丘成桐数学科学中心
YAU MATHEMATICAL SCIENCES CENTER

TSIMF
清华三亚国际数学论坛

2025三亚算术几何研讨会

2025 Symposium on Number Theory and Arithmetic Geometry

December 15-19, 2025

Room A-120, TSIMF

组织者 ORGANIZERS

Heng Du(杜衡), Tsinghua University

Xu Shen(申旭), Morningside Center of Mathematics, AMSS, CAS

Laurent Fargues, Centre National de la Recherche Scientifique

Ziquan Yang(杨梓诠), The Chinese University of Hong Kong

Yu Min(闵钰), Hong Kong University of Science and Technology

Contents

About the conference

2025 三亚算术几何研讨会

2025 Symposium on Number Theory and Arithmetic Geometry

Date

December 15-19, 2025

Venue

Room A-120, TSIMF

Organizers

Heng Du(杜衡), Tsinghua University

Xu Shen(申旭), Morningside Center of Mathematics, AMSS, CAS

Laurent Fargues, Centre National de la Recherche Scientifique

Ziquan Yang(杨梓诠), The Chinese University of Hong Kong

Yu Min(闵钰), Hong Kong University of Science and Technology

Abstract

The 2025 Symposium on Number Theory and Arithmetic Geometry is a premier international forum devoted to exploring groundbreaking advances in these fields. The conference unites renowned experts, emerging scholars, and innovative young researchers from around the world, fostering a dynamic exchange of ideas.

Description of the aim

The conference aims to create a space where researchers from various branches of arithmetic geometry can come together to exchange ideas and collaborate. Featuring keynote speeches, panel discussions, and interactive sessions, attendees are encouraged to share new results and innovative ideas. We will primarily focus on recent advancements in the Langlands program and p-adic Hodge theory.

Participants will have the opportunity to meet experts, learn about cutting-edge research, and forge collaborations for future projects. The relaxed and open atmosphere is designed to welcome questions, facilitate the sharing of challenges, and inspire exploration beyond boundaries. Ultimately, the event seeks to unite the arithmetic geometry community, foster lasting connections within the mathematical community, and drive innovative research in the Langlands program and p-adic Hodge theory.

Schedule

Time&Date	Monday (December 15)	Tuesday (December 16)	Wednesday (December 17)	Thursday (December 18)	Friday (December 19)
7:30-8:30	Breakfast(60 minutes)				
09:30-10:30	Si Ying Lee	Lucas Gerth	Yongquan Hu	Yichao Tian	Luming Zhao
10:30-11:00	Coffee Break (30 minutes)				
11:00-12:00	Naoki Imai	David Urbanik	Ning Guo	Jingbang Guo	Daxin Xu
12:00-13:30	Lunch (90 minutes)				
14:00-15:00	Hiroki Kato	Huajie Li	Free Discussion 13:30-17:00	Zhongyipan Lin	Free Discussion 13:30-17:00
15:00-15:30	Coffee Break (30 minutes)			Coffee Break	
15:30-16:30	Kazuhiro Ito	Roy Zhao		Heejong Lee	
17:30-19:00	Dinner	Banquet 18:00-20:00	Dinner (90 minutes)		

December 15, 2025 - Monday

Time	Name	Title
7:30-8:30	Breakfast (60 minutes)	
09:30-10:30	Si Ying Lee	p-isogenies with G-structure
10:30-11:00	Coffee Break (30 minutes)	
11:00-12:00	Naoki Imai	Finite Langlands correspondence
12:00-13:30	Lunch (90 minutes)	
14:00-15:00	Hiroki Kato	Nearby cycles in the semistable case via gluing of stratified Tate motives
15:00-15:30	Coffee Break (30 minutes)	
15:30-16:30	Kazuhiro Ito	Affine Grassmannians and close fields
17:30-19:00	Dinner (90 minutes)	

December 16, 2025 - Tuesday

Time	Name	Title
7:30-8:30	Breakfast (60 minutes)	
09:30-10:30	Lucas Gerth	Moduli spaces of analytic p-divisible groups
10:30-11:00	Coffee Break (30 minutes)	
11:00-12:00	David Urbanik	Raynaud-style semistability for degenerating families
12:00-13:30	Lunch (90 minutes)	
14:00-15:00	Huajie Li	On the geometric side of the Guo-Jacquet trace formula
15:00-15:30	Coffee Break (30 minutes)	
15:30-16:30	Roy Zhao	p-adic Periods of CM Abelian Varieties
18:00-20:00	Banquet	

