

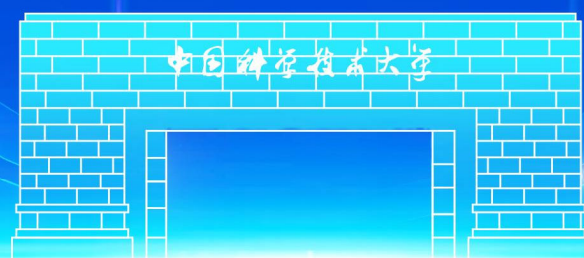


中国科学技术大学
University of Science and Technology of China

2026 中国科大冬季组合图论研讨会

会 | 议 | 手 | 册

2026年1月11日-13日
安徽·合肥



会议须知

一、会议时间和地点：

报到时间：2026 年 1 月 11 日 14:00-21:00

报到地点：中国科学技术大学（东区）专家楼

会议时间：2026 年 1 月 11 日-13 日

会议地点：中国科学技术大学东校区水上报告厅（1 月 12 日）

中国科学技术大学东校区 5 教 5101（1 月 13 日）

二、用餐指南

● 科大东区专家楼

二楼自助餐厅：午餐：11:30-13:30 晚餐：17:30-20:00

● 科大东区教工餐厅

美食广场三楼：午餐：11:30-13:30 晚餐：17:30-19:30

三、交通信息

● 合肥南站：

- 出租车：距离科大东区 7 公里，预计时间 20 分钟，乘车费用约 20 元
- 地 铁：合肥南站乘坐地铁 5 号线（汲桥路方向）至中国科大东区站 C 口下车，步行 5 分钟到科大东区专家楼

● 新桥机场：

- 出租车：距离科大东区 39 公里，预计时间 45 分钟，乘车费用约 80 元
- 地 铁：乘坐机场巴士 3 号线至客运西站下，步行至汽车西站 B 口转乘地铁 2 号线（撮镇方向）至三孝口站，再转乘地铁 5 号线（贵阳路方向）至中国科大东区站 C 口下车，步行 5 分钟到科大东区专家楼

● 合肥站：

- 出租车：距离科大东区 9 公里，预计时间 25 分钟，乘车费用约 30 元
- 地 铁：乘坐 226 路公交车（翡翠公园方向）至中国科大 BRT 站下车，步行 5 分钟到科大东区专家楼



一、会议基本信息

2026 中国科大冬季组合图论研讨会将于 1 月 11 日至 1 月 13 日在安徽合肥举行。本次研讨会旨在讨论组合图论领域的最新研究成果和进展，加强相关领域专家学者的交流与合作，促进学科间的交叉、渗透和发展。此次研讨会为邀请会议，主题为（但不限于）极值组合、极值图论与代数图论等。

会议组织委员会（按姓氏拼音顺序）：

侯新民、胡夫涛、Jack H. Koolen、刘世平、刘西之、马杰、
潘向峰、潘永亮、Tran Manh Tuan、张先得

会议会务组：

胡夫涛（hufu@ahu.edu.cn, 15955130645）
钱思源（nickiqian@ustc.edu.cn, 13865592771）
曹梦月（caomengyue@ustc.edu.cn, 17812086528）

致谢：

本次会议由中国科学技术大学图论组合团队承办，并获分析中心（主任：李嘉禹教授）资助。

二、会议日程

1 月 11 日 星期日			
14:00-21:00	会议报到（中国科学技术大学东区专家楼）		
17:30-20:00	自助晚餐（地址见餐券）		
会议报告 （1 月 12 日 星期一上午） （地点：中国科学技术大学东区水上报告厅）			
08:30-08:50	开 幕 式		主持人 马 杰
08:50-09:00	合 影		
时 间	报告人	报告题目	主持人
09:00-09:30	王 毅	Palindromic polynomials with alternating gamma coefficients	范更华
09:30-10:00	郝荣霞	Ban-Linial's Conjecture for Halin snarks	李学良
10:00-10:20 休息			
10:20-10:50	李建平	Approximation algorithms for solving the windy k-traveling salesman problem and its variations	王 军
10:50-11:20	金贤安	Fomichev-Karev conjecture	王维凡
11:20-11:50	张晓岩	Max-3-Cut with Limited Unbalance and Application in Scheduling via Complex Semidefinite Programming	王恺顺

