

# Curriculum Vitae

## Zhonggang Zeng

### CONTACT

Department of Mathematics, Northeastern Illinois University, 5500 N. St. Louis Avenue, Chicago, IL 60625  
Office phone: (773) 442-5763 Home phone: (847) 966-3651 Cell phone: (224)628-1779  
Email: zeng@neiu.edu website: <http://www.neiu.edu/~zeng>

### EDUCATION

1986-1991 Michigan State University  
Ph.D. (1991) in Applied Mathematics. Advisor: Tien-Yien Li  
1978-1984 Wuhan University  
M.S. (1985) & B.S. (1982) in Computational Mathematics

### PROFESSIONAL APPOINTMENTS

9/2004 – present:	Professor of Mathematics (tenured)	Northeastern Illinois University
9/1998 – 8/2004:	Associate Professor of Mathematics (tenured)	Northeastern Illinois University
9/1994 – 8/1998:	Assistant Professor of Mathematics	Northeastern Illinois University
9/1993 - 6/1994:	Visiting Assistant Professor of Mathematics	Michigan State University
8/1992 - 6/1993:	Visiting Assistant Professor of Mathematics	Northern Illinois University
9/1991 - 6/1992:	Visiting Instructor of Mathematics	Michigan State University
2/1985 - 8/1986:	Assistant Professor of Mathematics	Wuhan University (P.R. China)

### RESEARCH INSTITUTE MEMBERSHIPS

8/98 - 12/98:	Member in residence	Mathematical Sciences Research Institute (MSRI) Berkeley, California
9/06 - 10/06:	Member in residence	Institute for Mathematics and its Applications (IMA) Minneapolis, Minnesota

### HONORS:

<i>Distinguished Paper Award</i> , 2003	ACM International Symposium on Symbolic and Algebraic Computation (ISSAC '03)
Bernard J. Brommel Distinguished Research Professor Award (2009)	Northeastern Illinois University
Faculty Excellence Award (9 times: 1996, 2004, 2005, 2006, 2008, 2009, 2013, 2017, 2018)	Northeastern Illinois University

### RESEARCH GRANT AWARDS:

2016-2019	<i>National Science Foundation (NSF)</i> , DMS 1620337	\$179,992
2007-2010	<i>National Science Foundation (NSF)</i> , DMS 0715127	\$125,000
2004-2007	<i>National Science Foundation (NSF)</i> , DMS 0412003	\$91,000
2005-2006	<i>Research Community Grant</i> , co-PI, Northeastern Illinois University	\$5,000
1998-1999	<i>Committee on Organized Research (COR)</i> , Northeastern Illinois University	\$3,000
1995-1996	<i>Fund for Improvement of Postsecondary Education (FIPSE)</i> , U.S. Dept of Education,	\$3,000

## **RESEARCH AREA**

Numerical Analysis and Scientific Computing

## **PROFESSIONAL SOCIETIES**

Society for Industrial and Applied Mathematics (SIAM)

