Gordon L. Kindlmann

Curriculum Vitae, 3 February 2011

Contact Information

Computer Science, U of Chicago
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Positions

University of Chicago
Chicago, Illinois

January 2009 to Present
Assistant Professor, Department of Computer Science
Assistant Professor and Fellow, Computation Institute

Harvard Medical School (Brigham and Women's Hospital, Department of Radiology), Boston, Massachusetts

Instructor, August 2007 to December 2008
Post-doctoral Research Fellow, October 2004 to August 2007
Advisor: Carl-Fredrik Westin

Education

University of Utah, Salt Lake City, Utah

Ph.D., Computer Science, December 2004
"Visualization and Analysis of Diffusion Tensor Fields"
Advisor: Christopher R. Johnson

Cornell University, Ithaca, New York

M.S., Architecture (Computer Graphics), January 1999
"Semi-Automatic Generation of Transfer Functions for Direct Volume Rendering"
Advisor: Donald P. Greenberg.

Cornell University, Ithaca, New York

B.A., Mathematics, May 1995

Publications

Refereed Journals

AJ Golby, G Kindlmann, I Norton, A Yarmarkovich, S Pieper, R Kikinis. "Interactive Diffusion Tensor Tractography Visualization for Neurosurgical Planning." Neurosurgery, 68(2):496–505, 2011.

T Schultz, G Kindlmann. "Superquadric Glyphs for Symmetric Second-Order Tensors." IEEE Transactions on Visualization and Computer Graphics, 15(6):1595–1604, 2010.

T Schultz, G Kindlmann. "A Maximum Enhancing Higher-Order Tensor Glyph." Computer Graphics Forum (Proc. EuroVis), 29(3):1143–1152, 2010.

P Savadjiev, GL Kindlmann, S Bouix, ME Shenton, C-F Westin. "Local white matter geometry from diffusion tensor gradients." NeuroImage, 49(4):3175–3186, 2010.

M Hlawitschka, C Garth, X Tricoche, G Kindlmann, G Scheuermann, KI Joy, B Hamann. "Direct visualization of fiber information by coherence." International Journal of Computer Assisted Radiology and Surgery, 5(2):125–131, 2010.

GL Kindlmann, R San José Estépar, SM Smith, C-F Westin, "Sampling and Visualizing Creases with Scale-Space Particles." IEEE Transactions on Visualization and Computer Graphics, 15(6):1415–1424, 2009.

AA Qazi, A Radmanesh, L O'Donnell, G Kindlmann, S Peled, S Whalen, C-F Westin, AJ Golby. "Resolving crossings in the corticospinal tract by two-tensor streamline tractography: Method and clinical assessment using fMRI." NeuroImage, 47(Supp.2):T98–T106, 2009.

K Lee, T Yoshida, M Kubicki, S Bouix, C-F Westin, G Kindlmann, M Niznikiewicz, A Cohen, RW McCarley, ME Shenton. "Increased diffusivity in superior temporal gyrus in patients with schizophrenia: A Diffusion Tensor Imaging study." Schizophrenia Research, 108(1):33–40, 2009.

X Tricoche, G Kindlmann, C-F Westin. "Invariant Crease Lines for Topological and Structural Analysis of Tensor Fields." IEEE Transactions on Visualization and Computer Graphics, 14(6):1627–1634, 2008.

SX Vasquez, MS Hansen, AN Bahadur, MF Hockin, GL Kindlmann, L Nevell, IQ Wu, DJ Grunwald, DM Weinstein, GM Jones, CR Johnson, JL Vandeberg, MR Capecchi, C Keller. "Optimization of volumetric computed tomography for skeletal analysis of model genetic organisms." The Anatomical Record, 291(5):475–487, 2008.

G Kindlmann, D B Ennis, R T Whitaker, C-F Westin. "Diffusion Tensor Analysis with Invariant Gradients and Rotation Tangents." IEEE Transactions on Medical Imaging, 26(11):1483–1499, 2007.

G Kindlmann, X Tricoche, C-F Westin. "Delineating White Matter Structure in Diffusion Tensor MRI with Anisotropy Creases." Medical Image Analysis, 11(5):492–502, 2007.

