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RESEARCH INTERESTS

fast numerical algorithms for scientific computing; parallel algorithms; integral and differential equations; inverse problems; complex fluids; soft tissue and cardiovascular mechanics; medical image analysis; parallel algorithms for computational statistics

EDUCATION

- **PhD, Computational Science and Engineering** **Carnegie Mellon**, September 2000
Thesis: *Parallel Algorithms for PDE-Constrained Optimization and Applications to Optimal Control of Viscous Flows* (Advisor: Omar Ghattas)
- **MS, Biomedical Engineering** **Carnegie Mellon**, December 1996
Thesis: *2D Contour Smoothing and Surface Reconstruction of Tubular Anatomical Structures*
- **BS, Mechanical Engineering** **Aristotle University, Greece**, June 1995
Thesis: *An Expert System for Machinery Maintenance Using Temperature and Vibration Monitoring*

POSITIONS

- **Professor** **The University of Texas at Austin**, August 2011–
W. A. "Tex" Moncrief Chair in Simulation-Based Engineering Sciences
Institute for Computational Engineering and Sciences
Cockrell School of Engineering, Mechanical Engineering
School of Arts and Sciences, Computer Science (by courtesy)
- **Associate Professor** **Georgia Tech**, September 2008–2011
College of Computing, Computational Science and Engineering
College of Engineering, Biomedical Engineering (secondary appointment)
- **Assistant Dean for Technology Infrastructure** **Georgia Tech**, May 2009–May 2010
College of Computing
- **Adjunct Associate Professor** **University of Pennsylvania**, September 2008–
Department of Mechanical Engineering and Applied Mechanics
- **Assistant Professor** **University of Pennsylvania**, September 2003–2008
Department of Mechanical Engineering and Applied Mechanics
Department of Computer and Information Science (Secondary appointment)
Department of Bioengineering (Secondary appointment)
- **Postdoctoral Associate** **Courant Institute**, September 2000–August 2003

AWARDS/HONORS

- 2013 Hans Fischer Junior Fellow,
Institute for Advanced Study, Technische Universität München
- IEEE/ACM SC10, Gordon Bell Prize
- Offered Chair of Computational Science & Engineering at the Department of Informatics,
ETH Zurich, Switzerland, 2010 (declined)
- Georgia Tech 2010 Hesburgh Award Teaching Fellow
- IEEE/ACM SC09, Best Technical Paper Finalist

- Physical Review Letters 103(18), 2009, Highlight and Cover (<http://physics.aps.org/articles/v2/89>)
- IEEE/ACM SC07, Best Student Paper Finalist (advisor)
- 2006, 2008 J. Tinsley Oden Faculty Fellowship, University of Texas, Austin
- 2005 Early Career Young Investigator Award, U.S. Department of Energy
- IEEE/ACM SC03, Gordon Bell Prize for Special Achievement
- IEEE/ACM SC03, Best Student Paper (co-advisor)
- IEEE/ACM SC02, Best Technical Paper
- Fulbright Foundation Award (1995)
- Triandafylou Award for Graduate Studies (1995)
- Bodosakis Award for Academic Excellence (1995)

PEER-REVIEWED ARTICLES

- JOURNAL PUBLICATIONS
 1. W. B. MARCH, B. XIAO, AND G. BIROS, *ASKIT: Approximate Skeletonization Kernel-Independent Treecode in High Dimensions*, SIAM Journal on Scientific Computing, in review
<http://arxiv.org/abs/1410.0260>
 2. W. B. MARCH AND G. BIROS, *Far-Field Compression for Fast Kernel Summation Methods in High Dimensions*, SIAM Journal on Scientific Computing, in review
<http://arxiv.org/abs/1409.2802>
 3. A. MANG AND G. BIROS, *An inexact Newton-Krylov algorithm for constrained diffeomorphic image registration*, SIAM Journal on Imaging Science, in review
<http://arxiv.org/abs/1408.6299>
 4. A. GHOLAMI, A. MANG, AND G. BIROS, *Image-driven parameter estimation for low grade gliomas*, Journal of Mathematical Biology, in review
<http://arxiv.org/pdf/1408.6221v1>

5. A. GHOLAMI, D. MALHOTRA, H. SUNDAR, AND G. BIROS, *FFT, FMM, or multigrid? A comparative study of state-of-the-art Poisson solvers*, SIAM Journal on Scientific Computing, in review
<http://arxiv.org/abs/1408.6497>
6. H. SUNDAR, G. STADLER AND G. BIROS, *Comparison of Multigrid Algorithms for High-order Continuous Finite Element Discretizations*, Linear Algebra and its applications, in review
<http://arxiv.org/abs/1402.5938>
7. D. MALHOTRA AND G. BIROS, *PvFMM: A distributed memory fast multipole method for volume potentials*, ACM Transactions on Mathematical Software,
padas.ices.utexas.edu/static/papers/pvfmm.pdf
8. B. XIAO AND G. BIROS, *A High-dimensional Kernel Density Estimation-based likelihood function for Bayesian image segmentation*, in review
9. B. QUAIFFE AND G. BIROS, *High-volume fraction simulations of two-dimensional vesicle suspensions*, Journal on Computational Physics, 274, 2014
<http://dx.doi.org/10.1016/j.jcp.2014.06.013>
10. B. QUAIFFE AND G. BIROS, *On preconditioners for the Laplace double-layer in 2D*, Numerical Linear Algebra with Applications, 2014
<http://dx.doi.org/10.1002/nla.1940>
11. I. LASHUK AND A. CHANDRAMOWLISHWARAN AND H. LANGSTON AND R. SAMPATH AND A. SHRINGARPURE AND R. VUDUC AND L. YING AND D. ZORIN AND G. BIROS, *A massively parallel adaptive fast multipole method on heterogeneous architectures*, Communications of the ACM, 55(5), pp. 1–9, 2012 (**Research highlight, by invitation only**)
<http://dx.doi.org/10.1145/2160718.2160740>
12. S. CHAILLAT AND G. BIROS, *FaIMS: A fast algorithm for the inverse medium problem with multiple frequencies and multiple sources for the scalar Helmholtz equation*, Journal on Computational Physics, 231(20), pp. 4403–4421, 2012
<http://dx.doi.org/10.1016/j.jcp.2012.02.006>
13. W. ZHU AND S.H. KANG AND G. BIROS, *A geodesic-active-contour-based variational model for short-axis cardiac MR image segmentation*, International Journal of Computer Mathematics, pp. 1–16, 2012
14. A. GOOYA AND K. POHL AND M. BILELLO AND L. CIRILLO AND G. BIROS AND E. MELHEM AND C. DAVATZIKOS, *GLISTR: Glioma Image Segmentation and Registration*, IEEE Transactions on Medical Imaging, pp. 1–20, 2012
<http://dx.doi.org/10.1109/TMI.2012.2210558>

15. B. KAOUI AND N. TAHIRI AND T. BIBEN, AND H. EZ-ZAHRAOUI AND A. BENYOUSSEF AND G. BIROS AND C. MISBAH, *Complexity of vesicle microcirculation*, Physical Review E 84 (4), 2011
16. R.S. SAMPATH AND G. BIROS, *A multigrid-accelerated parallel Gauss-Newton-Krylov algorithm for elastic registration*, pp. 1–33, in review
17. A. RAHIMIAN AND T. LOYSEL AND G. BIROS, *Vesicle collisions in shear flow*, pp. 1–4, in review
18. S.K. VEERAPANENI, AND G. BIROS, *Arbitrary-order accurate schemes for computing boundary heat potentials in complex geometries*, pp. 1–25, in review
19. S.S. ADAVANI AND G. BIROS, *Fast algorithms for inverse problems with parabolic PDE constraints*, pp. 1–21, in review
20. S.K. VEERAPANENI, A. RAHIMIAN, G. BIROS, AND D. ZORIN, *A fast algorithm for simulating vesicle flows in three dimensions*, Journal of Computational Physics, 230 (14), pp. 5610–5634, 2011
21. G. GHIGLIOTTI, A. RAHIMIAN, G. BIROS, AND C. MISBAH, *Vesicle migration and spatial organization driven by flow line curvature*, pp. 1–4, Physical Review Letters, 106, 2011
22. A. GOOYA, G. BIROS AND C. DAVATZIKOS, *Deformable Registration of Glioma Images Using EM Algorithm and Diffusion Reaction Modeling*, IEEE Transactions on Medical Imaging, 99, pp. 1–20, 2011
23. A. RAHIMIAN, S.K. VEERAPANENI, AND G. BIROS, *2D dynamic simulation of locally inextensible vesicles suspended in an arbitrary domain*, Journal of Computational Physics, 229 (18), pp. 6466–6484, 2010
24. R. SAMPATH AND G. BIROS, *A parallel geometric multigrid method for finite elements on octree meshes*, SIAM Journal on Scientific Computing, 32 (3), pp. 1361–1392, 2010
25. S.S. ADAVANI AND G. BIROS, *Fast algorithms for source identification problems with elliptic PDE constraints*, SIAM Journal on Imaging Sciences, 3 (4), pp. 791–808, 2010
26. B. KAOUI, G. BIROS, AND C. MISBAH, *Why do red blood cells have asymmetric shapes even in a symmetric flow?*, Physical Review Letters, 103(18), 2009
27. S.K. VEERAPANENI, D. GUEYFFIER, G. BIROS, AND D. ZORIN, *A numerical method for simulating the dynamics of 3D axisymmetric vesicles suspended in viscous flows*, Journal of Computational Physics, 228 (19), pp. 7233–7249, 2009
28. S.K. VEERAPANENI, R. RITWIK, G. BIROS, AND P.K. PUROHIT, *Analytical and numerical solutions for shapes of quiescent 2D vesicles*, International Journal of Non-Linear Mechanics, 44, pp. 257–262, 2009