December 17, 2025 - Wednesday

Time	Name	Title
7:30-8:30	Breakfast (60 minutes)	
09:30-10:30	Yongquan Hu	A multiplicity one result in $\mathrm{mod}p$ Jacquet-Langlands correspondence for $\mathrm{GL}_2\left(\mathbb{Q}_p\right)$
10:30-11:00	Coffee Break (30 minutes)	
11:00-12:00	Ning Guo	Geometric presentations and torsors over affine lines
12:00-13:30	Lunch (90 minutes)	
13:30-17:00	Free Discussion	
17:30-19:00	Dinner (90 minutes)	

December 18, 2025 - Thursday

Time	Name	Title
7:30-8:30	Breakfast (60 minutes)	
09:30-10:30	Yichao Tian	Prismatic-etale comparison theorem and p-adic nearby cycles for semistable local systems
10:30-11:00	Coffee Break (30 minutes)	
11:00-12:00	Jingbang Guo	Prismatic cohomology and Hopf algebroids
12:00-13:30	Lunch (90 minutes)	
14:00-15:00	Zhongyipan Lin	On the homological local model theorem
15:00-15:30	Coffee Break (30 minutes)	
15:30-16:30	Heejong Lee	Serre weight conjectures and modularity lifting for GSp_4
17:30-19:00	Dinner (90 minutes)	

December 19, 2025 - Friday

Time	Name	Title
7:30-8:30	Breakfast (60 minutes)	
09:30-10:30	Luming Zhao	A Prismatic Herr Complex for Bloch-Kato Selmer Groups
10:30-11:00	Coffee Break (30 minutes)	
11:00-12:00	Daxin Xu	On $\mathbb{C}_p$ representations of the fundamental group in the p-adic Simpson correspondence over curves
12:00-13:30	Lunch (90 minutes)	
13:30-17:00	Free Discussion	
17:30-19:00	Dinner (90 minutes)	

Titles and Abstracts

p-isogenies with G-structure

Si Ying Lee
National University of Singapore, Singapore

I will talk about defining the notion of p-isogenies using the theory of F-gauges, and how this allows us to construct integral models of Hecke correspondences. I will also discuss some expected consequences of this, such as constructions of Rapoport-Zink spaces, and a general framework on understanding integral Hecke actions on Shimura varieties. This is joint work in progress with Keerthi Madapusi.

Finite Langlands correspondence

Naoki Imai
University of Tokyo, Japan

In this talk, we discuss the formulation and construction of the Langlands correspondence for reductive groups over finite fields, which we call the finite Langlands correspondence. We discuss also its conjectural relation with the categorical local Langlands correspondence. This is partially based on a joint work with David Vogan.

Nearby cycles in the semistable case via gluing of stratified Tate motives

Hiroki Kato
Institut des Hautes Études Scientifiques, France

The nearby cycle complex is relatively well-understood in the semistable case. For instance, in the Betti, étale, and motivic contexts, it is known to be an extension of constant objects (up to shift and twist) on the natural strata, respectively, by Steenbrink, Rapoport-Zink/Saito, Ayoub. Moreover, in the Betti and étale contexts, the extension class (i.e., the gluing datum) is analyzed well enough to fully understand the E_1-page of the weight spectral sequence. However, in any of the above contexts, a complete and concrete identification of the extension class does not seem to have been established. I will present an attempt towards such an identification.

Affine Grassmannians and close fields

Kazuhiro Ito
Tohoku University, Japan

Let G be a split reductive group over $\mathbb{Z}$ and μ a cocharacter of G. For a local field F of characteristic p with finite residue field k, we have the Schubert variety over k corresponding to μ in the affine Grassmannian of a parahoric subgroup $\mathcal{P}$ of G_F. On the other hand, for a local field E

of characteristic 0 with the same residue field k, we can naturally associate a parahoric subgroup $\mathcal{P}'$ of G_E to $\mathcal{P}$, and consider the Schubert variety over k corresponding to μ in the Witt vector affine Grassmannian of $\mathcal{P}'$. In this talk, we show that if the absolute ramification index of E is sufficiently large, then the Schubert varieties corresponding to μ in these two settings are isomorphic to each other (after taking perfections). This result aligns with the Deligne-Kazhdan philosophy of close fields. For hyperspecial subgroups, this result was proved by Bando. Our approach is different from that of Bando: we establish a certain representability result for a version of the affine Grassmannian defined using the moduli space of non-archimedean local fields introduced by Li-Huerta, from which we deduce our result. If time permits, I will also discuss potential applications to orbital integrals for G_F. This talk is based on joint work with Sebastian Bartling.

