



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



离散空间上的几何和解析函数 不等式

Geometric and analytic functional
inequalities on discrete spaces

会议时间 TIME

September 14-18, 2026

会议地点 VENUE

Room A-103, TSIMF

组织者 ORGANIZERS

Florian Fischer, University of Bonn, Germany

Shubham Gupta, Technion - Israel Institute of Technology, Israel

Matthias Keller, University of Potsdam, Germany

Bobo Hua (华波波), Fudan University, China



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About the conference

离散空间上的几何和解析函数不等式

Geometric and analytic functional inequalities on discrete spaces

Date

September 14-18, 2026

Venue

Room A-103, TSIMF

Organizers

Florian Fischer, University of Bonn, Germany

Shubham Gupta, Technion - Israel Institute of Technology, Israel

Matthias Keller, University of Potsdam, Germany

Bobo Hua (华波波), Fudan University, China

Abstract

This conference will focus on geometric and functional inequalities on discrete spaces, with particular emphasis on graphs, groups, and networks. Functional inequalities such as Hardy, Rellich, Sobolev, and Poincaré inequalities are cornerstones of modern analysis, providing fundamental tools for understanding diffusion, concentration, and geometry of discrete settings. Recent years have seen remarkable progress, including novel connections to discrete curvature, spectral geometry and random processes. The workshop will bring together leading experts and young researchers to present these advances, exchange ideas across analysis, probability and geometry, and identify promising directions for future research.

Participants

1. Philipp Bartmann, University of Potsdam, Germany
2. Davide Bianchi, Sun Yat-sen University, China
3. Krzysztof Bogdan, Wrocław University of Science and Technology, Poland
4. Jonathan Breuer, The Hebrew University of Jerusalem, Israel
5. Haoxuan Cheng (成浩轩), Fudan University, China
6. Bartłomiej Dyda, Wrocław University of Science and Technology, Poland
7. Florian Fischer, University of Bonn, Germany
8. Rubén de la Fuente Fernández, Basque Center for Applied Mathematics, Spain
9. Shubham Gupta, Technion - Israel Institute of Technology, Israel
10. Zunwu He (何遵武), South China University of Technology, China
11. Michael Hinz, Bielefeld University, Germany
12. Qi Hou (侯琦), Beijing Institute of Mathematical Sciences and Applications, China
13. Chunyang Hu (胡春阳), University of Science and Technology of China, China
14. Bobo Hua (华波波), Fudan University, China
15. Xia Huang (黄侠), East China Normal University, China
16. Xueping Huang (黄学平), Nanjing University of Information Science and Technology, China
17. Supanat Kamtue, Chulalongkorn University, Thailand
18. Matthias Keller, University of Potsdam, Germany
19. David Krejcirik, Czech Technical University in Prague, Czech Republic
20. Lianping Liu (刘恋平), East China University of Science and Technology, China
21. Shiping Liu (刘世平), University of Science and Technology of China, China
22. Shuang Liu (刘双), Renmin University of China, China
23. Yang Liu (刘洋), YMSC, Tsinghua University, China
24. Jun Masamune, Kyoto University, Japan
25. Florentin Münch, University of Leipzig, Germany
26. Kiyon Naderi, Universität Innsbruck, Austria
27. Noema Nicolussi, University of Innsbruck, Austria
28. Marius Nietschmann, Sorbonne Université (IMJ-PRG), France
29. Norbert Peyerimhoff, Durham University, UK
30. Felix Pogorzelski, University of Leipzig, Germany
31. Marcel Schmidt, Friedrich-Schiller University Jena, Germany
32. Alberto Setti, University of Insubria, Italy
33. Frantisek Stampach, Czech Technical University in Prague, Czech Republic
34. Yaojia Sun (孙曜嘉), Fudan University, China
35. Jakub Wacławek, Czech Technical University in Prague, Czech Republic

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36. Tao Wang (汪涛), Beijing International Center for Mathematical Research, China
 37. Zihao Wang (王子豪), Fudan University, China
 38. Radoslaw Wojciechowski, City University of New York, USA
 39. Wendi Xu (徐文迪), Shanghai Institute for Mathematics and Interdisciplinary Sciences, China
 40. Zhe You (游哲), East China University of Science and Technology, China
 41. Dong Zhang (张栋), Peking University, China
 42. Qianwei Zhang (张千末), Fudan University, China
 43. Liang Zhao (赵亮), Beijing Normal University, China
 44. Xinrong Zhao (赵鑫荣), Fudan University, China



