Curriculum Vitae

Personal Information

Full name	Yi Zhang
Date of birth	12.12.1988
Place of birth	Changzhou, Jiangsu Province, China
Nationality	Chinese

Contact

E-mail	Yi.Zhang03@xjtlu.edu.cn
Address	Department of Foundational Mathematics Xi'an Jiaotong-Liverpool University 111 Ren'ai Road, Suzhou Dushu Lake Science and Education Innovation District Suzhou Industrial Park, Suzhou, China, 215123
Office	MB 251
Phone	+86 0512 8188 9056
Homepage	https://www.xjtlu.edu.cn/en/departments/academic-departments/foundational-mathematics/staff/yi-zhang03

Research Interests

- Computer Algebra
- Algorithmic Combinatorics
- Algebraic Theory of Differential and Difference Equations
- Algebraic Statistics
- Coding and Cryptography
- Special Functions

Education

09/2013 – 02/2017 Ph.D. in Mathematics with distinction, Institute for Algebra, Johannes Kepler University Linz, Linz, Austria. (Co-supervisors: Prof. Manuel Kauers and Prof. Ziming Li)

09/2011 – 07/2016 Ph.D. in Applied Mathematics, Key Laboratory of Mathematics Mechanization, Academy of Mathematics and Systems Science, University of Academy of Sciences, Beijing, China. (Co-supervisors: Prof. Manuel Kauers and Prof. Ziming Li)

09/2007 – 07/2011 B.Sc. in Mathematics, School of Mathematical Sciences, Soochow University, Suzhou, China.

Work Experience

02/2020 – present Assistant Professor, Department of Foundational Mathematics, Xi'an Jiaotong-Liverpool University, Suzhou, China.

09/2018 – 01/2020 Research Associate, Department of Mathematical Sciences, The University of Texas at Dallas, Dallas, USA. (Advisor: Prof. Carlos E. Arreche)

03/2017 – 08/2018 Postdoctoral researcher, Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences, Linz, Austria. (Advisor: Prof. Christoph Koutschan)

Visiting Experience

06/2019 – 07/2019 Visiting scholar, Faculty of Mathematics and Statistics , Ton Duc Thang University, Ho Chi Minh City, Vietnam. (Host researcher: Dr. Thieu N. Vo)

05/2017 Visiting scholar, Department of Mathematics , Kobe University, Kobe, Japan. (Host researcher: Prof. Nobuki Takayama)

Teaching Experience

Spring 2024	Lecturer. (Multivariate Calculus) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Fall 2023	Lecturer. (Linear Algebra) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Spring 2023	Lecturer. (Multivariate Calculus) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Fall 2022	Lecturer. (Linear Algebra) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Spring 2022	Lecturer. (Multivariate Calculus) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Fall 2021	Lecturer. (Analysis 1) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Spring 2021	Lecturer. (Multivariate Calculus) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Fall 2020	Lecturer. (Analysis 1) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Spring 2020	Lecturer. (Multivariate Calculus) Xi'an Jiaotong - Liverpool University, Suzhou, China.
Fall 2019	Instructor. (Integral Calculus) The University of Texas at Dallas, Dallas, USA.
Spring 2019	Instructor. (Linear Algebra) The University of Texas at Dallas, Dallas, USA.
Fall 2010	Teaching internship. (High School Mathematics) Suzhou High School Affiliated to Xi'an Jiaotong University, Suzhou, China.

Professional Service Activities

2023 – present	UoL (University of Liverpool) Coordinator. Xi'an Jiaotong - Liverpool University, Suzhou, China.
2021 – 2023	PGRS (Postgraduate Research Scholarship) Panel Member. Xi'an Jiaotong - Liverpool University, Suzhou, China.
2020 – 2021	Global Engagement Officer. Xi'an Jiaotong - Liverpool University, Suzhou, China.

Professional Memberships

2021 – present	Fellow of The Higher Education Academy. In recognition of attainment against the UK Professional Standards Framework for teaching and learning support in higher education. Fellowship reference: PR227162. Date of Fellowship: August 24th, 2021.
2018 – present	Reviewer for Mathematical Reviews/MathSciNet.