29. S.K. VEERAPANENI, D. GUEYFFIER, D. ZORIN, AND G. BIROS, *A boundary integral method for simulating the dynamics of inextensible vesicles suspended in a viscous fluid in 2D*, Journal of Computational Physics, 228 (7), pp. 2334–2353, 2009
30. C. HOGEA, C. DAVATZIKOS, AND G. BIROS, *Brain-Tumor Interaction Biophysical Models for Medical Image Registration*, SIAM Journal on Scientific Computing, 30 (6), pp. 3050–3072, 2008
31. G. BIROS AND G. DOĞAN, *A multilevel algorithm for inverse problems with elliptic PDE constraints*, Inverse Problems, 24(3), pp. 1–19, 2008
32. H. SUNDAR, R.S. SAMPATH, AND G. BIROS, *Bottom-Up Construction and 2:1 Balance Refinement of Linear Octrees in Parallel*, SIAM Journal on Scientific Computing, 30(5), pp. 2675–2708, 2008
33. S.K. VEERAPANENI AND G. BIROS, *The Spectral Fast Gauss and Nonuniform Fast Fourier Transforms and their application to the evaluation of volume heat potentials*, Journal of Computational Physics, 227(16), pp. 7768–7790, 2008
34. S.S. ADAVANI AND G. BIROS, *Multigrid solvers for inverse problems with parabolic PDE constraints*, SIAM Journal on Scientific Computing, 31(1) pp. 369–397, 2008
35. C. HOGEA, C. DAVATZIKOS, AND G. BIROS, *An image-driven parameter estimation problem for a reaction-diffusion glioma growth model with mass effects*, Journal of Mathematical Biology, 56(6), pp. 793–825, 2008
36. E. ZACHARAKI, C. HOGEA, G. BIROS, AND C. DAVATZIKOS, *A comparative study of biomechanical simulators in deformable registration of brain tumor images*, IEEE Transactions in Biomedical Engineering, 55(3), pp. 1233–1236, 2008
37. C. HOGEA, G. BIROS, F. ABRAHAM, AND C. DAVATZIKOS, *A robust framework for soft tissue simulations with application to modeling brain tumor mass-effect in 3D MR images*, Physics in Medicine and Biology, 52, pp. 6893–6908, 2007
38. S.K. VEERAPANENI AND G. BIROS, *A fast high-order integral equation solver for the heat equation with moving boundaries in 1D*, SIAM Journal on Scientific Computing, 29(6), pp. 2581–2606, 2007
39. L. YING, G. BIROS AND D. ZORIN, *A high-order 3D boundary integral equation solver for elliptic PDEs with smooth boundaries*, Journal of Computational Physics, 219, pp. 247–275, 2006
40. G. BIROS AND O. GHATTAS, *Parallel Lagrange-Newton-Krylov-Schur methods for PDE-constrained optimization Part I: The Krylov-Schur solver*, SIAM Journal on Scientific Computing, 27(2), pp. 687–713, 2005

41. G. BIROS AND O. GHATTAS, *Parallel Lagrange-Newton-Krylov-Schur methods for PDE-constrained optimization. Part II: The Lagrange-Newton solver and its application to optimal control of steady viscous flows*, SIAM Journal on Scientific Computing, 27(2), pp. 714–739, 2005
42. L. YING, G. BIROS AND D. ZORIN, *A kernel-independent adaptive fast multipole algorithm in two and three dimensions*, Journal of Computational Physics, 196(2), pp. 591–626, 2004
43. G. BIROS, L. YING AND D. ZORIN, *A fast solver for the Stokes equations with distributed forces in complex geometries*, Journal of Computational Physics, 193(1), pp. 317–348, 2003
44. V. AKÇELİK, G. BIROS, O. GHATTAS, K.R. LONG, B. VAN BLOEMEN WAANDERS, *A Variational Finite Element Method for Source Inversion for Convective-Diffusive Transport*, Finite Elements in Analysis and Design, 39, pp. 683–705, 2003,

- REFEREED CONFERENCE PUBLICATIONS

1. AHMED KHAWAJA, JIAJUN WANG, DHAIRYA MALHOTRA, ANDREAS GERSTLAUER, GEORGE BIROS AND LIZY JOHN, *Performance Analysis of HPC Applications with Irregular Tree Data Structures*, Proceedings of the 20th IEEE International Conference on Parallel and Distributed Systems (ICPADS 2014), IEEE, Hsinchu, Taiwan, December 2014
2. DHAIRYA MALHOTRA, AMIR GHOLAMI, AND GEORGE BIROS, *A volume integral equation Stokes solver for problems with variable coefficients*, Proceedings of SC2014, IEEE/ACM, New Orleans, LA, November 2014, (**Best Student Paper Finalist**)
3. HARI SUNDAR, DHAIRYA MALHOTRA, AND GEORGE BIROS, *HykSort: a new variant of hypercube quicksort on distributed memory architectures*, ACM International Conference on Supercomputing, Eugene, Oregon, June 2013
4. D. ALLAIRE AND G. BIROS AND J. CHAMBERS AND O. GHATTAS AND D. KORDONOWY AND K. WILLCOX, *Dynamic Data Driven Methods for Self-aware Aerospace Vehicles*, Proceedings of the International Conference on Computational Science, pp. 1–11, ICCS 2012, Omaha, NE, June 2012
5. H. SUNDAR AND G. BIROS AND C. BURSTEDDE AND J. RUDI AND O. GHATTAS AND G. STADLER, *Parallel Geometric Multigrid Methods on Unstructured Forests of Octrees*, Proceedings of SC2012, IEEE/ACM, Salt Lake City, UT, November 2012
6. A. RAHIMIAN AND I. LASHUK AND S.K. VEERAPANENI AND A. CHANDRAMOWLISHWARAN AND D. MALHOTRA AND L. MOON AND R. SAMPATH AND A. SHRINGARPURE AND J. VETTER

- AND R. VUDUC AND D. ZORIN AND G. BIROS, *Petascale direct numerical simulation of blood flow on 200K cores and heterogeneous architectures*, Proceedings of SC2010, IEEE/ACM, New Orleans, LA, November 2010, (**Gordon Bell Prize**)
7. A. GOOYA, G. BIROS AND C. DAVATZIKOS, *An EM Algorithm for Brain Tumor Image Registration: a Tumor Growth Modeling Based Approach*, Proceedings on Computer Vision and Pattern Recognition (CVPR), IEEE, San Francisco, CA, June 2010
 8. A. CHANDRAMOWLISHWARAN AND S. WILLIAMS AND L. OLIKER AND I. LASHUK AND G. BIROS AND R. VUDUC, *Optimizing and Tuning the Fast Multipole Method for State-of-the-Art Multicore Architectures*, Proceedings of IPDPS 2010, IEEE, Atlanta, GA, April 2010
 9. I. LASHUK, A. CHANDRAMOWLISHWARAN, H. LANGSTON, T-A. NGUYEN, R. SAMPATH, A. SHRINGARPURE, R. VUDUC, L. YING, D. ZORIN, AND G. BIROS, *A massively parallel adaptive fast-multipole method on heterogeneous architectures*, Proceedings of SC2009, IEEE/ACM, Seattle, WA, November 2009, (**Best Technical Paper Finalist**)
 10. G. GHIGLIOTTI, H. SELMI, B. KAOU, G. BIROS, AND C. MISBAH, *Dynamics and rheology of highly deflated vesicles*, European Series in Applied and Industrial Mathematics Proceedings, Vol 7, 2009
 11. H. SUNDAR, C. DAVATZIKOS, AND G. BIROS, *Biomechanically-Constrained 4D Estimation of Myocardial Motion*, Proceedings of MICCAI 2009, London, UK, October 2009
 12. E.G. MENDIZABAL-RUIZ, G. BIROS, AND I.A. KAKADIARIS, *An inverse scattering algorithm for the segmentation of the luminal border on intravascular ultrasound data*, Proceedings of MICCAI 2009, London, UK, October 2009
 13. R.S. SAMPATH, H. SUNDAR, I. LASHUK, AND G. BIROS, *Dendro: Parallel algorithms for multigrid and AMR methods on 2:1 balanced octrees*, Proceedings of SC2008, IEEE/ACM, Austin, TX, November 2008,
 14. H. SUNDAR, R.S. SAMPATH, C. DAVATZIKOS, AND G. BIROS, *Low-constant Parallel Algorithms for Finite Element Simulations using Linear Octrees*, Proceedings of SC2007, IEEE/ACM, Reno, NV, November 2007, (**Best Student Paper Finalist**)
 15. C. HOGEA, C. DAVATZIKOS, AND G. BIROS, *Glioma growth and mass effect in 3D images*, Proceedings of MICCAI, 2007
 16. H. SUNDAR, D. SHEN, G. BIROS, C. XU, AND C. DAVATZIKOS, *Robust estimation of Mutual Information using Spatially Adaptive Meshes*, Proceedings of MICCAI 2007, Brisbane Australia, October 2007