会议报告 （1月12日 星期一下午）
（地点：中国科学技术大学东区水上报告厅）

时间	报告人	报告题目	主持人
14:00-14:30	李书超	Some extremal problems on color-critical graphs	冯荣权
14:30-15:00	尤利华	Saturation number and spectral saturation number of graphs	康丽英
15:00-15:30	李红海	Maximizing the α -spectral radius of hypergraphs with degree stability	陈旭瑾
15:30-15:50 休息			
15:50-16:20	周书明	Characterization of Diagnosability Based on Hybrid Fault Patterns	赖虹建
16:20-16:50	李永涛	Spectral supersaturation for color-critical graphs	冯衍全
16:50-17:20	刘西之	The inducibility of Turán graphs	张胜贵

会议报告 （1月13日 星期二上午）
（地点：中国科学技术大学东区 5 教 5101）

时间	报告人	报告题目	主持人
08:30-09:00	吴耀坤	Simple things related to face vectors of rainbow simplicial complexes	陈耀俊
09:00-09:25	杨 超	平移密铺的不可判定性	张晓东
09:25-09:50	夏正江	Characterization of the structure of k -edge-maximal graphs	周 波
09:50-10:10 休息			
10:10-10:35	刘佳飞	The dual-attribute fault diagnosability of interconnection networks and its applications	晏卫根
10:35-11:00	李平山	The characterization of lower bound of dissociation number of graphs	徐 敏
11:00-11:25	葛川源	Equiangular lines and eigenvalue multiplicities of graphs	刘世平
11:25-11:50	陈 昊	Semi-Inducibility of Alternating Paths and Cycles	鲁红亮

三、报告题目与摘要

Palindromic polynomials with alternating gamma coefficients

王毅 (大连理工大学)

摘要: I will talk our recent results about palindromic polynomials with alternating gamma coefficients, including some criteria, examples and applications for such polynomials.

Ban-Linial's Conjecture for Halin snarks

郝荣霞 (北京交通大学)

摘要: A k -bisection (resp. k -quasi-bisection) of a bridgeless cubic graph G is a vertex 2-coloring satisfying: (i) the sizes of the two color classes are equal (resp. the sizes of the two color classes differ by at most 2), and (ii) the order of each connected component induced by each color class is at most k . Ban and Linial gave the conjecture that every bridgeless cubic graph admits a 2-bisection, except for the Petersen graph. In 2017, Esperet, Mazzuocolo and Tarsi in [J. Graph Theory. 2017] conjectured that any cubic graph admits a 2-quasi-bisection. In this paper, we prove that this conjecture holds for all bridgeless cubic graphs with oddness 2. Furthermore, we gave a result about Halin snarks to tackle Ban-Linial's conjecture. As corollaries, we prove that several infinite families of Halin snarks including a superset of treelike snarks admit a 2-bisection.

Approximation algorithms for solving the windy k -traveling salesman problem and its variations

李建平 (云南大学)

摘要: In this talk, we propose some routing problems on windy weighted graphs. Concretely, given a windy connected graph $G = (V, E; w)$ of order n and size m , where $w : E \rightarrow \mathbb{R}^+$ is a windy cost function, i.e., for each edge $v_i v_j \in E$, we denote $w(v_i, v_j)$ to be a cost to traverse this edge $v_i v_j$ from v_i to v_j and $w(v_j, v_i)$ to be a cost to traverse the same edge $v_i v_j$ from v_j to v_i , for any two subsets V_0 and E_0 to satisfy $\phi \subseteq V_0 \subseteq V$ and $\phi \subseteq E_0 \subseteq E$, the routing problem on windy weighted graphs is asked to find a circuit C such that C visits each vertex in V_0 and traverses each edge in E_0 at least once, the objective is to minimize the cost of that circuit C . Particularly, when $E_0 = E$, we refer this routing problem as to the windy postman problem, and when $E_0 = \phi$ and $V_0 = V$, we refer this routing problem as to the windy traveling salesman problem.