Moduli spaces of analytic p-divisible groups

Lucas Gerth
Institut de Mathématiques de Jussieu - Paris Rive Gauche, France

We prove a classification of families of analytic p-divisible groups on adic spaces S over $\mathbb{Q}_p$ in terms of Hodge-Tate triples on S, generalizing a theorem of Fargues. From this, for S a perfectoid space, we construct an analytic Dieudonné theory with values in mixed characteristic Shtukas over the Fargues-Fontaine disc. As applications, we realize the local Shimura varieties of EL and PEL type of Rapoport-Zink as moduli spaces of analytic p-divisible groups with framed universal cover, and we reinterpret the Hodge-Tate period map of Scholze in terms of p-topological torsion subgroups of abelian varieties.

Raynaud-style semistability for degenerating families

David Urbanik
Institute for Advanced Study, America

From the perspective of semistability, the theory of abelian varieties is special, in that the weight filtration appearing in etale cohomology has a geometric rigid-analytic origin (a theorem of Raynaud). We describe work in progress aimed at generalizing this perspective to arbitrary rigid-analytic degenerations of algebraic varieties to a normal crossing divisor.

On the geometric side of the Guo-Jacquet trace formula

Huajie Li(李华杰)
Yau Mathematical Sciences Center, Tsinghua University, China

A well-known theorem of Waldspurger relates the central value of automorphic L-function for GL(2) to the period integral on a nonsplit torus. Guo-Jacquet proposed a relative trace formula approach to generalise this theorem to higher dimensions. In a joint work in progress with Pierre-Henri Chaudouard, we establish such a trace formula in the coarse form. We shall explain the

background and present our results with emphasis on the geometric side, where we obtain relative weighted orbital integrals for most terms.

p-adic Periods of CM Abelian Varieties

Roy Zhao(赵世豪)
Yau Mathematical Sciences Center, Tsinghua University, China

While the Colmez Conjecture is often stated as an equality between the Faltings heights of CM abelian varieties and special values of logarithmic derivatives of L -functions, it was originally formulated as a product formula for p-adic periods of CM abelian varieties. In fact, proving the equality between Faltings heights and special values of L-functions will only give "half" of Colmez's original conjecture. We will explain how this product of p-adic periods can be understood in terms of Arakelov geometry. This geometric reformulation gives an avenue to tackle the full Colmez Conjecture. As a consequence, we show that the Colmez Conjecture can be reduced to a height formula for surfaces, and recover some previous known results concerning heights of nearby CM-types.

A multiplicity one result in $\mathrm{mod}p$ Jacquet-Langlands correspondence for $\mathrm{GL}_2(\mathbb{Q}_p)$

Yongquan Hu(胡永泉)
Morningside center of Mathematics, AMSS, CAS, China

The classical Jacquet-Langlands (J-L) correspondence relates complex smooth representations of $\mathrm{GL}(n)$ and that of its inner forms. In the mod p setting, Scholze constructed a cohomological covariant δ-functor from the category of admissible smooth mod p representations of $\mathrm{GL}_n(L)$ to admissible smooth mod p representations of $D^\times$ which carry a continuous Galois action. In this talk I will report some results on Scholze's functors in the (simplest) case of $\mathrm{GL}(2,\mathbb{Q}_p)$; in particular I will focus on a multiplicity one property related to Scholze's functors and its applications. This is joint work with Haoran Wang.

Geometric presentations and torsors over affine lines

Ning Guo(郭宁)
Harbin Institute of Technology, China

Geometric presentations are an effective method for simplifying cohomological problems by reducing their relative dimension. This talk will trace the history of this technique, from Artin's "bon voisinage" to its modern applications. We will particularly focus on its relevance to the Grothendieck-Serre conjecture for reductive torsors over regular local rings. In this context, the talk will also review recent advances in the analysis of torsors over affine and projective lines.

