

Johanna Beyer

Curriculum Vitae

I am a researcher in the field of visual computing, with a focus on scalable techniques for high-throughput data visualization and visual methods for large-scale data analysis. I am also interested in the combination of abstract information visualization with scientific visualization for novel domain-specific applications.

Education

- 2004–2009 **Ph.D. in Computer Science**, *Vienna University of Technology*, Austria.
Dissertation: *GPU-based Multi-Volume Rendering of Complex Data in Neuroscience and Neurosurgery*.
Ph.D. committee: Prof. Dr. Eduard Gröller, Prof. Dr. Hanspeter Pfister.
- 2000–2004 **Dipl. Ing. (FH) in Medical Software Engineering**, *Upper Austrian University of Applied Science*, Austria.

Research Experience

- 2016–now **Research Associate**, *Visual Computing Group, Harvard University*, USA.
- 2013–2016 **Postdoctoral Fellow**, *Visual Computing Group, Harvard University*, USA.
- 2013 **Visiting Research Fellow**, *Institute of Computer Graphics and Algorithms, Vienna University of Technology*, Austria.
- 2010–2013 **Postdoctoral Fellow**, *Geometric Modeling and Scientific Visualization Research Center, King Abdullah University of Science and Technology (KAUST)*, Saudi Arabia.
- 2009 **Visiting Research Fellow**, *Initiative on Innovative Computing, Harvard University*, USA.
- 2008–2010 **Researcher**, *Visualization Group, VRVis Research Center*, Austria.
- 2004–2008 **Junior Researcher**, *Medical Visualization Group, VRVis Research Center*, Austria.

Teaching Experience

Classroom Teaching

- 2018 **Head Teaching Fellow**, *Visualization*, 80 undergraduate and 30 online students. Harvard University.
- 2017 **Lecturer**, *Visualization*, 70 undergraduate and graduate students. Harvard University.
- 2015–2016 **Head Teaching Fellow**, *Visualization*, 240 undergraduate and online students. Harvard University.
- 2013–2014 **Senior Teaching Fellow**, *Visualization*, Harvard University.
- 2014 **Senior Teaching Fellow**, *Systems Development for Computational Science*, 70 graduate and online students. Harvard University.
- 2013 **Senior Teaching Fellow**, *Data Science*, 400 undergraduate, graduate and online students. Harvard University.
- 2010–2012 **Teaching Fellow**, *Scientific Visualization*, KAUST.
- 2010–2012 **Teaching Fellow**, *GPU and GPGPU Programming*, KAUST.

Student Co-Supervision and Mentoring

- 2015–now Leader of the visualization subgroup of Prof. Pfister’s lab, including student mentoring, Harvard University.
- 2013–now Supervision of PhD students and Master’s theses, Harvard University.
- 2010–2012 Supervision of Master’s theses and directed research, King Abdullah University of Science and Technology.
- 2009–2010 Supervision of Master’s theses and directed research, VRVis Research Center.

Academic Activities

- Committees Program Committee IEEE SciVis 2014-2015, 2017.
Program Committee SciVis Short Papers 2018.
Program Committee EuroVis 2014, 2016.
Posters Chair IEEE LDAV 2015.
Program Committee IEEE LDAV 2014, 2015, 2017, 2018.
Program Committee EuroVis Short Papers 2012-2014, 2017-2018.
Program Committee EG VCBM 2018.
- Conference Reviewing IEEE Visualization Conference; ACM Siggraph; ACM Siggraph Asia; SC International Conference for High Performance Computing, Networking, Storage and Analysis; ACM Chi; Eurographics Conference on Visualization; IEEE Pacific Visualization Symposium; IEEE/EG International Symposium on Volume and Point-Based Graphics; Eurographics Symposium on Parallel Graphics and Visualization; IEEE Symposium on Large-Scale Data Analysis and Visualization; International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision; Eurographics Workshop on Visual Computing for Biology and Medicine; Central European Seminar on Computer Graphics.
- Journal Reviewing IEEE Transactions on Visualization and Computer Graphics; IEEE Computer Graphics and Applications; Computer Graphics Forum; The Visual Computer; Computer Assisted Radiology and Surgery; Information Visualization; Computers in Biology and Medicine; Neuroinformatics.

