Marc Niethammer

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Personal

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Areas of Interest

Medical Image Analysis, Spatio-temporal Modeling, Image Processing, Shape Analysis, Visual Tracking, Control- and Estimation-Theory, Biomedical Applications.

Education

07/01–12/04 **Georgia Institute of Technology**, Atlanta, GA, USA
Ph.D. in Electrical and Computer Engineering,
Research Area: Image Processing, Visual Tracking, Visual Control
Thesis title: *Dynamic level sets for visual tracking*

07/01–12/02 **Georgia Institute of Technology**, Atlanta, GA, USA
M.S. in Applied Mathematics

10/95–09/00 **Universität Stuttgart**, Stuttgart, Germany
Diplom-Ingenieur in Engineering Cybernetics (with highest honors)
Research Area: Control Theory, System Identification
Thesis title: *An approach towards nonlinear continuous-time system identification*

09/98–08/99 **Georgia Institute of Technology**, Atlanta, GA, USA
M.S. in Engineering Science and Mechanics
Research Area: Signal Processing for Nondestructive Testing of Materials
Thesis title: *Application of time-frequency representations to characterize ultrasonic signals*

Professional Experience

Research Experience

since 01/14 **Associate Professor, Department of Computer Science and Biomedical Research Imaging Center (BRIC), University of North Carolina**, Chapel Hill, NC, USA

01/08-12/13 **Assistant Professor, Department of Computer Science and Biomedical Research Imaging Center (BRIC), University of North Carolina**, Chapel Hill, NC, USA

09/12-11/12 **Visiting Assistant Professor**
INRIA, Sophia Antipolis, France

06/12-08/12 **Visiting Scholar**
Kitware Inc., Carrboro, NC, USA

Research Experience

07/07–12/07	**Instructor, Harvard Medical School**, Boston, MA, USA
09/05–06/07	**Officer, Harvard Medical School**, Boston, MA, USA
09/05–12/07	**Research Fellow, Brigham and Women's Hospital**, Boston, MA, USA **Joint Appointment in the Departments of Psychiatry and Radiology,** Research in medical image processing and analysis.
01/05–09/05	**Research Engineer, School of Electrical and Computer Engineering,** **Georgia Institute of Technology**, Atlanta, GA, USA
08/01–12/04	**Research Assistant, School of Electrical and Computer Engineering,** **Georgia Institute of Technology**, Atlanta, GA, USA Research in image processing and analysis.
04/00–05/01	**Research Assistant, Institute for Systems Theory in Engineering,** **Universität Stuttgart**, Stuttgart, Germany Research in nonlinear continuous-time system identification.
11/99–04/00	**Intern, Daimler Chrysler**, Esslingen, Germany Research in nonlinear vehicle skidding control.
02/99-08/99	**Research Assistant, School of Civil and Environmental Engineering,** **Georgia Institute of Technology**, Atlanta, GA, USA Research in signal processing for nondestructive testing of materials.
08/97–08/98	**Research Assistant, Institute for System Dynamics and Control Theory,** **Universität Stuttgart**, Stuttgart, Germany Development of an interpreter for a chemical engineering simulation environment.

Other Experience

07/04	**Institute for Pure and Applied Mathematics (IPAM)**, UCLA, CA, USA Participated in the Graduate Summer School: Mathematics in Brain Imaging.
07/02–08/02	**Mathematical Sciences Research Institute (MSRI)**, Berkeley, CA, USA Participated in the International School on Biomathematics, Bioengineering and Clinical Aspects of Blood Flow.

HONORS

2014	Teaching award, The Computer Science Student Association, UNC Chapel Hill
2012	NSF Career Award
2011	Teaching award, The Computer Science Student Association, UNC Chapel Hill
2010	Best paper award at Miccai workshop for Longitudinal and Time-Series Image Data
2004	Marion and Henry Bourne Fellowship
2001–2003	Steve Chaddick Fellowship
2001–2004	e-fellows Fellowship
2001	Prof. P. Sagirow Award
2001	Procter and Gamble Award
1998–2000	German National Merit Foundation Fellowship (Studienstiftung des deutschen Volkes)
1998–1999	German academic exchange service Fellowship (DAAD)
1997	Oustanding pre-diploma in Engineering Cybernetics Award

BIBLIOGRAPHY

See http://scholar.google.com/citations?user=KqtBi6MAAAAJ&hl=en for citation information.