G Kindlmann and C-F Westin. "Diffusion Tensor Visualization with Glyph Packing." IEEE Transactions on Visualization and Computer Graphics, 12(5):1329–1336, October 2006.

DB Ennis and G Kindlmann. "Orthogonal tensor invariants and the analysis of diffusion tensor magnetic resonance images." Magnetic Resonance in Medicine 55(1):136–146, 2006.

G Kindlmann, DM Weinstein, GM Jones, CR Johnson, MR Capecchi, C Keller. "Practical vessel imaging by computed tomography in live transgenic mouse models for human tumors." Molecular Imaging. 4(4):417–424, October–December 2005.

M Magnor, G Kindlmann, C Hansen, N Duric. "Reconstruction and Visualization of Planetary Nebulae." IEEE Transactions on Visualization and Computer Graphics, 11(8):485–496, 2005.

DB Ennis, G Kindlmann, I Rodriguez, PA Helm and ER McVeigh. "Visualization of tensor fields using superquadric glyphs." Magnetic Resonance in Medicine 53(1):169–176, 2005.

J Kniss, G Kindlmann, C Hansen. "Multi-Dimensional Transfer Functions for Interactive Volume Rendering." IEEE Transactions on Visualization and Computer Graphics, 8(4):270–285, July 2002.

H Pfister, W Lorensen, C Bajaj, G Kindlmann, W Schroeder, L Sobeierajski Avila, K Martin, R Machiraju, and J Lee. "The Transfer Function Bake-Off." IEEE Computer Graphics and Applications, 21(3):16–22, May/June 2001.

AL Alexander, K Hasan, G Kindlmann, DL Parker, JS Tsuruda. "A Geometric Comparison of Diffusion Anisotropy Measures." Magnetic Resonance in Medicine 44:283–91, 2000.

G Kindlmann, D Weinstein, and DA Hart. "Strategies for Direct Volume Renderings of Diffusion Tensor Fields." IEEE Transactions on Visualization and Computer Graphics, 6(2):124–138, April-June 2000.

CR Johnson, SG Parker, C Hansen, G Kindlmann, and Y Livnat. "Interactive Simulation and Visualization." IEEE Computer, 32(12):59–65, 1999.

SJ Young, GY Fan, D Hessler, S Lamont, TT Elvins, M Hadida, G Hanyzewski, JW Durkin, P Hubbard, G Kindlmann, E Wong, D Greenberg, S Karin, MH Ellisman. "Implementing a Collaboratory for Microscopic Digital Anatomy." Supercomputer Applications and High Performance Computing, 10(2/3):170–181, 1996.

Conference Papers– full paper review

T Schultz, C-F Westin, G Kindlmann, "Multi-Diffusion-Tensor Fitting via Spherical Deconvolution: A Unifying Framework." In Proceedings MICCAI 2010, pages 673–680.

J Ross, R San José Estépar, A Diaz, C-F Westin, E Silverman, G Washko, "Automatic Lung Lobe Segmentation Using Particles, Thin Plate Splines, and Maximum a Posteriori Estimation." In Proceedings MICCAI 2010, pages 163–171.

P Savadjiev, G Kindlmann, S Bouix, ME Shenton, C-F Westin, "Local White Matter Geometry Indices from Diffusion Tensor Gradients." (oral presentation), In Proceedings MICCAI 2009, pages 345–352. September 2009.

A Qazi, G Kindlmann, L O'Donnell, S Peled, A Radmanesh, S Whalen, A Golby, C-F Westin. "Two-tensor streamline tractography through white matter intra-voxel fiber crossings: Assessed by fMRI." In Proceedings Computer Vision and Pattern Recognition Workshop: Mathematical Methods in Biomedical Image Analysis, pages 1–8. June 2008.

G Kindlmann, R San José Estépar, M Niethammer, S Haker, C-F Westin. "Geodesic-Loxodromes for Diffusion Tensor Interpolation and Difference Measurement." (oral presentation), In Proceedings MICCAI 2007, pages 1–9, Lecture Notes in Computer Science 4792, October 2007.