We design three approximation algorithms to solve the windy k -traveling salesman problem and its variations, respectively.

Fomichev-Karev conjecture

金贤安 (厦门大学)

摘要: In this talk, we prove a conjecture of Fomichev and Karev by showing the equality of two graph invariants: ϕ , defined via graph colorings, and ψ , derived from the $sl(2)$ -weight system of its 2-dimensional irreducible representation. We also discuss its connection with the Tutte polynomial. This is joint work with Qinging Deng and Qi Yan.

Max-3-Cut with Limited Unbalance and Application in Scheduling via Complex Semidefinite Programming

张晓岩（南京师范大学）

摘要： The uses of linear programming for designing approximation algorithms for combinatorial optimization problems has long been known. Recently, researchers have investigated the use of nonlinear programming, particularly semidefinite programming motivated by the seminal paper of Lovász, since semidefinite programs can be solved in polynomial time (up to any prescribed accuracy). In this talk, we mainly introduce our recent progress on the problem of Max-3-Cut with limited unbalance which has application in scheduling problems via the randomized approximation technique based on complex semidefinite programming relaxation.

Some extremal problems on color-critical graphs

李书超（华中师范大学）

摘要： Turán-type problem is a fundamental problem in extremal graph theory. The spectral Turán-type problem is a newly developed one in this field. Both of these two types of extremal problems attract more and more researchers' attention. In this talk, we first introduce the background in this field. Then we present our results related to above two types of extremal problems on color-critical graphs. Finally, we propose some further research issues along this line.

Saturation number and spectral saturation number of graphs

尤利华（华南师范大学）

摘要： A graph G is called H -saturated if G is H -free but for any $uv \notin E(G)$, $G + uv$ contains a copy of H . The minimum number of edges among all n -vertex H -saturated graphs is defined as the saturation number of H , denoted by $\text{sat}(n, H)$, the minimum spectral radius among all n -vertex H -saturated graph is defined as the spectral saturation number of H , denoted by $\text{sat}_\rho(n, H)$. In this talk, we introduce some progress on saturation number and spectral saturation number of some graphs, and propose some questions for further research.

Maximizing the α -spectral radius of hypergraphs with degree stability

李红海（江西师范大学）

摘要： An r -pattern P is defined as an ordered pair $P = ([l], E)$, where l is a positive integer and E is a set of r -multisets with elements from $[l]$. An r -graph H is said to be P -colorable if there is a homomorphism $\phi: V(H) \rightarrow [l]$ such that the r -multiset $\{\phi(v_1), \dots, \phi(v_r)\}$ is in E for every edge $\{v_1, \dots, v_r\} \in E(H)$. Let $\text{Col}(P)$ denote the family of all P -colorable r -graphs. This paper establishes spectral extremal results for α -spectral radius of hypergraphs using analytic techniques. We show that for any family $\mathcal{F}$ of r -graphs that is degree-stable with respect to $\text{Col}(P)$, spectral Turán-type problems can be effectively reduced to spectral extremal problems within $\text{Col}(P)$. As an application, we determine the maximum α -spectral radius ($\alpha \geq 1$) among all n -vertex $F^{(r)}$ -free r -graphs, where $F^{(r)}$ represents the r -expansion of the color critical graph F . We also characterize the corresponding extremal hypergraphs. Furthermore, leveraging the spectral method, we derive a corresponding edge Turán extremal result. More precisely, we show that if $\mathcal{F}$ is degree-stable with respect to $\text{Col}(P)$, then every $\mathcal{F}$ -free edge extremal hypergraph must be a P -colorable hypergraph.

