中国科学院数学与系统科学研究院
Academy of Mathematics and Systems Science
Chinese Academy of Sciences

组合理论与算法研讨会

会议手册

2023 年 4 月 21 日-24 日

中国科学院数学与系统科学研究院

数学机械化重点实验室，北京

会议信息

时间：2023 年 4 月 21 日-24 日 （**21 日报到，地点数学院南楼 204**）

地点：北京中关村东路 55 号中国科学院数学院南楼 204 会议室

会议日程

会议报到：2023 年 4 月 21 日下午 2 点-6 点，南楼 204

2023 年 4 月 22 日周六学术报告（南楼 204 会议室）

时间	日程	演讲人
8:20-8:30	签到	
8:30-8:40	开幕	
8:40-8:50	特邀学者讲话	王军
8:50-9:50	置换与加法组合 I	孙智伟
9:50-10:20	**合影与茶歇**	
10:20-10:50	組合、图论學在物理、化學、統計上的應用	叶永南
10:50-11:20	A multiple q-translation formula	刘治国
11:20-11:50	非交换基本超几何级数导引	张之正
11:50-12:20	Kazhdan-Lusztig polynomials of complete graphs	杨立波
12:30-13:30	**午餐（物科宾馆自助）**	
14:00-15:00	Analytic Aspects of Combinatorial Sequences I	王毅
15:00-16:00	Analytic Aspects of Combinatorial Sequences II	王毅
16:00-16:20	**茶歇**	
16:20-16:50	Modularity of Nahm Sums for the Tadpole Diagram	王六权
16:50-17:20	The stability of multivariate polynomial sequences	刘丽
17:20-17:50	Ehrhart Theory on Lattice Path Matroids	范久瑜
18：00-20：00	**晚宴（物科宾馆）**	

2023 年 4 月 23 日周日（南楼 204 会议室）

时间	日程	演讲人
8:30-9:30	Analytic Aspects of Combinatorial Sequences III	王毅
9:30-10:30	Analytic Aspects of Combinatorial Sequences IV	王毅
10:30-10:50	**茶歇**	
10:50-11:20	Equidistribution of set-valued statistics on standard Young tableaux and transversals	严慧芳
11:20-11:50	On lattice paths and the Thue-Morse sequence	傅士硕
12:00-13:30	**午餐（物科宾馆自助）**	
14:00-15:00	置换与加法组合 II	孙智伟
15:00-16:00	置换与加法组合 III	孙智伟
16:00-16:20	**茶歇**	
16:20-16:50	完全对称多项式零点的新下界	张俊
16:50-17:20	Further q-supercongruences from a transformation of Rahman	郭军伟
17:20-17:50	Some results and problems on nontrivial cross intersecting families	张华军
18：00-20：00	**晚餐（物科宾馆）**	

2023 年 4 月 24 日周一（南楼 204 会议室）

时间	日程	演讲人
8:30-9:30	置换与加法组合 IV	孙智伟
9:30-9:50	**茶歇**	
9:50-10:20	Abel 引理与 q-级数变换	马欣荣
10:20-10:50	Generalized q-partial differential equations for q-3D hypergeometric polynomials and some applications	曹健

10:50-11:20	Symmetries in parking functions, Dyck paths and trees	林志聪
11:30-14:00	**午餐 (物科宾馆)**	
14:00-17:00	自由讨论	

报告信息

系列专题讲座

题目 1：置换与加法组合

报告人：孙智伟 教授（南京大学）

摘要： 与 Abel 群加法结构有关的加法组合是组合和数论的交叉领域，国际上这方面的研究十分活跃。本课程讨论有关的置换与和集问题，介绍这方面的已有结果与研究方法， 还将提及一些未解决问题。

题目 2：Analytic aspects of combinatorial sequences

报告人：王毅 教授（大连理工大学）

摘要： In this talk, we discuss some analytic properties of combinatorial sequences. The talk consists of four parts.