17. C. HOGEA, G. BIROS, F. ABRAHAM, AND C. DAVATZIKOS, *A Framework for Soft Tissue Simulations with Application to Modeling Brain Tumor Mass-Effect in 3D Images*, Computational Biomechanics for Medicine: a MICCAI 2006 workshop, Copenhagen, Denmark, October 2006
18. H. SUNDAR, D. SHEN, G. BIROS, H. LITT, AND C. DAVATZIKOS, *Estimating myocardial fiber orientation by template warping*, IEEE International Symposium on Biomedical Imaging, Arlington, Virginia, USA, 2006
19. V. AKCELİK, G. BIROS, A. DRAGENESCU, J. HILL, O. GHATTAS, AND B. VAN BLOEMEN WAANDERS, *Inversion of airborne contaminants in a regional model*, Proceedings of ICCS 2006, Springer Lecture Notes in Computer Science, volume 3993, 2006
20. V. AKCELİK, G. BIROS, A. DRAGENESCU, J. HILL, O. GHATTAS, AND B. VAN BLOEMEN WAANDERS, *Dynamic data-driven inversion for terascale simulations: Real-time identification of airborne contaminants*, Proceedings of SC2005, IEEE/ACM, Seattle, WA, November 2005
21. L. YING, G. BIROS, D. ZORIN, AND H. LANGSTON, *A parallel kernel independent fast multipole method*, Proceedings of SC2003, ACM/IEEE Computer Society, Phoenix, Arizona, 2003 (**Best Student Paper Award, Gordon Bell Prize Finalist, Best Technical Paper Award**)
22. V. AKÇELİK, J. BIELAK, G. BIROS, I. EPANOMERITAKIS, A. FERNANDEZ, O. GHATTAS, E.J. KIM, DÓ'HALLARON, AND T. TU, *High-resolution forward and inverse earthquake modeling on terascale computers*, Proceedings of SC2003, ACM/IEEE Computer Society, Phoenix, Arizona, 2003 (**Gordon Bell Prize**)
23. V. AKÇELİK, G. BIROS, AND O. GHATTAS, *Parallel multiscale Gauss-Newton-Krylov methods for inverse wave propagation*, Proceedings of SC2002, Baltimore, Maryland, ACM/IEEE Computer Society, November 2002 (**Best Technical Paper Award**)
24. G. BIROS AND O. GHATTAS, *Parallel SQP algorithms for PDE-constrained optimization*, Proceedings of SC99, ACM/IEEE Computer Society, Portland, Oregon, 1999
25. G. BIROS, L. YING AND D. ZORIN, *The Embedded Boundary Integral Method for the Incompressible Navier-Stokes Equations*, Proceedings of the International Association for Boundary Element Methods Symposium, University of Texas at Austin, Austin TX, May 2002,

- INVITED PAPERS/BOOK CHAPTERS

1. B. QUAIFFE AND G. BIROS *High-order adaptive time stepping for vesicle suspensions with viscosity contrast*, in proceedings of IUTAM Symposium on Dynamics of Capsules,

- Vesicles and Cells in Flow, Anne-Virginie Salsac, Mark Blyth, and Dominique Barthes-Biesel, eds, Elsevier, 2014
2. A. RAHIMIAN AND S.K. VEERAPANENI AND D. ZORIN AND G. BIROS, *Dynamics of inextensible Vesicles Suspended in a Confined Two-Dimensional Stokes Flow*, in *Frontiers in Applied and Computational Mathematics Proceedings*, D. Blackmore, A. Bose, and P. Petropoulos, eds, Word Scientific, 2008
 3. V. AKCELIK, G. BIROS, O. GHATTAS, J. HILL, D. KEYES, AND B. VAN BLOEMEN WAANDERS, *Parallel algorithms for PDE-constrained optimization*, in *Parallel Processing for Scientific Computing*, M. Heroux, P. Raghavan, and H. Simon, eds, SIAM, 2006.
 4. G. BIROS AND O. GHATTAS, *Inexactness issues in Lagrange-Newton-Krylov-Schur methods for PDE-constrained optimization*, *Proceedings of the First Sandia Workshop in Large-Scale PDE-Constrained Optimization*, Springer Lecture Notes in Computational Science and Engineering, 30, 2003
 5. G. BIROS AND O. GHATTAS, *A Lagrange-Newton-Krylov-Schur method for PDE-constrained optimization*, *SIAG/OPT News and Views*, SIAM, Vol.11, No. 2, August 2000
 6. G. BIROS AND O. GHATTAS, *Parallel domain decomposition methods for optimal control of viscous incompressible flows*, A. Ecer and D. Emerson, eds., *Parallel Computational Fluid Dynamics '99*, North Holland, 1999

TECHNICAL REPORTS

1. G. BIROS, L. YING AND D. ZORIN, *The Embedded Boundary Integral method for the unsteady incompressible Navier-Stokes equations*, Technical Report TR2003-838, Courant Institute of Mathematical Sciences, New York NY, 10012

INVITED TALKS

1. G. BIROS, *N-body methods in computational science and engineering*, in *Minisymposium: Fast Multipole Methods Maturing at 30 years*, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015
2. G. BIROS, *A fast N-body algorithm for kernel sums in high dimensions*, in *Minisymposium: UQ in Large Scale Computing*, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015

3. G. BIROS, *Toward black-box simulation of transport phenomena for particulate flows*, Symposium on Dynamics of Capsules, Vesicles and Cells in Flow, Compiègne, France, July 2014
4. G. BIROS, Fast algorithms for the evaluation for volume integral equations on hybrid architectures, **Keynote** Workshop: Exploiting Different Levels of Parallelism for Exascale Computing, ACM International Conference on Supercomputing, Munich, Germany, June 2014
5. G. BIROS, *N-body algorithms in computational science and engineering*, Institute for Advanced Studies Colloquium, Technical University of Munich, Munich, Germany, June 2014
6. G. BIROS, *Fast algorithms for problems in biomechanics and medical imaging*, Computational Science and Engineering Colloquium, Technical University of Munich, Munich, Germany, June 2014
7. G. BIROS, *Parallel hierarchical algorithms for volume integral equations*, Scalable Hierarchical Algorithms for eXtreme Computing-2 Workshop, King Abdullah University of Science and Technology, Saudi Arabia, May 2014
8. G. BIROS, *Scalable Nearest Neighbor Search Algorithms in High Dimensions*, Data-centered and Grid-based Non-parametric Probability Density Estimation minisymposium, SIAM Conference on Uncertainty Quantification, Savannah, GA, March 2014
9. *Scalable algorithms for the evaluation of volume potentials*, University of Michigan, Colloquium series, Department of Mathematics, Ann Arbor, MI, March 2014
10. *A Volume Integral Equation Solver for Boundary Value Problems with Highly Heterogeneous Coefficients*, (PhD student Dhairya Malhotra presented), 16th SIAM Conference on Parallel Processing for Scientific Computing, Portland, OR, February 2014
11. *Kernel density estimation algorithms for the construction of likelihood and prior densities for Bayesian inverse problems*, DOE Applied Mathematics PI meeting, Albuquerque, NM, August 2013
12. *Parallel, fmm-accelerated, FaIMS for inverse scattering*, AFOSR Computational Mathematics PI meeting, Washington, DC, July 2013
13. *N-body algorithms in computational physics and statistical inference*, Department of Informatics Colloquium, Technical University of Munich, Munich, Germany, June 2013