Grants and Grant Writing Experience

- 2016-2018 *Administering*: CCF collaborative research project Harvard University, KAUST Visual Computing Center, with Hanspeter Pfister and Markus Hadwiger.
- 2013-2015 *Administering*: NSF OIA-1125087, with Hanspeter Pfister.
- 2013-2015 *Administering*: Harvard Cuda Center of Excellence, with Hanspeter Pfister.
- 2015 *Assisting*: KAUST CCF Grant Proposal, with Markus Hadwiger.
- 2011 Sabic Postdoctoral Fellowship, post-doctoral funding.
- 2008 Marshall Plan Scholarship, partial doctoral funding.
- 2008 *Assisting*: WWTF ICT08-040, with Markus Hadwiger.

Publications – Journal and Reviewed Conference Publications

- 2018 J. Beyer, H. Mohammed, M. Agus, A. K. Al-Awami, H. Pfister, and M. Hadwiger. Culling for Extreme-Scale Segmentation Volumes: A Hybrid Deterministic and Probabilistic Approach. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE SciVis 2018)*, to appear.
- 2017 H. Mohammed, A. K. Al-Awami, J. Beyer, C. Corrado Cali, P. Magistretti, H. Pfister, and M. Hadwiger. Abstractocyte: A Visual Tool for Exploring Nanoscale Astroglial Cells. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE SciVis 2017)*.

- 2017 M. Hadwiger, A. K. Al-Awami, J. Beyer, M. Agos, and H. Pfister. SparseLeap: Efficient Empty Space Skipping for Large-Scale Volume Rendering. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE SciVis 2017)*.
- 2017 B. Bach, R. Sicat, J. Beyer, M. Cordeil, and H. Pfister. The Hologram in My Hand: How Effective is Interactive Exploration of 3D Visualizations in Immersive Tangible Augmented Reality?. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE InfoVis 2017)*.
- 2017 D. Haehn, J. Hoffer, B. Matejek, A. Suissa-Peleg, Ali. K. Al-Awami, L. Kementsky, F. Gonda, E. Meng, W. Zhang, R. Schalek, A. Wilson, T. Parag, J. Beyer, V. Kaynig, T. R. Jones, J. Tompkin, M. Hadwiger, J. W. Lichtman, and H. Pfister. Scalable Interactive Visualization for Connectomics. *Informatics*.
- 2015 A. K. Al-Awami, J. Beyer, D. Haehn, N. Kasthuri, J. W. Lichtman, H. Pfister, and M. Hadwiger. NeuroBlocks - Visual Tracking of Segmentation and Proofreading for Large Connectomics Projects. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE SciVis 2015)*.
- 2015 J. Beyer, M. Hadwiger, and H. Pfister. State-of-the-Art in GPU-Based Large-Scale Volume Visualization. *Computer Graphics Forum*.
- 2014 A. K. Al-Awami, J. Beyer, H. Strobel, N. Kasthuri, J. W. Lichtman, H. Pfister, and M. Hadwiger. NeuroLines: A Subway Map Metaphor for Visualizing Nanoscale Neuronal Connectivity. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE InfoVis 2014)*.
- 2014 D. Haehn, S. Knowles-Barley, M. Roberts, J. Beyer, N. Kasthuri, J. W. Lichtman, and H. Pfister. Design and Evaluation of Interactive Proofreading Tools for Connectomics. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE SciVis 2014)*.
- 2013 J. Beyer, A. K. Al-Awami, N. Kasthuri, J. W. Lichtman, H. Pfister, and M. Hadwiger. onnectomeExplorer: Query-Guided Visual Analysis of Large Volumetric Neuroscience Data. *IEEE Trans. on Visualization and Computer Graphics, (Proc. of IEEE SciVis 2013)*.
- 2013 J. Beyer, M. Hadwiger, A. Al-Awami, W.-K. Jeong, N. Kasthuri, J. W. Lichtman, and H. Pfister. Exploring the Connectome - Petascale Volume Visualization of Microscopy Data Streams. *IEEE Computer Graphics and Applications*.
- 2012 M. Hadwiger, R. Sicat, J. Beyer, J. Krüger, and T. Möller. Sparse PDF Maps for Non-Linear Multi-Resolution Image Operations. *ACM Transactions on Graphics (Proc. of SIGGRAPH Asia 2012)*.
- 2012 M. Hadwiger, J. Beyer, W.-K. Jeong, and H. Pfister. Interactive Volume Exploration of Petascale Microscopy Data Streams Using a Visualization-Driven Virtual Memory Approach. *IEEE Trans. on Visualization and Computer Graphics (Proc. of IEEE SciVis 2012)*.
- 2011 T. Hoell, J. Beyer, F. Gschwantner, P. Muigg, H. Doleisch, G. Heinemann, and M. Hadwiger. Interactive Seismic Interpretation with Piecewise Global Energy Minimization. *Proc. of IEEE Pacific Visualization*.
- 2010 W.-K. Jeong, J. Beyer, M. Hadwiger, R. Blue, C. Law, A. Vasquez, C. Reid, J. Lichtman, and H. Pfister. SSECRET and NeuroTrace: Interactive Visualization and Analysis Tools for Large-Scale Neuroscience Datasets. *IEEE Computer Graphics and Applications*.
- 2009 W.-K. Jeong, J. Beyer, M. Hadwiger, A. Vasquez, H. Pfister, and R. Whitaker. Scalable and Interactive Segmentation and Visualization of Neural Processes in EM Datasets. *IEEE Trans. on Visualization and Computer Graphics (Proc. of IEEE Visualization 2009)*.
- 2008 J. Beyer, M. Hadwiger, T. Möller, and L. Fritz. Smooth Mixed-Resolution GPU Volume Rendering. *Proc. of IEEE International Symposium on Volume and Point-Based Graphics 2008*.