1. Analytic aspects of combinatorial sequences---from the viewpoint of total positivity.

2. Unimodal, log-concave and Polya frequency sequences.

3. Log-convexity of combinatorial sequences.

4. Catalan-like numbers, log-convex and Stieltjes moment sequences.

邀请学术报告

题目 1：組合、图论學在物理、化學、統計上的應用

报告人：叶永南 教授（温州大学）

摘要： 在這個演講裏。我將用淺顯的語言簡單介紹過去我用組合、圖論在物理、化學、統計等跨學科領域的一些應用。

题目 2：A multiple *q*-translation formula

报告人：刘治国 教授（华东师范大学）

摘要： In this talk, we shall introduce a multiple q-exponential differential operational identity for the analytic functions in several variables, which can be regarded as a multiple q-translation formula. This multiple q-translation formula is a fundamental result and play a pivotal role in q-mathematics. Using this formula, we can easily recover many classical conclusions in q-mathematics and derive some new q-formulas.

题目 3：非交换基本超几何级数导引

报告人： 张之正 教授（洛阳师范学院）

摘要：在本报告中，将从 Gauss 非交换二项式定理出发，介绍一般非交换基本超几何级数的基本概念及基本结果。

题目 4：Kazhdan-Lusztig polynomials of complete graphs

报告人：杨立波 教授（南开大学）

摘要： Recently, Luis Ferroni and Matt Larson provide a combinatorial interpretation of Kazhdan–Lusztig polynomials of complete graphs. In particular, they confirm a conjecture of Elias, Proudfoot and Wakefield on the top coefficients of Kazhdan–Lusztig polynomials of complete graphs. In this talk we will show how to determine the top coefficients of inverse Kazhdan–Lusztig polynomials of complete graphs based on Ferroni and Larson's work.

题目 5： Modularity of Nahm Sums for the Tadpole Diagram

报告人：王六权 教授（武汉大学）

摘要： We prove Rogers-Ramanujan type identities for the Nahm sums associated with the tadpole Cartan matrix of rank 3. These identities reveal the modularity of these sums, and thereby we confirm a conjecture of Calinescu, Milas and Penn in this case. We show that these Nahm sums together with some shifted sums can be combined into a vector-valued modular function on the full modular group. We also present some conjectures for a general rank. This talk is based on a joint work with Antun Milas.

题目 6：A unified approach to multivariate polynomial sequences with real stability

报告人：刘丽 教授（曲阜师范大学）

摘要： We give some new sufficient conditions for a sequence of multivariate polynomials to be real stable. As applications, we obtain the real stability of many important multivariate polynomials, such as multivariate Eulerian polynomials, multivariate Bell polynomials and multivariate polynomials over Stirling permutations in a unified manner. And we also show some new results, such as the real stability of multivariate polynomials over Jacobi-Stirling permutations, and the proper position property of multivariate matching polynomials.

题目 7：Ehrhart Theory on Lattice Path Matroids

报告人：范久瑜 副教授（四川大学）

摘要： We will give a survey of the Ehrhart theory of lattice path maroids and report our recent progress on this topic.

题目 8：Equidistribution of set-valued statistics on standard Young tableaux and transversals

报告人：严慧芳 教授（浙江师范大学）

摘要： As a natural generalization of permutations, transversals of Young diagrams play an important role in the study of pattern-avoiding permutations. In this talk, , we are mainly concerned with the distribution of the peak set and the valley set on standard Young tableaux and pattern-avoiding transversals.

题目 9：On lattice paths and the Thue-Morse sequence

报告人：傅士硕 教授（重庆大学）

摘要： In answering a question of Berstel, Lauve, Reutenauer, and Saliola, we present a combinatorial argument basing on the symmetry of certain lattice paths to explain that the diagonal of certain bivariate rational function is congruent to the Thue-Morse series modulo 2.

