山东大学
SHANDONG UNIVERSITY

Jinan · Shandong
July 29 - August 2, 2024
Organizer: Shandong University

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The International Number Theory Conference in Commemoration of Chengdong Pan

CONFERENCE HANDBOOK

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PREFACE

Amid the vibrant summer, with the fragrance of lotus flowers in the air, Shandong University sincerely appreciates your acceptance of the invitation to visit the beautiful Spring City of Jinan to attend the International Number Theory Conference in Commemoration of Chengdong Pan.

The theme of this conference is “Honoring the Past and Inspiring the Future,” in memory of Chengdong Pan’s remarkable contributions to the development of mathematics and education. Taking this opportunity, Shandong University will intensively advance the construction of basic disciplines, inspire future scholars, and accelerate the construction of a world-class university committed to the great rejuvenation of the Chinese nation.

If you need any assistance during the conference, please feel free to contact our staff. We will do our best to serve you. We wish you good health and a pleasant stay!

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Conference Schedule

山东大学 SHANDONG UNIVERSITY

Conference Date: July 30 - August 2, 2024
Conference Venue: Shandong Hotel (2-1 Ma'anshan Road, Jinan, Shandong)
Registration Time: 09:00-22:00 (Beijing Time), July 29, 2024
Registration Venue: Lobby, Shandong Hotel
Contact Us: Lü Guangshi (Shandong Hotel) 15966302392
Huang Bingrong (Shandong Hotel) 15154100793
Lin Yongxiao (Shandong Hotel) 13853141815
Zhai Shuai (Shandong Hotel) 13964175200
Ji Guanghua (Xuefu Hotel) 13853145539
Email: mrc@sdu.edu.cn

Date	Time	Schedule	Venue
July 29 (Mon.)	09:00-22:00	Registration	Lobby, Shandong Hotel
July 30 (Tue.)	09:00-12:00	The 90th Anniversary Memorial Conference of Chengdong Pan	Shandong Conference Hall
	12:00	Buffet Lunch	Confucius Hall, Shandong Hotel
	14:00-17:30	The International Number Theory Conference	Qilu Hall
	18:00	Buffet Dinner	Garden Cafe, Shandong Hotel
July 31 (Wed.)	08:30-12:15	The International Number Theory Conference	Qilu Hall
	12:15	Buffet Lunch	Evergreen Hall, Shandong Hotel
	14:00-17:40	The International Number Theory Conference	Qilu Hall
	18:00	Buffet Dinner	Garden Cafe, Shandong Hotel
August 1 (Thu.)	08:30-12:15	The International Number Theory Conference	Qilu Hall
	12:15	Buffet Lunch	Evergreen Hall, Shandong Hotel
	14:00-17:40	The International Number Theory Conference	Qilu Hall
	18:00	Buffet Dinner	Garden Cafe, Shandong Hotel
August 2 (Fri.)	09:00-12:00	The International Number Theory Conference	Qilu Hall
	12:00	Buffet Lunch	Evergreen Hall, Shandong Hotel
	14:00-16:50	The International Number Theory Conference	Qilu Hall
	18:00	Buffet Dinner	Garden Cafe, Shandong Hotel
August 3 (Sat.)	Departure		

Conference Agenda

List of Speakers

July 30, 2024 (Tuesday) - August 2, 2024 (Friday)
Shandong Hotel, Qilu Hall

Jinpeng An	Peking University
Heng Huat Chan	National University of Singapore
Lei Fu	Tsinghua University
Yongquan Hu	Chinese Academy of Sciences
Bingrong Huang	Shandong University
Henryk Iwaniec	Rutgers University
Yujiao Jiang	Shandong University (Weihai)
Yuk-Kam Lau	The University of Hong Kong
Yongxiao Lin	Shandong University
Ruochuan Liu	Peking University
Yifeng Liu	Zhejiang University
Hourong Qin	Nanjing University
Zeév Rudnick	Tel Aviv University
Peter Sarnak	IAS & Princeton University
Zhiwei Sun	Nanjing University
Yichao Tian	Chinese Academy of Sciences
Jie Wu	Centre national de la recherche scientifique
Ping Xi	Xi'an Jiaotong University
Fei Xu	Capital Normal University
Libo Yang	Nankai University
Yangbo Ye	The University of Iowa
Shuai Zhai	Shandong University (Qingdao)
Yitang Zhang	UC Santa Barbara
Weizhe Zheng	Chinese Academy of Sciences
Chuanming Zong	Tianjin University