Prismatic-etale comparison theorem and p-adic nearby cycles for semistable local systems

Yichao Tian(田一超)
Morningside center of Mathematics, AMSS, CAS, China

Let K be a finite extension of $\mathbb{Q}_p$, and X be a semistable p-adic formal scheme over $\mathcal{O}_K$. Semistable étale local systems on X_K can be viewed as natural generalizations of classical semistable Galois representations over K. Recently, Du-Liu-Moon-Shimizu proved that the category of semistable étale $\mathbb{Z}_p$-local systems on X_K is equivalent to analytic prismatic F-crystals on the absolute log -prismatic site of X. In this talk, I will explain a comparison theorem between the geometric étale cohomology of a semistable $\mathbb{Z}_p$-local system on X_K and the cohomology of its attached log -prismatic F-crystal.

Prismatic cohomology and Hopf algebroids

Jingbang Guo(郭靖邦)
Shanghai Center for Mathematical Sciences, Fudan University, China

The prismatic cohomology, introduced first by Bhatt and Scholze, is a cohomology theory for p-adic formal schemes which can be specialized to many other cohomology theories. In this talk, following the idea of prismatizaiton, we will briefly explain the method of studying prismatic cohomology by using suitable Hopf algebroids. Then we apply this method to study prismatic cohomology of polynomial rings: by considering certain q-de Rham prisms and corresponding Hopf algebroids, we obtain explicit complexes (with q-de Rham operators) computing prismatic cohomology.

This talk is based on joint work with Ruochuan Liu and Guozhen Wang.

On the homological local model theorem

Zhongyipan Lin(林中一攀)
Tongji University, China

In this talk, I will report on recent advancements of the geometric Breuil-Mezard conjecture. First, I will explain how to use the homological local model theorem to promote the topological Breuil-Mezard conjecture to the geometric Breuil-Mezard conjecture. Then I will talk about the correct form of the topological Breuil-Mezard conjecture. Finally, I will say a few words about the proof of the homological local model theorem for small Hodge types and generic Weil-Deligne types. This is partly based on joint work in progress with Tony Feng and Bao Le Hung.

Serre weight conjectures and modularity lifting for GSp_4

Heejong Lee
Korea Institute for Advanced Study, Korea

Given a Galois representation attached to a regular algebraic cuspidal automorphic representation, the Hodge-Tate weight of the Galois representation is matched with the weight of the automorphic representation. Serre weight conjectures are mod p analogue of such a correspondence, relating ramification at p of a mod p Galois representation and Serre weights of mod p algebraic automorphic forms. In this talk, I will discuss the proof of the conjecture for the group GSp_4 using the geometry of " $\ell = p$ " local Galois representations and representation theory of finite groups of Lie type (e.g. $\mathrm{GSp}_4(\mathbb{F}_p)$). If time permits, I will explain how one can deduce modularity lifting theorem by combining our result with the recent progress on the Breuil-Mézard conjecture by Feng-Le Hung-Lin. This is based on a joint work with Daniel Le and Bao V. Le Hung.

A Prismatic Herr Complex for Bloch-Kato Selmer Groups

Luming Zhao(赵路明)
Dalian University of Technology, China

In 1998, Laurent Herr constructed a three-term complex using etale (phi, Gamma)-modules to compute the Galois cohomology of corresponding Galois representations. This approach was later extended to various settings, and recently to Kummer setting via (phi, tau)-modules. Inspired by the work of Du-Liu, we will introduce a prismatic Herr complex, formulated using a prismatic version of (phi, tau)-modules attached to a (log-)crystalline representation. For a crystalline representation, this complex computes the Bloch-Kato Selmer group and relates to the cohomology of the corresponding F-gauge. The talk is based on joint work with Heng Du.

On $\mathbb{C}_p$ representations of the fundamental group in the p-adic Simpson correspondence over curves

Daxin Xu(许大昕)
Morningside Center of Mathematics, Academy of Mathematics and Systems Science, China