Books and Edited Volumes

[1] S. Durrleman, T. Fletcher, G. Gerig, and —, Eds., *Spatio-temporal Image Analysis for Longitudinal and Time-Series Image Data*, vol. 7570 of *Lecture Notes in Computer Science*. Springer, 2012, http://wwwx.cs.unc.edu/~mn/?q=content/spatio-temporal-image-analysis-longitudinal-and-time-series-image-data.

Peer-reviewed Journal Publications

[1] P. Zhang, —, D. Shen, and P.-T. Yap, "Large deformation diffeomorphic registration of diffusion-weighted imaging data," *Medical Image Analysis*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/large-deformation-diffeomorphic-registration-diffusion-weighted-imaging-data.

[2] L. Shan, C. Zach, C. Charles, and —, "Automatic atlas-based three-label cartilage segmentation from MR knee images," *Medical Image Analysis*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/automatic-atlas-based-three-label-cartilage-segmentation-mr-knee-images-0.

[3] Y. Hong, B. Davis, J. S. Marron, R. Kwitt, N. Singh, J. S. Kimbell, E. Pitkin, R. Superfine, S. D. Davis, C. J. Zdanski, and —, "Statistical atlas construction via weighted functional boxplots," *Medical Image Analysis*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/statistical-atlas-construction-weighted-functional-boxplots.

[4] D. Kwon, —, H. Akbari, M. Bilello, C. Davatzikos, and K. Pohl, "PORTR: Pre-operative and post-recurrence brain tumor registration," *IEEE Transactions on Medical Imaging*, vol. 33, no. 3, pp. 651–667, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/portr-pre-operative-and-post-recurrence-brain-tumor-registration.

[5] T. Cao, C. Zach, S. Modla, D. Powell, K. Czymmek, and —, "Multi-modal registration for correlative microscopy using image analogies," *Medical Image Analysis*, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/multi-modal-registration-correlative-microscopy-using-image-analogies.

[6] D. F. Pace, S. R. Aylward, and —, "A locally adaptive regularization based on anisotropic diffusion for deformable image registration of sliding organs," *IEEE Transactions on Medical Imaging*, vol. 32, no. 11, pp. 2114–2126, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/locally-adaptive-regularization-based-anisotropic-diffusion-deformable-image-registration-sl.

[7] I. Csapo, Y. Shi, B. Davis, M. Sanchez, M. Styner, and —, "Longitudinal image registration with temporally-dependent image similarity measure," *IEEE Transactions on Medical Imaging*, vol. 32, no. 10, pp. 1939–1951, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/longitudinal-image-registration-temporally-dependent-image-similarity-measure.

[8] W. K. Funkhouser III, —, J. L. Carson, K. A Burns, M R. Knowles, M. W. Leigh, M. A. Zariwala, and W. K. Funkhouser Jr., "A new tool improves diagnostic test performance for transmission EM evaluation of axonemal dynein arms.," *Ultrastructural Pathology*, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/new-tool-improves-diagnostic-test-performance-transmission-em-evaluation-axonemal-dynein-arm.

[9] — and C. Zach, "Segmentation with area constraints," *Medical Image Analysis*, vol. 17, no. 1, pp. 101–112, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/segmentation-area-constraints.

[10] Y. Shi, S. J. Short, R. C. Knickmeyer, J. Wang, C. L. Coe, —, J. Gilmore, H. Zhu, and M. Styner, "Diffusion tensor imaging based characterization of brain neurodevelopment in primates," *Cerebral Cortex*, vol. 23, no. 1, pp. 36–48, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/diffusion-tensor-imaging-based-characterization-brain-neurodevelopment-primates.