Detailed Agenda

July 30 Afternoon

14:00-15:00 Yitang Zhang (UC Santa Barbara)
Combinatorial arguments in sums over primes

15:00-15:30 Refreshment Break

15:30-16:15 Jie Wu (CNRS)
On a sum involving the integral part function

16:20-17:05 Yichao Tian (AMSS, CAS)
Anticyclotomic Iwasawa main conjecture for Rankin-Selberg motives

17:05 Group Photo

July 31 Morning

08:30-09:30 Henryk Iwaniec (Rutgers University)
The Riemann zeta zeros and Kloosterman sums

09:35-10:20 Yifeng Liu (Zhejiang University)
Gan-Gross-Prasad conjecture and its number theoretical applications

10:20-10:40 Refreshment Break

10:40-11:25 Lei Fu (Tsinghua University)
An effective Deligne's equidistribution theorem

11:30-12:15 Shuai Zhai (Shandong University, Qingdao)
Elliptic curves and quadratic forms

12:15 Buffet Lunch (Shandong Hotel, Evergreen Hall)

July 31 Afternoon

14:00-14:45 Yangbo Ye (The University of Iowa)
Algorithms of the Möbius function by random forests and neural networks

14:50-15:35 Jinpeng An (Peking University)
丢番图逼近中的联立奇异性

15:35-16:05 Refreshment Break

16:05-16:50 Ping Xi (Xi'an Jiaotong University)
The Brun-Titchmarsh Theorem

16:55-17:40 Yongxiao Lin (Shandong University)
Nonvanishing for twists of L-functions

August 1 Morning

08:30-09:30 Peter Sarnak (IAS & Princeton University)
Saturation numbers for primes and almost primes

09:35-10:20 Ruochuan Liu (Peking University)
Recent progress in p-adic modular forms

10:20-10:40 Refreshment Break

10:40-11:25 Weizhe Zheng (AMSS, CAS)
Ultraproduct cohomology and the decomposition theorem

11:30-12:15 Yujiao Jiang (Shandong University, Weihai)
Correlations of multiplicative functions

12:15 Buffet Lunch (Shandong Hotel, Evergreen Hall)

August 1 Afternoon

14:00-14:45 Zhiwei Sun (Nanjing University)

Problems and results on combinatorial properties of primes

14:50-15:35 Libo Yang (Nankai University)

Log-concavity of Kazhdan-Lusztig polynomials of uniform matroids

15:35-16:05 Refreshment Break

16:05-16:50 Heng Huat Chan (National University of Singapore)

Class invariants and birthday identities

16:55-17:40 Bingrong Huang (Shandong University)

Value distribution of Hecke eigenforms

August 2 Morning

09:00-10:00 Zeév Rudnick (Tel Aviv University)

Zeros of modular forms

10:00-10:20 Refreshment Break

10:20-11:05 Fei Xu (Capital Normal University)

Counting lattice points in central simple algebras with a given characteristic polynomial

11:10-11:55 Yongquan Hu (AMSS, CAS)

On the dimension of Bianchi modular forms

12:00 Buffet Lunch（Shandong Hotel, Evergreen Hall）

August 2 Afternoon

14:00-14:45 Yuk-Kam Lau (The University of Hong Kong)

Randomness of the Möbius function

14:45-15:15 Refreshment Break

15:15-16:00 Hourong Qin (Nanjing University)

A relation between the Milnor K group and the Shafarevich-Tate group

16:05-16:50 Chuanming Zong (Tianjin University)

Post-quantum cryptography, sphere packing and sphere covering

Titles and Abstracts

丢番图逼近中的联立奇异性

Jinpeng An
(Peking University)

摘要： 在丢番图逼近中，实数、实向量、实矩阵的奇异性由著名数学家Khintchine引入，并成为度量数论中的重要研究对象。最近十余年来，人们在计算奇异集合Hausdorff维数方面取得了突破性进展。报告人与人合作，引入了联立奇异性的概念，并给出了联立奇异集合的Hausdorff维数。本报告将回顾这些工作，并介绍奇异性与联立奇异性和齐性动力系统的关系。

Class invariants and birthday identities

Heng Huat Chan
(National University of Singapore)

Abstract: The Kronecker-Weber theorem states that every finite abelian extension of Q is contained in an extension generated by certain cyclotomic units. We will discuss an analogue of this result with Q and the cyclotomic units replaced by the imaginary quadratic extension and class invariants. We will then show how to generate birthday identity, which is a non-trivial identity that expresses a birthdate in terms of a sum involving the Legendre symbol.