Awards

12/2022	2022 Backbone Scientific and Education Talents (RMB 40, 000), Suzhou, China.
07/2021	2021 Jiangsu Province Innovation & Entrepreneurship Doctor-Talent Program (RMB 150, 000), Jiangsu, China.
07/2016	ISSAC'16 Distinguished Student Author Award, SIGSAM, Association for Computing Machinery (ACM).
09/2009 – 07/2010	The Second Prize Scholarship of Soochow University, Suzhou, China.
09/2008 – 07/2009	The First Prize Scholarship of Soochow University, Suzhou, China.
09/2007 – 07/2008	The First Prize Scholarship of Soochow University, Suzhou, China.
09/2007 – 07/2008	The Zhu Jingwen Scholarship of Soochow University, Suzhou, China.
09/2007 – 07/2008	The Merit Student of Soochow Universtiy, Suzhou, China.

Grants

01/2024 – 12/2027	National Science Foundation of China General Programme Fund, **Principle Participant**. No. 12371520. "The Study on the Cycle Structure and Complexity of Nonlinear Feedback Shift Registers Sequences", RMB 43, 500.
10/2021 – 09/2023	Natural Science Foundation of the Jiangsu Higher Education Institutions of China Programme-General Programme, **Principle Investigator**. No. 21KJB110032. "Algebraic and Numerical Analysis of Differential Equations based on Computer Algebra", RMB 30, 000.
01/2022 – 12/2024	National Science Foundation of China Young Scientist Fund, **Principle Investigator**. No. 12101506. "Theory and Algorithms of Algebraic Differential and Difference Equations based on Symbolic Computation", RMB 300, 000.
03/2021 – 02/2024	XJTLU Research Development Fund, **Principle Investigator**. No. RDF-20-01-12. RMB 60, 000.

PhD Thesis

- Yi Zhang. *Univarite Contraction and Multivariate Desingularization of Ore Ideals*. PhD thesis, Institute for Algebra, Johannes Kepler University Linz, 2017. arXiv:1710.07445

Publications

Published

1. Dmitrii Karp and Yi Zhang (corresponding author). *Log-concavity and Log-convexity of Series containing Multiple Pochhammer Symbols*, Fractional Calculus and Applied Analysis, 27, pp. 458–486, 2024. DOI:10.1007/s13540-023-00238-0, arXiv:2305.09029. (SCI, JCR Q1).

2. Dmitrii Karp and Yi Zhang (corresponding author). *Convergent Expansions and Bounds for the Incomplete Elliptic Integral of the Second Kind near the Logarithmic Singularity*, Mathematics of Computation, 92 (344), pp. 2769–2794, 2023. DOI: 10.1090/mcom/3874, arXiv:2208.05242. (SCI, CAS Q1)

3. Carlos E. Arreche and Yi Zhang (corresponding author). *Mahler Discrete Residues and Summability for Rational Functions*. In *Proceedings of the 2022 International Symposium on Symbolic and Algebraic Computation (ISSAC)*, pp. 525–533, ACM Press, 2022. DOI:10.1145/3476446.3536186, arXiv:2202.09805. (EI, ISSAC is a top international conference in the field "Algorithms and Theory", NUS evaluation: Rank 1, AUS evaluation: A+, MSAR field rating: Rank 1, conference ranks: A)

4. Alin Bostan, Jordan Tirrell, Bruce W. Westbury and Yi Zhang (corresponding author). *On Some Combinatorial Sequences Associated to Invariant Theory*, European Journal of Combinatorics, 105, 103554, 2022. DOI:10.1016/j.ejc.2022.103554, arXiv:2110.13753. (SCI)

5. Sebastian Falkensteiner, Yi Zhang (co-first author) and Thieu N. Vo. *On Existence and Uniqueness of Formal Power Series Solutions of Algebraic Ordinary Differential Equations*, Mediterranean Journal of Mathematics, 19, 74, 2022. DOI:10.1007/s00009-022-01984-w, arXiv:1803.09646. (SCI)

6. Carlos E. Arreche and Yi Zhang (corresponding author). *Computing Differential Galois Groups of Second-order Linear q-Difference Equations*, Advances in Applied Mathematics, 132, 102273, 2022. DOI:10.1016/j.aam.2021.102273, arXiv:2009.14026. (SCI)

7. Zhimin Sun, Xiangyong Zeng, Lin Yi and Yi Zhang (corresponding author). *The Expansion Complexity of Ultimately Periodic Sequences over Finite Fields*, IEEE Transactions on Information Theory, 67 (11), pp. 7550-7560, 2021. DOI:10.1109/TIT.2021.3112824. (SCI, JCR Q1)