题目 10：完全对称多项式零点的新下界

报告人：张俊 教授（首都师范大学）

摘要： 在报告中，我们介绍最新的关于完全对称多项式零点个数的下界，该下界大大改进了已有的下界。该工作是与万大庆教授合作。

题目 11： Further q-supercongruences from a transformation of Rahman

报告人：郭军伟 教授（淮阴师范学院）

摘要： Employing a quadratic transformation formula of Rahman and the method of `creative microscoping' (introduced by the author and Zudilin in 2019), we provide some new q-supercongruences for truncated basic hypergeometric series. In particular, we confirm two recent conjectures of Liu and Wang. We also propose some related conjectures on supercongruences and q-supercongruences.

题目 12：Some results and problems on nontrivial cross intersecting families

报告人：张华军 教授（绍兴文理学院）

摘要：

Let n, k and ℓ be positive integers satisfying $n \geq k+\ell$. Two families $\mathcal{A} \subseteq \binom{[n]}{k}$ and $\mathcal{B} \subseteq \binom{[n]}{\ell}$ are called cross intersecting if $|A \cap B| \geq 1$ for all $A \in \mathcal{A}$ and $B \in \mathcal{B}$. In this talk, we will prove that if $\mathcal{A} \subseteq \binom{[n]}{k}$ and $\mathcal{B} \subseteq \binom{[n]}{\ell}$ are cross intersecting with $\cap_{F \in \mathcal{A} \cup \mathcal{B}} F = \emptyset$ and $2k \leq 2\ell \leq n$, then

$$|\mathcal{A}||\mathcal{B}| \leq \max\left\{\left(\binom{n-1}{k-1}+\binom{n-2}{k-1}\right)\binom{n-2}{\ell-2}, \left(\binom{n-1}{k-1}+1\right)\left(\binom{n-1}{\ell-1}-\binom{n-k-1}{\ell-1}\right)\right\}.$$

题目 13：Abel 引理与 q-级数变换

报告人：马欣荣 教授（苏州大学）

摘要： This talk is about three new and general transformations with sixteen parameters and bases via Abel's lemma on summation by parts. As their applications, we will exhibit some new transformations of basic hypergeometric series. Among include some new results of Gasper and Rahman's quadratic,cubic, and quartic transformations. Furthermore, we put forward the so-called (R,S)-type transformation with arbitrary degree to unify such multibasic transformations. Some special (R,S)-type transformations are presented. This talk is based on joint work with Jianan Xu.

题目 14：Generalized q-partial differential equations for q-3D hypergeometric polynomials and some applications

报告人：曹健 教授（杭州师范大学）

摘要： In this talk, our investigation is focusing on q-analogue complex Hermite polynomials, which were motivated by Ismail and Zhang [Adv. Appl. Math. **80**(2016), 70 --92.] and [Trans. Amer. Math. Soc. **369**(2017), 6779 --6821.]. We give a new pair of q-3D Hermite polynomials and their corresponding q-partial differential equations. In addition, we generalize (q,c)-derivative operator of Zhang [Adv. Appl. Math. **121**(2020), 102081, 23pp.] and (q,λ)-derivative operator of Yang

[Ramanujan J. 2022, https://doi.org/10.1007/s11139-022-00617-w.] and give some applications. Moreover, we define the generalized homogeneous Rogers--Szegö polynomial and Stieltjes—Wigert polynomial involving two parameters in the binomial coefficient and find their corresponding q-partial differential equations. Finally, we define generalized q-3D Hermite polynomials with double binomial coefficients, find their corresponding q-partial differential equations and generalize some results of Ismail and Zhang.

题目 15：Symmetries in parking functions, Dyck paths and trees

报告人：林志聪 教授（山东大学）

摘要： I will talk about some bijective proofs of several symmetries arising in Parking functions, Dyck paths and trees. This talk is based on my recent joint work with Yang Li and Tongyuan Zhao.