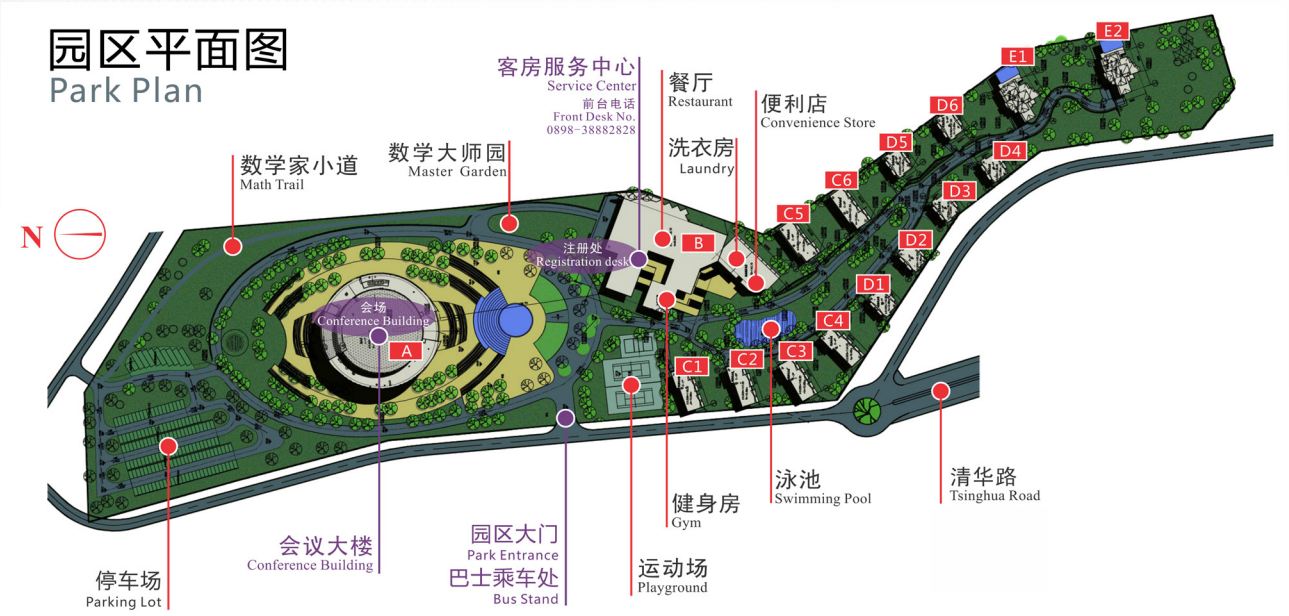
In the p-adic Simpson correspondence over a smooth proper curve, an important question is to understand the essential image of the continuous $\mathbb{C}_p$ representations of the geometric fundamental group under this correspondence. The essential image is expected to consist of semistable Higgs bundles of degree zero. We first review the work of Deninger--Werner and myself on this question. We then discuss some recent progress, including the case of rank two Higgs bundles with a non-zero nilpotent Higgs field.

Welcome to TSIMF

The facilities of TSIMF are built on a 23-acre land surrounded by pristine environment at Phoenix Hill of Phoenix Township. The total square footage of all the facilities is over 29,000 square meter that includes state-of-the-art conference facilities (over 10,000 square meter) to hold many international workshops simultaneously, two reading rooms of library, a guest house (over 10,000 square meter) and the associated catering facilities, a large swimming pool, gym and sports court and other recreational facilities.

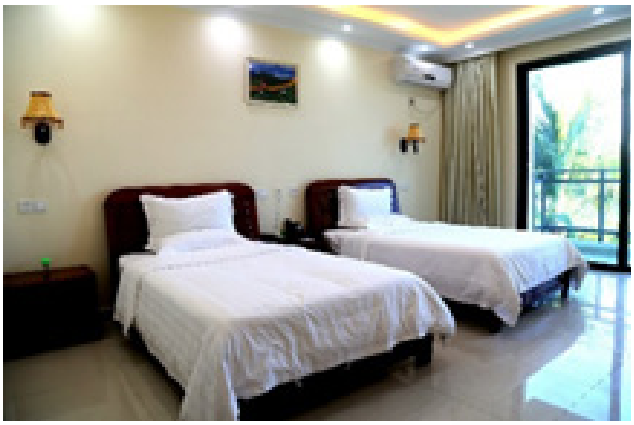
Management Center of Tsinghua Sanya International Forum is responsible for the construction, operation, management and service of TSIMF. The mission of TSIMF is to become a base for scientific innovations, and for nurturing of innovative human resource; through the interaction between leading mathematicians and core research groups in pure mathematics, applied mathematics, statistics, theoretical physics, applied physics, theoretical biology and other relating disciplines, TSIMF will provide a platform for exploring new directions, developing new methods, nurturing mathematical talents, and working to raise the level of mathematical research in China.

About Facilities



Registration

Conference booklets, room keys and name badges for all participants will be distributed at the front desk. Please take good care of your name badge. It is also your meal card and entrance ticket for all events.