8. Nobuki Takayama, Lin Jiu, Satoshi Kuriki and Yi Zhang (corresponding author). *Computation of the Expected Euler Characteristic for the Largest Eigenvalue of a Real Wishart Matrix*, Journal of Multivariate Analysis, 179, 104642, 2020. DOI:10.1016/j.jmva.2020.104642, arXiv:1903.10099. (SCI)

9. Thieu N. Vo and Yi Zhang (corresponding author). *Rational Solutions of First-Order Algebraic Ordinary Difference Equations*, Advances in Applied Mathematics, 117, 102018, 2020. DOI:10.1016/j.aam.2020.102018, arXiv:1901.11048. (SCI)

10. Thieu N. Vo and Yi Zhang (corresponding author). *Rational Solutions of High-Order Algebraic Ordinary Differential Equations*, *Journal of Systems Science and Complexity*, 33, pp. 821-835, 2020. DOI:10.1007/s11424-019-8133-0, arXiv:1709.04174. (SCI)

11. Shaoshi Chen, Manuel Kauers, Ziming Li and Yi Zhang (corresponding author). *Apparent Singularities of D-finite Systems*, *Journal of Symbolic Computation*, 95, pp. 217-237, 2019. DOI:10.1016/j.jsc.2019.02.009, arXiv:1705.00838. (SCI)

12. Ting Guo, Christian Krattenthaler and Yi Zhang (corresponding author). *On (shape-)Wilf-equivalence for Words*, *Advances in Applied Mathematics* , 100, pp. 87-100, 2018. DOI:10.1016/j.aam.2018.05.006, arXiv:1802.09856. (SCI)

13. Christoph Koutschan and Yi Zhang (corresponding author). *Desingularization in the q-Weyl Algebra. Advances in Applied Mathematics*, 97, pp. 80–101, 2018. DOI: 10.1016/j.aam.2018.02.005, arXiv:1801.04160. (SCI)

14. Yi Zhang. *Contraction of Ore Ideals with Applications*. In *Proceedings of the 2016 International Symposium on Symbolic and Algebraic Computation (ISSAC)*, pp. 413-420, ACM Press, 2016. DOI:10.1145/2930889.2930890, arXiv:1511.07922. [Distinguished Student Author Award] (EI, ISSAC is a top international conference in the field "Algorithms and Theory", NUS evaluation: Rank 1, AUS evaluation: A+, MSAR field rating: Rank 1, conference ranks: A)

Submitted/in preparation

1. Yi Zhang. *Desingularization of Linear Mahler Operators*, 2024, in preparation.

2. Carlos E. Arreche and Yi Zhang. *Twisted Mahler Discrete Residues*, September, 2023, submitted. arXiv:2308.16765.

Research Note

- Ziming Li and Yi Zhang. *A Note on Gröbner Bases of Ore Polynomials over a PID*, 2016. `https://yzhang1616.github.io/GB.pdf`

Software

- Discrete_Log_Concavity_Hyper.nb, a Mathematica notebook for proving the discrete log-concavity of certain hypergeometric functions by using Cylindrical Algebraic Decomposition. It is based on joint work with Dmitrii Karp.

- Fake_Degree_Sequence.nb, a Mathematica notebook for finding a linear q-difference equation satisfied by the fake degree sequence associated to a given representation and a given simple complex Lie algebra by the method of creative telescoping and the closure properties of the class of q-holonomic sequences. It is based on joint work with Bruce W. Westbury. The notebook requires the availability of Koutschan's package HolonomicFunctions.m.