O Bergmann, G Kindlmann, S Peled, C-F Westin. "Two-Tensor Fiber Tractography." In Proceedings ISBI 2007, pages 796–799, April 2007.

M Jolley, J Stinstra, D Weinstein, S Pieper, R San José Estépar, G Kindlmann, R MacLeod, DH Brooks, JK Triedman. "Open-Source Environment for Interactive Finite Element Modeling of Optimal ICD Electrode Placement." In Proceedings 4th International Conference on Functional Imaging and Modeling of the Heart, pages 373–382, Lecture Notes in Computer Science 4466, June 2007.

G Kindlmann, X Tricoche, C-F Westin. "Anisotropy Creases Delineate White Matter Structure in Diffusion Tensor MRI." (oral presentation), In Proceedings MICCAI 2006, pages 126–133, Lecture Notes in Computer Science 4191, October 2006.

O Bergmann, G Kindlmann, A Lundervold, C-F Westin. "Diffusion k-tensor Estimation from Q-ball Imaging Using Discretized Principal Axes." In Proceedings MICCAI 2006, pages 268–275, Lecture Notes in Computer Science 4191, October 2006.

M Magnor, G Kindlmann, C Hansen, N Duric. "Constrained Inverse Volume Rendering for Planetary Nebulae." In Proceedings IEEE Visualization 2004, pages 83–90, October 2004.

X Tricoche, C Garth, G Kindlmann, E Deines, G Scheuermann, M Ruetten, C Hansen. "Visualization of Intricate Flow Structures for Vortex Breakdown Analysis." In Proceedings IEEE Visualization 2004, pages 187–192, October 2004.

G Kindlmann, DM Weinstein, AD Lee, AW Toga, PM Thompson. "Visualization of Anatomic Covariance Tensor Fields." 26th Annual Conference of the IEEE Engineering in Medicine and Biology Society (EMBS), pages 1842–1845, September 2004.

G Kindlmann. 'Superquadric Tensor Glyphs." In Proceedings IEEE TVCG/EG Symposium on Visualization 2004, pages 147–154, May 2004.

G Kindlmann, R Whitaker, T Tasdizen, T Möller. "Curvature-Based Transfer Functions for Direct Volume Rendering: Methods and Applications." In Proceedings IEEE Visualization 2003, pages 513–520, October 2003.

G Kindlmann, E Reinhard, S Creem. "Face-based Luminance Matching for Perceptual Colormap Generation." In Proceedings IEEE Visualization 2002, pages 299–306, October 2002.

J Kniss, G Kindlmann, C Hansen. "Interactive Volume Rendering Using Multi-Dimensional Transfer Functions and Direct Manipulation Widgets." In Proceedings IEEE Visualization 2001, pages 255–262, October 2001. (*Awarded Best Paper*)

G Kindlmann and D Weinstein. "Hue-Balls and Lit-Tensors for Direct Volume Rendering of Diffusion Tensor Fields." In Proceedings IEEE Visualization 1999, pages 183–189, October 1999. (*Awarded Best Paper*)

D Weinstein, G Kindlmann, and E Lundberg. "Tensorlines: Advection-Diffusion based Propaga-

tion through Diffusion Tensor Fields." In Proceedings IEEE Visualization 1999, pages 249–253. October 1999

G Kindlmann and JW Durkin. "Semi-Automatic Generation of Transfer Functions for Direct Volume Rendering." In IEEE Symposium On Volume Visualization, pages 79–86, October 1998. (*Awarded Best Paper*)

Book Chapters

SM Smith, G Kindlmann. "Cross-subject Comparison of Local Diffusion MRI Parameters." In H Johansen-Berg, TEJ Behrens, editors, "Diffusion MRI: From Quantitative Measurement to In-vivo Neuroanatomy," Chapter 8, pages 148–175. Academic Press, 2009.

GL Kindlmann, C-F Westin. "Practical and Intuitive Basis for Tensor Field Processing with Invariant Gradients and Rotation Tangents." In S Aja-Fernández, R de Luis García, D Tao, X Li, editors, "Tensors in Image Processing and Computer Vision," pages 299–314. Springer London, 2009.

