



天元數學國際交流中心
Tianyuan Mathematics Research Center

Symposium on Graph Theory and Combinatorics

Conference Handbook



Yunnan·Kunming·Yiliang Chai Shitan Reservoir Area

October 19, 2025 – October 25, 2025

Welcome to the Symposium on Graph Theory and Combinatorics

The Symposium on Graph Theory and Combinatorics will be held from October 19 to 25, 2025. It aims to provide a platform for young scholars in the fields of Graph Theory and Combinatorics to present their latest research findings, focusing on nurturing young scholars, addressing challenges in academic research, and supporting their growth.

Conveners:

Xu Jin Chen (Academy of Mathematics and Systems Science, Chinese Academy of Sciences)

Jie Ma (University of Science and Technology of China)

Guang Hui Wang (Shandong University)

Notes:

- The center is located on the mountainside within the Chai Shitan Reservoir area. The temperature is 2-3 degrees Celsius lower than in the county town, and it is relatively cool in the morning and evening.
- The center is situated within a National Level I Public Welfare Forest, where there are many mosquitoes and insects. Additionally, the center is about a 1-hour drive from the county hospital. It is recommended to bring some common medicines.
- The journey to the center includes nearly 40 minutes on rural roads, which are narrow and winding. From the reservoir gate to the center, there is a three-kilometer mountain road where rockfalls occur from time to time, especially on rainy days. For safety reasons, it is advised not to travel too late.

Breakfast: 7:30-9:00

Lunch: 11:30-13:00

Dinner: 17:30-19:00

Symposium on Graph Theory and Combinatorics

Schedule

(Venue: Hua Loo-Keng Lecture Hall)

(Group discussions can be held in small classrooms daily from
13:30-17:30, unless otherwise specified)

Time		Activity	Chair
10-19		Registration	
10-20	8:50-9:00	Opening Ceremony	
	9:00-9:50	The maximal size and the stable result of t -intersecting multisets Mengyu Cao (Renmin University of China)	
	9:50-10:40	On the extremal problems for complete bipartite graph and its extensions Guorong Gao (Fuzhou University)	
	10:50-11:40	Vertex degree sums for rainbow matchings in 3-uniform hypergraphs Yi Zhang (Beijing University of Posts and Telecommunications)	
10-21	9:00-9:50	4-cycle tilings in a digraph Fuhong Ma (Shandong University of Technology)	
	9:50-10:40	Perfectly 2-edge-connected graphs and c-minor minimal 3-connected graphs Rongchuan Tao (The University of Hong Kong)	
	10:50-11:40	Integral biflow maximization Mengxi Yang (University of Science and Technology of China)	
10-23	9:30-10:20	Perfect tilings with the generalised triangle in k -graphs Linpeng Zhang (Shandong University)	
	10:30-11:20	Ramsey-Turán density of Hypergraphs Suyun Jiang (Jiangnan University)	

Abstracts and Speaker Bios

1. Title: The maximal size and the stable result of t -intersecting multisets

Speaker: Mengyu Cao (Renmin University of China)

Abstract: F is called an m -bounded multiset of $[n]$ (denoted by $F \subseteq [n]_m$), if F is a sequence $(m(1, F), m(2, F), \dots, m(n, F)) \in \mathbf{R}_n$ of n integers with $1 \leq m(i, F) \leq m$ for $1 \leq i \leq n$ (the ∞ -bounded multiset of $[n]$ is abbreviated as multiset of $[n]$). $m(i, F)$ is the multiplicity of i in F and $|F| = \sum_{i=1}^n m(i, F)$ is the cardinality of F . Using shifting (compression) operations and generating set method we gave the maximal size and a stable result of t -intersecting multisets. This is joint work with Mei Lu and Haixiang Zhang.

Bio: Mengyu Cao is an associate professor at Renmin University of China. She received her Ph.D. in Science from Beijing Normal University in June 2020. From September 2020 to September 2022, she conducted postdoctoral research at Tsinghua University. Her main research interests in recent years focus on intersecting families and their applications. She has published over 10 SCI papers in journals such as J. Combin. Theory Ser A, SIAM J. Discrete Math., and European J. Combin. She has presided over one Youth Fund project.

2. Title: On the extremal problems for complete bipartite graph and its extensions.

Speaker: Guorong Gao (Fuzhou University)

Abstract: It is well known that extremal problems for complete bipartite graph play an important role in extremal graph theory. In this talk, I will introduce some results and problems on complete bipartite graph and its extensions in hypergraphs, including our recent work.

