

Date of preparation: February 7, 2012.

CONTACT
INFORMATION

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EDUCATION

University of North Carolina, Chapel Hill, North Carolina
Ph.D. in Computer Science, May 2007.
Dissertation: *An MRI Segmentation Framework for Brains with Anatomical Deviations.*

Purdue University, West Lafayette, Indiana
B.S. in Computer Science and Mathematics (with highest distinction), August 2001.

RESEARCH
INTERESTS

Image-driven modeling in medical image analysis (image segmentation, image registration, physical and statistical modeling of biological phenomena, computational anatomy, longitudinal analysis), imaging informatics, computer vision.

Applications of computational medicine, in particular: brain tumor, early brain development, aging brain, traumatic brain injury, cardiac arrhythmia.

RESEARCH
EXPERIENCE

University of Utah, Salt Lake City, Utah
Research Assistant Professor, School of Computing
Research Assistant Professor, Scientific Computing and Imaging Institute
July 2007 - present
Conducting research on the longitudinal analysis of multimodal structural and diffusion MR images.

- Developing a mathematical regression framework for longitudinal changes in anatomy (shape) and tissue properties (image appearance).
- Developing methods for identifying pathological development in longitudinal trajectories.

University of North Carolina, Chapel Hill, North Carolina
Research Assistant, Department of Computer Science
May 2002 - May 2007
Conducted research on automatic brain segmentation from Magnetic Resonance images.

- Developed atlas-based methods for automatic segmentation of adult brains with tumor and neonatal infant brains.
- Developed a system for simulation of tumor mass effect and edema infiltration in a healthy subject MRI to provide ground truth for validation of segmentation results.

Siemens Corporate Research, Princeton, New Jersey
Intern, Imaging and Visualization Department
May 2006 - August 2006
Research and development of automatic and semi-automatic brain MRI segmentation tools within the neuroimaging group.

- Developed a robust and efficient tool for automatic annotation of brain MRI. The software divides the brain into 63 anatomical regions in minutes.
- Developed a gesture based graphical interface for editing 3D binary segmentations.

University of North Carolina, Chapel Hill, North Carolina
Research Assistant, Department of Computer Science
 August 2001 - May 2002
 Conducted research on visualization of errors in tracking and motion capture devices.

TEACHING
 EXPERIENCE

University of Utah, Salt Lake City, Utah
Seminar Coordinator, School of Computing
 August 2008 - present
 Coordinated invited presentations for the Scientific Computing and Imaging seminar series.

University of North Carolina, Chapel Hill, North Carolina
Instructor, Department of Computer Science
 August 2005 - December 2005
 Taught an undergraduate introductory programming course using Java. Fully responsible for lectures, assignments, examinations, and grading.

Purdue University, West Lafayette, Indiana
Teaching Assistant, Department of Computer Science
 June 2000 - August 2000
 Held regular laboratory hours in an introductory programming course using Java.

Purdue University, West Lafayette, Indiana
Teaching Assistant, Department of Mathematics
 August 1999 - December 1999
 Graded assignments and held regular office hours in freshmen level mathematics courses (algebra, trigonometry, and calculus).

RESEARCH
 GRANTS

NIH NLM HHSN276201000584P 06/25/2010 - 06/30/2012
 PI: M. Prastawa (Utah) \$ 150,000
SCORE: Systematic Comparison through Objective Rating and Evaluation
 Role: Principal Investigator

NIH NIBIB 1R41 EB011796 08/01/2010 - 07/31/2012
 PIs: S. Aylward (Kitware), G. Gerig (Utah) \$ 237,264
Web-Based Infrastructure for Comparison and Validation of Image Computing Methods
 Role: Co-Investigator

NIH NIBIB 2U54EB005149-06 09/01/2010 - 08/31/2014
 PI: R. Kikinis (Harvard)
NA-MIC: National Alliance for Medical Image Computing
 Role: Senior Personnel, Algorithms Core, Utah II

NIH NIMH 2P50MH064065-06 08/01/07 - 07/31/12
 PI: J. H. Gilmore (Univ. of North Carolina)
Prospective Studies of the Pathogenesis of Schizophrenia, Silvio O. Conte Center for the Neuroscience of Mental Disorders
 Role: Senior Personnel, Utah Subcontract

NIH NIMH 1R01HD055741-01 07/01/07 - 06/30/12
 PI: J. Piven (Univ. of North Carolina)
A Longitudinal MRI Study of Infants at Risk for Autism, Autism Centers of Excellence (ACE) Network
 Role: Senior Personnel, Utah Subcontract

AWARDS AND
HONORS

- 2nd most cited article in Medical Image Analysis journal for 2005-2010.
- 9th most cited article in Medical Image Analysis journal for 2006-2011.
- Graduated *summa cum laude* from Purdue University, 2001.
- Phi Beta Kappa.
- Phi Kappa Phi.
- Upsilon Pi Epsilon.