An effective Deligne's equidistribution theorem

Lei Fu
(Tsinghua University)

Abstract: Using the Weyl integration formula, the Weyl character formula and results from harmonic analysis, we prove an Erdös-Turán type inequality for compact Lie groups, from which we deduce an effective version of Deligne's equidistribution theorem.

On the dimension of Bianchi modular forms

Yongquan Hu
(AMSS, Chinese Academy of Sciences)

Abstract: Given a level N and a weight k, we know the dimension of the space of (classical) modular forms. This turns out to be unknown if we consider Bianchi modular forms, which are modular forms over imaginary quadratic fields. Recently, Weibo Fu (Annals of Math., 2024) proved that the dimension of Bianchi modular forms of fixed level grows linearly when the weight (k,k) grows. In this talk, I will recall the background and review the history of this problem (including the work of Simon Marshall and of myself).

Value distribution of Hecke eigenforms

Bingrong Huang
(Shandong University)

Abstract: In this talk, we will discuss value distribution of Hecke eigenforms in the large weight limit. We will first introduce the quantum unique ergodicity theorem, and effective decorrelation of Hecke eigenforms. As consequences, we can prove an effective version of equidistribution of mass and zeros of linear combinations of Hecke eigenforms. Then we will talk about the L^4 norm and joint distribution of Hecke eigenforms. We can prove some conditional results under GRH and GRC, from which we get conditional results on a first moment and nonvanishing of the triple product L-functions.

The Riemann zeta zeros and Kloosterman sums

Henryk Iwaniec
(Rutgers University)

Abstract: This will be a report on my joint work in progress with Brian Conrey. The basic goal is to estimate the sixth power moment of partial sums of the Riemann zeta function on the critical line. Our desired bound is not perfect, yet it is good enough to derive the same zero-density estimation which one gets (indirectly by Jutila's method) by applying the true bound for the full sixth power moment. The results are conditional subject to some natural assumptions about cancellation in sums of Kloosterman sums.

Correlations of multiplicative functions

Yujiao Jiang
(Shandong University, Weihai)

Abstract: Understanding the correlations of multiplicative functions is a central issue in analytic number theory, closely linked to several unsolved problems such as Chowla's conjecture on the autocorrelation of the Möbius function and the additive divisor problem. In this talk, we will discuss our work concerning the correlations on two types of multiplicative functions. As applications, we make some progress on shifted convolution problems for GL(m)×GL(2) (m≥4) and Hypothesis C of Iwaniec-Luo-Sarnak.

Randomness of the Möbius function

Yuk-Kam Lau
(The University of Hong Kong)

Abstract: The Möbius function is a classical important function whose oscillatory behaviour is dictated by the non-trivial zeros of the Riemann zeta function. There have been several attempts to understand its potential randomness. In particular, Sarnak's conjecture on Möbius disjointness in dynamical systems has received much attention. In this talk we give a brief account of some recent work by different researchers.

Nonvanishing for twists of L-functions

Yongxiao Lin
(Shandong University)

Abstract: Let F be a Hecke-Maass cusp form on GL_3 and \chi be primitive Dirichlet characters modulo q. We discuss the simultaneously nonvanishing problem for the Dirichlet L-function L(s,\chi) and the twisted GL_3 L-function L(s,Fx \chi) in the case when the modulus q of \chi's is an almost-prime. This is a work in progress with Junxian Li (UC Davis) and Xiannan Li (Kansas State).

Recent progress in p-adic modular forms

Ruochuan Liu
(Peking University)

Abstract: We will briefly introduce some of the recent developments in the field of p-adic modular forms.