Schedule

Time&Date	Monday (Sept. 14)	Tuesday (Sept. 15)	Wednesday (Sept. 16)	Thursday (Sept. 17)	Friday (Sept. 18)	
7:30-8:30	Breakfast (60 minutes)					
Chair	Matthias Keller	Florian Fischer	Shubham Gupta	Bobo Hua	Bartłomiej Dyda	
9:00-9:15	Welcome					
9:15-9:55	Alberto Setti	Jonathan Breuer	David Krejcirik	Norbert Peyerimhoff	Krzysztof Bogdan	
10:00-10:30	Coffee Break (within 30 minutes)					
Chair	Felix Pogorzelski	Marcel Schmidt	Norbert Peyerimhoff	Alberto Setti	Matthias Keller	
10:30-11:10	Marcel Schmidt	Jun Masamune	Felix Pogorzelski	Shiping Liu	Qi Hou	
11:15-11:55	Florentin Münch	Frantisek Stampach & Jakub Wacławek	Xia Huang	Supanat Kamtue	Davide Bianchi	
			Group picture			
12:00-13:30	Lunch (90 minutes)					
Chair	Jun Masamune	David Krejcirik	Free Discussion 13:30-17:00	Florentin Münch	Free Discussion	
14:00-14:40	Radosław Wojciechowski	Zunwu He		Shuang Liu		
14:45-15:25	Philipp Bartmann	Noema Nicolussi		Liang Zhao		
15:30-16:00	Coffee Break (within 30 minutes)			Coffee Break		
Chair		Krzysztof Bogdan		Davide Bianchi		
16:00-16:40	Poster Session	Bartłomiej Dyda	Banquet 18:00-20:00	Marius Nietschmann		
16:45-17:25	Poster Session	Dong Zhang		Xueping Huang		
17:30	Dinner (90 minutes)			Dinner (90 minutes)		
19:30-20:30	Open Problems			Open Problems		

September 14, 2026 - Monday

Time	Name	Title
7:30-8:30	<i>Breakfast (60 minutes)</i>	
Chair	Matthias Keller University of Potsdam, Germany	
9:00-9:15	Welcome	
9:15-9:55	Alberto Setti University of Insubria, Italy	On the accretivity and m-accretivity of Laplacians and porous medium-type operators on graphs
10:00-10:30	<i>Coffee Break (within 30 minutes)</i>	
Chair	Felix Pogorzelski University of Leipzig, Germany	
10:30-11:10	Marcel Schmidt Friedrich-Schiller University Jena, Germany	Criticality theory for nonlinear Dirichlet forms
11:15-11:55	Florentin Münch University of Leipzig, Germany	Non-negative Ollivier curvature and polynomial volume growth
12:00-13:30	<i>Lunch (90 minutes)</i>	
Chair	Jun Masamune Kyoto University, Japan	
14:00-14:40	Radosław Wojciechowski City University of New York, USA	Essential self-adjointness, form uniqueness and stochastic completeness for symmetric graphs
14:45-15:25	Philipp Bartmann University of Potsdam, Germany	Eigenvalues of the discrete Hodge Laplacian across dimensions
15:30-16:00	<i>Coffee Break (within 30 minutes)</i>	
16:00-16:40	Poster Session	
16:45-17:25	Poster Session	
17:30-19:00	<i>Dinner (90 minutes)</i>	
19:30-20:30	Open Problems	

September 15, 2026 - Tuesday

Time	Name	Title
7:30-8:30	<i>Breakfast (60 minutes)</i>	
Chair	Florian Fischer University of Bonn, Germany	
9:00-9:15	Welcome	
9:15-9:55	Jonathan Breuer The Hebrew University of Jerusalem, Israel	The Point Spectrum of Periodic Quantum Trees
10:00-10:30	<i>Coffee Break (within 30 minutes)</i>	
Chair	Marcel Schmidt Friedrich-Schiller University Jena, Germany	
10:30-11:10	Jun Masamune Kyoto University, Japan	Emergence of an unsaturated Darcy's law and a Richards-type equation via homogenization of the Stokes-Cahn-Hilliard system
11:15-11:55	Frantisek Stampach And Jakub Wacławek Czech Technical University in Prague, Czech Republic	Optimal Hardy inequalities for powers of the discrete Laplacian on the half-line
12:00-13:30	<i>Lunch (90 minutes)</i>	
Chair	David Krejčířík Czech Technical University in Prague, Czech Republic	
14:00-14:40	Zunwu He (何遵武) South China University of Technology, China	Conformal tetrahedra and global rigidity of sphere packings in constant curvature background geometry
14:45-15:25	Noema Nicolussi University of Innsbruck, Austria	Optimal eigenvalues on a metric graph with densities
15:30-16:00	<i>Coffee Break (within 30 minutes)</i>	
Chair	Krzysztof Bogdan Wrocław University of Science and Technology, Poland	
16:00-16:40	Bartłomiej Dyda Wrocław University of Science and Technology, Poland	Fractional and non-fractional Hardy inequality on a lattice $\mathbb{Z}^d$
16:45-17:25	Dong Zhang (张栋) Peking University, China	The eigenvalue problem for infinity-Laplacian on finite graphs
17:30-19:00	<i>Dinner (90 minutes)</i>	