- Mihailovs_Conjecture.nb, a Mathematica notebook for proving Mihailovs' conjecure by the method of creative telescoping. It is based on joint work with Jordan Tirrell and Bruce W. Westbury. The notebook requires the availability of Koutschan's package HolonomicFunctions.m.
- ansatz.m, a Mathematica package for computing the expansion complexity of a given finite length sequences. It is based on joint work with Zhimin Sun and Xiangyong Zeng.
- TestNonvanishing.nb, a Mathematica notebook for checking the nonvanishing property of algebraic ordinary differential equations in Kamke's collection. It is based on joint work with Sebastian Falkensteiner and N. Thieu Vo. The notebook requires the availability of the Mathematica package Kamke_ODE.m.
- zof.m, a Mathematica package for generating 0-1-fillings of a Ferrers board (shape), checking the number of sigma-avoiding 0-1-fillings of a Ferrers board, generating generalized 0-1-fillings of a Ferrers board, and checking the number of generalized 0-1-fillings of a Ferrers board with weight n such that the longest ne-chain has length u and the longest se-chain has length v. It is based on joint work with Ting Guo and Christian Krattenthaler. For a demonstration of the package, see the zof.nb notebook.
- Example1_HGM.nb, a Mathematica notebook for the demonstration of the holonomic gradient method for the evaluation of expection of an Euler characteristic number. It is based on joint work with Satoshi Kuriki and Nobuki Takayama. The notebook requires the availability of Koutschan's package HolonomicFunctions.m.
- KamkeODEs.mw, a Maple worksheet for checking the (completely) maximal comparability and noncriticality of algebraic ordinary differential equations in Kample's collection. It is based on joint work with Dr. Thieu Vo Ngoc. The worksheet requires the availability of the Maple package KamkeODEs.mpl.
- qDesingularization.m, a Mathematica package for computing desingularized operators and the q-Weyl closure of a given q-difference operator in the first q-Weyl algebra. It is based on joint work with Dr. Christoph Koutschan. The package requires the availability of Koutschan's package HolonomicFunctions.m and Kauer's pacakge Singular.m. For a description of the usage of the package, see the Example.nb notebook.

Talks

1. *Rational Solutions of First-Order Algebraic Ordinary Difference Equations.* Invited talk at Key Laboratory of Mathematics Mechanization, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing, China, May, 2024.
2. *Rational Solutions of First-Order Algebraic Ordinary Difference Equations.* Invited talk at School of Mathematics, Shandong University, Jinan, China, January, 2024.
3. *On Some Combinatorial Sequences Associated to Invariant Theory.* Invited talk at School of Mathematical Sciences, Shang Jiao Tong University, Shanghai, China, January, 2024.

4. *Rational Solutions of First-Order Algebraic Ordinary Difference Equations.* Invited talk at School of Mathematical Sciences, Shanghai Jiao Tong University, Shanghai, China, September, 2023.

5. *Rational Solutions of First-Order Algebraic Ordinary Difference Equations.* Contributed talk at the Cutting-edge Symposium on Computer Mathematics, Tianyuan Mathematics International Exchange Center, Kunming, China, August, 2023.

6. *Rational Solutions of First-Order Algebraic Ordinary Difference Equations.* Contributed talk at the 28th International Conference on Applications of Computer Algebra (ACA'23), Institute of Information Technology, Warsaw University of Life Sciences, Warsaw, Poland, July, 2023.

7. *Mahler Discrete Residues and Summability for Rational Functions.* Contributed talk at the 13th National Conference on Computer Mathematics, School of Mathematical Sciences, Dalian University of Technology, Dalian, China, June, 2023.

8. *Mahler Discrete Residues and Summability for Rational Functions.* Invited talk at at the 6th Conference on Combinatorics and Symbolic Computation, School of Mathematical Sciences, Luoyang Normal University, Luoyang, China, May, 2023.

9. *Mahler Discrete Residues and Summability for Rational Functions.* Invited talk at School of Mathematical Sciences, Shang Jiao Tong University, Shanghai, China, December, 2022.

10. *Mahler Discrete Residues and Summability for Rational Functions.* Contributed talk at the 3rd Suzhou Area Youth Mathematicians Workshop, School of Mathematics and Physics, Xi'an Jiaotong-Liverpool University, Suzhou, China, November, 2022.

11. *Mahler Discrete Residues and Summability for Rational Functions.* Invited talk at School of Mathematics, Beihang University, Beijing, China, October, 2022.

12. *Mahler Discrete Residues and Summability for Rational Functions.* Invited talk at School of Mathematics, Shandong University, Jinan, China, September, 2022.

13. *Apparent Singularities of D-finite Systems.* Invited talk at Key Laboratory of Mathematics Mechanization, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing, China, October, 2021.

14. *Desingularization in the q-Weyl algebra.* Invited talk at the Workshop on Combinatorics, q-series, and Symbolic Computation in Suzhou Area, School of Mathematical Sciences, Soochow University, Suzhou, China, October, 2021.

