

# HONGCHAO ZHANG

*Department of Mathematics,  
Louisiana State University,  
140 Lockett Hall,  
Baton Rouge, LA 70803-4918  
Tel: 225-578-1982 (Math Office)*

*E-mail: hozhang@math.umn.edu  
Telephone: 225-578-0828 (CCT Office)  
Address (CCT): 216 Johnston Hall  
Baton Rouge, LA, 70803  
Homepage: www.math.lsu.edu/~hozhang*

---

## Education

♣ IMA, University of Minnesota, Sep. 2006–2008

Industrial Post-Doctoral Fellow

♠ IBM T. J. Watson Research Center, Sep 2006–2007

Mentor : Andrew R. Conn and Katya Scheinberg

♠ Institute for Mathematics and Its Applications (IMA), Sep 2007–2008

Annual Program : Mathematics of Molecular and Cellular Biology

♣ University of Florida (UFL) Aug. 2001–2006

Ph. D. Applied Mathematics, Aug. 2006

Department of Mathematics, Center for Applied Optimization

Advisor: William W. Hager

♣ Chinese Academy of Sciences (CAS) Sep. 1998–2001

M. S. Computational Mathematics, July 2001

Institute of Computational Mathematics and Scientific/Engineering Computing (ICMSEC), Academy of Mathematics and System Sciences (AMSS)

Advisor: Ya-xiang Yuan

♣ Shandong University (SDU) Sep. 1994–1998

B. S. Computational Mathematics, July 1998

## Research Interests

- Nonlinear Programming and its Applications
- Mixed Integer Nonlinear Programming
- Sparse Matrix Computing, Graph Partitioning
- Inverse Problems in Medical Imaging and Petrophysics

- Derivative Free Optimization

## Teaching Experiences

### Department of Mathematics, UFL

- Fall 2005, instructor of MAC2312 (*Analyt Geom & Calc 2*)
- Fall 2004, instructor of MAC2512 (*Calculus 2 for AP Student*)
- Spring and Fall 2003, discussion instructor for MAC2311 (*Analyt Geom & Calc 1*), two sections at each semester
- Fall 2002, discussion instructor for MAC1147 (*Precalc Alg & Trig*)

## Honors

- **SIAM Travel Award** , SIAM Annual Meeting, 2004
- **Keene Dissertation Fellowship** , Univ. of Florida, Spring 2006
- **SIAM best student paper prize**, 2006

## Editorship

- **Associate Editor**, *Computational Optimization and Applications (COAP)*

## Publications and Reports

### ♣ Optimization Theory and Algorithms

- *A derivative-free algorithm for the least-square minimization*, Oct., 2007, preprint. (Joint work with A. R. Conn and K. Scheinberg)
- *An affine-scaling interior-point CBB method for box constrained optimization*, Accepted October 15, 2007; To appear on *Mathematical Programming*. (Joint work with W. W. Hager and B. Mair)
- *Asymptotic convergence analysis of a new class of proximal point methods*, Accepted May 9, 2007; To appear on *Siam Journal on Control and Optimization*. (Joint work with W. W. Hager)
- *Recent advances in bound constrained optimization*, in *System Modeling and Optimization*, F. Ceragioli, A. Dontchev, H. Furuta, K. Marti, and L. Pandolfi, eds., Springer, 2006, pp. 67-82.(Joint work with W. W. Hager)
- *A new active set algorithm for large-scale bound constrained optimization*, *SIAM Journal on Optimization*, 17 (2006), pp. 526-557. (Joint work with W. W. Hager)