- 2007 J. Beyer, M. Hadwiger, S. Wolfsberger, and K. Bühler. High-Quality Multimodal Volume Rendering for Preoperative Planning of Neurosurgical Interventions. *IEEE Trans. on Visualization and Computer Graphics (Proc. of IEEE Visualization 2007)*.
- 2007 J. Beyer, M. Hadwiger, S. Wolfsberger, C. Rezk-Salama, and K. Bühler. Segmentierungsfreie Visualisierung des Gehirns für Direktes Volume Rendering. *Proc. of Bildverarbeitung für die Medizin 2007*.
- 2007 J. Beyer, C. Langer, L. Fritz, M. Hadwiger, S. Wolfsberger, and K. Bühler. Interactive Diffusion Based Smoothing and Segmentation of Volumetric Datasets on Graphics Hardware. *Methods of Information in Medicine*.

Publications – Book Chapters

- 2011 W.-K. Jeong, H. Pfister, J. Beyer, and M. Hadwiger. GPU-accelerated Brain Connectivity Reconstruction and Visualization in Large-Scale Electron Micrographs. *GPU Computing Gems, Vol 1*.

Publications – Technical Sketches, Talks and Posters

- 2017 H. Mohammed, A. K. Al-Awami, J. Beyer, C. Corrado Cali, P. Magistretti, H. Pfister, and M. Hadwiger. Abstractocyte: A Visual Tool for Exploring Nanoscale Astroglial Cell Morphology. *Poster at IEEE Pacific Visualization (PacificVis)*.
- 2016 J. Beyer, H. Strobel, M. Oppermann, L. Deslauriers, and H. Pfister. Teaching Visualization for Large and Diverse Classes on Campus and Online. *Pedagogy of Data Visualization Workshop*.
- 2014 A. K. Al-Awami, J. Beyer, H. Strobel, N. Kasthuri, J. W. Lichtman, H. Pfister, M. Hadwiger. NeuroLines - A Subway Map Metaphor for Visualizing Nanoscale Neuronal Connectivity. *Poster at 4th Symposium on Biological Data Visualization (BioVis)*.
- 2011 J. Beyer, M. Hadwiger, W. Jeong, H. Pfister, J. Lichtmann, and C. Reid. Demand-Driven Volume Rendering of Terascale EM Data. *SIGGRAPH 2011 Talks*.
- 2011 J. Beyer, M. Hadwiger, W. Jeong, H. Pfister. Distributed Terascale Volume Visualization Using a Shared Virtual Memory Space. *IEEE Symposium on Large-Scale Data Analysis and Visualization (LDAV)*.
- 2010 J. Beyer, M. Hadwiger, W. Jeong, H. Pfister, J. Lichtmann, and C. Reid. Distributed Multi-Level Out-of-Core Volume Rendering. *Poster at NVIDIA GPU Technology Conference (NVIDIA Research Summit)*.

Publications – Courses

- 2014 J. Beyer, M. Hadwiger, H. Pfister. A Survey of GPU-Based Large-Scale Volume Visualization. *Eurographics Conference on Visualization (EuroVis) - State of The Art Reports*.