September 16, 2026 - Wednesday

Time	Name	Title
7:30-8:30	<i>Breakfast (60 minutes)</i>	
Chair	Shubham Gupta Technion - Israel Institute of Technology, Israel	
9:15-9:55	David Krejcirik Czech Technical University in Prague, Czech Republic	Hardy inequalities for magnetic p -Laplacians
10:00-10:30	<i>Coffee Break (within 30 minutes)</i>	
Chair	Norbert Peyerimhoff Durham University, UK	
10:30-11:10	Felix Pogorzelski University of Leipzig, Germany	News on Hardy inequalities for discrete Laplacians
11:15-11:55	Xia Huang (黄侠) East China Normal University, China	Hardy-Rellich inequalities on $\mathbb{Z}^d$
<i>Group picture directly After the last talk</i>		
12:00-13:30	<i>Lunch (90 minutes)</i>	
13:30-17:00	<i>Free Discussion</i>	
18:00-20:00	<i>Banquet (120 minutes)</i>	

September 17, 2026 - Thursday

Time	Name	Title
7:30-8:30	<i>Breakfast (60 minutes)</i>	
Chair	Bobo Hua (华波波) Fudan University, China	
9:15-9:55	Norbert Peyerimhoff Durham University, UK	A survey about some curvature rigidity results
10:00-10:30	<i>Coffee Break (within 30 minutes)</i>	
Chair	Alberto Setti University of Insubria, Italy	
10:30-11:10	Shiping Liu (刘世平) University of Science and Technology of China, China	Spectral rigidity of the hypercube via Bakry-Émery curvature
11:15-11:55	Supanat Kamtue Chulalongkorn University, Thailand	Entropic Ricci Curvature on Graphs: An Introduction and Survey
12:00-13:30	<i>Lunch (90 minutes)</i>	
Chair	Florentin Münch University of Leipzig, Germany	
14:00-14:40	Shuang Liu (刘双) Renmin University of China, China	The Lin-Lu-Yau Ricci flow on graphs
14:45-15:25	Liang Zhao (赵亮) Beijing Normal University, China	Curvature of hypergraphs with applications in hypergraph community detection
15:30-16:00	<i>Coffee Break (within 30 minutes)</i>	
Chair	Davide Bianchi Sun Yat-sen University, China	
16:00-16:40	Marius Nietschmann Sorbonne Université (IMJ-PRG), France	Optimal Hardy Inequalities for Fractional p -Laplacians on the Integers
16:45-17:25	Xueping Huang (黄学平) Nanjing University of Information Science and Technology, China	Sharp criteria for the existence of positive solutions to Lane-Emden-type inequalities
17:30-19:00	<i>Dinner (90 minutes)</i>	
19:30-20:30	Open Problems	

September 18, 2026 - Friday

Time	Name	Title
7:30-8:30	<i>Breakfast (60 minutes)</i>	
Chair	Bartłomiej Dyda Wrocław University of Science and Technology, Poland	
9:15-9:55	Krzysztof Bogdan Wrocław University of Science and Technology, Poland	Discrete Hardy inequality for Sobolev-Bregman forms
10:00-10:30	<i>Coffee Break (within 30 minutes)</i>	
Chair	Matthias Keller University of Potsdam, Germany	
10:30-11:10	Qi Hou (侯琦) Beijing Institute of Mathematical Sciences and Applications, China	Heat kernels of left-invariant diffusions on infinite dimensional compact groups
11:15-11:55	Davide Bianchi Sun Yat-sen University, China	Existence, uniqueness and qualitative properties of solutions for evolution equations driven by accretive Laplacian-type operators on graphs
12:00-13:30	<i>Lunch (90 minutes)</i>	
Chair	Florentin Münch University of Leipzig, Germany	
13:30-17:00	<i>Free Discussion</i>	
17:30-19:00	<i>Dinner (90 minutes)</i>	