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[13] J. Caplan, —, R. M. Taylor III, and K. J. Czymmek, "The power of correlative microscopy: Multi-modal, multi-scale, multi-dimensional," *Current Opinions in Structural Biology*, vol. 21, no. 5, pp. 686–693, 2011, http://wwwx.cs.unc.edu/~mn/?q=content/power-correlative-microscopy-multi-modal-multi-scale-multi-dimensional.

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Peer-reviewed Conference Publications

[1] N. Singh, H. D. Couture, J. S. Marron, C. Perou, and —, "Topological descriptors of histology images," in *Proceedings of the MICCAI Workshop on Machine Learning in Medical Imaging (MLMI)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/topological-descriptors-histology-images.

[2] Y. Hong, N. Singh, R. Kwitt, N. Vasconcelos, and —, "Geodesic regression on the grassmannian," in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/geodesic-regression-grassmannian.

[3] Q. Zhao, S. Pizer, —, and J. Rosenman, "Geometric-feature-based spectral graph matching in pharyngeal surface registration," in *Proceedings of the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/geometric-feature-based-spectral-graph-matching-pharyngeal-surface-registration.

[4] N. Singh and —, "Splines for diffeomorphic image regression," in *Proceedings of the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/splines-diffeomorphic-image-regression.

[5] X. Liu, —, R. Kwitt, M. McCormick, and S. Aylward, "Low-rank to the rescue – atlas-based analyses in the presence of pathologies," in *Proceedings of the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/low-rank-rescue-%E2%80%93-atlas-based-analyses-presence-pathologies.

[6] Y. Hong, N. Singh, R. Kwitt, and —, "Time-warped geodesic regression," in *Proceedings of the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/time-warped-geodesic-regression.

[7] Y. Hong, Y. Gao, —, and S. Bouix, "Depth-based shape analysis," in *Proceedings of the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2014, http://wwwx.cs.unc.edu/~mn/?q=content/depth-based-shape-analysis.

[8] J. Tighe, —, and S. Lazebnik, "Scene parsing with object instances and occlusion ordering," in *Proceedings of the Conference on Computer Vision and Pattern Recognition (CVPR)*, http://wwwx.cs.unc.edu/~mn/?q=content/beyond-pixel-labels-image-parsing-object-instances-and-occlusion-ordering.

[9] D. Wassermann, M. Toews, M. Niethammer, and W. Wells III, "Probabilistic diffeomorphic registration: Representing uncertainty," in *Proceedings of the International Workshop on Biomedical Image Registration (WBIR)*, http://wwwx.cs.unc.edu/~mn/?q=content/probabilistic-diffeomorphic-registration-representing-uncertainty.

[10] Y. Rathi, —, O. Mihailovich, F. Laun, and C. F. Westin, "Diffusion propagator estimation using radial basis functions," in *Proceedings of the MICCAI Workshop on Computational Diffusion MRI (CDMRI)*, 2013, http://wwwx.cs.unc.edu/~mn/?q=content/diffusion-propagator-estimation-using-radial-basis-functions.

[11] — and F. X. Vialard, "Riemannian metrics for statistics on shapes: parallel transport and scale invariance," in *Proceedings of the 4th MICCAI workshop on Mathematical Foundations of Computational Anatomy (MFCA)*, 2013, pp. 1–13, http://wwwx.cs.unc.edu/~mn/?q=content/riemannian-metrics-statistics-shapes-parallel-transport-and-scale-invariance.

[12] R. Kwitt, S. Aylward, D. Pace, and —, "Studying cerebral vasculature using structure proximity and graph kernels," in *MICCAI*, 2013, vol. 8150, pp. 534–541, http://wwwx.cs.unc.edu/~mn/?q=content/studying-cerebral-vasculature-using-structure-proximity-and-graph-kernels.