Characterization of Diagnosability Based on Hybrid Fault Patterns

周书明（福建师范大学）

摘要： In the design and optimization of multiprocessor systems, one of the most fundamental concerns is the system reliability and self-diagnosis capability, which can be usually characterized by connectivity and diagnosability of the underlying network topologies of multiprocessor systems. Existing conditional diagnosabilities, such as g -good-neighbor diagnosability, g -extra diagnosability and r -component diagnosability, extend classical diagnosability through distinguishing different fault patterns and scenarios, while they focus on single fault patterns solely. In contrast, real-world systems often experience hybrid fault patterns that combine multiple fault circumstances concurrently. To address this flaw, we elaborate on topological characterizations of two representative hybrid diagnosabilities, namely g -good-neighbor r -component diagnosability and g -extra r -component diagnosability, respectively. We further apply the metric characterizations to determine the hybrid diagnosabilities of some well-known interconnection networks, including (n, k) -star graph, data center networks BCDC and DCell. To validate practical diagnostic capability, we suggest two novel algorithms, namely DAPMC and DAMM, that accurately identify faulty nodes under hybrid fault patterns.

Spectral supersaturation for color-critical graphs

李永涛（清华大学）

摘要： A graph is *color-critical* if it contains an edge whose deletion reduces its chromatic number. This class of graphs, including cliques and odd cycles, plays a central role in extremal graph theory. In this paper, following an influential line of research initiated by Bollobás–Nikiforov, we study the spectral supersaturation problem for color-critical graphs. Let $T_{n,r}$ be the r -partite Turán graph, let $\mathcal{T}_{n,r,q}$ denote the family of graphs obtained from $T_{n,r}$ by adding q edges, and let $\lambda(G)$ be the spectral radius of a graph G . We first prove that for any color-critical graph F with chromatic number $r+1$, there exists $\delta_F > 0$ such that for sufficiently large n and all $1 \leq q \leq \delta_F \sqrt{n}$, any n -vertex graph G with $\lambda(G) \geq \min_{T \in \mathcal{T}_{n,r,q}} \lambda(T)$ contains at least $q \cdot c(n, F)$ copies of F , where $c(n, F)$ denotes the minimum number of copies of F created by adding a single edge to $T_{n,r}$; moreover, any extremal graph G must belong to $\mathcal{T}_{n,r,q}$. Next, we prove a spectral supersaturation result for the analogous condition $\lambda(G) \geq \max_{T \in \mathcal{T}_{n,r,q}} \lambda(T)$, valid for all $1 \leq q \leq \delta_F n$. Together, these results provide a complete resolution to a problem proposed by Ning–Zhai, and establish a spectral counterpart to the well-known results of Mubayi and Pikhurko–Yilma in the extremal supersaturation setting.

A notable feature of our first result is that the restriction $q = O(\sqrt{n})$ is tight up to a constant factor, in contrast to the linear bounds provided by other settings discussed above.

As applications, we extend a result of Liu–Mubayi, and solve a related conjecture by Li–Lu–Peng.

Our proof is based on a novel spectral incremental technique for graphs close to the Turán graph $T_{n,r}$, which may be of independent interest.

The inducibility of Turán graphs

刘西之（中国科学技术大学）

摘要： This talk concerns the problem of maximizing the number of induced copies of a given graph F in an n -vertex graph. Let $I(F, n)$ denote this maximum number, and let $i(F)$ be the limit of $I(F, n)/\binom{n}{v(F)}$ as $n \rightarrow \infty$.

For the case when F is a Turán graph, several classical results are known:

- For bipartite Turán graphs, Pippenger and Golumbic (1975) determined $I(F, n)$.
- For r -partite Turán graphs with each part of size at least $(1 + o(1)) \ln r$, Brown and Sidorenko (1994) determined $i(F)$, while Bollobás, Egawa, Harris, and Jin (1995) determined $I(F, n)$ and identified the unique extremal construction.

- Recently, Yuster (2026) determined $i(F)$ for r -partite Turán graphs with very small part sizes (at most four).

We will talk about some recent results based on joint work with Jie Ma and Tianming Zhu on this topic, including a confirmation of a conjecture of Bollobás, Egawa, Harris, and Jin from 1995, and an answer to a recent question of Yuster. In particular, our results complete this picture by determining, for large n , the exact value of $I(F, n)$ for every Turán graph F .

Simple things related to face vectors of rainbow simplicial complexes

吴耀坤（上海交通大学）

摘要： This talk is to report some simple things we know or don't know about (big) face vectors of rainbow simplicial complexes.