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Titles and Abstracts

September 14, 2026 - Monday

On the accretivity and m-accretivity of Laplacians and porous medium-type operators on graphs

Alberto G. Setti

University of Insubria, Italy

We study the accretivity and m-accretivity of Laplacian and porous medium-type operators on weighted graphs, and give several conditions that imply these properties for maximal operators and investigate when these operators agree with various restrictions. For porous medium-type operators on ℓ^1 and for Laplacians on ℓ^p for $p \in [1, \infty)$, we show that there always exists a dense subset of the domain on which the maximal operator is m-accretive. Under additional conditions on the graph, we then prove that the maximal operators are m-accretive on the entire domain, and not just a dense subset. For the ℓ^2 case, we give connections to Markov uniqueness and essential self-adjointness. For the ℓ^∞ case, we establish the equivalence of stochastic completeness at infinity, m-accretivity for the maximal Laplacian on ℓ^∞ and m-accretivity of the minimal Laplacian on ℓ^1 .

This is joint work with Davide Bianchi (Sun Yat-sen University, Zhuhai, China), Matthias Keller (Universität Potsdam, Germany) and Radosław K. Wojciechowski (York College and Graduate Center, CUNY, New York, USA).

Criticality theory for nonlinear Dirichlet forms

Marcel Schmidt

Friedrich-Schiller University Jena, Germany

Nonlinear Dirichlet forms are lower semicontinuous convex functionals on L^2 -spaces whose subdifferentials generate order-preserving and L^∞ -contractive nonlinear semigroups. Important examples include Cheeger energies on metric measure spaces, the p-Dirichlet energy, and energies arising from nonlinear resistance networks.

In this talk, we present a criticality theory for such functionals. We study the dichotomy between subcriticality and criticality, characterize subcriticality in terms of weighted Hardy inequalities and the finiteness of the associated Green operator, and characterize criticality through the existence of a ground state in the sense of Agmon. Our main aim is to identify the additional assumptions under which such a theory can be developed and to highlight both the similarities and the differences between the linear and nonlinear settings. Motivated by the theme of the conference, particular emphasis will be placed on applications to discrete spaces.

This is joint work with Ian Zimmermann (Jena).

Non-negative Ollivier curvature and polynomial volume growth

Florentin Münch

University of Leipzig, Germany

We show that reversible Markov chains with non-negative Ollivier curvature have polynomial volume growth. Specifically, we show that the maximal volume of balls increases at most by a factor only depending on the minimal positive jump rate, when doubling the radius. The proof has two ingredients. First, we show that the expected distance between two independent random walks with same starting point increases at most like square root of the time. Second, we give a Li-Yau-Hamilton gradient estimate for a non-linear modification of the heat equation. This is joint work with Camillo Brena (ETH) and Tom Hutchcroft (Caltech).

Essential self-adjointness, form uniqueness and stochastic completeness for symmetric graphs

Radosław K. Wojciechowski

City University of New York, USA

We present a series of results, many achieved with undergraduate students, on the questions of essential self-adjointness, form uniqueness and stochastic completeness on graphs. In particular, we give characterizations in terms of geometric quantities for these properties in the case of birth-death chains and, if possible, weakly spherically symmetric graphs. The main technical tool is a study of α -harmonic functions which can be reduced to working with recurrence relations for these graphs. This includes joint work with Luis Hernandez, Atsushi Inoue, Sean Ku, Jun Masamune, Genevieve Romanelli and Emily Shteynberg.

Eigenvalues of the discrete Hodge Laplacian across dimensions

Philipp Bartmann

University of Potsdam, Germany

We will show that the eigenvalues of the discrete Hodge Laplacian of a finite simplicial complex can be estimated in terms of the eigenvalues in lower dimensions. As a result, we obtain new criteria for vanishing of the cohomology groups of the complex. We then apply those results to the Alexander dual to obtain analogous estimates in terms of the eigenvalues in higher dimensions.

September 15, 2026 - Tuesday

The Point Spectrum of Periodic Quantum Trees

Jonathan Breuer

The Hebrew University of Jerusalem, Israel

Periodic Jacobi matrices on trees have been the subject of considerable interest in the past several years. Their quantum analogs, namely periodic quantum trees, have received much less attention and are less well understood. We consider the point spectrum of such operators, prove some analogous statements to those known in the discrete case and discuss some differences. This is joint work with Netanel Y. Levi.