A Vilanova, S Zhang, G Kindlmann, D Laidlaw. "An Introduction to Visualization of Diffusion Tensor Imaging and Its Applications." In J Weickert and H Hagen, editors, "Visualization and Processing of Tensor Fields," pages 121–153. Springer Verlag, 2006.

G Kindlmann. "Tensor Invariants and their Gradients." In J Weickert and H Hagen, editors, "Visualization and Processing of Tensor Fields," pages 215–224. Springer Verlag, 2006.

J Kniss, G Kindlmann, CD Hansen. "Multidimensional Transfer Functions for Volume Rendering." In C Johnson, C Hansen, editors, "The Visualization Handbook," pages 189–210. Academic Press, 2004.

S Zhang, G Kindlmann, D Laidlaw. "Diffusion Tensor MRI Visualization." In C Johnson, C Hansen, editors, "The Visualization Handbook," pages 327–340. Academic Press, 2004.

CR Johnson, Y Livnat, L Zhukov, D Hart, and G Kindlmann. "Computational Field Visualization." In B Engquist and W Schmid, editors, "Mathematics Unlimited - 2001 and Beyond," volume 2, pages 605–630. Springer-Verlag, 2001.

Invited Papers

G Kindlmann, RA Normann, A Badi, C Keller, GM Jones, CR Johnson. "Scientific Visualization in Small Animal Imaging." ACM SIGGRAPH Computer Graphics Quarterly, 38(2):4-7, May 2004.

C Johnson, D Brederson, C Hansen, M Ikits, G Kindlmann, Y Livnat, S Parker, D Weinstein, R Whitaker. "Computational Field Visualization." ACM SIGGRAPH Computer Graphics Quaterly, 35(4):5-9, November 2001.

Conference Abstracts and Posters

PJ La Rivière, A Rojek, P Vargas, G Kindlmann, D Clark, K Cheng, X Xiao, F DeCarlo. "Optimizing synchrotron microCT for high-throughput phenotyping of zebrafish." Developments in X-Ray Tomography, Proc SPIE Vol. 7804, pp. 78040M, August 2010, San Diego, CA.

D P Clark,, G Kindlmann, P La Riviere, X Xiao, F De Carlo, K C Cheng. "Morphological Phenotyping of Zebrafish Mutants Using Micron-Scale CT." 9th International Meeting on Zebrafish Development and Genetics, June 2010. Madison, WI.

M Nakamura, U Khan, M Kubicki, G Kindlmann, S Bouix, K Quintus, M Niznikiewicz, C-F Westin, R Kikinis, R McCarley, M Shenton. "Global abnormalities in white and gray matter of chronic schizophrenia: A diffusion tensor imaging study." Ninth World Congress of Biological Psychiatry, June 2009, Paris, France.

AA Qazi, G Kindlmann, C-F Westin. "Simulated diffusion dataset for multi-tensor fiber tractography." 14th Annual Meeting of the Organization for Human Brain Mapping, June 2008.

G Kindlmann, S Whalen, R Suarez, A Golby, C-F Westin. "Quantification of white matter fiber orientation at tumor margins with diffusion tensor invariant gradients." In Proceedings 16th Annual Meeting of International Society for Magnetic Resonance in Medicine (ISMRM), May 2008.

DB Ennis, G Kindlmann, M Mogensen, T Vertinsky, SW Atlas, R Bammer. "Application of Novel Directionally Encoded Colormaps for Isolating Linear Anisotropic Structures in Human Brain Diffusion Tensor Magnetic Resonance Imaging." In Proceedings 14th Annual Meeting of International Society for Magnetic Resonance in Medicine (ISMRM), page 3164, May 2006.

DB Ennis and G Kindlmann. "Orthogonal tensor decomposition for analysis of DTMRI anisotropy." In Proceedings 13th Annual Meeting of International Society for Magnetic Resonance in Medicine (ISMRM), page 627, 2005.

G Kindlmann, AL Alexander, M Lazar, J Lee, T Tasdizen, R Whitaker. "Moment-Based Global Registration of Echo Planar Diffusion-Weighted Images." In Proceedings 12th Annual Meeting of International Society for Magnetic Resonance in Medicine (ISMRM), page 2200, May 2004.

