

Stephen C. Billups

Curriculum Vitae

(February 7, 2014)

EDUCATION

<u>Institution</u>	<u>Date</u>	<u>Degree</u>	<u>Major</u>
George Mason University	1983	B.S.	Mathematics, Computer Science
Virginia Polytechnic Institute and State University	1985	M.S.	Computer Science and Applications
University of Wisconsin-Madison	1993	M.A.	Mathematics
University of Wisconsin-Madison	1995	Ph.D.	Computer Science

PROFESSIONAL EXPERIENCE

2013 – present	Associate Chair, University of Colorado Denver Department of Mathematical and Statistical Sciences
2001 - present	Associate Professor of Mathematics, University of Colorado Denver
2010	Visiting Researcher, National Renewable Energy Laboratory, Scientific Computing Center
2003 – 2009	Director, University of Colorado Center for Computational Biology
2002 – 2003	Visiting Researcher, Center for Computational Pharmacology, University of Colorado Health Sciences Center
2001 - 2002	Associate Chair, Dept. of Mathematics, University of Colorado Denver
1996 - 2001	Director, Mathematics Clinic Program, University of Colorado Denver
1995 - 2001	Assistant Professor of Mathematics, University of Colorado Denver
1991-1995	Research Assistant, Computer Sciences Department, University of Wisconsin-Madison
1989-1991	Senior Member of Technical Staff, Sandia National Laboratories, Containment Modeling Division
1985-1989	Member of Technical Staff, Sandia National Laboratories, Safety Assessment Technologies Division
1985	Research Assistant, Virginia Polytechnic Institute and State University, Computer Sciences Department
1983-1985	Teaching Assistant, Virginia Polytechnic Institute and State University, Computer Sciences Department

REFEREED JOURNAL ARTICLES

- [1] L. T. Watson, S. C. Billups, C. Y. Wang, and E. A. Everett, Slow viscous flow in a syringe, *ASME Journal of Biomechanical Engineering*, 108(1986):317-323.

- [2] L. T. Watson, S. C. Billups, and A. P. Morgan, Algorithm 652: HOMPACK: A suite of codes for globally convergent homotopy algorithms, *ACM Transactions on Mathematical Software*, 13(1987):281-310.
- [3] S. C. Billups, and M. C. Ferris, Convergence of an infeasible interior-point algorithm from arbitrary positive starting points, *SIAM Journal on Optimization*, 6(1996):316-325.
- [4] S. C. Billups, and M. C. Ferris, QPCOMP: A quadratic programming based solver for mixed complementarity problems, *Mathematical Programming*, 76(1997):533-562.
- [5] S. C. Billups, S. P. Dirkse and M. C. Ferris, A comparison of algorithms for large scale mixed complementarity problems, *Computational Optimization and Applications*, 7(1997):3-26.
- [6] S. C. Billups and M. C. Ferris, Solutions to affine generalized equations using proximal mappings, *Mathematics of Operations Research.*, 24(1999):219-236.
- [7] S. C. Billups, Improving the robustness of descent-based methods for semismooth equations using proximal perturbations, *Mathematical Programming*, 87(2000):153-175.
- [8] S. C. Billups, and K. Murty, Complementarity problems, *Journal of Computational and Applied Mathematics*, 124(2000):303-318.
- [9] S. C. Billups, A homotopy based algorithm for mixed complementarity problems, *SIAM Journal on Optimization*, 12:3(2002):583-605.
- [10] S. C. Billups and L. T. Watson, A probability-one homotopy algorithm for nonsmooth equations and mixed complementarity problems, *SIAM Journal on Optimization*, 12:3(2002): 606-626.
- [11] S. C. Billups and J. M. Kennedy, Minimum-support solutions for radiotherapy planning, *Annals of Operations Research*, 119(2003): 229-245.
- [12] E. Al-Shemas and S. C. Billups, An iterative method for set-valued nonlinear mixed quasi-variational inequalities, *Journal of Computational and Applied Mathematics*, 170(2004): 423-432
- [13] H. N. Mocan, S. C. Billups, and J. Overland, A dynamic model of differential human capital and criminal activity, *Economica*, 72(2005): 655-681.
- [14] K. Ahuja, L. T. Watson, and S. C. Billups, Probability-one homotopy maps for mixed complementarity problems, *Computational Optimization and Applications*, 41(2008): 363-375, DOI 10.1007/s 10589-007-9107-z.