[13] T. Cao, V. Jojic, S. Modla, D. Powell, K. Czymmek, and —, "Robust multimodal dictionary learning," in *MICCAI*, 2013, vol. 8149, pp. 259–266, http://wwwx.cs.unc.edu/~mn/?q=content/robust-multimodal-dictionary-learning.

[14] P. Zhang, C.-Y. Wee, —, D. Shen, and P.-T. Yap, "Large deformation image classification using generalized locality-constrained linear coding," in *MICCAI*, 2013, vol. 8149, pp. 292–299, http://wwwx.cs.unc.edu/~mn/?q=content/momentum-based-locality-constrained-linear-coding-image-classification.

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[16] M. Lorenzi, B. Menze, —, N. Ayache, and X. Pennec, "Sparse scale-space decomposition of volume changes in deformation fields," in *MICCAI*, 2013, vol. 8150, pp. 328–335, http://wwwx.cs.unc.edu/~mn/?q=content/sparse-scale-space-decomposition-volume-changes-deformation-fields.

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[18] C. Huang, L. Shan, C. Charles, —, and H. Zhu, "Diseased region detection of longitudinal knee mri data," in *Proceedings of the Conference on Information Processing in Medical Imaging (IPMI)*, 2013, vol. 7917, pp. 632–643, http://wwwx.cs.unc.edu/~mn/?q=content/diseased-region-detection-longitudinal-knee-mri-data.

[19] I. Lyu, S. H. Kim, J.-K. Seong, S. W. Yoo, A. C. Evans, Y. Shi, M. Sanchez, —, and M. Styner, "Group-wise cortical correspondence via sulcal curve-constrained entropy minimization," in *Proceedings of the Conference on Information Processing in Medical Imaging (IPMI)*, 2013, vol. 7917, pp. 364–375, http://wwwx.cs.unc.edu/~mn/?q=content/group-wise-cortical-correspondence-sulcal-curve-constrained-entropy-minimization.

[20] Y. Hong, —, A. Johan, J. Kimbell, E. Pitkin, R. Superfine, S. Davis, C. Zdanski, and B. Davis, "A pediatric airway atlas and its application to subglottic stenosis," in *Proceedings of the International Symposium on Biomedical Imaging (ISBI)*, 2013, pp. 1206–1209, http://wwwx.cs.unc.edu/~mn/?q=content/pediatric-airway-atlas-and-its-application-subglottic-stenosis.

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[23] I. Csapo, B. Davis, Y. Shi, M. Sanchez, M. Styner, and —, "Longitudinal image registration with non-uniform appearance change," in *MICCAI*, 2012, pp. 280–288, http://wwwx.cs.unc.edu/~mn/?q=content/longitudinal-image-registration-non-uniform-appearance-change.

[24] P. Zhang, —, D. Shen, and P.-T. Yap, "Large deformation diffeomorphic registration of diffusion-weighted images," in *MICCAI*, 2012, pp. 171–178, http://wwwx.cs.unc.edu/~mn/?q=content/large-deformation-diffeomorphic-registration-diffusion-weighted-images.

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[26] I. Csapo, Y. Shi, M. Sanchez, M. Styner, and —, "Temporally-dependent image similarity measure for longitudinal analysis," in *Workshop on Biomedical Image Registration (WBIR)*, 2012, pp. 99–109, http://wwwx.cs.unc.edu/~mn/?q=content/temporally-dependent-image-similarity-measure-longitudinal-analysis.

[27] Y. Hong, M. Sanchez, M. Styner, and —, "Simple geodesic regression for image time-series," in *Workshop on Biomedical Image Registration (WBIR)*, 2012, pp. 11–20, http://wwwx.cs.unc.edu/~mn/?q=content/simple-geodesic-regression-image-time-series.

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[2] J. Lee, C. Ehlers, F. Crews, —, F. Budin, B. Paniagua, K. Sulik, J. Johns, M. Styner, and I. Oguz, "Automatic cortical thickness analysis on rodent brain," in *Proceedings of the SPIE*, 2011, vol. 7962, http://wwwx.cs.unc.edu/~mn/?q=content/automatic-cortical-thickness-analysis-rodent-brain.