Emergence of an unsaturated Darcy's law and a Richards-type equation via homogenization of the Stokes-Cahn-Hilliard system

Jun Masamune

Kyoto University, Japan

We study the homogenization of a microscopic Stokes–Cahn–Hilliard system in a periodically perforated porous medium with logarithmic free energy. The model describes an incompressible two-phase flow with diffuse interfaces inside pore-scale geometries and incorporates capillary effects through the chemical potential. We prove that the microscopic system converges to a Darcy–Korteweg type law coupled with a generalized Richards-type equation. A central consequence of the analysis is that the resulting macroscopic law generally cannot be reduced to the classical unsaturated Darcy law. In particular, the effective driving mechanism is not, in general, governed by a scalar gradient structure, reflecting the influence of interfacial energy and microscopic phase configurations. This is a collaborative effort with Lei RONG (Tohoku University).

Optimal Hardy inequalities for powers of the discrete Laplacian on the half-line

Frantisek Stampach & Jakub Wacławek

Czech Technical University in Prague, Czech Republic

The talk consists of two parts. In the first part (presented by F. Š.), we discuss optimal discrete p -Hardy-Rellich-Birman inequalities for general $p > 1$, i.e., optimal Hardy-type inequalities for an arbitrary integer power of the discrete p -Laplacian on the half-line. In the second part (presented by J. W.), we discuss similar developments, partly still in progress, for $p = 2$ and an arbitrary positive power of the discrete Laplacian on the half-line.

Conformal tetrahedra and global rigidity of sphere packings in constant curvature background geometry

Zunwu He (何遵武)

South China University of Technology, China

In this paper, we give the dual characterization of conformal tetrahedra in constant curvature spaces, which develops a geometric technique to obtain the global rigidity of (ideal) hyperbolic, Euclidean, spherical sphere packings on a tetrahedron. Moreover, we introduce ideal hyperbolic sphere packings and extend the variational principle to obtain the global rigidity of (ideal) hyperbolic sphere packings on 3-manifolds. We also provide a characterization of conformal $n(\geq 3)$ -simplices in constant curvature spaces, which is useful for studying higher-dimensional sphere packings. This is a joint work with Guangming Hu and Ziping Lei.

Optimal eigenvalues on a metric graph with densities

Noema Nicolussi

University of Innsbruck, Austria

Motivated by the notion of conformal eigenvalues for surfaces, we investigate Laplacians on a metric graph with varying mass density. This setting provides a common framework for several well-studied classes of operators: discrete Laplacians, Dirichlet-to-Neumann operators on graphs, and Kirchhoff Laplacians (a.k.a. quantum graph operators). Our main interest is the spectral optimization problem for eigenvalues with respect to the underlying mass density, which turns out to behave rather differently than in the manifold setting. In particular, we discuss the relation of optimal eigenvalues with geometrical properties, including a complete geometric description of the first optimal eigenvalue and a Weyl law.

Based on joint work with Kiyan Naderi (University of Innsbruck).

Fractional and non-fractional Hardy inequality on a lattice $\mathbb{Z}^d$

Bartłomiej Dyda

Wrocław University of Science and Technology, Poland

I will show the following pre-Hardy inequality: if $sp < d$, then for some $K \in \mathbb{N}$ large enough,

$$\sum_{j \in \mathbb{Z}_+^d \setminus \{0\}} \frac{|u(j)|^p}{\|j\|_\infty^{sp}} \leq C(d, p, s, K) \sum_{n=1}^{\infty} \sum_{2^{n-1} \leq \|j\|_\infty < 2^n} \sum_{2^{n+K-1} \leq \|m\|_\infty < 2^{n+K}} \frac{|u(j) - u(m)|^p}{2^{(n+K)(d+sp)}}$$

for all functions u for which the left side is finite. Then I will show that it yields Hardy and fractional Hardy inequalities. The constants are explicit, but not optimal.

The eigenvalue problem for infinity-Laplacian on finite graphs

Dong Zhang (张栋)
Peking University, China

In this talk, I will present some results on the graph infinity-Laplacian eigenproblem, including nodal domain theorems, as well as eigenvalue estimates involving the packing radii, the independence number, and the matching number.