Gan-Gross-Prasad conjecture and its number-theoretical applications

Yifeng Liu
(Zhejiang University)

Abstract: Gan-Gross-Prasad conjecture and its refinement Ichino-Ikeda conjecture have recently been completely solved for unitary groups under the effort of a group of people. In this talk, we will survey this progress and focus on its various applications in number theory, including the Beilinson-Bloch-Kato conjecture, Iwasawa's main conjecture, and subconvexity bounds for central L-values.

A relation between the Milnor K group and the Shafarevich-Tate group

Hourong Qin
(Nanjing University)

Abstract: The congruent number problem has a long history. We will introduce the congruent number problem and related research, and present our recent research on this problem. We will explain the connection between the congruent numbers and the Milnor K groups and the connection between the Milnor K group and the Shafarevich-Tate group.

Zeros of modular forms

Zeév Rudnick
(Tel Aviv University)

Abstract: I will discuss old and new results about the distribution of zeros of various families of modular forms, such as Eisenstein series, Hecke eigenforms, Poincare series, and the Miller basis, and the connection with Quantum Unique Ergodicity.

Saturation numbers for primes and almost primes

Peter Sarnak
(IAS & Princeton University)

Abstract: The classical problems such as twin primes and Goldbach-Waring, of producing an abundance of primes and almost primes can be formulated in terms of saturation numbers. This allows for their investigation more generally in terms of orbits of affine linear and nonlinear morphisms. We review some highlights and recent developments.

Problems and results on combinatorial properties of primes

Zhiwei Sun
(Nanjing University)

Abstract: Combinatorial properties of primes depend on the exact values (not asymptotic behaviors) of primes. In this talk we give a survey of problems and results on combinatorial properties of primes. In particular, we introduce various results and conjectures of the speaker on the prime-counting function.

Anticyclotomic Iwasawa main conjecture for Rankin-Selberg motives

Yichao Tian
(AMSS, Chinese Academy of Sciences)

Abstract: Let M be the Rankin-Selberg motive arising from a regular algebraic conjugate self-dual cuspidal automorphic representations of minimal weight on GL_n*GL_{n+1} over a CM number field F. Consider an anti-cyclotomic Z_p^d-extension F_{\infty}/F such that M is good ordinary at the p-adic primes ramified in F_{\infty}. In a recent joint work with Yifeng Liu and Liang Xiao, we prove that under some technical assumptions, the characteristic ideal of the Bloch-Kato Selmer group for M along F_{\infty}/F contains the corresponding p-adic L-function, constructed previously by Yifeng Liu.

On a sum involving the integral part function

Jie Wu
(CNRS & Université Paris-Est Cretéil)

Abstract: Let f be an arithmetic function satisfying some simple conditions. The aim of this paper is to establish some asymptotic estimates for quantities

$$\psi_f(x) := \sum_{n\leqslant x} \Lambda(n) f\Big(\Big[\frac{x}{n}\Big]\Big), \qquad \pi_f(x) := \sum_{p\leqslant x} f\Big(\Big[\frac{x}{p}\Big]\Big)$$

for $x\to\infty$, where $\Lambda(n)$ is the von Mangoldt function and $[t]$ is the integral part of $t\in\mathbb{R}$. These generalise or sharpen some recent results of Saito-Suzuki-Takeda-Yoshida. As an application, we show that

$$\sum_{p\leqslant x,\,[\frac{x}{p}]\text{ is prime}} 1 \underset{x\to\infty}{\sim} \Big(\sum_p \frac{1}{p(p+1)}\Big)\frac{x}{\log x}.$$

This is a joint work with Hengcai Tang.

The Brun-Titchmarsh theorem

Ping Xi
(Xi'an Jiaotong University)

Abstract: The classical Brun-Titchmarsh theorem gives an upper bound, which is of correct order of magnitude, for the number of primes in an individual arithmetic progression. We will discuss our recent work on sharpening this theorem with better constants by combining Dirichlet polynomials, character/exponential sums, l-adic cohomology and spectral theory of automorphic forms. If time permits, we also mention its connection with the Landau-Siegel zero and subconvex bounds for Dirichlet L-functions. This is a joint work with Junren Zheng.