A d -colored set of type $(n_1, \dots, n_d)$ is a d -tuple of disjoint sets $S = (S_1, \dots, S_d)$ such that $|S_i| = n_i$ for all $i \in \{1, \dots, d\}$. Its underlying set, denoted S , is the union $\cup_{i=1}^d S_i$. A k -rainbow subset of S is a set $X \in \binom{S}{k}$ satisfying $|X \cap S_i| \leq 1$ for all $i \in \{1, \dots, d\}$. A rainbow simplicial complex on S is a family Δ of its rainbow subsets that is closed under taking subsets. For such a complex Δ , we write Δ_k for the set of its k -rainbow subsets. The face vector of Δ is defined as $f_\Delta = (f_0^\Delta, \dots, f_d^\Delta) = (|\Delta_0|, \dots, |\Delta_d|)$. The dimension of Δ is $\max\{i \in \{0, \dots, d\} : |\Delta_i| > 0\}$; if $\Delta = \emptyset$, we define the dimension of Δ to be 0. The big face vector of Δ is defined as $F_\Delta = (F_I^\Delta)_{I \subseteq \{1, \dots, d\}}$, where F_I^Δ counts the number of $X \in \Delta$ such that $X \cap S_i \neq \emptyset$ if and only if $i \in I$. An additional parameter, rainbow face vector of Δ , was introduced and studied in [QWX23].

We now assume S is of the all-ones type $(1, \dots, 1)$. In this case, the face vector of Δ is completely characterized by the Kruskal-Katona theorem. If we further require Δ to be t -collapsible without any $(k+1)$ -faces, then Alon and Kalai [AK85, Theorem 4.1][Kal84, Theorem 3.1] proved that for any $j \in \{0, \dots, k\}$,

$$|\Delta_j| \leq \sum_{i=0}^t \binom{k}{j-i} \binom{d-k+i}{t}.$$

For the independent set complexes of matroids, Mason's ultra-log-concavity conjecture [Mas72] imposes necessary conditions on their face vectors. The resolution of this conjecture represents a major achievement in modern combinatorics [BH18, BH20, ALOGV24]. When Δ has type $(n_1, \dots, n_d)$ where $\max_{i \in [d]} n_i - \min_{i \in [d]} n_i \leq 1$, a characterization of f_Δ was given by Frankl, Füredi, and Kalai [FFK88, Theorem 1.2]. For general rainbow simplicial complexes, a description of their face vectors follows from the fact that the star product yields a Macaulay poset [Eng97, Theorem 8.1.1]. Face vectors of pure rainbow simplicial complexes, however, are less understood. Nevertheless, some interesting necessary conditions for face vectors of pure rainbow simplicial complexes of dimension d over a d -colored sets have been studied, often in different guises, across discrete geometry, hypergraph theory, information theory, and binary-class or multiclass learning theory. Inclusion matrices are central to extremal set theory; analogously, the rainbow inclusion matrix introduced in [QWX24] is expected to play a similar role in the developing area of extremal rainbow set theory. The inequality (1) of Alon and Kalai was generalized to rainbow simplicial complexes by Qian, Wu, and Xiong in 2023 [QWX23, Theorem 19]. More recently, Tian, Wu, and Zhang [TWZ26] derived new constraints to the big face vectors of pure rainbow simplicial complexes of dimension d over a d -colored set, using Shearer's inequality [CGFS86, p. 33, The Product Theorem] and canonical forms of high dimensional Young diagrams. Our recent observations in [TWZ26] connect big face vectors to the stability of box structure, in the spirit of the Box Theorem of Bollobás and Thomason [BT95, Theorem 1].

Studying big face vectors of rainbow simplicial complexes can be viewed as a discrete analogue of investigating constructible regions of projected volumes [LRR21] and entropic vectors of random variables [Yeu02, Chaps 13–16][Mat07]. In the context of projected volumes, June Huh and his collaborators have examined projected areas [HHM+25, GHM+25], extending earlier work on face vectors of matroid independence complexes.