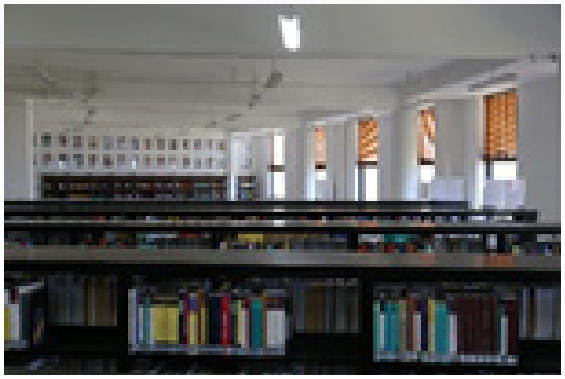


Guest Room

All the rooms are equipped with: free Wi-Fi (Password:tsimf123), TV, air conditioning and other utilities.

Family rooms are also equipped with kitchen and refrigerator.

Library



Opening Hours: 09:00am-22:00pm

TSIMF library is available during the conference and can be accessed by using your room card. There is no need to sign out books but we ask that you kindly return any borrowed books to the book cart in library before your departure.

In order to give readers a better understanding of the contributions made by the Fields Medalists, the library of Tsinghua Sanya International Mathematics Forum (TSIMF) instituted the Special Collection of Fields Medalists as permanent collection of the library to serve the mathematical researchers and readers.

So far, there are 271 books from 49 authors in the Special Collection of Fields Medalists of TSIMF library. They are on display in room A220. The participants are welcome to visit.

Restaurant

All the meals are provided in the restaurant (Building B1) according to the time schedule.

Breakfast 07:30-08:30
Lunch 12:00-13:30
Dinner 17:30-19:00

Laundry

Opening Hours: 24 hours

The self-service laundry room is located in the Building(B1).

Gym

Opening Hours: 24 hours

The gym is located in the Building 1 (B1), opposite to the reception hall. The gym provides various fitness equipment, as well as pool tables, tennis tables etc.

Playground

Playground is located on the east of the central gate. There you can play basketball, tennis and badminton. Meanwhile, you can borrow table tennis, basketball, tennis balls and badminton at the reception desk.

Swimming Pool

Please enter the pool during the open hours, swimming attire and swim caps are required, if you feel unwell while swimming, please stop swimming immediately and get out of the pool. The depth of the pool is 1.2M-1.8M.

Opening Hours: 13:00-14:00 18:00-21:00

Free Shuttle Bus Service at TSIMF

We provide free shuttle bus for participants and you are always welcome to take our shuttle bus, all you need to do is wave your hands to stop the bus.

Destinations: Conference Building, Reception Room, Restaurant, Swimming Pool, Hotel etc.

Contact Information of Administration Staff

Location of Conference Affairs Office: Room 104, Building A

Tel: 0086-898-38263896

Conference Affairs :

Sarah 陈媛姗

Tel/Wechat:0086-130-2983-0780

Email: tsimf@tsinghua.edu.cn

Shouxi He 何守喜

Tel/Wechat:0086-186-8980-2225

Email: heshouxi@tsinghua.edu.cn

Location of Accommodation Affairs Office: Room 200, Building B1

Tel: 0086-898-38882828

Accommodation Manager: Ms. Li YE 叶莉

Tel/Wechat: 0086-139-7679-8300

Email: yel@tsinghua.edu.cn

*Reception duty hours: 7:00-23:00, chamber service please call: 0086-38882828 (exterior line) 80000 (internal line)

*Room maintainer night duty hours: 23:00-7:00, if you need maintenance services, please call: 0086-38263909 (exterior line) 30162 (internal line)

IT

Yuanhang Zhou 周远航

Tel/Wechat: 0086-133-6898-0169

Email: 13368980169@163.com

Director Assistant of TSIMF

Kai CUI 崔凯

Tel/Wechat: 0086- 136-1120-7077

Email :cuik@tsinghua.edu.cn

Director of TSIMF

Junpeng Zhu 朱俊鹏

Tel: 0086-136-1113-2615

Email: zjp@tsinghua.edu.cn

清华大学三亚国际论坛管理中心 | 三亚清华数学论坛管理中心
Tsinghua Sanya International Mathematics Forum (TSIMF)
0086-898-38882828
0086-898-38883896
0086-898-38883895
tsimf@tsinghua.edu.cn
572000
https://www.tsimf.cn
海南省三亚市天涯区清华路 100 号 , 清华三亚国际数学论坛
No.100, Tsinghua Road, Tianya District, Sanya, Hainan, P. R. China.