14. *Supervised learning algorithms for construction of likelihood and prior densities for Bayesian inverse medium problems*, Workshop on large-scale inverse problems and quantification of uncertainty: big data meets big models, Santa Fe, NM, May 2013
15. *N-body algorithms for multiscale simulations*, Annual Research Symposium Keynote, University of Illinois at Urbana-Champaign, Urbana, IL, April 2013
16. *H-FaIMS: A hierarchical fast inverse medium solver*, SIAM Conference on Computational Science and Engineering, Boston, MA, February 2013
17. *Fast algorithms for biophysics-based medical image analysis*, SIAM Annual Meeting, Minneapolis, MN, July 2012
18. *Fast algorithms for numerical simulation of vesicle flows with high volume fraction*, Softflow 2012, Biological Complex Fluids Summer School, Cargese, France, June 2012
19. *Fast algorithms for 4D biophysically-constrained image registration*, SIAM Conference on Imaging Sciences, Philadelphia, PA, May 2012
20. *Fast numerical methods for boundary value problems with moving interfaces*, Workshop on the BEM: Bridging Education and Industrial Applications”, University of Minnesota, April 2012
21. *Massively parallel N-body solvers in heterogeneous architectures*, **Plenary**, SIAM Conference on Parallel Processing for Scientific Computing, Savannah GA, February 2012
22. *Fast tree algorithms for inverse medium problems with multiple excitations*, Colloquium, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, Boston MA, December 2011
23. *A fast algorithm for the numerical simulation of vesicles suspended in a Stokesian fluid*, Colloquium, Department of Mechanical Engineering, Massachusetts Institute of Technology, Boston MA, December 2011
24. *Fast algorithms for biophysically-constrained image analysis*, Workshop in Mathematics of Medical Imaging, Vancouver CA, October 2011
25. *Parallel Algorithms for Clustering and Nearest Neighbor Search Problems in High Dimensions*, DOE Applied Mathematics Program Meeting, Washington DC, October 2011
26. *Randomized algorithms for inverse medium problems with multiple excitations*, Applied Mathematics Colloquium, The University of Texas at Austin, 2011

27. *Randomized algorithms for inverse scattering problems* , **Plenary**, IFIP TC7 Conference on System Modeling and Optimization, Berlin, Germany, September 2011
28. *Algorithms for direct numerical simulation of particulate flows*, **Semi-Plenary**, 11th US National Congress on Computational Mechanics, Minneapolis MN, July 2011
29. *Parallel Multigrid Algorithms for Inverse Problems*, Computer Science Colloquium, New York University, New York City NY, March 2011
30. *A fast algorithm for the inverse medium problem with multiple sources*, Workshop on Large-scale inverse problems and quantification of uncertainty, Texas A& M University, College Station TX, February 2011
31. *Fast Schur complement approximations for KKT systems*, Minisymposium on fast methods for KKT methods, SIAM Conference on Computational Science and Engineering, Reno NV, February 2011
32. *A fast algorithm for the time harmonic elastic inverse medium problem with multiple events*, Minisymposium on large-scale optimization in inverse wave propagation, SIAM Conference on Computational Science and Engineering, Reno NV, February 2011
33. *Fast algorithms for simulations of blood flow in the Stokes regime*, Applied Mathematics Colloquium, University of Colorado at Boulder, Boulder CO, February 2011
34. *Fast algorithms for three-dimensional vesicle flow simulations*, Theoretical and Computational Biophysics Group, University of Illinois at Urbana-Champaign, Urbana IL, November 2010
35. *Theoretical investigations of the rheology of fluid membranes*, School of Physics, Georgia Institute of Technology, Atlanta GA, October 2010
36. *Full Waveform Acoustic and Elastic Reconstructions with Multiple Sources*, Workshop on Model Management and Reduced Order Model Approaches for Simulation Driven Optimization, Rice University, Houston TX, October 2010
37. *Fast algorithms for particulate flows in confined geometries*, Minisymposium on free boundary problems in biology, SIAM Conference on Nonlinear Wave and Coherent Structures, Philadelphia PA, August 2010
38. *A parallel adaptive fast-multipole method on heterogeneous architectures* , Workshop on integral equation methods, fast algorithms, and applications, Institute for Mathematics and its Applications, University of Minnesota, Twin cities MN, August 2010

39. *Fast parallel matrix-free preconditioners for elliptic PDEs*, **Plenary**, Parallel Matrix Algorithms and Applications, Basel, Switzerland, July 2010
40. *A massively parallel kernel-independent fast multipole method*, IBM Research, Zurich, Switzerland, July 2010
41. *Parallel multigrid algorithms for nonlinear elliptic PDEs*, 9th World Congress on Computational Mechanics, Sydney, Australia, July 2010
42. *Fast algorithms for 3D vesicle flows*, Minisymposium on the fast multipole method, European Conference on Computational Mechanics, Paris, France, May 2010
43. *A parallel adaptive fast-multipole method on heterogeneous architectures*, Computer Science Colloquium, ETH Zurich, Switzerland, April 2010
44. *FaIMS: A fast algorithm for the inverse medium problem in acoustic scattering*, Minisymposium on PDE constrained optimization and applications, 11th Copper Mountain Conference on Iterative Methods in Colorado, April 4-9, 2010
45. *Biophysically-constrained inversion algorithms for cardiac motion estimation*, **Plenary**, Applied Inverse Problems, Vienna Austria, July 2009
46. *Fast algorithms for 3D simulations of vesicles*, Summer school in “Complex fluids and Biofluids”, Cargese, France, June 2009
47. *An efficient numerical method for vesicle simulations*, Applied & Computational Mathematics Seminar, Dartmouth College, Hanover NH, February 2009
48. *An efficient numerical method for simulations of fluid membranes in shear flows*, ICES Seminar, University of Texas at Austin, Austin TX, November 2008
49. *Fast inverse scattering algorithms*, Computational Linear Algebra for Partial Differential Equations, LMS Durham Research Symposium, Durham UK, July 2008
50. *An efficient numerical method for simulations of fluid membranes in shear flows*, Summer school in Modeling and Numerical Simulation of Complex Fluids, Marseilles, France, July 2008
51. *Parallel Elastic Registration using Octrees*, SIAM Conference on Imaging Science, San Diego CA, June 2008

52. *Fast algorithms for the Inverse Medium Problem with Multiple Right-Hand Sides*, Conference of the Engineering Mechanics Institute, University of Minnesota, Minneapolis MN, May 2008
53. *Large-Scale Parallel Algorithms for Inverse Problems in Electrocardiology*, SIAM Conference on Optimization, Boston MA, May 2008
54. *Numerical Simulation of 2D fluid membranes*, Frontiers in Applied and Computational Mathematics, New Jersey Institute of Technology, May 2008
55. *Parallel Algorithms for Inverse Problems with Elliptic and Parabolic PDE constraints*, Inverse Problem Center Seminar, Rensselaer Polytechnic Institute, Troy NY, April 2008
56. *Toward petaflop algorithms for medical-image driven inverse problems in biophysics*, Computational Science & Engineering Seminar, Georgia Tech, Atlanta GA, February 2008
57. *Fast solvers for Stokesian particulate flows*, Center for Applied Mathematics Colloquium, Cornell University, Ithaca NY, January 2008
58. *Fast algorithms for the simulation of continuum models of biophysical systems*, Computational Life Sciences Seminar, Emory University, Atlanta GA, November 2007
59. *Fast algorithms for inverse problems for systems governed by parabolic PDEs*, Second International Conference on Continuous Optimization + Modeling and Optimization: Theory and Applications, Toronto Canada, August 2007
60. *Constructing adaptive meshes for large-scale finite-element applications using distributed linear octrees*, 9th U.S. National Congress on Computational Mechanics, San Francisco CA, July 2007
61. *Fast solvers for fluid membranes in two dimensions*, 6th International Congress on Industrial and Applied Mathematics, Zurich Switzerland, July 2007
62. *Multigrid algorithms for distributed parameter estimation problems related to systems governed by partial differential equations*, 6th International Congress on Industrial and Applied Mathematics, Zurich Switzerland, July 2007
63. *Multigrid solvers for very large scale saddle-point systems*, 6th International Congress on Industrial and Applied Mathematics, Zurich Switzerland, July 2007
64. *Scalable nonlinear multigrid solvers for inverse reaction-diffusion problems*, SIAM Conference on Control and Its Applications, San Francisco CA, June 2007.

