



# Yanlai Chen

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## Employment:

08/2007 – Now: Postdoctoral Research Associate, Division of Applied Mathematics, Brown University.

## Education:

- 09/2002 – 07/2007: Ph.D. in Applied Mathematics, School of Mathematics, University of Minnesota, Twin Cities. Major: Numerical Analysis Advisor: Prof. Cockburn, Bernardo.
- 09/2006 – 08/2007: M.S. in Computer Science, Department of Computer Science and Engineering, University of Minnesota, Twin Cities. Advisor: Prof. Roumeliotis, Stergios.
- 09/1997 – 07/2002: B.S. Department of Mathematics, University of Science & Technology of China (USTC), Hefei, China.

## Research Interests:

- Numerical Analysis, Scientific Computing, Computational Partial Differential Equations.
- Conservation Laws, Hamilton-Jacobi-like Equations and Applications.
- Discontinuous Galerkin Finite Element Methods, Adaptive Numerical Methods.
- Reduced Basis Methods, Reduced Basis Element Methods and Applications.

## Publications:

### Theses:

1. **Y. Chen**, *Some Numerical Experiments on Burgers Equation*, B.S. Dissertation, University of Science and Technology of China, May 2002.
2. **Y. Chen**, *An adaptive high order discontinuous Galerkin method with error control for the Hamilton-Jacobi equations*, Ph. D. Dissertation, University of Minnesota, July 2007.

### Papers in Refereed Journals:

1. **Y. Chen**, B. Cockburn, *An adaptive high order discontinuous Galerkin method with error control for the Hamilton-Jacobi equations. Part I : the one dimensional steady state case*. J. Comput. Phys., v 226/1 (2007), pp. 1027-1058.
2. **Y. Chen**, J.S. Hesthaven, Y. Maday, J. Rodriguez, *A Monotonic Evaluation of Lower Bounds for Inf-Sup Stability Constants in the Frame of Reduced Basis Approximations*. C. R. Acad. Sci. Paris, Ser. I 346 (2008) 1295 - 1300.
3. **Y. Chen**, J.S. Hesthaven, Y. Maday, J. Rodriguez, *Improved Successive Constraint Method Based A Posteriori Error Estimate for Reduced Basis Approximation of 2D Maxwell's Problem*. M2AN, Accepted.

### Papers Submitted:

1. **Y. Chen**, J.S. Hesthaven, Y. Maday, J. Rodriguez, *Certified Reduced Basis Methods and Output Bounds for the Harmonic Maxwell's Equations*, Submitted.

2. D.B.P. Huynh, D.J. Knezevic, **Y. Chen**, J.S. Hesthaven, A.T. Patera, *A Natural-Norm Successive Constraint Method for Inf-Sup Lower Bounds*, Submitted.

#### Papers in Preparation:

1. **Y. Chen**, B. Cockburn, *Error Analysis of HDG Methods for Convection-Diffusion Equations*. To be submitted.
2. **Y. Chen**, J.S. Hesthaven, Y. Maday, *Reduced Basis Element Methods for Electromagnetics*, In Preparation.
3. **Y. Chen**, B. Cockburn, *An adaptive high order discontinuous Galerkin method with error control for the Hamilton-Jacobi equations. Part II : the two dimensional steady state case*. In preparation.

#### Talks:

1. 7th World Congress on Computational Mechanics, Los Angeles, CA, July 16-22, 2006.
2. SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 19-23, 2007.
3. Reservoir Engineering Research Institute (RERI), March 19, 2007.
4. International Conference On Spectral and High Order Methods, Beijing, China, June 18-22, 2007.
5. Discontinuous Galerkin Methods for Partial Differential Equations, Banff International Research Station, Banff, AB, Canada. November 25 – 30, 2007.
6. Department of Mathematics, Michigan State University, April 18, 2008.
7. Finite Element Circus, Rensselaer Polytechnic Institute, Troy, NY. October 24 -25, 2008.
8. Finite Element Circus, University of Delaware, Newark, DE. April 24-25, 2009

#### Workshops:

- 2006 CNA summer School, Probabilistic and Analytical Perspectives on Contemporary PDEs, Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh, PA. May 29 - June 06, 2006.
- 2009 CBMS Conference on Adaptive Finite Element Methods for Partial Differential Equations, Texas A&M University, College Station, TX. May 18-22, 2009.

#### Awards and Honors:

- 2007:** Travel Award from MSI, GAPSA and COGS, University of Minnesota.
- 2007:** Good Teaching Award, School of Mathematics, University of Minnesota.
- 2006:** Summer School Travel Award, Center for Nonlinear Analysis, Carnegie Mellon University.
- 2006:** Travel Award, School of Mathematics, University of Minnesota.
- 1997 – 2001:** USTC Excellent Student Scholarships.

#### Research Experience and Projects:

- 08/07 – Now: **Postdoctoral Research Associate** supervised by Prof. Hesthaven, Jan and Prof. Maday, Yvon. Work on “Reduced basis method and Reduced basis element method”.  
Made major contribution to resolving the bottleneck problem of Reduced Basis Method, a method that improves the efficiency of simulating certain partial differential equations by several orders of magnitude while maintaining a sufficient accuracy prescribed beforehand by the user. The method has broad applications including optimization and control, time reversal and medical imaging. Began investigating Reduced Basis Element Method that couples domain decomposition ideas with reduced basis method to solve sophisticated problems on complicated domains.
- 06/03 – 08/03, **Research Assistant** of Prof. Cockburn, Bernardo.
- 09/05 – 12/05, Work on “Adaptive, high-order numerical methods for Hamilton-Jacobi equations”.
- 09/06 – 05/07: Developed an adaptive numerical method for Hamilton-Jacobi equations. The method

solves the equations efficiently, introduces a new idea to estimate the error and generates meshes by an adaptive algorithm that achieves any order of accuracy with strict error control and optimal computational complexity.

Spring, 2005, Computer science projects including **data exploration** (Conducted gene expression analysis by SVD/PCA), **computer networks** (Designed a peer-to-peer file sharing system and IP network emulation), **SLAM (Simultaneous Localization and Mapping)** (Developed an algorithm that achieves linear runtime on many qualitatively different data sets).  
Fall, 2005,  
Summer 2007:

### Industrial Experience:

07/05 – 08/05: **Summer Intern** at Minneapolis Consulting Group, Minneapolis, Minnesota.  
Worked with utility consultants and software developers to analyze a transmission congestion management tool in electrical networks. Built the core computing part involving data analysis and sparse matrix computation to help decision-making on efficient electricity transmission.

### Teaching Experience:

09/02 – 05/03: Grader for Basic Theory of Probability and Statistics, Introduction to Stochastic Processes and Introduction to Topology.  
09/03 – 12/03, 01/04 – 05/04: Recitation Instructor for *Calculus II*, *College Algebra and Probability* or  
09/04 – 12/04, 01/06 – 05/06: *Precalculus II*.  
01/05 – 05/05: Grader for *Mathematical Modeling and Methods of Applied Mathematics* and Tutor for undergraduate students.

### Professional Activities and Services:

**Peer Reviewing:** Journal of Scientific Computing, SIAM Journal on Scientific Computing.  
**Undergraduate Mentoring:** ALANA (African, Latino, Asian, and Native American) mentoring program 2008 - 2009, Brown University.

### Computer Skills:

- Computer literate in Windows, UNIX, and Linux. Professional experience in Latex, programming languages (C, C++, Matlab and Mathematica), computer algorithms and data structures.
- Familiarity with multiprecision computation, parallel computing, Fortran programming.