Tianran Chen

Curriculum Vitae

P.O. Box 244023
Montgomery, AL 36124
✉ tchen1@aum.edu
www.tianranchen.org

Experience

2017 – **Assistant Professor**, *Auburn University Montgomery*.
2016 – 2017 **Lecturer**, *Auburn University Montgomery*.
2012 – 2016 **Research Instructor**, *Michigan State University*.
2006 – 2012 **Research and Teaching Assistant**, *Michigan State University*.

Education

2012 **Ph.D. Applied Mathematics**, *Michigan State University*, (MI USA).
2005 **B.A. Computer Science**, *Western Connecticut State University*, (CT USA).
Secondary major in Mathematics

Honors & Awards

2016 AMS-Simons Travel Grant
2014 A paper selected for Journal of Chemical Physics Editors' Choice for 2014
2010 Dr. Paul & Wilma Dressel endowed scholarship award
(*Michigan State University*)
2005 Student leadership recognition award for outstanding leadership
(*Western Connecticut State University*)
2005 Sigma Xi research award in Physics, Astronomy & Meteorology
(*Western Connecticut State University*)
2004 Wohlever award in Computer Science
(*Western Connecticut State University*)

Research Interests

Numerical analysis, scientific computing, high performance computing, numerical algebraic geometry, applications of numerical methods in physics, chemistry, and engineering.

Publications

(14) 2017 A Product Formula for the Normalized Volume of Free Sums of Lattice Polytopes. *Advances in Algebra: Research from the Southern Regional Algebra Conference 2017* (With Robert Davis) (https://arxiv.org/abs/1711.11130)

(13) 2017 Fixed points of belief propagation: An analysis via polynomial homotopy continuation. *IEEE Transactions on Pattern Analysis and Machine Intelligence* Volume 40, Issue 9, 0162-8828, Sep. 2018, pp. 2124-2136
(with Christian Knoll, Dhagash Mehta, and Franz Pernkopf).
https://doi.org/10.1109/TPAMI.2017.2749575

(12) 2017 On the Network Topology Dependent Solution Count of the Algebraic Load Flow Equations. *IEEE Transactions on Power Systems* (2017)
(with Dhagash Mehta). https://doi.org/10.1109/TPWRS.2017.2724030

(11) 2017 Mixed cell computation in Hom4PS-3.
Journal of Symbolic Computation Volume 79, Part 3, Mar.–Apr. 2017, pp. 516-534.
(with Tsung-Lin Lee and Tien-Yien Li).
http://dx.doi.org/10.1016/j.jsc.2016.07.017

(10) 2017 Parallel degree computation for binomial systems.
Journal of Symbolic Computation Volume 79, Part 3, Mar.–Apr. 2017, pp. 535-558.
(with Dhagash Mehta). http://dx.doi.org/10.1016/j.jsc.2016.07.018

(9) 2015 Response to "Comment on 'Exploring the potential energy landscape of the Thomson problem via Newton homotopies"'.
The Journal of Chemical Physics 143, 247102, 2015.
(with Dhagash Mehta, John Morgan, and David Wales).
http://dx.doi.org/10.1063/1.4939011

(8) 2015 Homotopy continuation method for solving systems of nonlinear and polynomial equations. *Communications in Information and Systems* 15(2):119–307, 2015.
(with Tien-Yien Li). http://dx.doi.org/10.4310/CIS.2015.v15.n2.a1

(7) 2015 Exploring the potential energy landscape of the Thomson problem via Newton homotopies. *The Journal of Chemical Physics* 142, 194113, 2015.
(with Dhagash Mehta, John Morgan, and David Wales).
http://dx.doi.org/10.1063/1.4921163

(6) 2014 Theoretical aspects of mixed volume computation via mixed subdivision.
Communications in Information and Systems 14(4):213–242, 2014.
(with Tien-Yien Li and Xiaoshen Wang).
http://dx.doi.org/10.4310/CIS.2014.v14.n4.a1

(5) 2014 Newton homotopies for sampling stationary points of potential energy landscapes. *The Journal of Chemical Physics* 141 (12), 121104, 2014.
(with Dhagash Mehta, Jonathan Hauenstein, and David Wales).
http://dx.doi.org/10.1063/1.4896657
http://scitation.aip.org/content/jcp-editors-choice-for-2014
(**Selected for a Journal of Chemical Physics Editors' Choice for 2014**)

(4) 2014 Solutions to systems of binomial equations.
Annales Mathematicae Silesianae 28:7–34, 2014.
(with Tien-Yien Li)

(3) 2014 Hom4PS-3: A parallel numerical solver for systems of polynomial equations based on polyhedral homotopy continuation methods *Mathematical Software – ICMS 2014 – 4th International Congress, Seoul, South Korea, August 5-9, 2014. Proceedings* 8592:183–190, 2014. (with Tsung-Lin Lee and Tien-Yien Li).
http://dx.doi.org/10.1007/978-3-662-44199-2_30