- [15] S. C. Billups, M. C. Neville, M. Rudolph, P. Schedin, and W. Porter, Identifying Significant Temporal Variation in Time Course Microarray Data Without Replicates. *BMC Bioinformatics*, 2009, 10:96 doi:10.1186/1471-2105-10-96.
- [16] D. Y. Gao, L.T. Watson, D.R. Easterling, W.I. Thacker, and S. C. Billups, Solving the canonical dual of box- and integer-constrained nonconvex quadratic programs via a deterministic direct search algorithm, *Optimization Methods & Software*, 2011.
- [17] S.C. Billups, J. Larson, and P. Graf, Derivative-Free Optimization of Expensive Functions with Computational Error Using Weighted Regression. *SIAM Journal on Optimization*, 23:1(2013): 27-53.
- [18] L.T. Watson, S.C. Billups, J.E. Mitchell and D.R. Easterling, A globally convergent probability-one homotopy for linear programs with linear complementarity constraints. *SIAM Journal on Optimization*, 23:2(2013): 1167-1188.

REFEREED CONFERENCE PAPERS

- [1] S. C. Billups, A. L. Speight, and L. T. Watson, Nonmonotone path following methods for nonsmooth equations and complementarity problems, in Complementarity: *Applications, Algorithms and Extensions*, M.C. Ferris & O.L. Mangasarian & J.-S. Pang, eds., Kluwer Academic Publishers, 2001, pp 19-41.

REFEREED BOOK CHAPTERS

- [1] S. C. Billups, Optimization in medical imaging, *Encyclopedia of Optimization*, P.M. Pardalos & C.A. Floudas, (Eds.), Kluwer Academic Press, 2001, Vol. 4, pp 196-200.

NON-REFEREED PUBLICATIONS

- [1] R. A. Axline, S. C. Billups, and M. F. Grady, *Guidelines for Software Security (U)*. Technical Report SAND88-2955 (1998), Sandia National Laboratories, Albuquerque, New Mexico.
- [2] S. C. Billups, K. K. Murata, K. E. Washington, and D. L. Y. Louie, *User's Manual for CONTAIN-HWR/0, rev. 1: A computer code for the analysis of heavy water nuclear reactor containments under accident conditions*. Technical Report SAND91-1482 (1994), Sandia National Laboratories, Albuquerque, New Mexico,
- [3] S. Billups, L. Lana, P. Gee, *Clustering Gene Expression Profiles Via Permutation Vectors*, UCD/CCM Report No. 180, Center for Computational Mathematics, University of Colorado at Denver, December 2001.

PUBLICATIONS IN PREPARATION

In Review

- [1] J. Larson and S. C. Billups, Stochastic Derivative-free Optimization using a Trust-Region Framework. *Submitted to Computational Optimization and Applications.*

COURSES TAUGHT

Precalculus Mathematics
Calculus III
Linear Algebra
Differential Equations
Linear Algebra and Differential Equations
Discrete Mathematics II
Introduction to Operations Research
Optimization Modeling
Linear Programming
Advanced Linear Programming
Computational Methods in Nonlinear Optimization
Nonlinear Programming Theory
Network Flows
Integer Programming
Mathematics for Bioscientists
Computational Biology
Introductions to Real Analysis I
Math Clinic: Problems in Digital Image Processing
Math Clinic: Automatic Calibration of Water Distribution Network Models
Math Clinic: Cancer Detection via Laser Induced Fluorescence Spectroscopy
Math Clinic: Lead Compound Optimization Using Gene Expression Profiling
Math Clinic: Satellite Mission Scheduling With Dynamic Tasking
Math Clinic: Modeling of Tissue Dynamics
Math Clinic: Modeling Mutation Rates for Avian Flu Neuraminidases
Math Clinic: Simulation Optimization