- A survey of the nonlinear conjugate gradient methods, *Pacific Journal of Optimization*, 2(2006), pp. 35-58, (invited paper). (Joint work with W. W. Hager)
- Self-adaptive inexact proximal point methods, Accepted June 22, 2006; To appear on *Computational Optimization and Applications*. (Joint work with W. W. Hager)
- PCBB: A projected cyclic Barzilai-Borwein algorithm for box constrained optimization, in *Multiscale Optimization Methods and Applications*, William W. Hager, P .M. Pardalos, etc. ed., 2005, pp. 215-220.
- The Cyclic Barzilai-Borwein Stepsize Method for Unconstrained Optimization, *IMA Journal of Numerical Analysis*, 26 (2006), pp.604-627. (Joint work with Y. H. Dai, W. W. Hager, K. Schittkowski)
- Algorithm 851: CG-DESCENT, A Conjugate Gradient Method with Guaranteed Descent, *ACM Transactions on Mathematical Software*, 32 (2006), pp. 113-137. (Joint work with W. W. Hager)
- A New Conjugate Gradient Method with Guaranteed Descent And An Efficient Line Search, *SIAM Journal on Optimization*, 16 (2005), pp. 170-192. (Joint work with W. W. Hager)
- A Nonmonotone Line Search Technique and its Application to Unconstrained Optimization, *SIAM Journal on Optimization*, 14 (2004), pp. 1043-1056. (Joint work with W. W. Hager)
- A nonmonotone trust region algorithm for nonlinear optimization subject to general constrains, *Journal of Computational Mathematics*, No 2, 21(2003), pp. 237-246.
- A trust region-CG algorithm for deblurring problem in atmospheric image reconstruction, *Science in China*, 45(2002), pp. 731-740. (joint work with Y. F. Wang and Y. Yuan)
- An Adaptive Two-point Stepsize Gradient Algorithm, *Numerical Algorithms* (2001), pp. 377-385. (joint work with Y. H. Dai)
- A few nonmonotone algorithms in nonlinear optimization, Master Thesis, Beijing, June, 2001

### ♣ Applications in Medical imaging, Digital communication, Graph partitioning, Petrophysics

- Affine-scaling interior-point CBB methods for maximum-likelihood reconstruction in PET imaging, July, 2007, Preprint. (Joint work with W. W. Hager and B. Mair)
- Rock physics and depositional history from seismic matching: A model study, April, 2007, *EAGA* London, England. (Joint work with S. A. Levin, U. T. Mello, V. Lopez, L. Xu, A. R. Conn and K. Scheinberg)
- Assisted seismic matching: joint inversion of seismic, rock physics and basin modeling, Sep, 2007, *SEG* San Antonio, U.S.A. (Joint work with S. A. Levin, U. T. Mello, V. Lopez, A. R. Conn, K. Scheinberg, M. Henderson and L. Xu)

- *Box Constrained Optimization for Detection of 16-QAM Signaling in MIMO Channels*, May 12, 2007, Submitted to *IEEE journal on Transaction of Signal Processing*. (Joint work with S. Park, W. W. Hager and D. S. Han)
- *Quadratic programming techniques for graph partitioning*, October 16, 2006, Submitted to *Siam Journal on Scientific Computing*. (Joint work with S. Park, W. W. Hager and A. Davis)
- *Estimation, Smoothing, and Characterization of Apparent Diffusion Coefficient Profiles from High Angular Resolution DWI*, *Proceeding of IEEE computer society conference on Computer Vision and Pattern Recognition*, CVPR'04, pp. 588-593. (Joint work with Y. Chen, W. Guo, F. Huang, Y. Liu and B. C. Vemuri )
- *Reconstruction of Apparent Diffusion Coefficient and Characterization of Anisotropy in Diffusion Weighted MRI*, Submitted to *IEEE Transactions on Medical Imaging*. (Joint work with Y. Chen, W. Guo, F. Huang, Y. Liu and B. C. Vemuri)

## Softwares

- CG\_DESCENT Version 1.1, December 10, 2004,  
A nonlinear conjugate gradient method with guaranteed descent for large-scale unconstrained optimization. (Joint work with W. W. Hager)  
User's Guide and Software are available : <http://www.math.ufl.edu/hager/papers/CG>
- PACBB Version 1.0, March 10, 2004,  
A projected adaptive cyclic Barzilai-Borwein method for large-scale box constrained optimization. (Joint work with W. W. Hager)
- CGCBB Version 1.0, April 29, 2004,  
A new active set method for large-scale bound constrained optimization. (Joint work with W. W. Hager)
- CGCBB Version 1.1, March 31, 2005,  
The CGCBB software with incomplete cholesky factorization as preconditioner for large-scale bound constrained optimization with sparse hessian.
- ASCBB Version 1.0, June 30, 2006,  
An affine-scaling interior-point cyclic Barzilai-Borwein method for box constrained optimization. (Joint work with W. W. Hager)
- QPSLCBB Version 1.0, Nov. 1st, 2006,  
An cyclic Barzilai-Borwein code for solving optimization problems with box and one linear constraint.