(2) 2014 Mixed cells computation in parallel.
Taiwanese Journal of Mathematics 18(1):93–114, 2014.
(with Tsung-Lin Lee and Tien-Yien Li).
http://dx.doi.org/10.11650/tjm.18.2014.3276

(1) 2012 Spherical projective path tracking for homotopy continuation methods.
Communications in Information and Systems 12(3):195–220, 2012.
(with Tianran Chen and Tien-Yien Li).
http://dx.doi.org/10.4310/CIS.2012.v12.n3.a2)

Preprints

2017 (With Robert Davis and Dhagash Mehta) Counting equilibria of the Kuramoto model using birationally invariant intersection index.
(http://arxiv.org/abs/1708.09246)

2017 Unmixing the mixed volume computation (https://arxiv.org/abs/1703.01684)

2016 (With Dhagash Mehta and Matthew Niemerg) A network topology dependent upper bound on the number of equilibria of the Kuramoto model.
(http://arxiv.org/abs/1512.04987)

2015 (With Tianran Chen and Dhagash Mehta) An index-resolved fixed-point homotopy and potential energy landscapes. (http://arxiv.org/abs/1504.06622)

Scientific Software

- Core developer of Hom4PS-3 (`http://www.hom4ps3.org`): A parallel numerical solver for systems of polynomial equations based on the Polyhedral Homotopy Method.
- Lead developer of MixedVol-3 (`http://www.hom4ps3.org`): A parallel software package for computing volume of polytopes, mixed volume, BKK bound, and fine mixed cells.
- Developer of libtropicana (`https://github.com/chentianran/libtropicana`): A software package for computing regular simplicial subdivision for lattice polytopes.

Invited Presentations and Lectures

Sep. 2018	ICERM 2018 Semester program on nonlinear algebra. Brown University. Providence, RI USA
Jul. 2018	International Congress on Mathematical Software. South Bend, IL USA
Jul. 2018	SIAM Annual Meeting. Portland, OR USA
Apr. 2018	Southern Regional Algebra Conference. Montgomery, AL USA
Oct. 2017	Auburn Unversity. Auburn, AL USA
Aug. 2017	2017 SIAM Conference on Applied Algebraic Geometry. Atlanda, GA USA
Mar. 2017	Georgia Institute of Technology. Atlanta, GA USA
Mar. 2017	Southern Regional Algebra Conference. Mobile, AL USA
Oct. 2016	Workshop on Numerical Algebraic Geometry (CSU). Fort Collins, CO USA.
Oct. 2016	AMS Fall Western Sectional Meeting. Denver, CO USA.
Jul. 2016	SIAM Annual Meeting. Boston, MA USA.
Mar. 2015	AMS Central Sectional Meeting Spring. East Lansing, MI USA.
Aug. 2014	The 4th International Congress on Mathematical Software. Seoul, South Korea.
Jan. 2014	AMS Joint Mathematics Meetings. Baltimore, MD USA.
Aug. 2013	SIAM Conference on Applied Algebraic Geometry. Fort Collins, CO USA.
Jun. 2013	Chengdu Institute of Computer Applications. Sichuan, China.
Oct. 2011	SIAM Conference on Applied Algebraic Geometry. Raleigh, NC USA.
May 2011	Midwest Numerical Analysis Day. West Lafayette, IN USA.
Apr. 2011	Colorado State University, Fort Collins, CO USA.
Nov. 2010	1064th AMS Meeting. Notre Dame, IN USA.

Student Projects Supervised

2013 Reliable communication in large scale parallel computing (with Nick Ovenhouse)

2012 A web interface for a scientific database based on Flask (with Jared Jonckheere)

2012 A JIT compiler for automatic differentiation based on LLVM (with Nick Ovenhouse)

Teaching Experience

2016 – **Instructor**, *Pre-calculus, Calculus I,II, Multivariable Calculus, Linear Algebra, Modern Algebra I, Modern Algebra II*.

2012 – 2016 **Instructor**, *College level algebra courses, Calculus sequence, Calculus sequence for business majors, Linear Algebra, Transition to Advanced Mathematics, Abstract algebra*.

2006 – 2011 **Teaching assistant**, *College Algebra, Finite Mathematics and Elements of College Algebra, Survey of Calculus with Applications I & II, Calculus I*.

Professional Services

2018 Organizer for the Southern Regional Algebra Conference 2018

2017 Organizer for the *Special Session on Algorithms and Implementation in Numerical Algebraic Geometry*, 2017 SIAM Conference on Applied Algebraic Geometry

2015 Co-organizer for the *Special Session on Homotopy Continuation Methods and Their Applications to Science and Engineering* at the American Mathematical Society 2015 Central Spring Sectional Meeting

Reviewer for *ACM Transactions on Mathematical Software, International Symposium on Symbolic and Algebraic Computation, LMS Journal of Computation and Mathematics, IEEE Transactions on Power Systems, SIAM Journal on Applied Dynamical Systems*