Curriculum Vitae

Cover Letter

Curriculum Vitae

Personal Data

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

Contact

E-mail	Yi.Zhang@UTDallas.edu
Address	Department of Mathematical Sciences The University of Texas at Dallas (UTD) 800 West Campbell Road, Richardson, TX 75080-3021
Office	BSB 11.334
Homepage	http://www.utdallas.edu/~yxz180069/

Research Interests

Symbolic Computation, Computer Algebra, Computational Algebraic Geometry, Algorithmic Combinatorics, Algebraic Theory of Differential and Difference Equations

Education

09/2013 – 02/2017	Ph.D. in Mathematics with distinction, Institute for Algebra, Johannes Kepler University 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

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

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

Visiting Experience

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

Career-Related Activities

- reviewer for Mathematical Reviews

Teaching Experience

Spring 2019 Instructor. (Linear Algebra)
The University of Texas at Dallas.

Fall 2010 Teaching internship. (High School Mathematics)
Suzhou High School Affiliated to Xi'an Jiaotong University, China.

Awards

07/2016 ISSAC'16 Distinguished Student Author Award, SIGSAM, Association for Computing Machinery.

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.

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

1. Thieu N. Vo and Yi Zhang. *Rational Solutions of High-Order Algebraic Ordinary Difference Equations*, 2019, in preparation.

2. Carlos Arreche and Yi Zhang. *Computation of the unipotent radical of the differential Galois group for a parameterized linear differential equation*, 2019, in preparation.

3. Zhimin Sun, Xiangyong Zeng and Yi Zhang. *The relation between the maximum order omplexity and expansion complexity of finite length sequences*, 2019, in preparation.

4. Maximilian Jaroschek and Yi Zhang. *Desingularization in General Shift Algebras*, 2019, in preparation.

5. Lin Jiu, Satoshi Kuriki, Nobuki Takayama, and Yi Zhang. *Euler Characteristic Method for the Largest Eigenvalue of a Random Matrix*, 2019, in preparation.

6. Thieu N. Vo and Yi Zhang. *Rational Solutions of First-Order Algebraic Ordinary Difference Equations*, 2019, arXiv:1901.11048, submitted.

7. Thieu N. Vo and Yi Zhang (corresponding author). *Rational Solutions of High-Order Algebraic Ordinary Differential Equations*, 2018, arXiv:1709.04174, accepted by Journal of Systems Science and Complexity. (SCI)

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

9. 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)

10. Shaoshi Chen, Manuel Kauers, Ziming Li and Yi Zhang (corresponding author). *Apparent Singularities of D-finite Systems*, 2017. arXiv:1705.00838, accepted by Journal of Symbolic Computation. (SCI)

11. Yi Zhang (corresponding author). *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. [Distinguished Student Author Award] (EI, ISSAC is a top international conference in the field "Algorithms and Theory", NUS evaluation: Rank 1, AUS evaluation: A+)

Research Notes

- N. Thieu Vo, Sebastian Falkensteiner and Yi Zhang. *Formal Power Series Solutions of Algebraic Ordinary Differential Equations*, 2018, arXiv:1803.09646.

- Yi Zhang. *Testing q-shift Equivalence of Polynomials*, July, 2017.

- Yi Zhang. *Integer Vectors of a Fundamental Parallelepiped*, 2016.

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

Software

- 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. *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.

2. *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.

3. *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.

4. *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.

5. *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.

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

7. *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.

8. *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.

9. *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.

- Conferences on Applications of Computer Algebra (1)
- Journal of Systems Science and Complexity (1)
- Journal of Computational and Applied Mathematics (1)
- Advances in Applied Mathematics (1)
- International Symposiums on Symbolic and Algebraic Computation (2)
- Journal of Symbolic Computation (3)

Further Skills

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

Research Plan

Teaching Philosophy

As Socrates said, "Education is not the filling of a vessel, but the kinding of a flame". A good teacher will not only teach students key ideas and techniques of a course, but also motivate their interests so that they will learn and study by themselves in the future. Meanwhile, a teacher shall also show the general methodology for learning a course so that they know how to learn it by themselves. There are general goals I want to achieve for my teaching. Under this philosophy, I teach my courses with the following schemes:

- Design lecture notes for audience. Before my lectures, I investigate mathematical backgrounds of my students by checking their previous course lists online. On the other hand, I also ask some of my senior colleagues about their experience in teaching the same course. This is very helpful in preparing my lecture notes because with those information I know how to organize the material so that it is not so hard for my students. When I design my lecture notes, I first recall some key results in the previous lecture so that students can have a retrospect about what they learned before at the very beginning. In the final part of my notes, I give a summary about all the ingredients of the current lecture. After my lectures, I scan and submit my notes online so that students can download and read them for the convenience of their study.

- General guides in the first lecture. In my first lecture, I give an outline of the content of the course, such as: what are objects we are going to study; some historical backgrounds of the topic; main problems and results in this area; possible applications in related areas. Besides, I also give some general suggestions for studying: 1. read the textbook and attend my lectures regularly; 2. discuss with classmates and me (after lectures and during my office hours); 3. use library properly; 4. finish homework independently as much as possible (discussion is encouraged, but plagiarism is definitely prohibited).

- Balance between time and material. Each lecture has fixed time and is scheduled to teach one section (sometimes a half one) from the designated textbook. This requires the instructor or lecturer to prepare lecture notes with balance between time and material. For instance, sometimes one section contains five subsections (or even more). It would be very time-consuming to go through every detail of each subsection. In that case, I always try to summarize key ideas of each subsection and show students how to apply them to do concrete examples. If the time is still very tight, I simply give some remarks in the lecture and suggest students to learn that part by self-reading. On the other hand, if the time is quite abundant, I would give more concrete examples, details and some historical backgrounds of the topic during the class.

- Teaching with concrete examples. Mathematics is abstract because it contains a lot of definitions, lemmas, propositions and theorems. I find that it is an excellent idea to teach with concrete examples, especially for those students who are not from the mathematical department. Actually, classical examples not only illustrate abstract concepts and important ideas in mathematics, but also show students

how to apply them to solve practical problems. Last but not least, examples help students understand, review and memorize key points of materials in lectures.

- Communicating with students. Roughly speaking, teaching a course is all about communicating with students, exchanges ideas and thoughts with them. During my lectures, I always speak loudly, clearly and slowly so that my students can hear what I am talking about. Besides, I also write in the backboard with large enough handwriting and try to have suitable eye contact with students. Sometimes, they ask me some questions during the class. I always try to answer their questions concisely and clearly. On the other hand, their questions, comments and suggestions also help me improve the quality of my lectures and learn how to explain certain materials of the course in a more proper way. Moreover, I help them as possible as I can through office hours and emails.

Teaching Experience

Spring 2019	Instructor. (Linear Algebra) The University of Texas at Dallas, USA.
Fall 2010	Teaching internship. (High School Mathematics) Suzhou High School Affiliated to Xi'an Jiaotong University, China.

Reference Providers

- Prof. Manuel Kauers, Institute for Algebra, Johannes Kepler University Linz, Austria. Phone: +43 (0)732 2468 6850 (secretary), +43 (0)732 2468 9958 (direct). Email: manuel@kauers.de
- Prof. Christoph Koutschan, Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences, Austria. Phone: +43 732 2468 5254. Email: christoph@koutschan.de
- Prof. Carlos E. Arreche, Department of Mathematical Sciences, The University of Texas at Dallas, USA. Phone: +1 (972) 883 6594. Email: arreche@utdallas.edu

Prof. Carlos E. Arreche can comment on my teaching at UT Dallas.