- 2013 M. Hadwiger, J. Krüger, J. Beyer, S. Bruckner. GPU-Based Large-Scale Visualization. *SIGGRAPH Asia*.

Invited Talks and Guest Lectures

- 2017 *Guest lecture: Visualizing Spatial Data: Volumes and Flow*. COMPSCI 205: Computing Foundations for Computational Science. Harvard University.
- 2016 *Visualization for Connectomics*. Immersive Approaches to Biological Data Visualization. Cold Spring Harbor Laboratory.
- 2015 *Visualization for Connectomics*. Data Visualization Meeting. Broad Institute.
- 2015 *Data Visualization and Visual Computing for Life Sciences*. Visual Computing Center, King Abdullah University of Science and Technology.
- 2014 *NeuroLines: A Subway Map Metaphor for Visualizing Nanoscale Neuronal Connectivity*. CSAIL, Massachusetts Institute of Technology.
- 2012 *Interactive Volume Exploration of Petascale Microscopy Data*. Visual Computing Group, Harvard University.
- 2012 *Petascale Visualization for Neuroscience*. Workshop on Computational Biomedicine and Geophysics, Salt Lake City.
- 2011 *Petascale Visualization for Neuroscience*. Argonne National Labs.
- 2006 *High-Quality Real-Time Visualization of Medical Data*. European Workshop on basic techniques of microsurgery and cerebral revascularization.

Conference Presentations

- 2014 *A Survey of GPU-Based Large-Scale Visualization*. EuroVis.

- 2013 *Course on GPU-Based Large-Scale Visualization*. ACM Siggraph Asia.
- 2013 *ConnectomeExplorer: Query-Guided Visual Analysis of Large Volumetric Neuroscience Data*. IEEE SciVis.
- 2013 *Interactive Non-Linear Image Operations on Gigapixel Images*. NVIDIA GPU Technology Conference.
- 2012 *Terascale Volume Visualization in Neuroscience*. NVIDIA GPU Technology Conference.
- 2011 *Demand-Driven Volume Rendering of Terascale EM Data*. ACM Siggraph.
- 2009 *Scalable and Interactive Segmentation and Visualization of Neural Processes*. IEEE SciVis.
- 2008 *Smooth Mixed-Resolution GPU Volume Rendering*. IEEE Volume and Point-based Graphics.
- 2007 *High-Quality Multimodal Volume Rendering for Preoperative Planning of Neurosurgical Interventions*. IEEE Visualization.

--- Awards

- 2014 Best Paper Honorable Mention, IEEE InfoVis Conference.
- 2014 Best Poster, BioVis.
- 2012 Best Paper Honorable Mention, IEEE SciVis Conference.
- 2008 Medvis Award (Karl-Heinz-Höhne-Preis), second place.
- 2007 Best Applications Paper Award, IEEE Visualization Conference.
- 2011 Best Student Project Award, Upper Austrian University of Applied Sciences.