Counting lattice points in central simple algebras with a given characteristic polynomial

Fei Xu
(Capital Normal University)

Abstract: Eskin, Mozes and Shah determined an asymptotic formula for integral matrices with a given irreducible characteristic polynomial over Z. We'll extend this result to a central simple algebra based on our previous work about counting integral points in homogeneous spaces. This is a joint work in progress with Jiaqi Xie.

Log-concavity of Kazhdan-Lusztig polynomials of uniform matroids

Libo Yang
(Nankai University)

Abstract: Elias, Proudfoot and Wakefield conjectured that the Kazhdan-Lusztig polynomial of every matriod is log-concave. This interesting conjecture remains widely open. In this talk I will show how to prove this conjecture for uniform matroids and q-niform matroids. This is based on my joint works with Alice Gao, Ethan Li, Matthew Xie, Philip Zhang, and Zhong-Xue Zhang.

Algorithms of the Möbius function by random forests and neural networks

Yangbo Ye
(The University of Iowa)

Abstract: The Möbius function contains important arithmetic information, but its known algorithms are all based on integer factorization and hence are exponentially slow. In this talk, novel algorithms of the Möbius function by machine learning techniques without factorization will be presented.

Elliptic curves and quadratic forms

Shuai Zhai
(Shandong University, Qingdao)

Abstract: In this talk, I will discuss fundamental results concerning elliptic curves and explore the connections between the number of representations of integers by quadratic forms, K-groups, the class number of imaginary quadratic fields, and the central L-values of elliptic curves.

Combinatorial arguments in sums over primes

Yitang Zhang
(University of California Santa Barbara)

Abstract: Many problems in analytic number theory are reduced to estimating certain sums over primes. In this field the combinatorial arguments introduced by I.M. Vinogradov, Pan Cheng Dong, R.C. Vaughan, D.R. Heath-Brown and others play important roles. In this talk we will summarize their work, and describe a new argument that can be used to break the barries of the Bombieri-Vinogradov theorem.

Ultraproduct cohomology and the decomposition theorem

Weizhe Zheng
(AMSS, Chinese Academy of Sciences)

Abstract: Ultraproducts of étale cohomology provide a large family of Weil cohomology theories for algebraic varieties. Their properties are closely related to questions of l-independence and torsion-freeness of l-adic cohomology. I will present recent progress in ultraproduct cohomology with coefficients and applications, such as an integral l-adic decomposition theorem for l large enough. This talk is based on joint work with Anna Cadoret.

Post-quantum cryptography, sphere packing and sphere covering

Chuanming Zong
(Tianjin University)

Abstract: On July 5, 2022, the National Institute of Standards and Technology announced four possible post-quantum cryptography standards, three of them are based on lattice theory. It is well-known that the security of the lattice cryptography relies on the hardness of the shortest vector problem (SVP) and the closest vector problem (CVP). In fact, the SVP is a sphere packing problem and the CVP is a sphere covering problem. In this talk we will show these connections and present some recent progresses in quantum computing, sphere packing and sphere covering.

Conference Guide

Accommodation Hotel

Shandong Hotel

Location: 2-1 Ma' anshan Road, Jinan, Shandong
Hotel Reception: (86-531) 82958888/82508888

- Distance from Jinan Yaoqiang International Airport: 46 km, 60-minute drive
- Distance from Jinan West Station: 19 km, 30-minute drive
- Distance from Jinan Station: 6 km, 20-minute drive
- Distance from Jinan East Station: 22 km, 35-minute drive

Dining Service

- July 30 — Buffet Lunch (12:00-14:00)

Please use your lunch voucher at the Confucius Hall in Shandong Hotel

- July 31- August 2 — Buffet Lunch (12:00-14:00)

Please use your lunch voucher at the Evergreen Hall in Shandong Hotel

- July 30- August 2 — Buffet Dinner (17:30-20:30)

Please use your lunch voucher at the Garden Cafe in Shandong Hotel

Please Note

1. Please wear your conference badge during the event and present it upon entering the conference venue.
2. Please keep the venue quiet during the sessions and turn off or silence your mobile phones.

Weather Forecast

Weather in Jinan during the conference:

July 30	July 31	August 1	August 2
26~33℃	26~33℃	27~33℃	26~33℃
Cloudy	Cloudy	Sunny	Sunny
Tuesday	Wednesday	Thursday	Friday

Hotel Floor Plan