65. *Optimization of systems governed by partial differential equations*, Applied Mathematics Seminar, California Institute of Technology, Pasadena CA, April 2007
66. *Domain-decomposition and operator-split smoothers for inverse problems with parabolic PDEs*, SIAM Conference on Computational Science & Engineering, Cost Mesa CA, February 2007
67. *Inverse Problems in Medical Imaging*, GlaxoSmithKline Scientific Computing Group, King of Prussia PA, November 2006
68. *Fast algorithms for the solution of optimal control, design, and inverse problems*, Applied Mathematics Seminar, New Jersey Institute of Technology, Newark NJ, October 2006
69. *Nonlinear full approximation multigrid for PDE-constrained optimization*, SIAM Annual Meeting, Boston MA, July 2006
70. *PDE-constrained optimization problems for soft tissue deformation estimation from medical images*, The Mathematics of Finite Elements and Applications Conference, Brunel Institute of Computational Mathematics, Brunel UK, June 2006
71. *Fast solvers for elliptic and parabolic problems*, Texas Institute for Computational and Applied Mathematics, University of Texas at Austin, Austin TX, May 2006
72. *Fast solvers for elliptic PDEs in complex geometries*, Seminar in Applied Mathematics, Duke University, NC, April 2006
73. *Multilevel and domain-decomposition solvers for inverse problems with parabolic PDEs*, 77th Annual Meeting of the Gesellschaft für Angewandte Mathematik und Mechanik, Berlin Germany, March 2006
74. *Physics-based Constrained Variational Methods in Medical Imaging*, Department of Radiology, University of Pennsylvania, Philadelphia PA, April 2006
75. *Operator-splitting algorithms for inverse and optimization problems for systems modeled by reaction-diffusion equations*, Internationaler Kongress der Osterreichischen Mathematischen Gesellschaft Jahrestagung der Deutschen Mathematiker-Vereinigung, Klagenfurt Austria, September 2005
76. *Image based biophysical modeling: PDE-constrained optimization algorithms for scalable registration and inversion*, Center for Computational Biology, University of California at Los Angeles, Los Angeles CA, August 2005

77. *Terascale Algorithms for optimization of systems governed by Partial Differential Equations: Applications in Bioengineering and Medical Imaging*, Department of Computer Science, University of Houston, Houston TX, June 2005
78. *An integral equation solver for parabolic problems with dynamic interfaces* 8th US National Congress in Computational Mechanics, Austin TX, July 2005
79. *An integral equation solver for parabolic problems with dynamic interfaces*, 8th US National Congress in Computational Mechanics, Austin TX, July 2005
80. *A Lagrange-Newton-Krylov method for the inverse medium problem in electromagnetic scattering*, 8th US National Congress in Computational Mechanics, Austin Texas, July 2005
81. *Inverse problems for systems governed by reaction-diffusion equations and applications to cardiac electrophysiology*, 8th SIAM Conference on Optimization, Stockholm Sweden, May 2005
82. *Parallel algorithms for boundary value problems in complex geometries*, Institute for Mathematics, University of Graz, Graz Austria, May 2005
83. *Fast algorithms for the solution of optimal control, design, and inverse problems*, Department of Mathematics, April 2005
84. *A fast LNKS-multigrid solver for the inverse medium problem*, Summer School on Mathematical Geophysics and Uncertainty in Earth Models, Golden, CO, June 2005
85. *A Lagrange-Newton-Krylov-Schur Solver for the Optimal Control of the Helmholtz Equation*, SIAM Conference on Computational Science & Engineering, Orlando FL, February 2005
86. *Control and Inverse Problems for Systems Governed by Reaction-Diffusion Equations*, Biomolecular and Chemical Engineering Colloquium, University of Pennsylvania, Philadelphia PA, December 2004
87. *Fast Integral Equation Solvers for Fluid-Structure Interaction Problems in Three Dimensions*, Sixth World Congress on Computational Mechanics, Beijing China, September 2004
88. *Distributed Parameter Control of a 2D Acoustic Helmholtz Problem on a Halfspace*, XXI International Conference on Theoretical and Applied Mechanics, Warsaw Poland, August 2004
89. *Introduction to PDE-Constrained Optimization*, Eighth Copper Mountain Conference On Iterative Methods, Copper Mountain CO, March, 2004

90. *Integral Equations and Fast Multipole Algorithms: Applications in Control, Design, and Inverse Problems*, Eleventh SIAM Conference on Parallel Processing for Scientific Computing, San Francisco CA, February 2004
91. *Towards Terascale Algorithms for Simulation and Optimization*, High Performance Computation for Engineered Systems Seminar, Massachusetts Institute of Technology, Cambridge, MA, February 2004
92. *Parallel Algorithms for Integral Equation-Constrained Optimization*, Mini-Workshop on Numerical Methods for Instationary Control Problems, Mathematisches Forschungsinstitut Oberwolfach, Wolfach, Germany, January 2004
93. *Order(N) Terascale Solvers for Elliptic PDEs in Complex Geometries*, Applied Mathematics Colloquium, Columbia University, New York NY, November 2003
94. *Solving multiphysics and interface problems with Sundance*, SIAM Conference on Computational Science and Engineering, San Diego CA, February 10-13, 2003
95. *Boundary integral formulations for shape optimization of elliptic PDEs*, Workshop on Optimization in Simulation-Based Models, Institute for Mathematics and its Applications, Minneapolis MN, January 2003
96. *Fast scalable solvers for viscous flows with dynamic interfaces*, Numerical Analysis seminar, Courant Institute, New York NY, November 2002
97. *Algorithms and trends in PDE-constrained optimization*, SIAM 50th annual meeting, Philadelphia PA, July 2002
98. *The Embedded Boundary Integral method for viscous incompressible fluids*, Department of Civil & Environmental Engineering, Rice University, Houston TX, April 2002
99. *Algorithmic issues in PDE-constrained optimization*, Mathematics and Computer Science Division, Argonne National Laboratory, February 2002
100. *Adjoint methods for optimal control and optimal design*, Sandia National Laboratories, Albuquerque NM, August 2001
101. *Wing-tip vorticity reduction using PDE-constrained optimization algorithms*, Texas Institute for Computational and Applied Mathematics, Austin TX, April 2001

102. *Inexactness issues in Lagrange-Newton-Krylov-Schur methods for PDE-constrained optimization*, First Sandia Workshop on Large-Scale PDE-Constrained Optimization, Santa Fe NM, April 2001
103. *Lagrange-Newton-Krylov methods for PDE-constrained optimization*, Department of Computational and Applied Mathematics, colloquium, Rice University, Houston TX, March 2001
104. *The Veltisto library for the solution of PDE-constrained optimization problems*, SIAM Conference on Parallel Processing for Scientific Computing, Portsmouth VA, March 2001
105. *Optimal control of viscous drag via Dirichlet controls*, Applied Mathematics Seminar, Courant Institute, New York NY, November 2000
106. *All-at-once techniques for optimization of systems governed by time-independent partial differential equations*, Workshop on Solution Methods for Large-Scale Nonlinear Problems, Institute for Terascale Simulation, Lawrence Livermore National Laboratory, Pleasanton CA, July 2000
107. *The Veltisto library for the solution PDE-constrained optimization problems*, Sandia National Labs, Computer Science Research Institute, Livermore CA, March 2000

SELECTED CONFERENCES

1. A. MANG, *Efficient algorithms for physically constrained diffeomorphic image registration*, in Minisymposium: Efficient Algorithms for Variational Methods in Imaging, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015
2. A. GHOLAMI, *Parameter Estimation for Malignant Brain Tumors*, in Minisymposium: Efficient Algorithms for Variational Methods in Imaging, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015
3. D. MALHOTRA, *PVFMM: A Parallel Fast Multipole Method for Volume Potentials*, in Minisymposium: Software Components for Integral Equation Methods, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015
4. B. QUAIFFE, *An Adaptive Spectral Deferred Time Integrator for Vesicle Suspensions*, in Minisymposium: Parallel methods for time integration, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015

5. G. BIROS, *Parallel Multiscale Algorithms for Construction of Likelihood and Prior Densities for Bayesian Inverse Problems*, HPC Meets UQ minisymposium, SIAM Conference on Uncertainty Quantification, Savannah, GA, March 2014
6. B. MARCH, *Efficient, Scalable Algorithms for N-Point Correlation Functions*, 16th SIAM Conference on Parallel Processing for Scientific Computing, Portland, OR, February 2014
7. B. XIAO, *Parallel Algorithms For Nearest Neighbor Searches*, 16th SIAM Conference on Parallel Processing for Scientific Computing, Portland, OR, February 2014
8. H. SUNDAR, *Nested Partitioning Scheme for Adaptive Meshes on Parallel Heterogeneous Clusters*, 16th SIAM Conference on Parallel Processing for Scientific Computing, Portland, OR, February 2014
9. D. MALHOTRA AND G. BIROS, *A Distributed-Memory Fast Multipole Method for Volume Potentials*, finalist, ACM Student Research Competition, ACM/IEEE SC13, Denver CO, November 2013
10. B. QUAIFFE AND G. BIROS, *High Concentration Two-dimensional Vesicle Suspensions*, Applied Mathematics, Modeling and Computational Science International Conference, Ontario CA, August 2013
11. D. MALHOTRA AND G. BIROS, *A Petascale Fast Multipole Method for Volume Potentials*, SIAM Annual Meeting, San Diego, CA, July 2013
12. B. QUAIFFE AND G. BIROS, *Time Step Control for Two-Dimensional Moving Interface Problem*, SIAM Annual Meeting, San Diego, CA, July 2013
13. B. QUAIFFE AND G. BIROS, *Multigrid Applied to Stokes Double Layer Potential*, 16th, Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, March 2013
14. H. SUNDAR AND G. STADLER AND O. GHATTAS AND G. BIROS, *Geometric Multigrid for high-order discretizations*, 16th Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, March 2013
15. BRYAN QUAIFFE AND G. BIROS, *High Volume Fraction Simulations of Two-Dimensional Vesicle Suspensions*, SIAM Conference on Computational Science, Boston, MA, February 2013
16. S. CHAILAT AND G. BIROS, *Adaptive discretizations for the time harmonic inverse medium problem*, Sixth Applied Inverse Problems Conference, College Station TX, May 2011