## Conference & Seminar Talks

- *Derivative Free Optimization*, SIAM-SEAS, Orlando, USA, March 14-15, 2008 (invited presentation)

- Applied Seminar talk, Department of Mathematics, Iowa State Univ. Nov. 10th, 2007 (invited)
- *An affine-scaling interior-point CBB algorithm and its applications*, INFORMS, Seattle, USA, Nov. 4-7, 2007 (invited presentation)
- *A derivative-free algorithm for the least square minimization*, International Conference on Numerical Linear Algebra and Optimization, Urumqi, China, Sep. 8-11, 2007 (invited presentation)
- *A derivative-free approach for the least square minimization*, International Conference on Continuous Optimization (ICCOPT) , Hamilton, Canada, Aug. 13-16, 2007 (invited presentation)
- *Gradient methods for box constrained optimization*, IBM Watson Research Center, Yorktown, New York, USA, Jan. 31st, 2007
- *Asymptotic convergence analysis of a new class of proximal point methods*, AMS annual meeting, Jan. 5-8, 2007 (invited presentation)
- *Self-adaptive inexact proximal point methods*, 19th International Symposium on Mathematical Programming, Rio de Janeiro, Brazil, Jul. 30- Aug.4, 2006 (invited presentation, session organizer)
- *New algorithms for bound constrained optimization*, SIAM Annual Meeting, Boston, USA, Jul. 10-14, 2006 (invited presentation)
- *Introduction to the nonlinear conjugate gradient methods*, Tutorial for graduate students at School of Electrical Engineering and Computer Science, Kyungpook National University, Daegu, South Korea, Jul. 2nd, 2006 (invited lecture)
- *Gradient algorithms in nonlinear optimization*, School of Electrical Engineering and Computer Science, Kyungpook National University, Daegu, South Korea, Jul. 3-8, 2006 (invited talk)
- *Recent advances on box constrained optimization*, CORS/Optimization Days 2006, Montreal, Canada, May 10-12, 2006 (invited presentation)
- *Gradient methods for Large-scale nonlinear optimization*, Dept. of Math., University of Central Florida, Orlando, USA, Feb. 2nd, 2006 (Colloquium talk)
- *A new active set method for large-scale box constrained optimization*, INFORMS Annual Meeting, San Francisco, USA, Nov. 13-16, 2005 (invited presentation)
- *Application of CBB and CG-Descent Methods to Bound Constrained Optimization*, SIAM Conference on Optimization, Stockholm, Sweden, May 15-19, 2005 (invited presentation, session organizer)
- *A New Conjugate Gradient Method with Guaranteed Descent Property*, INFORMS Annual Meeting, Denver, USA, Oct. 24-27, 2004 (invited presentation)
- *A New Conjugate Gradient method with Guaranteed Descent and Efficient Line Search*, SIAM Annual Meeting, Portland, USA, Jul. 10-16, 2004 (invited presentation )

- *PCBB: A Projected Adaptive Cyclic B-B Methods for Box Constrained Optimization*, SIAM student workshop, Gainesville, FL, Mar. 3-4, 2004 (invited presentation)
- *A nonmonotone linesearch technique and its application to unconstrained optimization* 18th International Symposium on Mathematical Programming, Copenhagen, Denmark, Aug. 18-22, 2003

### Other Professional Activities

- Referee for **Computational Optimization and Applications (COAP)**, **SIAM Journal on Optimization (SIOPT)**, **Journal of Global Optimization**, **Pacific Journal of Optimization**, **Numerical Functional Analysis and Optimization**, **Journal of Computational and Applied mathematics**, **Mathematical and Computer Modelling**, etc.
- Attending IMA Tutorial: Algebraic algorithms in optimization, Minneapolis, MN, Jan. 12-13, 2007
- Attending IMA Workshop: Optimization and control, Minneapolis, MN, Jan. 16-20, 2007
- Attending International Conference on Numerical Optimization and Numerical Linear Algebra, Lhasa China, Aug. 8-12, 2005
- Attending International Conference on Computational Management Science, Gainesville FL, Mar. 31 - Apr. 3, 2005
- Attending International Conference on Multiscale Optimization Methods and Applications, Gainesville FL, Feb. 26-28, 2004
- One of the co-organizers of SIAM student workshop, Mar.3-4, 2004
- Visiting ICMSEC, Chinese Academy of Science, Jun. 15-22, 2004; Jul. 2-7, 2005

### Professional Organizations

- Member, Society for Industrial and Applied Mathematics (SIAM)
- Member, Institute of Operations Research and Management Science (INFORMS)
- Member, Mathematical Programming Society (MPS)
- Member, American Mathematical Society (AMS)