SERVICE

Reviewer for the following journals:

- IEEE Transactions on Medical Imaging,
- Medical Image Analysis,
- NeuroImage,

and for:

Annals of Biomedical Engineering, Human Brain Mapping, IEEE Transactions on Biomedical Engineering, International Journal of Computer Assisted Radiology and Surgery, International Journal of Computer Mathematics, International Journal of Computer Vision, Journal of Mathematical Imaging and Vision, Pattern Recognition, Pediatric Research.

Reviewer for the following conference series:

- MICCAI (Medical Image Computing and Computer Assisted Intervention)
- ISBI (International Symposium on Biomedical Imaging)

Program committee member for the following workshops:

- Medical Image Analysis on Multiple Sclerosis (MIAMS); MICCAI 2008, 2009.
- Probabilistic Models for Medical Image Analysis (PMMIA); MICCAI 2009.

Grant proposal reviewer for Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO / Netherlands Organization for Scientific Research) and Technology Foundation STW.

INVITED TALKS

Discriminative and Generative Models for Brain Tumor MR Images, IEEE EMBC Mini-symposium on Brain Tumor Segmentation, September 2011.

Image Analysis for Multiple Sclerosis Research, The Brain Institute at the University of Utah, December 2008.

Statistical and Physical Models for Generating a Brain Tumor MR Image Validation Database, Mathematical Biosciences Institute at the Ohio State University, June 2008.

SOFTWARE
DEVELOPMENT
SKILLS

- Programming environments: C/C++, FORTRAN, Haskell, Java, MATLAB, Motorola 68HC12 assembly, Python, and Scheme.
- General purpose GPU computing using NVIDIA's CUDA.
- Software packages/libraries: 3D Slicer, Insight image registration and segmentation toolkit (ITK), visualization toolkit (VTK), and OpenGL.
- Cross-platform software development experience on FreeBSD, Linux, MacOS X, Solaris, and Windows operating systems.

PAST SOFTWARE
PROJECTS

- Automatic brain MRI segmentation and bias correction software for healthy adults. The software has been applied to thousands of adult subjects in several studies at Univ. North Carolina, Duke Univ., Univ. of Iowa, Univ of California at Los Angeles, and Éc. Polytechnique Fédérale de Lausanne (EPFL).

- Automatic brain MRI segmentation for adults with tumor and edema. This work is part of an effort to study and analyze vessel shape characteristics in subjects with brain tumors.
- Automatic brain MRI segmentation for neonatal infants (age less than 2 weeks). The software has been applied to over 200 subjects to study early brain development.
- Diffusion tensor (DT) image processing: registration, filtering, resampling, warping and reorientation, and non-linear averaging of DT data. Developed a system for simulating the destruction of white matter fibers due to tumor mass effect, as observed through DT imaging.
- DT image visualization using tensor glyphs, fiber tracking, and connectivity measure.
- Display and graphical manipulation of 3D curves, combined with computation of the shape properties of curves (curvature, torsion, number of inflection points).
- Simulation of brain deformation and infiltration using a linear elastic biomechanical model and reaction-diffusion. The simulation is combined with texture synthesis to generate synthetic ground truth and validation image data for brain tumor MRI segmentation methods.
- Curve data analysis for structural and diffusion MRI over space and time. The analysis compares longitudinal curves over different anatomical regions to extract markers for rapid growth in early development as well as growth through adulthood.
- Joint registration of images and geometries (points, curves, surfaces) within a diffeomorphic framework, which generates smooth invertible mappings. Geometries are represented as “currents” that allow mapping without correspondence or landmarks. The software has been applied for mapping infant brains across age as well as cardiac walls before and after arrhythmia treatment.
- Estimation of finite dimensional representation of diffeomorphisms for mapping subject images in populations. These representations allow statistical measurements of shape changes in a lower dimensional space.
- Construction of 4-D anatomies from spatiotemporal image data by jointly solving the segmentation, registration, and atlas estimation problems.