DB Ennis, G Kindlmann, PA Helm, I Rodriguez, H Wen, ER McVeigh. "Visualization of high-resolution myocardial strain and diffusion tensors using superquadric glyphs." In Proceedings 12th Annual Meeting of International Society for Magnetic Resonance in Medicine (ISMRM), page 2487, May 2004.

Software

Principal Developer, **Teem** (`http://teem.sourceforge.net`) 1998 - present
A set of libraries and command-line tools for analyzing and visualizing raster data, including diffusion-weighted and diffusion tensor images. Now a component of 3D Slicer (`www.slicer.org`), SCIRun (`http://software.sci.utah.edu/scirun.html`), and the NA-MIC Toolkit (`http://www.na-mic.org`).

Invited Presentations

"Probing the Scale-Space Structure of Anisotropy and its Orientation," Department of Simulation and Graphics (Prof. Dr. Holger Theisel, host), University of Magdeburg, Magdeburg, Germany, November 2009.

"Novel Mathematical Approaches (with Practical Considerations) to Biomedical Image Analysis," Committee on Medical Physics (P La Rivière, host), Chicago, August 2009.

"Sampling the Scale-Space behavior of Tensor Invariants," Dagstuhl Seminar 09302, "New Developments in the Visualization and Processing of Tensor Fields," (B Burgeth, D Laidlaw, organizers), Dagstuhl, Germany, July 2009.

"Sampling and Visualizing Creases with Scale-Space Particles." Max-Planck Institut für Informatik (H-P Seidel, host), Saarbrücken, Germany, July 2009.

"Symmetry and Continuity in Visualization and Tensor Glyph Design." Dagstuhl Seminar 09251, "Scientific Visualization," (DS Ebert, E Gröller, H Hagen, A Kaufman, organizers), Dagstuhl, Germany, June 2009.

"Visualization of Diffusion Image Data and its Models." Dagstuhl Seminar 07291, "Scientific Visualization," (D E Ebert, H Hagen, K I Joy, D A Keim, organizers), Germany, July 2007.

"Recent Developments in the Visualization, Interpolation, and Analysis of Diffusion Image Data and its Models." Technische Universiteit (TU) Eindhoven, TU Delft, and Visual Interactive Effective Worlds (VIEW) Workshop, (A Vilanova, C Botha, F Post, hosts), The Netherlands, June 2007.

"Anisotropy Creases and Extremal Surfaces in Diffusion Tensor Images." Visualization Research Lab (D Laidlaw, host), Brown University, February 2007.

"Anisotropy Creases and Extremal Surfaces." Dagstuhl Seminar 07022, "Visualization and Image Processing of Tensor Fields," (J Weickert and D Laidlaw, organizers), Germany, January 2007.

"An Open-Source Framework for Tensor Visualization and Analysis." University of Las Palmas de Gran Canaria (H Knutsson, D Sosa, hosts), Spain, November 2006.

"Crease Features in Tensor Invariants." Radiologic Sciences Laboratory (DB Ennis, host), Stanford University, February 2006.

"Visual Display of Diffusion Tensor Fields." PICASso Research Seminar (A Finkelstein, host), Princeton University, November 2005.

"Visualization and Analysis of Diffusion Tensor Fields." Electrical and Computer Engineering Colloquium, (SA McKee, host), Cornell University, September 2005.

"Tensor Invariants, their Gradients, and their Failings." Dagstuhl Perspectives Seminar 04172

"Visualization and Image Processing of Tensor Fields," (H Hagen and J Weickert, organizers), Germany, April 2004.

Conference Courses, Tutorials, Panels

A Joshi (panel moderator), J Dykes, D F Keefe, G L Kindlmann, T Munzner. "Perspectives on Teaching Data Visualization." IEEE VisWeek 2010 Panel, October 2010. (*Awarded Best Panel*)

T Schultz (tutorial organizer), G L Kindlmann, X Tricoche, A O Vasilescu, A Vilanova, E Zhang. "Tensors in Visualization." IEEE VisWeek 2010 Tutorial, October 2010.