PRESENTATIONS AT MEETINGS AND SEMINARS PRESENTED

- 1995 Improving the Robustness of Complementarity Solvers Using Proximal Perturbations, Invited speaker, International Conference on Complementarity Problems, Johns Hopkins University, Baltimore MD.
- 1996 Improving the Robustness of Descent Based Solvers for Nonsmooth Equations via Proximal Perturbations, presented at the Fifth SIAM Conference on Optimization in Victoria, British Columbia..
- 1996 Algorithms for Generalized Equations Involving Polyhedral Multifunctions, Invited speaker, INFORMS Fall 1996 meeting in Atlanta, GA.
- 1996 Techniques for Improving the Robustness of Solvers for Complementarity Problems, Invited speaker, INFORMS Fall 1996 meeting in Atlanta, GA.
- 1997 Medical Image Segmentation via Linear Programming, presented at the 16th International Symposium on Mathematical Programming, Lausanne Switzerland.
- 1998 Enhancing the Optical Density Range of Digital Cameras: A Mathematical Approach, Rocky Mountain Section of the MAA ColoMATYC, 1998 Annual Meeting, Arapahoe Community College, Littleton Colorado.
- 1998 A Homotopy Based Algorithm for Mixed Complementarity Problems, Invited speaker, INFORMS National Meeting, Seattle, Washington.
- 1999 Medical Image Segmentation, Presented at the Sixth SIAM Conference on Optimization, Atlanta, GA.
- 1999 A Nonmonotone Path Following Method for Complementarity Problems and Nonsmooth Equations, Invited speaker, International Conference on Complementarity Problems, University of Wisconsin, Madison WI.
- 1999 The Math Clinic Program at the University of Colorado at Denver, SIAM Math in Industry Workshop, Claremont, CA.
- 2000 A Conjugate Gradient Algorithm for Complementarity Problems, Invited speaker, 17th International Symposium on Mathematical Programming, Atlanta, GA.
- 2000 Cancer Detection Via Laser-Induced Fluorescence Spectroscopy, INFORMS National Meeting, San Antonio, Texas.

- 2000 Complementarity Problems, Tutorial Speaker, INFORMS National Meeting, Miami Beach, Florida
- 2001 Feasible Homotopy Methods for Complementarity Problems, Invited speaker, INFORMS National Meeting, Miami Beach Florida.
- 2001 Minimum Support Solutions for Radiotherapy Treatment Planning, Invited speaker, National Cancer Institute/National Science Foundation Workshop on Radiation Treatment Planning.
- 2003 Clustering Gene Expression Data Using Independent Component Analysis, Sixth IMACS International Symposium on Iterative Methods, Denver, Colorado, March, 2003.
- 2003 Clustering Gene Expression Data Using Independent Component Analysis, Invited speaker, INFORMS National Meeting, Atlanta, Georgia, October, 2003.
- 2004 Clustering Gene Expression Time Series Data, INFORMS National Meeting, Denver, Colorado, October 2004.
- 2004 A New Algorithm for Clustering Noisy Temporal Data into Coherent Expression Patterns: Analysis of Changes in Mammary Gene Expression During the Estrus Cycle in the Rat. Butcher Symposium, Broomfield, Colorado, November, 2004. (with Zach Fiorelli, Michael Rodolph, Pepper Schedin, and Margaret C. Neville).
- 2004 An Algorithm for Clustering Noisy Temporal Gene Expression Data, 2nd Annual Rocky Mountain Regional Bioinformatics Conference, Aspen, Colorado, December, 2004.
- 2005 Bridge Courses for Cross-Training Between Biology, Computer Science, and Mathematics, Invited speaker, DIMACS High School Student Research Conference, Rutgers University, April, 2005.
- 2005 Analysis of Phylogenetic Trees and Algorithms. Invited speaker, Bio-Math Connect Institute, Rutgers University, July, 2005.
- 2005 Clustering Gene Expression Time Series Data. Invited speaker, Center for Computational Pharmacology, UCDHSC, School of Medicine. Sept, 2005.
- 2005 Identifying Temporally Dependent Variation in Noisy Gene Expression Data Without Replicates, 3rd Annual Rocky Mountain Regional Bioinformatics Conference, Aspen, Colorado, December, 2005.
- 2006 Analyzing Time Course Gene Expression Data. Invited speaker, Bio-Math Connect Institute, Colorado Institute of Technology, July 2006.