PUBLIC SOFTWARE

- Atlas based classification for healthy brain MRI:
<http://www.nitrc.org/projects/abc>
- Brain tumor MRI simulator:
<http://www.nitrc.org/projects/tumorsim>

PUBLICATIONS

Citation data from Google Scholar: 612 total citations with h-index = 10
(<http://scholar.google.com/citations?user=avpOgS4AAAAJ>)

ARTICLES IN JOURNALS

1. A. Irimia, M. C. Chambers, J. R. Alger, M. Filippou, M. W Prastawa, B. Wang, D. A. Hovda, G. Gerig, A. W. Toga, R. Kikinis, P. M. Vespa, J. D. Van Horn. Comparison of acute and chronic traumatic brain injury using semi-automatic multimodal segmentation of MR volumes. *Journal of Neurotrauma*. Vol 28, Number 11, November 2011, pages 2287-2306. **Featured on cover.**
2. L. Ha, M. Prastawa, G. Gerig, J. H. Gilmore, C. T. Silva, and S. Joshi. Efficient Probabilistic and Geometric Anatomical Mapping using Particle Mesh Approximation on GPUs. *International Journal of Biomedical Imaging (IJBI): Special Issue in Parallel Computation in Medical Imaging Applications*. Vol 2011, Article ID 572187, 16 pages.

3. C. McGann, E. Kholmovski, J. Blauer, S. Vijayakumar, T. Haslam, J. Cates, E. DiBella, B. Wilson, A. Alexander, M. Prastawa, G. Payne, N. Burgon, G. Vergara, N. Akoum, M. Daccaret, D. Parker, R. Macleod, N. Marrouche. Dark regions of no-reflow on late gadolinium enhancement MRI result in scar formation after atrial fibrillation ablation. *Journal of the American College of Cardiology*, Vol 58, Number 2, July 2011, pages 177-185.
4. M. Prastawa, E. Bullitt, and G. Gerig. Simulation of Brain Tumors in MR Images for Evaluation of Segmentation Efficacy. *Medical Image Analysis (MedIA)*. Volume 13, Number 2, April 2009, pages 297-311.
5. J. H. Gilmore, W. Lin, M. Prastawa, C. B. Looney, Y. S. K. Vetsa, R. C. Knickmeyer, D. Evans, J. K. Smith, R. M. Hamer, J. A. Lieberman, and G. Gerig. Regional Gray Matter Growth, Sexual Dimorphism and Cerebral Asymmetry in the Neonatal Brain. *Journal of Neuroscience*. Volume 27, Number 6, February 2007, pages 1255-1260.
6. P. Lorenzen, M. Prastawa, B. Davis, G. Gerig, E. Bullitt, and S. Joshi. Multi-Modal Image Set Registration and Atlas Formation. *Medical Image Analysis (MedIA)*, Volume 10, Issue 3, June 2006, pages 440-451. **9th most cited in MedIA 2006-2011.**
7. M. Prastawa, J. H. Gilmore, W. Lin, and G. Gerig. Automatic Segmentation of MR Images of the Developing Newborn Brain. *Medical Image Analysis (MedIA)*, Volume 9, Issue 5, October 2005, pages 457-466. **2nd most cited in MedIA 2005-2010.**
8. M. Prastawa, E. Bullitt, S. Ho, and G. Gerig. A Brain Tumor Segmentation Framework Based on Outlier Detection. *Medical Image Analysis (MedIA)*, Volume 8, Issue 3, September 2004, pages 275-283.
9. M. Prastawa, E. Bullitt, N. Moon, K. van Leemput, and G. Gerig. Automatic Brain Tumor Segmentation by Subject Specific Modification of Atlas Priors. *Academic Radiology*, Volume 10, Issue 12, December 2003, pages 1341-1348.

ARTICLES IN CONFERENCE AND WORKSHOP PROCEEDINGS

1. B. Wang, M. Prastawa, S. P. Awate, A. Irimia, M. C. Chambers, P. M. Vespa, J. D. van Horn, and G. Gerig. Segmentation of Serial MRI of TBI patients using Personalized Atlas Construction and Topological Change Estimation. *International Symposium on Biomedical Imaging (ISBI) 2012*. To appear.
2. A. Vardhan, M. Prastawa, S. Gouttard, J. Piven, and G. Gerig. Quantifying Regional Growth Patterns through Longitudinal Analysis of Distances between Multimodal MR Intensity Distributions. *International Symposium on Biomedical Imaging (ISBI) 2012*. To appear.
3. N. Sadeghi, M. Prastawa, P. T. Fletcher, J. H. Gilmore, W. Lin, and G. Gerig. Statistical Growth Modeling of Longitudinal DT-MRI for Regional Characterization of Early Brain Development. *International Symposium on Biomedical Imaging (ISBI) 2012*. To appear.
4. M. Prastawa, S. Awate, G. Gerig, and the Alzheimer's Disease Neuroimaging Initiative. Building Spatiotemporal Anatomical Models through Joint Segmentation, Registration, and 4D-Atlas Estimation. *Mathematical Methods in Biomedical Image Analysis (MMBIA) 2012* (Oral).
5. B. Wang, M. Prastawa, A. Irimia, M. C. Chambers, P. M. Vespa, J. D. Van Horn, and G. Gerig. A Patient-Specific Segmentation Framework for Longitudinal MR Images of Traumatic Brain Injury. *SPIE Medical Imaging 2012*. To appear (Oral).
6. N. Sadeghi, M. Prastawa, P. T. Fletcher, J. H. Gilmore, W. Lin, and G. Gerig. Statistical Growth Modeling of Longitudinal DT-MRI for Regional Characterization of Early Brain Development. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2011 Workshop on Image Analysis of Human Brain Development*