September 16, 2026 - Wednesday

Hardy inequalities for magnetic p -Laplacians

David Krejcirik

Czech Technical University in Prague, Czech Republic

We establish improved Hardy inequalities for the magnetic p -Laplacian due to adding nontrivial magnetic fields. In particular, for Aharonov-Bohm potentials, we show that the sharp constant in the Hardy inequality becomes strictly larger than in the case of a magnetic-free p -Laplacian. We also post some remarks with open problems.

The talk is based on joint work with Cristian Cazacu, Nguyen Lam and Ari Laptev published in Nonlinearity.

News on Hardy inequalities for discrete Laplacians

Felix Pogorzelski

University of Leipzig, Germany

Hardy inequalities play a fundamental role in analysis and its applications. Although the earliest forms of these inequalities, established by G. H. Hardy and others around 1920, were discrete in nature, subsequent research focused predominantly on the continuum setting for many decades. More recently, the discrete perspective has attracted renewed attention, in particular through the study of Hardy weights and their optimality properties for Laplace- and Schrödinger operators on graphs. In this talk, we focus on some new developments and emerging ideas.

Hardy-Rellich inequalities on $\mathbb{Z}^d$

Xia Huang (黄侠)

East China Normal University, China

In this talk, we will show the sharp asymptotic behaviour of the corresponding optimal constants in discrete Hardy-Rellich inequality on the lattice $\mathbb{Z}^d$ as $d \rightarrow \infty$ with $\Delta^{\ell/2}$, for any $\ell \geq 1$. Our approach is based on general weighted identities, which yield anisotropic weighted inequalities on the d -dimensional torus, then settle the higher order cases by iteration.

September 17, 2026 - Thursday

A survey about some curvature rigidity results

Norbert Peyerimhoff

Durham University, UK

Two widely used Ricci curvature notions for general graphs are Ollivier and Bakry-Émery curvature. They are defined on the edges and vertices of a graph and they can be computed with very reasonable effort. A lower positive curvature bound for these local curvature values imply bounds for global invariants like the diameter and the first non-zero Laplace eigenvalue. These relations are motivated by similar results in the setting of Riemannian manifolds (Bonnet-Myers and Lichnerowicz), and it is natural to ask whether all spaces, for which these curvature/diameter and curvature/eigenvalue inequalities hold with equality, can be classified. Since these weaker strictness inequality assumptions lead to strong restrictions of the spaces, such results are called rigidity results. The aim of this talk is to survey about the current state those rigidity results.

Spectral rigidity of the hypercube via Bakry-Émery curvature

Shiping Liu (刘世平)

University of Science and Technology of China, China

Hypercube graphs are fundamental model spaces of positive curvature in discrete geometry. In this talk, we will discuss spectral rigidity results for hypercube graphs in the category of unweighted graphs, from the viewpoint of Bakry-Émery curvature. In particular, we show that the hypercube is forced by a weaker spectral multiplicity assumption than previously known, and that this improvement is optimal. The proof combines a global spectral embedding associated with the first eigenspace with a local analysis of curvature matrices. This is based on joint work with Yanlong Ding and Chiyu Zhou.

Entropic Ricci Curvature on Graphs: An Introduction and Survey

Supanat Kamtue

Chulalongkorn University, Thailand

The notion of entropic Ricci curvature introduced by Erbar and Maas provides a synthetic framework for lower Ricci curvature bounds on finite graphs and Markov chains based on optimal transport and entropy. In this talk, I will present the basic construction of this curvature notion and discuss some of its analytic consequences, particularly its connections to functional inequalities. I will conclude with a brief survey of recent developments, including explicit curvature estimates for several families of graphs.

The Lin-Lu-Yau Ricci flow on graphs

Shuang Liu (刘双)

Renmin University of China, China

In this talk, I will introduce our recent work on the Lin-Lu-Yau Ricci flow on graphs. The flow is formulated as a system of nonlinear equations that characterizes the evolution of the edge metric governed by the Lin-Lu-Yau Ricci curvature. By treating edge weights and edge metrics as independent variables, we study the existence and uniqueness of solutions to the Ricci flows on general graphs. Furthermore, we investigate the convergence of the solutions on graphs with girth at least 6.

Curvature of hypergraphs with applications in hypergraph community detection

Liang Zhao (赵亮)

Beijing Normal University, China

We first introduce definitions of Ollivier and Lin-Lu-Yau curvatures of hypergraphs. Next, we define a hypergraph Ricci flow and prove the long-time existence of the flow. As applications, we focus on community detection in hypergraphs, which is both instrumental for functional module identification and intricate due to higher-order interactions among nodes of hypergraphs. We develop a Ricci-flow-based community detection approach (HyperRCD) that deforms hyperedge weights through curvature-driven evolution. Extensive experiments on both synthetic and real-world hypergraphs demonstrate that HyperRCD exhibits competitive performance across diverse datasets.