17. S. CHAILLAT AND G. BIROS, *A fast and adaptive algorithm for the inverse medium problem with multiple frequencies and multiple sources for the 3-D elastodynamic equation*, Eighth International Conference on Structural Dynamics EURODYN 2011, Minisymposium on Inverse problems, Leuven, Belgium, July 2011
18. S.K. VEERAPANENI AND G. BIROS, *Fast High-Order Methods for Simulating the Dynamics of Inextensible Vesicles*, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia PA, May 2008
19. R. SAMPATH AND G. BIROS, *Multigrid on 2:1 Balance-constrained Octrees for Finite Element Calculations with Billions of Unknowns*, SIAM Conference on Parallel Processing and Scientific Computing, Atlanta GA, March 2008
20. S.S. AKELLA AND G. BIROS, *Algorithms for inverse problems under uncertainty: applications to dynamic data driven assimilation of nonlinear dynamical systems*, SIAM Conference on Computational Science & Engineering, Costa Mesa CA, February 2007
21. C. HOGEA, G. BIROS AND C. DAVATZIKOS, *A coupled diffusion-elasticity PDE-constrained framework for simulating gliomas growth: a medical imaging perspective*, SIAM Conference on Computational Science & Engineering, Costa Mesa CA, February 2007
22. S.S. ADAVANI AND G. BIROS, *Control and Inverse Problems for Systems Governed by Reaction-Diffusion Equations*, SIAM Conference on Computational Science & Engineering, Orlando FL, February 2005
23. G. BIROS, *Terascale Algorithms for shape optimization of Elliptic PDEs*, Eleventh SIAM Conference on Parallel Processing for Scientific Computing, San Francisco CA, February 2004
24. G. BIROS, L. YING AND D. ZORIN, *An Embedded Boundary Integral Solver for the Incompressible Navier Stokes with Moving Boundaries*, SIAM Conference on Computational Science and Engineering February 10-13, 2003
25. G. BIROS, R. BARTLETT, O. GHATTAS, A. SALINGER AND B. V. WAANDERS, *Source inversion for chemical attacks via parallel PDE-constrained optimization*, SIAM Conference on Optimization, Toronto, May 2002
26. V. AKÇELIK, G. BIROS, I. EPANOMERITAKIS, AND O. GHATTAS, *Parallel algorithms for large-scale PDE-constrained optimization*, SIAM Conference on Computational Science and Engineering, Washington DC, September 2000

27. G. BIROS AND O. GHATTAS, *Domain decomposition methods for optimal control of viscous incompressible flows*, 5th US National Congress on Computational Mechanics, Boulder CO, August 1999
28. G. BIROS, L.F. KALLIVOKAS, O. GHATTAS, AND B. JARAMAZ, *Direct CT-Scan to finite element modeling using a 3D fictitious domain method with an application to biomechanics*, 4th US National Congress on Computational Mechanics, San Francisco CA, August 1997

GRANTS

1. G. BIROS and C. DAVATZIKOS (Lead PI) and others: *Predicting brain tumor progression via multiparametric image analysis and modeling*, NIH-10042242, \$330,000 (UT Austin portion), 10/01/2014–09/32/2019
2. G. BIROS (Lead PI) and others: *Extreme-scale Bayesian inference for uncertainty quantification of complex simulations*, DE-SC0010518, \$2,442,858 (UT Austin portion), 09/01/2013–08/31/2016
3. G. BIROS (Lead PI) and others: *XPS: DSD: A2MA–Algorithms and Architectures for Multiresolution Applications*, NSF/CCF-1337393, \$749,801, 10/01/2013–09/30/2016
4. G. BIROS and O. GHATTAS (Lead PI) and others: *DiaMonD: An Integrated Multifaceted Approach to Mathematics at the Interfaces of Data, Models, and Decisions*, DE-SC0009286, \$5,425,000 (UT Austin portion), 12/15/2012–12/14/2017
5. G. BIROS and O. GHATTAS (Lead PI) and others, *Ultra-Scalable Algorithms for Large-Scale Uncertainty Quantification in Inverse Wave Propagation*, AFOSR-FA9550-12-10484, \$1,825,000, 9/30/2012–11/30/2015
6. G. BIROS and K. WILLCOX (Lead PI) and others, *Dynamic Data-Driven Methods for Self-Aware Aerospace Vehicles*, AFOSR-FA9550-11-10339 \$305,319 (UT portion), 9/30/2011–9/29/2014
7. G. BIROS (Lead PI) and L. MOON, *Massively parallel algorithms for particulate flows*, NSF ASC070050N XSEDE computing resources, 2M System Units, 2012–2013
8. G. BIROS and O. GHATTAS (Lead PI) and others, *CDI Type II/Collaborative Research: Ultra-high Resolution Dynamic Earth Models through Joint Inversion of Seismic and Geodynamic Data*, NSF OCI-1029022/1209203, \$400,000 (Austin portion), 08/18/2011–06/30/2014

9. G. BIROS (Lead PI) and D. ZORIN, *SI2-SSE: Software for integral equation solvers on manycore and heterogeneous architectures*, OCI-1047980/1203182, \$600,000, Austin Portion portion: \$300,000, 09/01/2010–06/30/2013
10. O. GHATTAS (Lead PI) and G. BIROS, *Uncertainty Quantification for Large-Scale Inverse Scattering*, AFOSR-FA9550-09-1-0679, \$600,000, Georgia Tech portion: \$300,000, 09/01/09–10/01/12
11. P. LAGUNA (PI), G. BIROS et al., *NSF CDI: Observational Data as Central Engine of Binary Black Hole Simulations*, NSF/CBET 0941417, total \$800,000, Georgia Tech portion: \$560,000, 09/15/09–10/01/12
12. G. BIROS *DDDAS-TMRP: MIPS: A Real-Time Measurement-Inversion- Prediction-Steering Framework for Hazardous Events*, NSF, Dynamic Data Driven Application Systems (DDDAS) —Supplement Funds for undergraduate education, grant CNS 0939908, 10/1/09–9/30/10, total \$16,000
13. C. DAVATZIKOS (PI) and G. BIROS (co-PI) *NIH R01, Medical Imaging for Brain Tumors, NS042645*, 01/01/08–01/01/12
14. K. WILLCOX (Lead PI) and G. BIROS et al. *Large-Scale Optimization for Bayesian Inference in Complex Systems*, DOE/DE-FG02-08ER2585/FG02-08ER25855, 09/01/08–07/14/14, Georgia Tech portion \$450,000, UT Austin portion \$444,642.
15. G. BIROS (Lead PI) and D. ZORIN, *NSF/Teragrid: Parallel Algorithms for Particulate Flows*, NSF/Teragrid ASC070050N, 09/01/2007–09/01/2007, 200,000 System Units
16. G. BIROS (Lead PI), D. ZORIN *NSF: Collaborative Research: Petascale Algorithms for Particulate Flows*, NSF/OCI 0749285/0923710/1341290, 09/01/07–09/30/13, total \$800,000, Penn portion \$450,000, UT Austin portion \$200,557
17. O. GHATTAS (Lead PI), G. BIROS et al. , *NSF: Understanding the Dynamics of the Earth: High-Resolution Mantle Convection Simulation on Petascale Computers*, NSF/OCI 0749334, 09/01/07–09/01/10, total \$800,000, Penn portion \$35,000
18. S. DIAMOND (PI), G. BIROS et al. , *Blood Systems Biology*, NIH R33-1R33HL087317 09/01/06–07/31/09
19. O. GHATTAS (Lead PI), G. BIROS, *A PDE-Constrained Optimization Approach to Uncertainty Quantification in Inverse Problems*, 07/01/07–07/01/10, AFOSR FA9550-07-1-0481, total \$300,000, Penn portion \$75,000.