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- 2006 Satellite Mission Scheduling With Dynamic Tasking, INFORMS National Meeting, Pittsburgh, PA, October 2006.
- 2006 Analyzing Time Course Microarray Data With Temporal Uncertainty, 4th Annual Rocky Mountain Regional Bioinformatics Conference, Aspen, Colorado, December, 2006.
- 2007 Analyzing Time Course Microarray Data With Temporal Uncertainty. Presented at the Sixth Annual Graybill Conference, Fort Collins, CO, June 2007. (invited talk).
- 2007 Analyzing Gene Expression Microarray Data. Presented at MATHFEST, San Jose, CA, August, 2007. (invited talk)
- 2007 Analyzing Time Course Microarray Data With Temporal Uncertainty. INFORMS Annual Meeting, Seattle WA, November, 2007.
- 2009 ISPCA: A Sparse-PCA Solver. Presented at the International Symposium on Mathematical Programming, Chicago Illinois, August, 2009. (with Changhui Choi).
- 2009 Mathematics of Musical Intervals. Presented for RM-MSMSP summer course titled Math & Science of Musical Instruments, July 2009.
- 2010 Derivative-Free Optimization of Expensive Functions with Errors Using Weighted Regression. INFORMS Annual meeting, Austin TX, November, 2010.
- 2012 Managing the Trust Region and Sample Set for Regression Model Based Methods for Optimizing Noisy Functions Without Derivatives. Invited speaker, International Symposium on Mathematical Programming, Berlin Germany, August 2012. (with Jeff Larson).

RECOGNITIONS, HONORS, ETC.

Nominated for College of Liberal Arts and Sciences Teaching Excellence Award, 1998, 1999, 2000

Who's Who Among America's Teachers, 1998

University of Colorado at Denver, Junior Faculty Development Award, Spring 1998

University of Colorado at Denver College of Liberal Arts and Sciences Summer Research Stipend, 1997

Wisconsin Alumni Research Foundation Fellowship, 1991

Virginia Tech Math Scholarship Exam: Eighth place in 1982, fifth place in 1981

Putnam Mathematics Competition: top 100 nationally, 1980

George Mason University Mathematics Scholarship, 1980-1981

Virginia Mathematics League: State Champion, 1979-1980

PROFESSIONAL ORGANIZATIONS

Society for Industrial and Applied Mathematics
Mathematical Programming Society
Institute for Operations Research and Management Sciences
International Society for Computational Biology