## **PRESENTATIONS** (2000-present)

- 11/16/2018 NEIU Faculty Research Symposium presentation
- 07/26/2018 Contributed talk at International Congress on Mathematical Software (ICMS 2018), Notre Dame, IN
- 02/13/2018 Invited talk at University of California at San Diego, Department of Mathematics
- 02/05/2018 Curriculum talk at Penn State University, Department of Mathematics
- 10/20/2017 Curriculum talk at University of Wisconsin Milwaukee, Department of Mathematics
- 08/01/2017 Invited Minisymposium talk, SIAM Conference on Applied Algebraic Geometry, Atlanta, GA
- 06/21-23/2017 Curriculum talk series at Wuhan University, China
- 06/14/2017 Invited talk at Center of Mathematics, Huazhong University of Science and Technology, China
- 04/22/2017 Contributed talk at Midwest Numerical Analysis Day, Omaha, NE
- 11/18/2016 NEIU Faculty Research Symposium presentation
- 05/29/2016 Invited talk at Chongqing Branch of Chinese Academy of Science, Chongqing, China
- 05/21/2016 Invited talk at 2<sup>nd</sup> Yangzhou Conference on Dynamic System and Numerical Analysis, Yangzhou, China
- 04/23/2016 Contributed talk at Midwest Numerical Analysis Day, Univ. of Wisconsin at La Crosse
- 03/08/2016 NEIU CAS Brown Bag Series presentation
- 11/13/2015 NEIU Faculty Research Symposium presentation
- 03/14/2015 American Mathematics Society regional meeting
- 11/14/2015 NEIU Faculty Research Symposium presentation
- 05/02/2014 Contributed talk at Midwest Numerical Analysis Day, Milwaukee, WI.
- 01/16/2014 Joint Mathematical Meetings, Baltimore, MD
- 11/06/2013 NEIU Faculty Research Symposium presentation
- 06/28/2013 Contributed (refereed) presentation at International Symposium on Symbolic and Algebraic Computation  
Boston, MA
- 11/16/2012 NEIU Faculty Research Symposium presentation
- 07/09/2012 SIAM annual meeting, Minneapolis, MN
- 11/19/2011 Keynote address at MAA Florida Chapter Local Meeting, Pensacola, Florida
- 04/21/2011 Curriculum talk at University of Notre Dame, Notre Dame, Indiana
- 11/20/2010 Invited talk at MAA Florida Chapter Local Meeting, Pensacola, Florida
- 11/06/2010 Invited talk at AMS Sectional Meeting, Special Session on Numerical Algebraic Geometry, Notre Dame
- 08/15/2010 Invited talk at Banff International Research Station (BIRS) Workshop on New Geometric and  
Numeric Tools for the Analysis of Differential Equations, Banff, Canada
- 07/13/2010 Invited talk at SIAM Annual Meeting Special Session on Kinematics and Numerical Algebraic  
Geometry, Pittsburgh.
- 03/01/2010 Invited talk at Banff International Research Station (BIRS) Workshop on Randomization, Relaxation  
and Complexity, Banff, Canada
- 02/19/2010 Invited talk at Michigan State University, East Lansing, MI
- 10/02/2009 Colloquium talk at University of Wisconsin-Milwaukee, Dept of Math Sci, Milwaukee, WI
- 09/18/2009 Invited talk at Purdue University Computational and Applied Mathematics Seminar, West Lafayette, IN
- 08/14/2009 Invited talk at Linear and Numerical Linear Algebra Theory, Methods, and Applications, De Kalb, IL
- 07/31/2009 Contributed talk at International Symposium on Symbolic and Algebraic Computation (ISSAC'09),  
Seoul, South Korea
- 07/24/2009 Invited talk at Key Lab of Mathematics Mechanization, Chinese Academy of Science, Beijing, China
- 06/29/2009 Invited talk at International Workshop of Scientific Computing and its Applications, Shanghai, China
- 04/18/2009 Contributed talk at Joint Midwest Numerical Analysis Day and SIAM Great Lakes Numerical PDE Spring  
Conference, Detroit, MI
- 03/27/2009 Curriculum talk at Northern Illinois University
- 10/31/2008 Curriculum talk at Center for Applied Mathematics, University of Notre Dame
- 07/24/2008 Invited talk at Approximate Commutative Algebra (ApCoa) 2008, Hagenberg, Austria, Tsingchu, Taiwan