- (Oral).
7. S. Durrleman, *M. Prastawa*, G. Gerig, and S. Joshi. Optimal Data-driven Sparse Parametrization of Diffeomorphisms for Population Analysis. *Information Processing in Medical Imaging (IPMI) 2011*. Lecture Notes in Computer Science (LNCS) 6801, pages 123-134 (Oral).
 8. N. Sadeghi, *M. Prastawa*, J. H. Gilmore, W. Lin, and G. Gerig. Spatio-temporal Analysis of Early Brain Development *Asilomar Conference on Signals, Systems, and Computers 2010* (Oral).
 9. J. J. E. Blauer, J. Cates, C. J. McGann, E. G. Kholmovski, A. Alexander, *M. W. Prastawa*, S. Joshi, N. F. Marrouche, R. S. MacLeod. MRI Based Injury Characterization Immediately Following Ablation of Atrial Fibrillation. *Computing in Cardiology (CinC) 2010* (Oral).
 10. L. Ha, *M. Prastawa*, G. Gerig, J. H. Gilmore, C. T. Silva, and S. Joshi. Image Registration Driven by Combined Probabilistic and Geometric Descriptors. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2010*, Lecture Notes in Computer Science (LNCS) 6362, pages 602-609 (Poster).
 11. *M. Prastawa*, N. Sadeghi, J. H. Gilmore, W. Lin, and G. Gerig. A New Framework for Analyzing White Matter Maturation in Early Brain Development. *International Symposium on Biomedical Imaging (ISBI) 2010* (Poster).
 12. N. Sadeghi, *M. Prastawa*, J. H. Gilmore, W. Lin, and G. Gerig. Towards Analysis of Growth Trajectory through Multi-modal Longitudinal MR Imaging. *SPIE Medical Imaging 2010* (Poster).
 13. S. Gouttard, *M. Prastawa*, E. Bullitt, W. Lin, C. Goodlett and G. Gerig. Constrained Data Decomposition and Regression for Analyzing Healthy Aging from Fiber Tract Diffusion Properties. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2009*, Lecture Notes in Computer Science (LNCS) 5761, pages 321-328 (Oral).
 14. *M. Prastawa* and G. Gerig. Brain Lesion Segmentation through Physical Model Estimation. *International Symposium on Visual Computing (ISVC) 2008*. Lecture Notes in Computer Science (LNCS) 5358, pages 562-571 (Oral).
 15. A. Fedorov, E. Billet, *M. Prastawa*, A. Radmanesh, G. Gerig, R. Kikinis, S. K. Warfield, and N. Chrisochoides. Evaluation of Brain MRI Alignment with the Robust Hausdorff Distance Measures. *International Symposium on Visual Computing (ISVC) 2008*. Lecture Notes in Computer Science (LNCS) 5358, pages 594-603 (Oral).
 16. *M. Prastawa* and G. Gerig. Automatic MS Lesion Segmentation by Outlier Detection and Information Theoretic Region Partitioning. 3D Segmentation in the Clinic: A Grand Challenge II Workshop at *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2008*. Midas Journal: <http://hdl.handle.net/10380/1457> (Poster).
 17. S. Gouttard, M. Styner, *M. Prastawa*, W. Lin, J. H. Gilmore, and G. Gerig. Assessment of Reliability of Multi-site Neuroimaging via Traveling Phantom Study. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2008*, Lecture Notes in Computer Science (LNCS) 5242, pages 263-270 (Poster).
 18. *M. Prastawa*, E. Bullitt, and G. Gerig. Synthetic Ground Truth for Validation of Brain Tumor MRI Segmentation. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2005*, Lecture Notes in Computer Science (LNCS) 3749, pages 26-33 (Oral).
 19. B. Mortamet, D. Zeng, G. Gerig, *M. Prastawa*, and E. Bullitt. Effects of Healthy Aging Measured By Intracranial Compartment Volumes Using a Designed MR Brain