[3] C. Vachet, H. C. Hazlett, —, I. Oguz, J. Cates, R. Whitaker, J. Piven, and M. Styner, "Group-wise automatic mesh-based analysis of cortical thickness," in *Proceedings of the SPIE Medical Imaging*, 2010, http://wwwx.cs.unc.edu/~mn/?q=content/group-wise-automatic-mesh-based-analysis-cortical-thickness.

[4] L. Shan, C. Zach, M. Styner, C. Charles, and —, "Automatic bone segmentation and alignment from MR knee images," in *Proceedings of the SPIE Medical Imaging*, 2010, http://wwwx.cs.unc.edu/~mn/?q=content/automatic-bone-segmentation-and-alignment-mr-knee-images.

[5] P. Karasev, J. Malcolm, —, R. Kikinis, and A. Tannenbaum, "User-driven 3D mesh region targeting," in *in press; Proceedings of the SPIE Medical Imaging*, 2010, http://wwwx.cs.unc.edu/~mn/?q=content/user-driven-3d-mesh-region-targeting.

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Other Publications

[1] B. Paniagua, M. Styner, M. Macenko, D. Pantazis, and —, "Local shape analysis using MANCOVA," *Insight Journal*, 2009, `http://hdl.handle.net/10380/3124`.

[2] M. Niethammer, *Dynamic Level Sets for Visual Tracking*, Ph.D. thesis, Georgia Institute of Technology, 2004.

[3] M. Niethammer, "An approach towards nonlinear continuous-time system identification," M.S. thesis, Universität Stuttgart, 2000.

[4] M. Niethammer, "Application of time-frequency representations to characterize ultrasonic signals," M.S. thesis, Georgia Institute of Technology, 1999.

[5] M. Niethammer, "Reglerentwurf für ein Fahrzeug mit lenkbarer Vorder- und Hinterachse," Tech. Rep., Daimler-Chrysler, Esslingen, 2000.

Freely Available Software

[1] A. T. Vega, S. Aja-Fernandez, and —, "Rician LMMSE image filter," part of Slicer3 and Slicer4.

[2] —, M. Styner, and Kitware, "The Cross-Sectional and Longitudinal Atlas Toolkit (CalaTK) Fluid Registration and Atlas Toolkit," Hosted at: `www.calatk.org`.

[3] B. Paniagua, M. Styner, M. Macenko, D. Pantazis, and —, "Shape analysis with MANCOVA," Hosted by the Insight Journal: `http://hdl.handle.net/10380/3124`.

Patents, Patent Applications, and Reports of Invention

[1] H.-P. Lee, M. Foskey, —, and M. Lin, "Simulation-based estimation of elasticity parameters and use of same for non-invasive cancer detection and staging," Report of Invention, 2012.

[2] W. Funkhouser, —, and K. Funkhouser, "Development of a computer image analysis algorithm to assist in the evaluation of respiratory mucosal ciliary ultrastructure," Report of Invention, 2010.

[3] B. Eastwood, R. Taylor, R. Superfine, L. Mair, and —, "Patterned substrates for microscopy tracking," Provisional Patent Application, 2009.

[4] M. Macenko, —, S. Marron, and N. Thomas, "A method for normalizing histology slides for quantitative analysis," Provisional patent application, 2009.

