2023 第七届图论与组合学术研讨会程序册

4 月 15 日	14:00-22:00 注册（上海交通大学理科群楼 6 号楼）	
4 月 16 日	**地点**:	**上海交通大学理科群楼 6 号楼 703**
	主持人: 陈耀俊 (南京大学)	08:30-09:10 陆玫 (清华大学) 题目: Triangles in r-wise t-intersecting families
		09:10-09:50 彭岳建 (湖南大学) 题目: Minimum degree stability of graphs forbidding some odd cycles
	09:50-10:20 合影，茶歇	
	主持人: 汪彦 (上海交通大学)	10:20-11:00 王毅 (大连理工大学) 题目: Log-convexity of generalized Motzkin numbers
	11:30-14:00 午餐	
	主持人: 张晓东 (上海交通大学)	14:00-14:40 刘西之 (University of Warwick) 题目: A unified approach to the stability of nondegenerate hypergraph Turan problems
		14:40-15:20 刘鸿 (韩国基础科学研究院) 题目: Crux and its applications
	15:20-16:00 茶歇	
	主持人: 张晓东 (上海交通大学)	16:00-16:40 马杰 (中国科学技术大学) 题目: Supersaturation beyond color-critical graphs
	17:30-19:30 晚宴	
4 月 17 日	**地点**:	**上海交通大学理科群楼 6 号楼 703**
		09:00-12:00 自由讨论
	12:00-14:00 午餐	
	主持人: 张晓东 (上海交通大学)	15:00-15:40 魏煊 (上海交通大学) 题目: Learning from Crowds by Unifying Deep Networks and Graphical Models
	17:00-19:00 晚宴	

摘要

Crux and its applications

Hong Liu
Institute for Basic Science

Abstract

I would like to intruduce a recent notion of crux, which measures the essential order of a graph when it comes to sparse embedding problems. We propose a meta-problem involving this new notion. During my talk, I will survey some recent related results. Among others, using crux, we determine the circumference of subgraphs of hypercubes with given density.

A unified approach to the stability of nondegenerate hypergraph Turan problems

Xizhi Liu
University of Warwick

Abstract

We will talk about a method which provides a unified framework for many stability theorems that have been proved in graph and hypergraph theory. Our main result reduces stability for a large class of hypergraph problems to the simpler question of checking that a hypergraph H with large minimum degree that omits the forbidden structures is vertex-extendable. This means that if v is a vertex of H and H-v is a subgraph of the extremal configuration(s), then H is also a subgraph of the extremal configuration(s). In many cases vertex-extendability is quite easy to verify. Our method always yields an Andrásfai-Erdős-Sós type result, which says if H has large minimum degree, then it must be a subgraph of one of the extremal configurations. Based on joint work with Dhruv Mubayi and Christian Reiher.

Triangles in r-wise t-intersecting families

Mei Lu
Tsinghua University

Abstract

Let t, r, k and n be positive integers and $\mathcal{F}$ a family of k-subsets of an n-set V. The family is r-wise t-intersecting if for any $F_1, \ldots, F_r \in$, we have $\cap_{i=1}^{r} F_i t$. An r-wise t-intersecting family of $r+1$ sets $\{T_1, \ldots, T_{r+1}\}$ is called an $(r+1, t)$-triangle if $|T_1 \cap \cdots \cap T_{r+1}| t-1$. In this talk, I will present our results about the maximum number of $(r+1, t)$-triangles in r-wise t-intersecting families. This can be regarded as a generalized Turán type result.

This work is joint with Jiaqi Liao and Mengyu Cao.

Supersaturation beyond color-critical graphs

Jie Ma
University of Science and Technology of China

Abstract

A fundamental theorem of Rademacher from 1941 led to the study of supersaturation problems of graphs, which aim to count the minimum number of copies of a given graph F among all graphs with n vertices and m edges. This is closely related to a central concept in Extremal Graph Theory – the Turán number of F, which denotes the maximum number of edges in an n-vertex graph which does not contain F as a subgraph. Famous results of Erdős, and Lovász and Simonovits determine the minimum number of cliques K_r in graphs whose number of edges exceed the Turán number of K_r. Subsequent works of Mubayi as well as Pikhurko and Yilma extend these classical results from cliques to color-critical graphs, a rich family playing important roles in extremal problems. In this talk, we will discuss supersaturation problems beyond color-critical graphs and investigate natural enumerative parameters.