The report is based on collaborative works with Tian Yulu, Ma Jicheng and Yang Yunyan.

Optimal Hardy Inequalities for Fractional p -Laplacians on the Integers

Marius Nietschmann

Sorbonne Université (IMJ-PRG), France

We obtain optimal Hardy-type inequalities for fractional powers of the p -Laplacian Δ_p^σ on $\mathbb{Z}$, $p \in (1, \infty)$, $\sigma \in (0, 1/p)$. Asymptotically, the optimal weights behave like $|x|^{-p\sigma}$ as $|x| \rightarrow \infty$. This is joint work with Florian Fischer.

Sharp criteria for the existence of positive solutions to Lane-Emden-type inequalities

Xueping Huang (黄学平)

Nanjing University of Information Science and Technology, China

We study positive solutions of the superlinear Lane-Emden inequality $-\Delta u \geq \sigma u^q$, $q > 1$, on

infinite locally finite weighted graphs and connected domains. We explore both the potential theoretic approach and a new method via flow decomposition.

We first prove that solvability is equivalent to a nonlinear Green potential inequality. Then under conditions ensuring regular Green function estimates, we prove sharp characterizations of existence of positive solutions.

Our main result gives a sharp criterion of the form

$$\sum_{n \geq 1} \frac{n^{2q-1}}{\mu(B(o, n))^{q-1}} = \infty,$$

for the nonexistence of positive solution in full generality. Intrinsic metrics can be employed for general positive potential function σ . The proof combines flow decomposition and Hardy estimates along paths. Applications to concrete examples are also discussed. This talk is based on joint work with Qingsong Gu, Lu Hao, and Yuhua Sun.

September 18, 2026 - Friday**Discrete Hardy inequality for Sobolev-Bregman forms****Krzysztof Bogdan**

Wrocław University of Science and Technology, Poland

We establish ground-state representations and critical Hardy inequalities for Sobolev-Bregman forms in discrete settings. This is a joint project with Shubham Gupta, Kamil Kaleta, and Antoni Szczukiewicz.

Heat kernels of left-invariant diffusions on infinite dimensional compact groups**Qi Hou (侯琦)**

Beijing Institute of Mathematical Sciences and Applications, China

Infinite dimensional compact (connected metrizable) groups are projective limits of compact Lie groups. Many of them arise as infinite products, such as products of circles. On such product groups, the heat kernel measures of many bi-invariant Laplacians are the laws of independent Brownian motions on the factors. The Kakutani dichotomy theorem for product type measures thus applies, and satisfactory characterizations of such heat kernels have been obtained, pointing to a variety of properties ranging from genuine infinite dimensional phenomena to finite dimensional ones. Contrary to this diagonal case, the heat kernels of left-invariant Laplacians or sub-Laplacians are not well-understood, because most standard tools in finite dimensions do not carry over. I plan to present some attempts to analyze the heat kernel behaviors for left-invariant elliptic or subelliptic diffusions, via comparisons of intrinsic distances or Dirichlet forms at various levels. I will try to discuss the relations with graphs. This talk is based on joint works with Laurent Saloff-Coste.

Existence, uniqueness and qualitative properties of solutions for evolution equations driven by accretive Laplacian-type operators on graphs**Davide Bianchi**

Sun Yat-sen University, China

We study evolution equations on infinite weighted graphs driven by accretive Laplacian-type operators, covering generalized porous medium equations and semilinear equations with monotone or Lipschitz nonlinearities. Accretivity (or ω -accretivity) on ℓ^p yields existence and uniqueness of mild solutions via Crandall-Liggett-Bénilan theory. The construction uses implicit Euler discretization and exhaustion by finite Dirichlet subgraphs, requiring no heat kernel or spectral information. We also establish a range of qualitative properties, including comparison principles, a priori estimates, positivity, and finite-time extinction.

The background is a dark blue gradient. In the upper left, there are faint, stylized binary digits (0s and 1s) in a lighter blue color. In the upper right, there is a faint, stylized eye or face shape composed of binary digits. The text "Welcome to TSIMF" is centered in the middle of the image.

