

Titles and Abstracts

ASPECTS OF AUTOMORPHIC FORMS AND APPLICATIONS



UNIVERSITY OF HONG KONG

July 10–12, 2017

Alexandru Ioan Badulescu

University of Montpellier

The Jacquet–Langlands global correspondence

James Hsiong Lee Science Building JLG05

Tuesday, July 11, 16:30–17:30

Abstract

The global Jacquet–Langlands correspondence is a correspondence between representations of GL_n and representations of inner forms of GL_n over the adèles of a global field. In this talk I will explain the statement, the status and the proof of the global Jacquet–Langlands correspondence over fields of zero and non zero characteristic.

YoungJu Choie

Postech, Korea

Schubert Eisenstein series

James Hsiong Lee Science Building JLG05

Wednesday, July 12, 09:30–10:30

Abstract

Borel Eisenstein series for a split reductive group G over a global field F are sums over $B(F)\backslash G(F)$, where B is the Borel subgroup, that is, over integer points γ in the flag variety $X = B\backslash G$. We consider “Schubert Eisenstein series” in which the summation is restricted to a single Schubert cell. The case of GL_3 was investigated as a clue to the general situation, where properties such as analytic continuation and functional relations were investigated. In this talk, we investigate their Whittaker function. This is work in progress and joint work with D. Bump.

Tomoyoshi Ibukiyama

Osaka University

Universal automorphic differential operators on Siegel modular forms

James Hsiung Lee Science Building JLG05

Monday, July 10, 16:30–17:30

Abstract

Holomorphic differential operators acting on Siegel modular forms and preserving the automorphy when restricted to a fixed smaller domain are important objects. They are applied to obtain critical values of L functions, to construct modular forms, or to lift modular forms, and besides, they are also interesting as a theory of special functions whose prototype is the Gegenbauer polynomials. We will explicitly give a universal object defined by a certain concrete series such that all such differential operators as above are obtained from that in case of the restriction to any fixed diagonal blocks of the Siegel upper half space of any degree.

Ben Kane

University of Hong Kong

Regularized inner products and meromorphic modular forms

James Hsiung Lee Science Building JLG05

Wednesday, July 12, 14:00–15:00

Abstract

In this talk, we investigate the Petersson inner product between modular forms and explain how to “regularize” the integral defining it in order to obtain an inner product which is well defined and finite when taking the inner product between any two arbitrary meromorphic modular forms. We then evaluate the inner product between two specific meromorphic modular forms as the value of higher Green’s functions evaluated at CM-points. This evaluation goes through a modular object called a polar harmonic Maass form, and we conclude the talk by giving some additional applications of polar harmonic Maass forms which have recently arisen. Parts of this talk are based on joint work with Kathrin Bringmann and Anna von Pippich, with Bringmann, and with Bringmann, Löbrich, Rolen, and Ono.

Masanobu Kaneko

Kyushu University

On modular differential equations of the third order

James Hsiung Lee Science Building JLG05

Monday, July 10, 15:15–16:15

Abstract

We consider a special kind of differential equations on the upper half-plane, known as modular differential equations. Their solutions are sometimes modular or quasimodular forms, and have connections to such topics as j -invariants of supersingular elliptic curves or vertex operator algebras (VOAs). We review some previous works and present recent results on "VOA-character type" solutions in the third order case. This is a joint work with K. Nagatomo and Y. Sakai.

Ming-Hsuan Kang

National Chiao Tung University

Geometric zeta functions on reductive groups over non-archimedean local fields

James Hsiung Lee Science Building JLG05

Tuesday, July 11, 14:00–15:00

Abstract

Ihara zeta functions is a geodesic counting function associated to a finite quotient of the building of PGL_2 over a non-archimedean local field. In this talk, we discuss the generalization of Ihara zeta functions to two types of algebraic groups of higher ranks: simply connected groups and groups of adjoint type. For groups of adjoint type, we will first study the relation between Langlands L -functions and geometric zeta functions on a single apartment and then try to establish the result to the whole building. For simply connected groups, we will study geometric zeta function using generalized Poincaré series associated to Iwahori Hecke algebra.

Emmanuel Kowalski

ETH Zürich

The theory of the second moment of families of L-functions

James Hsiung Lee Science Building JLG05

Monday, July 10, 09:30-10:30

Abstract

Moments of special values of families of automorphic L -functions are among the key tools available in the study of their analytic properties. Some remarkably varied applications turn out to follow from a sufficiently precise knowledge of the second moment of the family: non-vanishing results, existence of large values, universality, etc. This first talk will present a general view of the principles underlying these applications, and survey some of the known families where the second moment has been evaluated.