Our results go beyond the previous results and show that supersaturation problems for general graphs can be rather complicate. Among others, we disprove a conjecture of Mubayi. Joint work with Long-Tu Yuan.

Minimum degree stability of graphs forbidding some odd cycles

Yuejian Peng
Hunan University

Abstract

We consider the minimum degree stability of graphs forbidding odd cycles: What is the tight bound on the minimum degree to guarantee that the structure of a C_{2k+1}-free graph inherits from the extremal graph (a balanced complete bipartite graph)? Andrásfai, Erdős and Sós showed that if a $\{C_3, C_5, \cdots, C_{2k+1}\}$-free graph on n vertices has minimum degree greater than $\frac{2}{2k+3}n$, then it is bipartite. Häggkvist showed that for $k \in \{1, 2, 3, 4\}$, if a

C_{2k+1}-free graph on n vertices has minimum degree greater than $\frac{2}{2k+3}n$, then it is bipartite. Häggkvist also pointed out that this result cannot be extended to $k \geq 5$. In this paper, we give a complete answer for any $k \geq 5$. We show that if $k \geq 5$ and G is an n-vertex C_{2k+1}-free graph with $\delta(G) \geq \frac{n}{6} + 1$, then G is bipartite, and the bound $\frac{n}{6} + 1$ is tight. Furthermore, the result can be strengthened as follows. Let $2 \leq l \leq k$ and $n \geq 1000k^8$ be integers. Let G be an n-vertex $\{C_3, C_5, \cdots, C_{2l-1}; C_{2k+1}\}$-free graph. Then the following holds. (i)If $l > \frac{2k-1}{8}$ and $\delta(G) \geq \frac{2}{2k+3}n + 1$, then G is bipartite, and the bound $\frac{2}{2k+3}n + 1$ is tight. If $\delta(G) = \frac{2}{2k+3}n$, then G must be a balanced blow up of C_{2k+3}. (ii)If $l < \frac{2k-1}{8}$ and $\delta(G) \geq \frac{n}{2(2l+1)} + 1$, then G is bipartite, and the bound $\frac{n}{2(2l+1)} + 1$ is tight. If $\delta(G) = \frac{n}{2(2l+1)}$, then G must be a graph taking $2l+1$ vertex-disjoint copies of $K_{\frac{n}{2(2l+1)}, \frac{n}{2(2l+1)}}$, select a vertex in each of them such that these vertices form a cycle of length $2l + 1$,. This is a joint work with Xiaoli Yuan.

Log-convexity of generalized Motzkin numbers

Yi Wang
Dalian University of Technology

Abstract

The generalized Motzkin numbers unify many well-known counting coefficients, such as the Catalan numbers, the Motzkin numbers, the large and little Schroeder numbers. An effective way to study the generalized Motzkin numbers is to embed them in the generalized Motzkin triangles. In this talk we discuss the log-convexity of the generalized Motzkin numbers by means of such an approach. We also discuss q-log-convexity of q-generalized Motzkin numbers.

Learning from Crowds by Unifying Deep Networks and Graphical Models

Xuan Wei
Shanghai Jiao Tong University

Abstract

Microtask crowdsourcing has emerged as a cost-effective approach to collecting large-scale high-quality labeled data across a wide range of business scenarios, particularly those artificial intelligence-powered applications that are usually data-hungry. To aggregate the crowd efforts and achieve certain cumulative goals, some assumptions (e.g., worker heterogeneity in quality) are considered, and models are developed based on these assumptions. However, most of the current design of learning from crowds makes simple or constrained assumptions, and the conclusions suffer from low generalizability. To provide a set of generalizable practices for the design of learning from crowds, we first formulate several general hypotheses, including worker heterogeneity in reliability, usefulness of task feature

and task clustering structure, etc. To test these hypotheses, we propose an interpretable deep graphical framework that enables incremental design and hence allows us to conduct before-and-after evaluation towards the underlying assumptions. This deep framework also allows us to make less constrained and hence more useful assumptions by modeling complex non-linear relationships with deep networks. An efficient inference algorithm combining variational message passing and amortized learning is then developed to estimate the parameters. Last, we empirically test these hypotheses using eight real-world tasks including text and image classifications. The results also demonstrate the effectiveness of our framework over state-of-the-art benchmark models. Our work not only serves as a cost-effective approach to aggregating crowd annotations but also provides general practices for the design of learning from crowds.