20. J. GEE (PI), G. BIROS et al. , *NIH R01: Shape Optimizing Diffeomorphisms for Computational Biology*, 04/01/06–03/30/10.
21. D. ZORIN (Lead PI) and G. BIROS (PI), *NSF: Collaborative Research: Fast High-Order Methods for Vesicle-Fluid and Membrane-Fluid Interaction and Adhesion* , NSF, Computational Mathematics, DMS-0612578, 9/1/06–8/30/08, total \$220,000, Penn portion \$100,000.
22. G. BIROS, *TeraGrid Allocation*, Coursework Grant: Introduction to Parallel Computing for Scientific Applications, Teragrid grant ASC070004P, 02/06/07–02/15/08, 40,000 System Units.
23. O. GHATTAS (Lead PI) G. BIROS et al. , *DDDAS-TMRP: MIPS: A Real-Time Measurement-Inversion- Prediction-Steering Framework for Hazardous Events*, NSF, Dynamic Data Driven Application Systems (DDDAS), grant CNS-0540302, 10/1/04–9/30/08, total \$825,000, Penn portion \$288,000
24. G. BIROS, *Parallel Algorithms for Control and Inverse Problems in Reaction-Diffusion Systems*, Department of Energy, Early Career Principal Investigator Program in Applied Mathematics, grant DE-FG02-04ER25646, 9/15/04–9/15/07, \$300,000
25. G. BIROS (PI), *Image-based Biophysical Modeling: Scalable Registration and Inversion Algorithms and Distributed Computing*, NSF, ITR Collaborative Research for National Priorities—Supplement Funds for undergraduate education, 9/15/04–8/31/05, Total \$12,000
26. O. GHATTAS (Lead PI) G. BIROS et al. *Image-based Biophysical Modeling: Scalable Registration and Inversion Algorithms and Distributed Computing*, NSF, ITR Collaborative Research for National Priorities, grant CCF-0427985, 9/15/04–9/15/07, Total \$1,250,000, Penn portion \$250,000
27. K. DANIILIDIS (PI), G. BIROS et al. *Computing and Retrieving 3D Archaeological Structures from Subsurface Surveying*, NSF, IIS-0431070, 9/15/04–9/15/08, \$1,500,000
28. G. BIROS, *An experimental apparatus for fluid-structure interaction problems*, University of Pennsylvania Foundation Award, July 2004, \$25,000
29. D. ZORIN (PI) and G. BIROS, *AAB Proposal: Scalable Algorithms for Viscous Flows with Dynamic Interfaces*, National Partnership for Advanced Computational Infrastructure, October 2002

EDUCATIONAL ACTIVITIES - TEACHING

1. *Numerical linear algebra*, UT Austin, Fall 2013, (Graduate)
2. *Computational methods in thermal/fluid systems*, UT Austin, Fall 2012 (Undergraduate/Graduate)
3. *Introduction to High Performance Scientific Computing*, UT Austin, Spring 2012, 2013 (Graduate)
4. *Introduction to Medical Imaging*, Georgia Tech, Fall 2010 (Undergraduate)
5. *Introduction to High Performance Computing*, Georgia Tech, Spring 2009, 2010, 2011 (Graduate)
6. *Introduction to Programming and Scientific Computing*, University of Pennsylvania, Fall 2006,2007 (Undergraduate, new course)
7. *Applied Math and Computational Science*, University of Pennsylvania, Spring 2006, (Graduate, group taught)
8. *Introduction to Parallel Computing for Scientific Applications*, University of Pennsylvania, Spring 2006, Spring 2008 (Graduate)
9. *Special Topics in Computational Science*, Krylov Methods, Computational Harmonic Analysis, Level Set Methods, University of Pennsylvania, Spring 2005 (Graduate)
10. *Continuum Biomechanics*, University of Pennsylvania, Fall 2004,2005,2006 (Undergraduate)
11. *Theory and Computation for ODE/PDE-Constrained Optimization*, University of Pennsylvania, Spring 2004 (Graduate)
12. *Parallel Algorithms in Scientific Computing*, Parallel Algorithms, Multigrid, Fast Multipole Methods, Many-Body Problems, Courant Institute of Mathematical Sciences, Spring 2003 (Graduate) (Taught jointly with Bastian J. Braams)

EDUCATIONAL ACTIVITIES - SHORT COURSES

1. *Softflow 2012, Biological Complex Fluids Summer School*, Cargese, France, June 2012
2. *Copper Mountain Conference on Iterative Methods*, Copper Mountain, CO, April 2006
3. *SIAM Conference on Computational Science and Engineering*, Orlando, FL, February, 2005

4. *Copper Mountain Conference on Iterative Methods*, Copper Mountain, CO, March 2004

STUDENT ADVISING

- Ph.D. Academic Advisor:
 - Keith Kelly, *Parallel algorithms for inverse medium problems*
 - Sameer Tharakan, *Algorithms for semi-supervised learning*
 - Dhairya Malhotra, *Parallel algorithms for volume integral equations*
 - Amir Gholaminejad, *Parallel algorithms for data-driven tumor modeling*
 - Bo Xiao, *Parallel algorithms for computational statistics*, September 2014 (Postdoc at ICES)
 - Abtin Rahimian, *Parallel Algorithms For Direct Blood Flow Simulations*, December 2011 (Postdoc at Courant)
 - Hari Sundar: *Inverse PDE-constrained optimization algorithms for physics-based cardiac image analysis* (co-advised with Christos Davatzikos), February 2009 (faculty, University of Utah)
 - Rahul S. Sampath: *A parallel geometric multigrid method for finite elements on octree meshes applied to elastic image registration*, August 2009 (ExxonMobil, Houston)
 - Shravan K. Veerapaneni: *Fast High-Order Integral Equation Methods for PDEs with Moving Interfaces*, August 2008, (faculty, University of Michigan)
 - Santi S. Adavani: *Inverse problems for reaction-diffusion systems with applications to electrophysiology*, August 2008, (Intel)
- Postdoctoral Research Associates:
 - William March (2013–): *Inverse problems and statistical inference*
 - Andreas Mang (2013–): *Image analysis and inverse problems*
 - Hari Sundar (2012–2014): *Scientific computing and imaging*
 - Bryan Quaipe (2011–): *Particulate Flows*
 - Meysam Moosavi (2011–2012) : *Inverse problems*
 - Stephanie Chaillat (2009–2011): *Inverse Problems* (ENSTA Paris)
 - Harper Langston (2008–2010): *Medical imaging* (Reservoir Labs, Adjunct faculty NYU)

- Ilya Lashuk (2008–2010): *Parallel algorithms for Particulate Flows*
 - Günay Doğan (2006–2008): *Fast algorithms for nonlinear diffusion tomography in complex geometries* (NIST)
 - Cosmina Hogeia (2005–2007): *Fast algorithms for brain-tumor growth simulation and inversion* (GlaxoSmithKline)
 - Feby Abraham (2004–2005): *Fast Cartesian solvers for soft-tissue simulations* (McKinsey % Company)
- Undergraduate students: Ioannis Tsonas (UT Austin) Artie Chen (UT Austin, ICES undergraduate fellow), Rob Raymond (Georgia Tech, Computing), Ikhun Ko (Georgia Tech, Biomedical Eng.), Wenchao Li (Georgia Tech, Biomedical Eng.), Carolyn Fu (Provost Research Fellowship, University of Pennsylvania), Alex Nakahara (Abel Internship Award, University of Pennsylvania), Raymond Hsu (University of Pennsylvania, Bioengineering), Kyle Johnson (University of Pennsylvania, Computer and Information Science), Peter Aquart (University of Pennsylvania, Mechanical Engineering), Danny Lee (University of Maryland), Mari Oisi (University of Pennsylvania), Alexander Rattner (University of Pennsylvania)
 - M.S. Academic Advisor: Florian Tramnitzke (UT Austin, 2012) *Medical Imaging*; Alana Kirchner (UT Austin, 2012) *Inverse problems*; Bharat Naik (UT Austin, 2012) *Parallel algorithms*; Daniel Long, (Georgia Tech, 2010) *Inverse Problems*; Sairam Sankaran (Georgia Tech, 2011), *Computational Fluid Mechanics*; Jonathan Brownsworth, (Georgia Tech, 2011) *Inverse problems*; Deepa Swaminathan (Georgia Tech, Computing), Sujit Garikapati (Georgia Tech, Computing), Ye Fei (Georgia Tech, Computing), Constantine Hatzis (Penn, MEAM), Stefanos Mazarakis (Penn, MEAM), Jonathan Nukpezah (Penn, Mathematics), Ait Mishra (Penn, MEAM), Bilwaj Gaonkar (Penn, Computing), Frank Lagor (Penn, MEAM)
 - Ph.D Committee member: Pierre Jolivet (2010-, University of Paris (Frederic Nataf), Junzhe Sun (2013-, UT Austin (Sergey Fomel)), Tobin Isaac (2013-, ICES, UT Austin (advisor: Ghattas)), Matthias Taus (2013-, ICES, UT Austin, (advisor: Rodin)), Fangzhou Wei (-, UT Austin), Nate Roberts (2013, ICES, UT Austin, (advisor: Demkowicz)), Vincent Doyeaux (University of Grenoble, 2014), Jun (Cliff) Zhou (2012-, Rhys Ulerich (-, ICES, UT Austin, (Advisor: Moser)), Janos Benk (Technical University of Munich, 2012), Cyril Flaig (ETH Zurich, 2012), Harper Langston (Courant Institute, Computer Science and Applied Mathematics, 2010), Marcelo Sequeira (University of Pennsylvania, Computer and Information Science, 2006), Shamik Shen (University of Pennsylvania, Bioengineering, 2007), Alexander Cunha (Carnegie Mellon, Civil & Environmental Engineering, 2004), Ph.D. Defense