OTHER INDICATORS OF SCHOLARSHIP

Grants

- 1997 Vexcel Imaging Corporation: Math Clinic--Problems in Digital Image Processing, \$7,500.
- 1998 Denver Water: Math Clinic--Automatic Calibration of Water Distribution Network Models, \$15,000.
- 1999 Optical Biospy Technologies: Math Clinic--Cancer Detection via Laser induced Fluorescence Spectroscopy, \$18,794.
- 1999 National Science Foundation, Computational Mathematics Division: Algorithms for Nonsmooth Equations, Grant DMS-9983321, \$100,000.
- 1999 ADA Technologies: Math Clinic—Artificial Life Simulation, with William Briggs, \$15,000.
- 2000 Lockheed Martin: Math Clinic—Survivability of Mars Landers on Rocky Terrain, with Karen Kafadar, \$15,000.
- 2001 National Science Foundation, Acquisition of a High-Performance Parallel Computer for Mathematical Sciences and Applications, Grant DMS-0079719, with Andrew Knyazev (PI), Jan Mandel, Lynn S. Bennethum, and Thomas F. Russell, \$100,000.
- 2001 Xenometrix, Inc. Math Clinic—Lead Compound Optimization Using Gene Expression Profiling. \$500.
- 2003 University of Colorado Butcher Award, Time Series Analysis of Hormone Dependent Phasic Variation in the Endometrium, with Margaret Neville, University of Colorado Health Sciences Center, \$98,025.
- 2003 Colorado Institute of Technology Equipment Grant, Computer Hardware Infrastructure for Computational Biology and Mathematics. (with Jan Mandel (PI)).
- 2004 Colorado Institute of Technology, CIT-CCHE Education and Research Program, Undergraduate Programs in Bioinformatics, \$164,351. (with Gerald Audesirk (PI) and Krzysztof Cios).
- 2005 Raytheon: Math Clinic – Satellite Mission Scheduling with Dynamic Tasking, \$15,000

2006 Raytheon: Math Clinic – Satellite Mission Scheduling with Dynamic Tasking,
\$15,000

SERVICE

Department of Mathematical and Statistical Sciences

2013-present	Associate Chair
2003-present	Graduate Committee (Chair, 2006-2009, 2011-present)
2008-present	Post-Tenure Review Committee
2005-present	Executive Committee
2005	Bylaws Committee
2001-2002, 2010	Associate Chair
2001-2003	Intermath Committee
2001-2002	Chair Search Committee
2003-present	Linear Algebra Preliminary Exam Committee, (chair: 2005-2006, May 2007).
2001-2002	Undergraduate Committee
1996-2001	Director, Mathematics Clinic Program
1997, 2000, 2002, 2005, 2008	Merit Committee
1997	Linear Algebra Textbook Committee
1997,2005-present	Faculty Search Committees
1996-present	Coordinator of Optimization Seminar (alternate years).

College of Liberal Arts and Sciences

2012-present	CLAS Council
2007-2008	Dean's Search Committee
2006-2007	CLAS Statistics Search Committee (co-chair)
2006-2007	Strategic Planning Committee
2005	Sciences planning subcommittee on Systems Biology
2003-2004	Dean's Committee on Computational Biology
1998	CLAS Curriculum and Employment Working Group

University of Colorado

2013-present	Equity in Excellence Committee
2008-2009	Faculty Assembly
2007-2009	Graduate School Rules Consolidation Committee
2006-2009	PhD director's committee
2005-2009	Advisory Board for the Computational Bioscience Program at UCD School of Medicine
2003-2009	Director, Center for Computational Biology
2003-2004	Strategic Action Committee
2004-2005	Academic Master Planning Search Conference Participant

State of Colorado

2001 Colorado Commission on Higher Education Core Curriculum Working Group on Mathematics

Professional Associations

2012-present Treasurer, Rocky Mountain Chapter of INFORMS

2000-present Reviewer for American Mathematical Society Reviews

1995-present Referee for
Linear Algebra and Its Applications
Mathematical Programming
Optimization Methods and Software
SIAM Journal on Control and Optimization
SIAM Journal on Optimization
Computers and Mathematics with Applications
Optimization and Engineering
Optimization

2003-2005 Co-chair of the Rocky Mountain Regional Bioinformatics Conferences, held annually in Aspen, Colorado.

2001-2004 Secretary/Treasurer, Optimization Section of INFORMS.

2003 Panel Reviewer for National Science Foundation SBIR/STTR Phase I: Biological Informatics.

2002 Co-chair of the 6th IMACS International Symposium on Iterative Methods in Scientific Computing.

1999-2001 Vice Chair for Linear Programming and Complementarity, Optimization Section of INFORMS.