15. *On Sequences Associated to the Invariant Theory of Rank Two Lie Algebras.* Invited talk at School of Mathematical Sciences, Soochow University, Suzhou, China, September, 2021.

16. *On Sequences Associated to the Invariant Theory of Rank Two Lie Algebras.* Contributed talk at the 26th International Conference on Applications of Computer Algebra (ACA'21), Virtual, Online, July, 2021.

17. *On Sequences Associated to the Invariant Theory of Rank Two Lie Algebras.* Contributed talk at the 12th Annual Conference on Computer Mathematics (CM'21), Guilin, China, June, 2021.

18. *On Sequences Associated to the Invariant Theory of Rank Two Lie Algebras.* Invited talk at School of Mathematics, Beihang University, Beijing, China, October, 2020.

19. *On Sequences Associated to the Invariant Theory of Rank Two Lie Algebras.* Invited talk at Mahidol University International College, Bangkok, Thailand, January, 2020.

20. *Apparent Singularities of D-finite Systems.* Invited talk at Kolchin Seminar, CUNY Graduate Center, New York, USA, December, 2019.

21. *Computations of the Expected Euler Characteristic for the Largest Eigenvalue of a Real Wishart Matrix.* Contributed talk at SIAM TX/LA Section (The 2nd Annual Meeting of the SIAM Texas Louisiana Section), Southern Methodist University, Dallas, USA, November, 2019.

22. *Computations of the Expected Euler Characteristic for the Largest Eigenvalue of a Real Wishart Matrix.* Invited talk at Key Laboratory of Mathematics Mechanization, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing, China, July, 2019.

23. *Computations of the Expected Euler Characteristic for the Largest Eigenvalue of a Real Wishart Matrix.* Invited talk at Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences, Austria, May, 2019.

24. *Desingularization in the q-Weyl algebra.* Invited talk at Key Laboratory of Mathematics Mechanization, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing, China, July, 2018.

25. *Desingularization in the q-Weyl algebra.* Contributed talk at at ACA'18 (the 24th Conference on Applications of Computer Algebra), the Faculty of Mathematics, The University of Santiago de Compostela, Santiago, Spain, June, 2018.

26. *Laurent Series Solutions of Algebraic Ordinary Differential Equations.* Invited talk at Computer Algebra Seminar, Research Institute for Symbolic Computation (RISC), Johannes Kepler University Linz, Austria, November, 2017.

27. *Apparent Singularities of D-finite Systems.* Contributed talk at ACA'17 (the 23rd Conference on Applications of Computer Algebra), Jerusalem College of Technology, Jerusalem, Israel, July, 2017.

28. *Contraction of Linear Difference and Differential Operators.* Contributed talk at ISSAC'16 (the 41st International Symposium on Symbolic and Algebraic Computation), Wilfrid Laurier University, Waterloo, Canada, July, 2016.

29. *Contraction of Linear Difference and Differential Operators.* Invited talk at the seminar of Center for Combinatorics, Nankai University, Tianjin, China, June, 2016.

30. *An Algorithm for Contraction of an Ore Ideal.* Invited talk at the seminar of Institute of Discrete Mathematics and Geometry, Vienna University of Technology, Vienna, Austria, October, 2015.

31. *The Restriction Problem for D-finite Functions.* Contributed talk at the Workshop on Computational and Algebraic Methods in Statistics, The University of Tokyo, Tokyo, Japan, March, 2015.

32. *An Algorithm for Decomposing Multivariate Hypergeometric Terms.* Contributed talk at CM'13 (the 5th National Conference of Computer Mathematics), Jilin University, Changchun, China, August, 2013.

Peer-Reviewing Activities

For each journal and conference the number of completed reviews in given in parentheses.

- Bulletin of Chinese Applied Mathematics (1)
- Journal of Difference Equations and Applications (1)
- Mathematical Reviews (1)
- Maple Conference (1)
- Mediterranean Journal of Mathematics (1)
- Conferences on Applications of Computer Algebra (1)
- Journal of Systems Science and Complexity (4)
- Journal of Computational and Applied Mathematics (1)
- Advances in Applied Mathematics (1)
- International Symposiums on Symbolic and Algebraic Computation (5)
- Journal of Symbolic Computation (4)

Further Skills

- Programming Skills: C, Matlab, Maple, Mathematica, Macaulay2, Sage, and Python
- Spoken Language: Chinese (native), English (fluent), and German (basic)