Bio: Guorong Gao received his Ph.D. from Fuzhou University in 2021 (supervisor Prof. An Chang). From 2021 to 2023, he was a postdoctoral researcher at the University of Science and Technology of China (co-supervisor Prof. Jie Ma). He then joined the School of Mathematics and Statistics at Fuzhou University. His main research interests include extremal problems in graphs and hypergraphs, VC-dimension theory, and spectral graph/hypergraph theory. He presides over one National Natural Science Foundation of China (NSFC) Youth Project and one Fujian Province Youth Innovation Fund Project.

3. Title: Ramsey-Turán density of Hypergraphs

Speaker: Suyun Jiang (Jiangnan University)

Abstract: Let the Turán number $ex(n, F)$ be the maximum number of edges in an n -vertex F -free r -graph, and let the Ramsey-Turán number $RT(n, F, l)$ be the maximum number of edges in an n -vertex F -free r -graph H with independence number $\alpha(H) < l$. In this talk, we investigate the relationship between the Turán density $\pi(F)$ and the Ramsey-Turán density $\varrho(F)$. We also provide sufficient conditions for $\varrho(F) = \pi(F)$ and $\varrho(F) = 0$, respectively, and give some constructions based on high-dimensional complex spheres.

Bio: Suyun Jiang is an Assistant Researcher at the School of Artificial Intelligence, Jiangnan University. She received her Ph.D. from Shandong University in 2018. She visited Georgia State University from September 2016 to September 2017 and the Institute for Basic Science (IBS) in Korea from November 2022 to August 2024. She has presided over and completed one NSFC Youth Fund project and currently presides over one General Program of the Hubei Provincial Natural Science Foundation. Her research directions mainly include structural graph theory and extremal graph theory. She has published over ten papers in journals such as Forum of Mathematics, Sigma, Journal of Combinatorial Theory, Series B, Journal of Graph Theory, and Discrete Mathematics.

4. Title: 4-cycle tilings in a digraph

Speaker: Fuhong Ma (Shandong University of Technology)

Abstract: For a positive integer t , a t -cycle is a cycle of length t . A tiling of a graph G is a set of disjoint subgraphs (called tiles) contained in G . A tiling is a factor, if its union spans G . The main purpose of this paper is to explore the minimum semi-degree condition to guarantee a directed 4-cycle factor in a digraph. To do this, we first need a structural result which shows that every standard multigraph on $4k$ vertices with minimum degree $16k/3$ contains a tiling of size $k-4$ such that any orientation of every tile has a directed 4-cycle. The degree condition is sharp up to an additive constant. Then using the absorbing method and the above result, we show that every digraph of sufficiently large order with minimum semi-degree at least $(2/3+\epsilon)n$ contains a directed 4-cycle factor, where $0 < \epsilon < 1$ and $n \equiv 0 \pmod{4}$.

Bio: Fuhong Ma is a lecturer at the School of Mathematics and Statistics, Shandong University of Technology. She was a postdoctoral fellow at the University of Science and Technology of China under the supervision of Prof. Jie Ma, and received her Ph.D. from Shandong University under the supervision of Prof. Jin Yan and Prof. Jianliang Wu. Her main research focus is on cycle problems in graphs and digraphs. Her papers have been published in journals such as JCTB, European J. Combin., Discrete Math., and Electc. J. Combin. She presides over one NSFC project and one Shandong Provincial Natural Science Foundation project.

5. Title: Perfectly 2-edge-connected graphs and c -minor minimal 3-connected graphs

Speaker: Rongchuan Tao (The University of Hong Kong)

Abstract: A perfectly 2-edge-connected (PTEC) graph is a graph $G=(V,E)$ such that the polytope determined by linear inequalities $0 \leq x(e) \leq 1, \forall e \in E, x(\delta(S)) \geq 2, \forall S \subset V$ is integral. Related work on PTEC graphs has shown that a c -minor of a PTEC graph is PTEC, where a c -minor of a graph G is a graph obtained from G by repeatedly deleting an edge or contracting a cycle. We show that any 3-connected simple graph has a c -minor isomorphic to a wheel or $K_{3,n}$, and it follows that any planar 3-connected graph is not PTEC.

Bio: Rongchuan Tao received his Ph.D. from The University of Hong Kong and is currently a postdoctoral fellow there. His research interests are primarily in combinatorial optimization, polyhedral combinatorics, and structural graph theory.