TEACHING ACTIVITIES

Courses Taught

Department of Computer Science,
UNC Chapel Hill, Chapel Hill, NC, USA

Spring 2014	COMP 790	Optimal Estimation in Image Analysis	(21 students)
Fall 2013	COMP 775	Medical Image Analysis	(23 students)
Spring 2012	COMP 790	Optimal Estimation in Image Analysis	(12 students)
Fall 2011	COMP 116	Introduction to Scientific Programming	(80 students)
Fall 2010	COMP 775	Medical Image Analysis	(16 students)
Spring 2010	COMP 790	Optimal Estimation in Image Analysis	(10 students)
Fall 2009	COMP 116	Introduction to Scientific Programming	(36 students)
Spring 2009	COMP 790	Optimal Estimation in Image Analysis – *new course*	(8 students)
Fall 2008	COMP 775	Introduction to Medical Image Analysis – *new course*	(16 students)
Spring 2008	COMP 875	Recent Advances in Image Analysis – *seminar*	(4 students)

Institute for Systems Theory in Engineering,
Universität Stuttgart, Stuttgart, Germany

04/00–05/01	Assisted in teaching the graduate courses *Control Theory I and II*.

PROFESSIONAL SERVICE TO DISCIPLINE

Membership in Professional Societies

since 2005	Medical Image Computing and Computer Assisted Intervention (MICCAI) Society
since 2002	Institute of Electrical and Electronics Engineers (IEEE)
2002-2004	Society of Industrial and Applied Mathematics (SIAM)

Conference Committees

2014	Program committee for the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
2012	Program committee for the International Conference on Information Processing in Medical Imaging (IPMI)
2011-2012	Program committee for the Workshop on Machine Learning in Medical Imaging (in conjunction with MICCAI'11/12)
2011, 2013	Program committee for the Workshop on Mathematical Foundations of Computational Anatomy (in conjunction with MICCAI'11)
2010	Session chair MICCAI, Workshop on Machine Learning in Medical Imaging
2010	Session chair MICCAI, Workshop on Spatio-Temporal Image Analysis for Longitudinal and Time-Series Image Data
2009-2010	Session co-chair, Conference on Decision and Control
2010	Program committee for the International Conference on Pattern Recognition (ICPR)
2010	Technical committee for the Asian Conference on Computer Vision
2009	Program committee for the Workshop on Probabilistic Models for Medical Image Analysis (MICCAI)
2008-2009	Judge in the Kitware visualization contest (MICCAI)
2008	Program committee for the Workshop on Tensors in Image Processing and Computer Vision (CVPR)

Conference Committees

2007	Program committee for the Workshop on "New Advances in Shape Analysis and Geometric Modeling" (NASAGEM; Cyberworlds)

Workshops/Special Sessions

2012	Co-organizer of the Workshop on "Spatiotemporal Image Analysis for Longitudinal and Time-Series Image Data (STIA)" at the Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
2010	Co-organizer of the Workshop on "Medical Image Analysis For The Clinic – A Grand Challenge" at the Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
2009, 2010	Co-organizer of the Special Session on "Images in the Loop: Control Theory Meets Image Analysis" at the Conference of Decision and Control (CDC)

Panels

2010	National Science Foundation (program suppressed for anonymity)

Conference Reviewing

2010	International Conference on Pattern Recognition (ICPR)
2009	American Control Conference (ACC)
2004, 2009	Conference on Decision and Control (CDC)
2006	International Symposium on Biomedical Imaging (ISBI)
2007	Workshop on Mathematical Methods in Biomedical Image Analysis (MMBIA)
2006, 2008–2013	Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
2013	Conference on Information Processing in Medical Imaging (IPMI)
2008-2010	Conference on Computer Vision and Pattern Recognition (CVPR)
2009, 2011	International Conference on Computer Vision (ICCV)
2009	IEEE Visualization Conference (VIS)

Journal Reviewing

2003	Journal of Engineering Mechanics
2004	Geophysical Journal International
2005	Signal Processing
2007	Journal of Mathematical Imaging and Vision
2005–2008, 2011	IEEE Transactions on Pattern Analysis and Machine Intelligence
2008, 2011-2012	International Journal of Computer Vision
2008	IEEE Transactions on Information Technology in Biomedicine
2008–2010	NeuroImage
2007-2008, 2012	SIAM Journal on Imaging Sciences
2006–2009, 2011-2012	IEEE Transactions on Medical Imaging
2006–2013	Medical Image Analysis
2009	Ultrasonics
2004, 2009	Journal of the Acoustical Society of America