- 07/21/2008 Contributed talk at International Symposium on Symbolic and Algebraic Computation, Hagenberg, Austria
- 01/05/2008 Invited talk at Recent Advances in Numerical Methods for Eigenvalue Problems 2008, Tsingchu, Taiwan
- 09/18/2007 Invited talk at Oxford University, Summer School for Solving Polynomial Equations, Oxford, England
- 07/22/2007 Contributed talk at International Conference on Application of Computer Algebra (ACA 07), Rochester, MI
- 07/21/2007 Contributed talk at International Conference on Application of Computer Algebra (ACA 07), Rochester, MI
- 10/23/2006 Invited talk at Institute for Mathematics and its Applications (IMA), Minneapolis
- 10/18/2006 Invited talk at Institute for Mathematics and its Applications (IMA), Minneapolis
- 02/21/2006 Invited talk at Radon Institute for Computational and Applied Mathematics, Austrian Academy of Science, Linz, Austria
- 04/08/2006 Invited talk at AMS Special Session on Numerical Solution of Polynomial Systems, AMS Regional Meeting, Notre Dame
- 01/15/2006 Invited talk at AMS-MAA-SIAM Joint Meetings, Special Session on Symbolic-Numeric Computation, San Antonio
- 10/09/2005 Invited talk at Midwest Algebra, Geometry and their Interaction (MAGIC 05), Notre Dame
- 09/09/2005 Invited talk at Department of Mathematics, University of Missouri Kansas City, Kansas City
- 07/27/2005 Contributed (refereed, highly selective) talk at ACM International Symposium on Symbolic and Algebraic Computation (ISSAC 05), Beijing
- 07/19/2005 Contributed talk at 2005 International Workshop on Symbolic-Numeric Computation (SNC 05), Xi'an
- 06/28-29/2005 Invited two-session seminar talk, College of Mathematical Sciences, Wuhan University, P.R. China
- 05/12/2005 Invited Plenary speaker at International Symposium on Dynamic System and Numerical Analysis, Taiwan
- 05/23/2005 Invited talk at Householder Symposium, Champion, Pennsylvania
- 05/20/2005 Contributed talk at Midwest Numerical Analysis Conference, Iowa City
- 03/16/2005 Invited talk at Symbolic Computation Seminar, North Carolina State University
- 10/24/2004 Invited talk at Special Session on Solving Polynomial Systems, AMS Central Section Meeting, Evanston
- 07/26/2004 Contributed (refereed, highly selective) talk at ACM International Symposium on Symbolic and Algebraic Computation (ISSAC '04), Santander, Spain
- 04/20/2004 Invited talk at Applied Mathematics Colloquium, Department of Mathematics, University of Notre Dame
- 04/24/2004 Contributed talk at Midwest Numerical Analysis Day, University of Wisconsin at Milwaukee
- 10/28/2003 Invited talk at Mathematics and Its Application Seminar, Department of Mathematics, Statistics and Computer Science, University of Illinois at Chicago
- 08/04/2003 Contributed (refereed, highly selective) talk and Distinguished Paper Award at ACM International Symposium on Symbolic and Algebraic Computation (ISSAC '03), Philadelphia
- 05/30/2003 Contributed talk at ETNA 10-th Anniversary Conference, Kent State University
- 04/26/2003 Contributed talk at Midwest Numerical Analysis Day, Western Illinois University
- 09/12-14/2002 Invited one-week workshop, College of Mathematical Sciences, Wuhan University, P. R. China
- 08/11/2002 Invited talk at International Conference on Linear Algebra and Applications, a satellite conference of International Congress of Mathematicians (ICM 2002), Shanghai, P. R. China
- 11/02/2001 Invited colloquium talk at Department of Mathematical Sciences, Northern Illinois University
- 05/12/2001 Contributed talk at Midwest Numerical Analysis Day, University of Illinois
- 10/16/2000: Invited talk at Applied Mathematics Seminar, Illinois Institute of Technology

## **PUBLICATIONS**

### ARTICLES (refereed)

*Intuitive interface for solving linear and nonlinear system of equations*, in Mathematical Software – ICMS 2018, Lecture Notes in Computer Science 10931, Springer, pp. 498-506, 2018

*RankRev: a Matlab package for computing the numerical rank and updating/downdating*, Numerical Algorithms, Vol. 77, No. 2, pp. 559-576, 2018