A Joshi (panel moderator), J Heer, G Kindlmann, M Meyer. "New Faculty Members and Postdoctoral Fellows Spill the Beans." IEEE VisWeek 2009 Panel, October 2009. (*Awarded Best Panel*)

S Oeltze, D Bartz, F Link, G Kindlmann, K Mueller, B Preim, M Wacker, "Visual Medicine: Techniques, Applications and Software." IEEE Visualization 2006 Tutorial 1, October 2006.

TJ Jankun-Kelly (panel moderator), R Kosara, G Kindlmann, C North, C Ware, EW Bethel. "Is There Science In Visualization?" IEEE Visualization 2006 Panel, October 2006. (*Awarded Best Panel*)

D Bartz, G Kindlmann, K Mueller, B Preim, M Wacker, "Visual Medicine: Foundations of Medical Imaging" and "Visual Medicine: Advanced Applications for Medical Imaging," IEEE Visualization 2005 Tutorials 2 and 3, October 2005.

L Ibanez, G Kindlmann, S Aylward, "Hot Topics in 3D Medical Visualization," ACM SIGGRAPH 2005, Tutorial/Course 33, August 2005.

AL Alexander, G Kindlmann, D Weinstein, L Zhukov, EK Jeong, "Diffusion Tensor MRI: From Acquisition to Application", SIAM Conference on Imaging Science, May 2004.

D Weinstein, PJ Basser, AL Alexander, E Hsu, G Kindlmann, D Laidlaw, L Zhukov, C-F Westin, J Tsuruda, "Diffusion Tensor MRI: From Acquisition to Application," IEEE Visualization 2003 Workshop 1, October 2003.

J Kniss, G Kindlmann, M Hadwiger, C Rezk-Salama, R Westermann, "High-Quality Volume Graphics on Consumer PC Hardware," IEEE Visualization 2002 Tutorial 2, October 2002.

T Yoo, G Gerig, R Whitaker, G Kindlmann, R Machiraju, and T Möller, "Image Processing for Volume Graphics," ACM SIGGRAPH 2002 Course 50, July 2002.

T Yoo, G Gerig, R Whitaker, G Kindlmann, R Machiraju, and T Möller, "From Transfer Functions to Level Sets: Advanced Topics in Volume Image Processing," IEEE Visualization 2001 Tutorial 5, October 2001.

H Pfister (panel moderator), B Lorensen, C Bajaj, G Kindlmann, W Schroeder, L Sobeierajski Avila, K Martin and R Machiraju. "The Transfer Function Bake-Off." In Proceedings IEEE

Visualization 2000, pages 523–526, October 2000. (*Awarded Best Panel*)

Teaching Experience

University of Chicago, Chicago, Illinois

CMSC 23710/33710 "Scientific Visualization" Spring 2009, Autumn 2010
New course material, taught with Python, Teem, and OpenGL.

CMSC 15400 "Introduction to Computer Systems" Spring 2010

University of Utah, Salt Lake City, Utah

TA, CS 5630 "Scientific Visualization" 2000 - 2001
Created and graded assignments, helped with writing and grading exams, gave occasional lectures, and created on-line resources for learning VTK/Tcl/Tk software.

Professional Service

Papers Co-Chair, IEEE/EG Intl. Symp. on Volume and Point-Based Graphics 2010
Co-Chair, Workshop on Visual Computing for Biomedicine (`http://www.vcbm.org`) 2008
Program Committee, Eurographics/IEEE Symposium on Visualization 2010,2008
Interactive Demos Co-Chair, IEEE Visualization 2008
Posters Co-Chair, IEEE Visualization 2006, 2007
Program Committee, IEEE Visualization 2005 – 2007
Program Committee, Applied Perception in Graphics and Visualization 2006 – 2008
Program Committee, Volume Graphics 2007
Program Committee, Vision, Modeling, and Visualization 2004 – 2005
Reviewer, IEEE Visualization, IEEE Transactions on Visualization and Computer Graphics, ACM SIGGRAPH, ACM EuroGraphics, NeuroImage, International Society for Magnetic Resonance in Medicine (ISMRM), Medical Image Computing and Computer-Assisted Intervention (MICCAI).