

Modular ℓ representations of p-adic groups and Bernstein decomposition

Peiyi Cui

IMJ and Universit Rennes 1

Let F be a p-adic field, and G be $GL_n(F)$. We endow a p-adic topology on G, of which we consider the category of k-smooth representations. Here k is an algebraically closed field, with char$(k)=\ell$ and ℓ is different from p. My talk will introduce the Bernstein decomposition on this category.

Geometric approach to non-Archimedean orbital integrals

Jingren Chi

Universite Paris-Sud

Orbital integrals on reductive groups over non-Archimedean local fields are certain combinatorial objects that appear frequently in number theory and representation theory. In this talk, I will explain how to understand (some of) them via algebro-geometric methods.

Modular tensor categories from the Coulomb branch

Du Pei

Caltech

We propose a new link between the geometry of the Coulomb branch and quantum invariants of 3-manifolds. The construction goes through a class of four-dimensional supersymmetric quantum field theories. Each such theory gives rise to several non-unitary modular tensor categories, whose algebraic structures are intimately related to the geometry of the Coulomb branch. This is based on joint work with Mykola Dedushenko, Sergei Gukov, Hiraku Nakajima and Ke Ye.

Mirabolic trace formula

Shuyang Cheng

University of Michigan

In the classical work of Jacquet and Zagier on the holomorphy of symmetric square L-functions on $GL(2)$, they introduced a variant of the Selberg trace formula as a linear relation among various geometric and spectral L-functions. Their construction involved the mirabolic Eisenstein series, generalizations also hold over $GL(n)$. In this talk I will discuss a project in progress on other generalizations of such mirabolic trace formulas and related problems.

List of Participants
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