- Sensitivity and computation of a defective eigenvalue*, SIAM J. Matrix Analysis and Applications, Vol 27, No. 2, pp. 798-217, 2016
- The numerical factorization of polynomials* (with Wenyuan Wu), J. of Foundation of Computatoinal Math. Vol. 17, pp. 259-286, 2018
- Algorithm 931: An algorithm and software for computing multiplicity structures at zeros of nonlinear systems*, (with Wenrui Hao and Andrew J. Sommese) ACM Transactions on Mathematical Software, **40**(2013) , Article 5.
- The numerical greatest common divisor of univariate polynomials*, In Randomization, Relaxation and Complexity in Polynomial Equation Solving, Contemporary Mathematics vol. 556, L. Gurvits, et al, eds., American Mathematical Society, pp. 187-217, 2011.
- Multiple zeros of nonlinear systems* (with B.H. Dayton and T.Y. Li), Mathematics of Computation, **80** (2011), 2143-2168.
- The approximate irreducible factorization of a univariate polynomial. Revisited*, Proceedings of International Symposium on Symbolic and Algebraic Computation (ISSAC '09), pp 367-374, 2009
- Regularization and matrix computation in numerical polynomial algebra*, in *Approximate Commutative Algebra*, Texts & Monographs in Symbolic Computation, L. Robbiano and J. Abbott eds., pp. 125-162, Springer, 2009
- The closedness subspace method for computing the multiplicity structure of a polynomial system*, Contemporary Mathematics Vol. 496, American Mathematical Society, *Interactions of Classical and Numerical Algebraic Geometry*, ed. by D. Bates, G. Besana, S. Di Rocco and C. Wampler, pp. 347-362, 2009
- A rank-revealing method with updating, downdating and applications, Part II* (with T.-L. Lee and T.Y. Li), SIAM J. Matrix Analysis and Applications, 31(2009), pp 503-525
- A polynomial elimination method for numerical computation*, Theoretical Computer Science, Vol. 409, pp 318-331, (2008)
- ApaTools: A Maple and Matlab toolbox for approximate polynomial algebra*, Software for Algebraic Geometry, IMA Volume 148, M.S. Stillman et al. eds., Springer, pp149-167, 2008
- Computing the multiplicity structure in solving polynomial systems* (with B.H. Dayton), Proceedings of ISSAC 05, pp 116-123, (2005)
- A rank-revealing method with updating, downdating and applications* (with T. Y. Li), SIAM J Matrix Anal. Appl., 26 (2005), pp 918-946
- Computing multiple roots of inexact polynomials*, Mathematics of Computation, 74 (2005), 869 - 903, Distinguished Paper Award at ACM ISSAC '03.
- Algorithm 835: MultRoot – A Matlab package for computing polynomial roots and multiplicities*, ACM Transactions on Mathematical Software, 30 (2004), pp. 218 – 235
- The approximate GCD of inexact polynomials, II: a multivariate algorithm* (with B. H. Dayton), Proc. of 2004 ACM International Symposium on Symbolic and Algebraic Computation (ISSAC '04), ACM Press, pp 320 – 327, (2004)
- The homotopy continuation algorithm for the real nonsymmetric eigenproblem, further development and implementation* (with T. Y. Li), SIAM J. Sci. Comp., 20 (1999), pp1627 – 1651
- The Quasi-Laguerre iteration* (with Q. Du, M. Jin and T.Y. Li), Math. Comp., 66 (1997), pp 345 – 361
- Quasi-Laguerre iteration in solving symmetric tridiagonal eigenvalue problems*, (with Q. Du, M. Jin and T. Y. Li), SIAM J. Sci. Comput., 17 (1996), pp 1347 – 1368
- An efficient and accurate parallel algorithm for the singular value problem of bidiagonal matrices* (with T. Y. Li and N. H. Rhee), Numer. Math., 69 (1995), pp 283 – 301
- A scalable eigenvalue solver for symmetric tridiagonal matrices* (with C. Trefftz, C.C. Huang, P., McKinley and T. Y. Li), Parallel Computing, 21 (1995), pp 1213-1240
- Laguerre's iteration for solving the symmetric tridiagonal eigenproblem --- revisited* (with T. Y. Li), SIAM J. Sci. Comput., 15 (1994), pp 1145 – 1173
- An algorithm for the generalized symmetric tridiagonal eigenproblem* (with T. Y. Li and K. Li), Numerical Algorithms, 8 (1994), pp 269 – 291
- Homotopy-determinant algorithm for solving nonsymmetric eigenvalue problems*, (with T. Y. Li), Math. Comp.,

59 (1992), No. 200, pp 483 – 502

*Solving eigenvalue problems of real nonsymmetric matrices with real homotopies* (with T. Y. Li and L. Cong), SIAM J. Numer. Anal., 29 (1992), No. 1, pp 229 – 248

*Solving systems of nonlinear equations in combinational form by a homotopy algorithm*, Numer. Math. J. Chinese Univ., 8 (1986), pp 308 – 318

*The convergence of Galerkin solutions to nonlinear variational problems* (with J. Lei), J. Wuhan Univ. Natur. Sci. Ed., Vol. 1986, No. 4, pp 8 – 16, (1986)

*A simplicial algorithm and its application in solving nonlinear operator equations*, J. of Math. (PRC), 4 (1984), pp 157 – 164