Committee member for Lexing Ying (Courant Institute, Computer Science and Applied Mathematics, 2004),

- M.S. Reader or Committee member for Jackson Massey (UT Austin, ECE (advisor: Ali Yilmaz), 2013), Abhishek Tondon (UT Austin, (advisor: Lizy John) 2013);

PROFESSIONAL ACTIVITIES

1. Member of the *ACM/IEEE SC14* Technical Papers Program Committee
2. Member of the *IEEE IPDPS 2014* Technical Papers Program Committee
3. Member of the *International Conference on Parallel Processing 2013* Technical Papers Program Committee
4. Member of the *SIAM Conference on Parallel Processing for Scientific Computing 2014* Organizing Committee
5. Associate Editor, *SIAM Journal on Scientific Computing*, January 2007–2013
6. Associate Editor, *ACM Transactions on Mathematical Software*, November 2011–November 2013
7. Member of the *ACM/IEEE SC13* Technical Papers Program Committee
8. Member of the *IEEE IPDPS 2012* Technical Papers Program Committee
9. Member of the *ACM/IEEE SC12* Technical Papers Program Committee
10. Editor for the ACM Computing Classification System Revision, 2011
11. Program committee, 2011 SIAM/ACM Joint Conference on Geometric and Physical Modeling, Orlando, Florida, USA
12. Session chair, Technical Papers Program, *ACM/IEEE SC10*
13. Panelist on Birds of a Feather on "Computational and Data-Enabled Science Engineering (CDS&E)," *ACM/IEEE SC10*
14. Co-Author: *National Science Foundation and Air Force Office for Scientific Research* Workshop Report on "InfoSybioticSystems – the power of Dynamic Data Driven Applications", November 2010

15. Co-Author: *National Science Foundation, OCI/OCI-2010 Workshop Report on Grand Challenges for Cyberinfrastructure*
16. Applications Area Chair, Technical Papers Program, *ACM/IEEE SC10*
17. Editor, Special Issue on “Soft Tissue Motion Modeling”, *Progress in Biophysics and Molecular Biology*
18. Member of the *IEEE IPDPS 2010* Technical Papers Program Committee
19. Member of the *ACM/IEEE SC09* Technical Papers Program Committee
20. Member of the *ACM/IEEE SC07* Technical Papers Program Committee
21. Reviewer: *Journal of Computational Physics, SIAM Journal on Scientific Computing, SIAM Journal on Control and Optimization, SIAM Journal on Optimization, International Journal for Numerical Methods in Engineering, Computer Methods in Applied Mechanics and Engineering, Inverse Problems, Journal of Computational and Applied Mathematics*
22. Co-Author: *National Science Foundation, CISE DDDAS-2006 Workshop Report*
23. Reviewer: *National Science Foundation DMS, CISE, and OCI; Department of Energy*
24. Panel member, Professional Development Evening: Successful Verbal Communication in the Workplace - Interviewing, *SIAM Annual Meeting*, Minneapolis, MN, July 9–13, 2012
25. Minisymposium Organizer, Efficient Algorithms for Variational Methods in Imaging, *SIAM Conference on Computational Science and Engineering*, Salt Lake City, UT, March 14–18, 2015
26. Minisymposium Organizer, Advances in Algorithms for Uncertainty Quantification in Large-scale Inverse Problems, *SIAM Conference in Computational Science and Engineering*, Salt Lake City, UT, March 14–18, 2015
27. Minisymposium Organizer, High performance computing meets uncertainty quantification, *SIAM Conference on uncertainty quantification*, Savannah, GA, March 31–April 3, 2014
28. Minisymposium Organizer, Scalable Algorithms for Computational Statistical Inference, *SIAM Conference on Parallel Processing*, Portland, OR, February 28–21, 2014
29. Minisymposium Organizer (with B. Quaife), Applications of Integral Equation Methods I–III, *SIAM Annual Meeting*, Minneapolis, MN, July 9–13, 2012

30. Minisymposium Organizer (with S. Veerapaneni et al.), Computational Algorithms for Simulating Particulate Flows I–III, *SIAM Conference on Computational Science and Engineering*, Reno, NV, February 28–March 4, 2011
31. Minisymposium Organizer (with O. Ghattas et al.), Challenges in Parallel AMR I–III, *SIAM Conference on Parallel Processing and Scientific Computing*, Seattle, WA, February 24–26, 2010
32. Minisymposium Organizer: (with G. Dogan), *Algorithms for ill-posed problems in imaging sciences*, SIAM Conference on Imaging Science, Chicago IL, April 2010
33. Minisymposium Organizer: (with D. Zorin and S.K. Veerapaneni), *Numerical Methods for Complex Fluids*, SIAM Conference on Computational Science and Engineering, Miami FL, March 2009
34. Minisymposium Organizer: (with O. Ghattas, Y.M. Marzouk, and D. Xiu) *Data Assimilation and Statistical Inverse Problems*, SIAM Conference on Computational Science and Engineering, Miami FL, March 2009
35. Minisymposium Organizer: (with P.K. Purohit), *Biophysics Problems in the Mechanics of Rods, Surfaces and Particles and their Interactions with Viscous Fluids*, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia PA, May 2008
36. Minisymposium Organizer: (with O. Ghattas), *Parallel PDE Solvers on Locally-Refined Grids*, SIAM Conference on Parallel Processing for Scientific Computing, Atlanta GA, March 2008
37. Minisymposium Organizer: (with K. Willcox), *Multiscale Methods for PDE-constrained Optimization*, SIAM Conference on Computational Science and Engineering, Costa Mesa CA, February 2007
38. Minisymposium Organizer: (with V. Akçelik, B. van Bloemen Waanders and O. Ghattas), *Large-Scale PDE-Constrained Optimization*, SIAM Conference on Computational Science and Engineering, Orlando FL, February 2005
39. Minisymposium Organizer: (with V. Akçelik, B. van Bloemen Waanders and O. Ghattas) *Frontiers in Parallel PDE-Constrained Optimization*, SIAM Conference on Parallel Processing for Scientific Computing, San Francisco CA, February 2004

40. Minisymposium Organizer: (with N. Walkington and X. Li) *Computational Methods for Simulation of Flows with Dynamic Interfaces (three sessions)*, SIAM Conference on Computational Science and Engineering, San Diego CA, February 2003
41. Minisymposium Organizer: (with M. Berggren and B. van Bloemen Waanders), *Algorithms for Optimal Design and Control of Systems Governed by Time-Dependent PDEs (two sessions)*, SIAM Conference on Computational Science and Engineering, San Diego CA, February 2003
42. Minisymposium Organizer: (with O. Ghattas and B. van Bloemen Waanders), *PDE-Constrained Optimization in Computational Science and Engineering (three sessions)*, SIAM Conference on Optimization, Toronto, May 2002

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

1. Association for Computing Machinery, since 1997
2. Institute of Electrical and Electronics Engineers, since 2003
3. Society for Industrial and Applied Mathematics, since 1997
4. US Association for Computational Mechanics, since 1997
5. American Society of Mechanical Engineers, since 2003
6. American Mathematical Society, since 1997

UNIVERSITY SERVICE

- The University of Texas at Austin
 - ME, search committee in operations research & industrial engineering faculty position (2013,2014)
 - ME, Thermofluid Systems PhD Qualifying examiner (2013,2014)
 - ICES, preliminary exams, area B chair (2014)
 - ICES, graduate admissions committee chair (2013)
 - ICES, online MS degree committee chair (2013)

- ME, search committee healthcare systems engineering faculty position (2013)
- ICES, the Graduate Studies Subcommittee (GSSC) member (2012,2013)
- ICES, graduate admissions committee member (2011, 2012)
- ASE/EM, search committee member (in the area of computational mechanics)
- Georgia Institute of Technology
 - CoC, Assistant Dean for Technology infrastructure, 2009–2010
 - Georgia Tech, CSE, faculty hiring committee, 2009,2010
 - Georgia Tech, CSE, RPT committee, 2009
 - Georgia Tech HPC center, Inaugural committee, 2008,2009
 - Integrative BioSystems Institute, Graduate Program Committee, 2008,2009
 - CSE, Distinguished Lectures co-ordinator, fall 2009/spring 2010
 - CoC, Advisory chair committee, fall 2009/spring 2010
 - CoC, Phd Funding committee, fall 2008/spring 2009
 - CoE/BME, Graduate recruiting committee, fall/2008/spring 2009
- University of Pennsylvania
 - Member of steering committee in the Working Group in Applied Mathematics and Computational Science (AMCS)
 - Co-organized AMCS Seminar, Fall 2005, Spring 2006, Fall 2007
 - Graduate student recruiting committee, Fall 2004
 - MEAM Faculty recruiting committee, Fall 2004, Spring 2006, Spring 2007
 - SEAS Information Resources Committee, Spring 2005, Fall 2006, Spring 2007
 - SEAS Computing Committee, Fall 2006
 - MEAM Graduate Mathematics Committee, Fall 2007