平移密铺的不可判定性

杨超（广东外语外贸大学）

摘要： 设 n, k 是两个固定的正整数，是否有算法判定任意给定的一组 k 个瓷砖（ $\mathbb{Z}^n$ 的一个有限子集视为一个瓷砖）能否平移密铺整个空间 $\mathbb{Z}^n$ ？这就是平移密铺问题。Greenfield 和陶哲轩发表在在 *Annals of Mathematics* 等期刊上的工作表明，可能存在某个固定的 n ，使得平移密铺问题对 $(n, k) = (n, 1)$ 是不可判定的。本报告回顾平移密铺的不可判定性的研究历史和最新研究进展，并介绍我们最近的一些工作。

Characterization of the structure of k -edge-maximal graphs

夏正江（安徽财经大学）

摘要： Let $\kappa'(G)$ be the edge-connectivity of the graph G . The strength of G , denoted by $\bar{\kappa}'(G)$, is the maximum edge-connectivity of its subgraphs. A simple graph G is called k -edge-maximal if $\bar{\kappa}'(G) \leq k$ but for any edge e not in G , $\bar{\kappa}'(G+e) \geq k+1$. In this paper, we propose the concepts of kernel and closure of a graph and discuss the properties of closure. Utilizing these properties, we present the necessary and sufficient condition for a graph to be k -edge-maximal, and prove that there exists a k -edge-maximal graph of order n with m edges if and only if $m = (n-1)k - \binom{k}{2}r$, for some integer r with $1 \leq r \leq \lfloor n/(k+2) \rfloor$. Furthermore, we characterize the structure of k -edge-maximal graphs with a given number of edges.

The dual-attribute fault diagnosability of interconnection networks and its applications

刘佳飞（广西师范大学）

摘要： As cloud computing, Internet of Things, and parallel distributed system undergo rapid development, accompanied by increasing complexity, the scale of multiprocessor system has grown considerably. Tremendous amounts of processors by interconnected have made it possible to yield faulty units through physical factors or hacking. Such failures are inevitably bound to hinder the reliability and robustness of the system. Fault diagnosis techniques incorporating multiple conditions can greatly enhance the recognition accuracy and efficiency of models in tasks with limited samples. In this talk, we present a novel dual-attribute fault diagnosability of interconnection networks under PMC and MM* models. Then we develop the fault diagnostic algorithms based on the corresponding fault pattern to detect faulty nodes and faulty-free nodes. Simulation experiments are executed in distinct networks for random faults, which verify the correctness and efficiency of our proposed algorithms in terms of ACCR, TPR, FPR and TNR.

The characterization of lower bound of dissociation number of graphs

李平山（湘潭大学）

摘要： The dissociation number $\text{diss}(G)$ of a graph G is defined as the maximum cardinality of a vertex subset $D \subseteq V(G)$ such that the induced subgraph $G[D]$ has maximum degree at most 1. In this talk, I will present some of our findings on this topic. This is a joint work with Jue Wu, Wei Jin and Min Xu.

Equiangular lines and eigenvalue multiplicities of graphs

葛川源（福州大学）

摘要：A set of lines in $\mathbb{R}^d$ passing through the origin is called equiangular if every two lines have a common angle. In this talk, we will first review the connection between the eigenvalue multiplicities of graphs and equiangular lines. We will then present our recent work on eigenvalue multiplicities of graph and its applications to equiangular lines. This is based on jointed works with Yanlong Ding and Shiping Liu.

Semi-Inducibility of Alternating Paths and Cycles

陈昊（中国科学技术大学）

摘要：Let H be a finite simple undirected graph whose edges are coloured with two colours, say red and blue. A natural extremal problem, raised recently by Basit, Granet, Horsley, Kündgen and Staden and known as the semi-inducibility problem, asks for the maximum number of copies of an edge-coloured graph in an edge-coloured graph G on n vertices. We solve this problem for alternating paths with odd length and the alternating cycle with length six and thus solve two problems posed by Basit et al. Our proof involves applications of the entropy method and the flag algebra method. This is joint work with Felix Christian Clemen and Jonathan A. Noel.

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