Jianya Liu

Shandong University

Manin's conjecture for singular cubic hypersurfaces

James Hsiung Lee Science Building JLG05

Monday, July 10, 14:00–15:00

Abstract

We establish an asymptotic formula for the number of rational points of bounded height on a class of singular cubic hypersurfaces. This result proves Manin's conjecture for the above hypersurfaces. Also it is a modest start on the study of rational points on those singular cubic hypersurfaces which are not covered by the classical theorems in this direction.

Jingbo Liu

University of Hong Kong

Universal sums of m -gonal numbers

James Hsiong Lee Science Building JLG05

Wednesday, July 12, 15:15–16:15

Abstract

Let $f(x) = \sum_{i=1}^n a_i P_m(x_i)$ where $P_m(x_i) := \frac{(m-2)x_i^2 - (m-4)x_i}{2}$ are generalized m -gonal numbers. In this talk, we determine an asymptotic upper bound, as a function of m , on the size of the set $S_m \subset \mathbb{N}$ such that if f represents S_m , then it represents \mathbb{N} . This is a joint work with Dr. Ben Kane.

Alex Lubotzky

Hebrew University

Ramanujan complexes and their applications

James Hsiong Lee Science Building JLG05

Tuesday, July 11, 09:30–10:30

Abstract

Ramanujan complexes are the high dimensional simplicial complexes analogous to the one dimensional Ramanujan graphs. Such complexes are built as quotients of the Bruhat-Tits buildings of simple groups over local fields. We will survey some of their (external) properties (such as chromatic numbers, "high girth" etc.), random walks on them and their applications to over lapping properties a la Gromov. (Based on Joint works with Samuels, Vishne, Evra, Golubev, Lubetzky, Parzanchevski, Kazhdan and Kaufman).

Philippe Michel

Swiss Federal University of Technology Lausanne

The theory of the second moment of families of L-functions: the
case of Dirichlet twists

James Hsiung Lee Science Building JLG05

Monday, July 10, 11:00–12:00

Abstract

Moments of special values of families of automorphic L -functions are among the key tools available in the study of their analytic properties. Some remarkably varied applications turn out to follow from a sufficiently precise knowledge of the second moment of the family: non-vanishing results, existence of large values, universality, etc. This second talk will discuss more precisely the evaluation of the second moment of Hecke L -function twisted by Dirichlet characters and the necessary methods to evaluate it; we will describe in particular some non-trivial bounds for bilinear sums of Kloosterman sums which rely ultimately on applied l -adic cohomology (joint work with Emmanuel Kowalski and Will Sawin).

Allen Moy

Hong Kong University of Science and Technology

An Euler-Poincaré formula for a depth zero Bernstein projector

James Hsiung Lee Science Building JLG05

Wednesday, July 12, 11:00–12:00

Abstract

Work of Bezrukavnikov-Kazhdan-Varshavsky uses an equivariant system of trivial idempotents of Moy-Prasad groups to obtain an Euler-Poincaré formula for the r -depth Bernstein projector. We establish an Euler-Poincaré formula for the projector to an individual depth zero Bernstein component in terms of an equivariant system of Peter-Weyl idempotents of parahoric subgroups P associated to a block of the reductive quotient P . This work is joint with Dan Barbasch and Dan Ciubortau.

Ori Parzanchevski

Hebrew University

From the Ramanujan Conjectures to quantum computation

James Hsiong Lee Science Building JLG05

Tuesday, July 11, 11:00–12:00

Abstract

In the 80's, the Ramanujan Conjectures were used by Lubotzky, Phillips and Sarnak to construct optimal expanders, which they named "Ramanujan graphs". Recently, it was discovered that their construction also leads to optimal logical gates for quantum computations on a single qubit. I will describe this development, and recent work which uses the structure of Bruhat-Tits buildings and the Generalized Ramanujan Conjectures to address computations in more than one qubit. Based on joint work with Peter Sarnak.

Fang-Ting Tu

Louisiana State University

Supercongruences for Rigid Hypergeometric Calabi-Yau
Threefolds

James Hsiong Lee Science Building JLG05

Tuesday, July 11, 15:15–16:15

Abstract

This is a joint work with Long, Yui, and Zudilin. We establish the supercongruences for the fourteen rigid hypergeometric Calabi–Yau threefolds over \mathbb{Q} conjectured by Rodriguez-Villegas. Two different approaches are used, and they both successfully apply to all the fourteen supercongruences. Our first method is based on Dwork's theory of p -adic unit roots, and the other is based on the theory of hypergeometric motives. In this talk, we will discuss our first approach, which allows us to obtain the supercongruences for ordinary primes.

Jiu-Kang Yu
Chinese University of Hong Kong

Algebraic structures on uniform pro- p groups

James Hsiung Lee Science Building JLG05

Wednesday, July 12, 16:30–17:30

Abstract

We will discuss results concerning algebraic nature of open compact subgroup of adjoint semisimple p -adic groups which are uniform pro- p groups.