6. Title: Integral biflow maximization

Speaker: Mengxi Yang (University of Science and Technology of China)

Abstract: Let $G=(V,E)$ be a graph with two sources s_1, s_2 , two sinks t_1, t_2 , and a non-negative integral capacity function c on E . A biflow in G is a collection of simple paths (repeats allowed) either from s_1 to t_1 or from s_2 to t_2 such that each edge $e \in E$ is used at most $c(e)$ times. In 1977 Seymour characterized, in terms of forbidden structures, all graphs G for which the maximum value of an integral biflow is equal to the minimum capacity of a bicut for every capacity function c ; such a graph G is referred to as a Seymour graph. In this talk, we first characterize the global structure of Seymour graphs. Using the characterization, we give a combinatorial algorithm in polynomial time for finding maximum integral biflows in Seymour graphs. This is a joint work with Guoli Ding, Rongchuan Tao, and Wenan Zang.

Bio: Mengxi Yang received her Ph.D. from The University of Hong Kong in 2024 and is currently a postdoctoral fellow at the University of Science and Technology of China. Her research focuses on graph theory and combinatorial optimization, particularly the integrality of polyhedra in combinatorial optimization and the design of algorithms for combinatorial optimization problems

on graphs.

7. Title: Perfect tilings with the generalised triangle in k -graphs

Speaker: Linpeng Zhang (Shandong University)

Abstract: Denote by T_k the generalised triangle, a k -uniform hypergraph on vertex set $\{1, 2, \dots, 2k-1\}$ with three edges $\{1, \dots, k-1, k\}$, $\{1, \dots, k-1, k+1\}$ and $\{k, k+1, \dots, 2k-1\}$. Recently, Bowtell, Kathapurkar, Morrison and Mycroft [arXiv: 2505.05606] established the exact minimum codegree threshold for perfect T_3 -tilings in 3-graphs. In this paper, we extend their result to all $k \geq 3$, determining the optimal minimum codegree threshold for perfect T_k -tilings in k -graphs. Our proof uses the lattice-based absorption method, as is usual, but develops a unified and effective approach to build transferrals for all uniformities, which is of independent interest. Additionally, we establish an asymptotically tight minimum codegree threshold for a rainbow variant of the problem.

Bio: Linpeng Zhang is a postdoctoral fellow at Shandong University, cooperating with Prof. Guanghui Wang. He received his Ph.D. from the University of Twente, the Netherlands, in September 2024, and another Ph.D. from Northwestern Polytechnical University in March 2025, under the supervision of Prof. Hajo Broersma and Prof. Ligong Wang. His main research direction is extremal problems in hypergraphs. He has published several articles in journals such as Electron. J. Combin and Discrete Math.

8. Title: Vertex degree sums for rainbow matchings in 3-uniform hypergraphs

Speaker: Yi Zhang (Beijing University of Posts and Telecommunications)

Abstract: Let $n \in 3\mathbb{Z}$ be sufficiently large. Zhang, Zhao and Lu proved that if H is a 3-uniform hypergraph with n vertices and no isolated vertices, and if $\deg(u) + \deg(v) > 2n^2/3 - 8n/3 + 2$ for any two vertices u and v that are contained in some edge of H , then H admits a perfect matching. In this paper, we prove that the rainbow version of Zhang, Zhao and Lu's result is asymptotically true. More specifically, let $\delta > 0$ and $F_1, F_2, \dots, F_{n/3}$ be 3-uniform hypergraphs on a common set of n vertices. For each $i \in [n/3]$, suppose that F_i has no isolated vertices and $\deg_{F_i}(u) + \deg_{F_i}(v) > (2/3 + \delta)n^2$ holds for any two vertices u and v that are contained in some edge of F_i . Then $\{F_1, F_2, \dots, F_{n/3}\}$ admits a rainbow matching. Note that this result is asymptotically tight.

Bio: Yi Zhang is a lecturer at Beijing University of Posts and Telecommunications. He received his undergraduate degree from Lanzhou University and his Ph.D. from Tsinghua University. He visited Prof. Xingxing Yu at Georgia Institute of Technology during 2016-2017 and Prof. Hao Huang at National University of Singapore during 2023-2024. He studies structural properties of hypergraphs. He has presided over one NSFC Young Scientists Fund project and one China Postdoctoral Science Foundation project, and participated in two NSFC General Program projects. He has published over 10 papers as first author or corresponding author in major graph theory SCI journals such as SIAM Journal on Discrete Mathematics and Electronic Journal of Combinatorics.