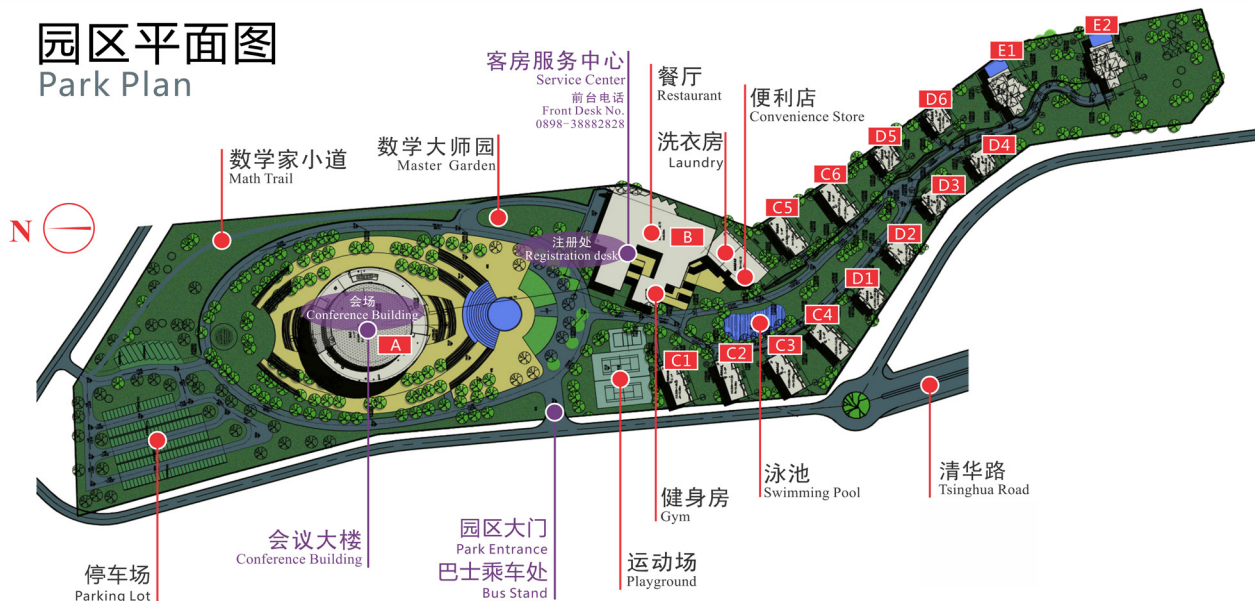
Welcome to TSIMF



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



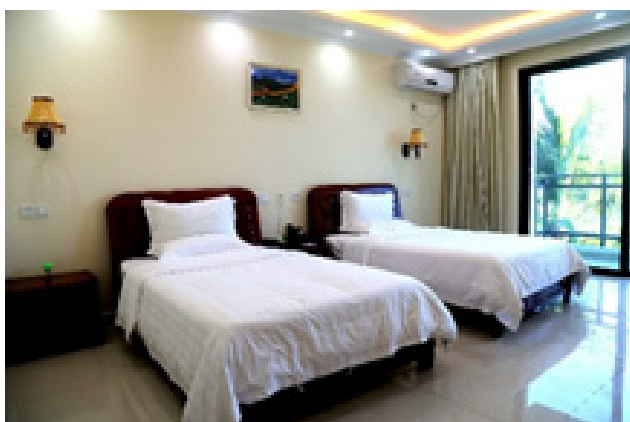
Registration

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.

Park-Wide WiFi Information

SSID:TSIMF-WiFi

Password:tsimf123



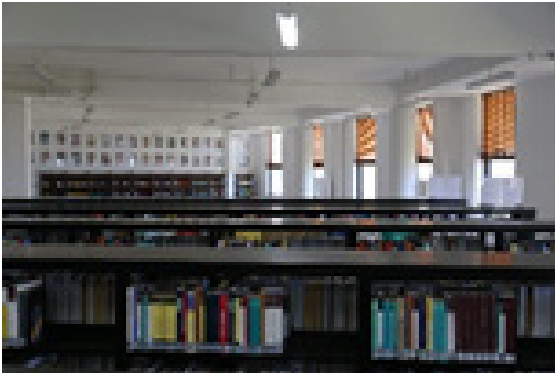
Guest Room

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

Family rooms are also equipped with kitchen and refrigerator.



Library



Opening Hours: 09:00-22:00

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 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



0086-898-38263896



0086-898-38263895

tsimf@tsinghua.edu.cn



572000



<https://tsimf.tsinghua.edu.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.



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