## BOOKS

*Nonlinear Numerical Analysis* (with X. Huang and Y. Ma), Wuhan Univ Press, 2000  
(2<sup>nd</sup> Edition: *The Theory and Methods for Nonlinear Numerical Analysis*, 2004)

*Scientific Computing with Maple Programming* (with D. Rutschman) textbook in writing,  
preprint available at <http://www.neiu.edu/~zzeng/340/Textbook/340book.pdf>

## SOFTWARE DEVELOPMENT

<i>NAClab</i>	a comprehensive software package in Matlab platform for Numerical Algebraic computation
<i>ApaTools</i>	a comprehensive software package in Maple platform for Approximate Polynomial Algebra
<i>Apalab</i>	a comprehensive software package in Matlab platform for Approximate Polynomial Algebra
<i>MultiRoot</i>	Matlab package for computing multiple roots and the multiplicity structure without using multiprecision arithmetic even if the polynomials are perturbed.
<i>uvGCD</i>	Matlab package for computing the approximate GCD of univariate polynomials with coefficients being exact or approximate
<i>mvGCD</i>	Matlab package for computing the approximate GCD of multivariate polynomials with coefficients being exact or approximate.
<i>RankRev</i>	Matlab package for computing approximate rank and null spaces of matrices with comprehensive updating and downdating capabilities.
<i>Dspmg</i>	Fortran package for computing eigenvalues of symmetric tridiagonal matrices.
<i>dhbsv</i>	Fortran package for computing singular values of bidiagonal matrices.
<i>dsmpe</i>	Fortran package for computing generalized eigenvalues of symmetric tridiagonal matrix pencils
<i>dsmhes</i>	Fortran package for computing eigenvalues/eigenvectors of nonsymmetric matrices.

## TEACHING EXPERIENCE

### CURRICULUM DEVELOPMENT

Designed a new course, *Computing for Mathematicians*, for math majors at Northeastern Illinois University.  
A textbook “*Scientific Computing with Maple Programming*” has been in use.

### GRADUATE COURSES TAUGHT

Nonlinear Programming  
Advanced Topics in Numerical Analysis  
Mathematical Modeling

### UNDERGRADUATE COURSES TAUGHT

Computing for Mathematicians  
Numerical Analysis I  
Numerical Analysis II  
Linear Programming

Number Theory  
Ordinary Differential Equations I  
Linear Algebra I  
Linear Algebra II  
Calculus I  
Calculus II  
Calculus III  
Advanced Calculus for Engineers  
Service courses (Business Calculus, Precalculus, College Algebra, Intermediate Algebra, etc)

## SYNERGISTIC ACTIVITIES

### CONFERENCE ORGANIZATIONS:

2006 AMS-MAA-SIAM Annual Joint Mathematics Meetings, Special Session on Symbolic-Numeric Computation,  
(with A. Szanto and J. Verschelde)

2007 AMS Special Session on Numerical and Symbolic Techniques in Algebraic Geometry and Its Applications,  
(with G. Besana and J. Verschelde)

Served the Program Committee for the 2005 International Workshop on Symbolic-Numeric Computation (SNC 05)

### GRANT REVIEW PANELS

May, 2008, served NSF Grant review panel

June, 2008, served NSF Grant review panel

served as a NSF grant reviewer numerous times

### COMMITTEE CHAIRS

2007-2010 Chair of the Department Personnel Committee, Northeastern Illinois University

1998-2007 Chair of the Undergraduate Major Committee, Northeastern Illinois University

2000-2001 Chair of the Department Search and Screen Committee, Northeastern Illinois University

### ADVISING:

1998-2007 served as the Advisor to Math Majors

## GRADUATE STUDENT SUPERVISION

Lisa Blum M.S. Thesis, Northeastern Illinois University  
Vatuyi Isiktel M.S. Thesis, Northeastern Illinois University  
Gregory Werner M.S. Thesis, Northeastern Illinois University  
Matt Lathrop M.S. Thesis, Northeastern Illinois University

Served Graduate Thesis Committee for Yusong Wang (Ph.D., University of Illinois Chicago),  
Ailing Zhao (Ph.D., University of Illinois Chicago) Stephen Treharne (M.S., Northeastern Illinois University)