- Database. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2005*, Lecture Notes in Computer Science (LNCS) 3749, pages 383-391 (Poster).
20. M. Prastawa, J. Gilmore, W. Lin, and G. Gerig. Automatic Segmentation of Neonatal Brain MRI. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2004*, Lecture Notes in Computer Science (LNCS) 3216, pages 10-17 (Oral).
 21. M. Prastawa, E. Bullitt, S. Ho, and G. Gerig. Robust Estimation for Brain Tumor Segmentation. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2003*, Lecture Notes in Computer Science (LNCS) 2879, pages 530-537 (Oral).
 22. G. Gerig, M. Prastawa, W. Lin, and J. Gilmore. Assessing Early Brain Development in Neonates by Segmentation of High-Resolution 3T MRI. *Medical Image Computing and Computer Assisted Intervention (MICCAI) 2003*, Lecture Notes in Computer Science (LNCS) 2879, pages 979-980 (Poster).

CONFERENCE ABSTRACTS AND POSTERS

1. A. Irimia, M. C. Chambers, M. Filippou, J. R. Alger, M. W. Prastawa, B. Wang, S. Gouttard, S. M. A. Pujol, S. R. Aylward, D. A. Hovda, G. Gerig, A. W. Toga, R. Kikinis, P. M. Vespa, J. D. van Horn. Three-dimensional calculation and quantification of morphometric and volumetric cortical atrophy indices of widespread clinical use from MRI volumes of traumatic brain injury using 3D Slicer. *Society for Neuroscience (SfN)*, November 2011.
2. A. Irimia, J. D. Van Horn, M. Chambers, M. Prastawa, S. Gouttard, P. M. Vespa, D. A. Hovda, J. R. Alger, S. M. Pujol, G. Gerig, S. R. Aylward, A. W. Toga, R. Kikinis. Automatic multimodal MR image segmentation for the clinical assessment of traumatic brain injury in 3D Slicer. Annual Meeting of the *Organization for Human Brain Mapping (OHBM)*, June 2011.
3. C. J. McGann, E. G. Kholmovski, J. J. Blauer, S. Vijayakumar, T. S. Haslam, J. E. Cates, N. W. Akoum, E. V. Dibella, N. S. Burgon, A. J. Alexander, M. Prastawa, D. Parker, R. MacLeod, and N. F. Marrouche. Dark Regions of No-Reflow on LGE-MRI Result in Permanent Scar Post Atrial Fibrillation Ablation. *International Society for Magnetic Resonance in Medicine (ISMRM)*, May 2011.
4. A. Alexander, J. Blauer, C. McGann, E. Kholmovski, M. Prastawa, S. Joshi, and R. MacLeod. Predicting Scarring After Cardiac Ablation using Diffeomorphic Surface Mapping. *Mountain West Biomedical Engineering Conference*, Sep. 2010.
5. N. Sadeghi, M. Prastawa, J. H. Gilmore, W. Lin, and G. Gerig. Towards Analysis of Growth Trajectory through Multi-modal Longitudinal MR Imaging. *Mountain West Biomedical Engineering Conference*, Sep. 2009.
6. A. Alexander, M. Harris, A. Anderson, J. Weiss, M. Prastawa, and S. Joshi. Estimation of Regional Biomechanical Properties within a Population Using a Representative Surface Average. *Mountain West Biomedical Engineering Conference*, Sep. 2009.
7. M. Benders, J. Dubois, F. Lazeyras, S. Warfield, M. Styner, M. Prastawa, and P. Huppi. Brain Development Evaluated by Two Different MR Imaging Segmentation Techniques in Preterm Neonates. *Pediatric Academic Societies' (PAS) Annual Meeting*, May 2007.
8. G. Gerig, P. Fillard, M. Prastawa, W. Lin, and J. H. Gilmore. Neonatal Brain Development Assessed by New Quantitative Analysis of High-field 3Tesla MRI and DTI. *Society of Biological Psychiatry (SOBP)*, Apr. 2004.
9. G. Gerig, P. Fillard, M. Prastawa, W. Lin and J. Gilmore. New Quantitative Analysis of High-field 3T MRI/DTI to Assess Neonatal Brain Development. *American College of Neuropsychopharmacology (ACNP)*, Dec. 2003.