Steffen Frey

Date of Birth	22.11.1982
Current Position	Postdoctoral Researcher Visualisierungsinstitut der Universität Stuttgart (VISUS)
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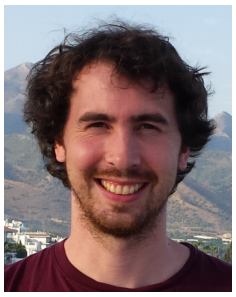

Academic Career

since 2014 **Postdoctoral Researcher**, *VISUS*.

Visionary Postdoc, SimTech Cluster of Excellence.

2008 – 2014 **Dr. rer. nat.**, *VISUS, date of defense: 07.11.2014*, Supervisor: Prof. Thomas Ertl , "Strategies for Efficient Parallel Visualization" *(summa cum laude)*.

Graduate School Simulation Technology, *SimTech Cluster of Excellence*.

2010 & 12 **Visiting Researcher**, *University of California, Davis, USA*, Prof. Kwan-Liu Ma, VIDI Labs.

2002 – 2008 **Dipl.-Inf.**, *University of Stuttgart*, Computer Science, thesis "GPU-based Cone Beam Reconstruction of Large CT Datasets" in collaboration with Daimler AG.

2005 – 2006 **Study Abroad**, *University of Kansas, Lawrence, USA*, with Science Scholarship.

List of Publications (talks at conference as noted; fully peer-reviewed, unless noted otherwise)

[1] Bruder, V., Kurzhals, K., **Frey, S.**, Weiskopf, D., Ertl, T., "Space-time volume visualization of gaze and stimulus," *ACM Symposium on Eye Tracking Research & Applications (ETRA)*, 12:1–12:9, 2019.

[2] Bruder, V., Müller, C., **Frey, S.**, Ertl, T., "On evaluating runtime performance of interactive visualizations," *IEEE Transactions on Visualization and Computer Graphics*, pp. 1–1, 2019.

[3] Bruder, V., Schulz, C., Bauer, R., **Frey, S.**, Weiskopf, D., Ertl, T., "Voronoi-based foveated volume rendering," *EuroVis - Short Papers*, 2019.

[4] Tabiai, I., Tkachev, G., Diehl, P., **Frey, S.**, Ertl, T., Therriault, D., Lévesque, M., "Hybrid image processing approach for autonomous crack area detection and tracking using local digital image correlation results applied to single-fiber interfacial debonding," *Engineering in Fracture Mechanics*, vol. 216, p. 106 485, 2019.

[5] Bruder, V., Hlawatsch, M., **Frey, S.**, Burch, M., Weiskopf, D., Ertl, T., "Volume-Based Large Dynamic Graph Analytics (Best Paper)," in *22nd International Conference on Information Visualisation*, 2018.

[6] **Frey, S.**, "Spatio-Temporal Contours from Deep Volume Raycasting," *Comput. Graph. Forum (EuroVis 2018)*, with talk, 2018.

[7] Frieß, F., Landwehr, M., Bruder, V., **Frey, S.**, Ertl, T., "Adaptive encoder settings for interactive remote visualisation on high-resolution displays," *Symposium on Large Data Analysis and Visualization (LDAV)*, 2018.

[8] Hui, Z., **Frey, S.**, Steeb, H., Uribe, D., Ertl, T., Wang, W., "Visualization of bubble formation in porous media," *IEEE Trans. Visual. Comput. Graphics (SciVis 2018)*, 2018.

[9] Bruder, V., **Frey, S.**, Ertl, T., "Prediction-based load balancing and resolution tuning for interactive volume raycasting," *Visual Informatics*, 2017.

[10] Bußler, M., Diehl, P., Pflüger, D., **Frey, S.**, Sadlo, F., Ertl, T., Schweitzer, M. A., "Visualization of fracture progression in peridynamics," *Computers and Graphics*, 2017.

[11] Diehl, P., Bußler, M., Pflüger, D., **Frey, S.**, Ertl, T., Sadlo, F., Schweitzer, M. A., "Extraction of fragments and waves after impact damage in particle-based simulations," in *Meshfree Methods for Partial Differential Equations VIII*, M. Griebel and M. A. Schweitzer, Eds. Cham: Springer International Publishing, 2017, pp. 17–34.

[12] Fernandes, O., **Frey, S.**, Ertl, T., "Transportation-based visualization of energy conversion," Springer, 2017.

[13] **Frey, S.**, Ertl, T., "Fast flow-based distance quantification and interpolation for high-resolution density distributions," in *EG 2017 - Short Papers*, with talk, 2017.

[14] Scharnowski, K., **Frey, S.**, B.Raffin, Ertl, T., "Spline-based decomposition of streamed particle trajectories for efficient transfer and analysis," in *EG 2017 - Short Papers*, 2017.

[15] Tkachev, G., **Frey, S.**, Müller, C., Bruder, V., Ertl, T., "Prediction of Distributed Volume Visualization Performance to Support Render Hardware Acquisition," in *Eurographics Symposium on Parallel Graphics and Visualization*, The Eurographics Association, 2017.

[16] **Frey, S.**, Ertl, T., "Progressive direct volume-to-volume transformation," *IEEE Trans. Visual. Comput. Graphics (SciVis 2016)*, vol. 23, no. 1, pp. 921–930, with talk, 2017.

[17] **Frey, S.**, "Sampling and estimation of pairwise similarity in spatio-temporal data based on neural networks," *Informatics*, vol. 4, no. 27, 2017.

[18] Bruder, V., **Frey, S.**, Ertl, T., "Real-time performance prediction and tuning for interactive volume raycasting," in *SIGGRAPH ASIA 2016 Symposium on Visualization*, ser. SA '16, Macau: ACM, 2016, 7:1–7:8.

[19] Fernandes, O., **Frey, S.**, Ertl, T., "Interpolation-based extraction of representative isosurfaces," in *Lecture Notes in Computer Science*, 2016.

[20] **Frey, S.**, Ertl, T., "Auto-tuning intermediate representations for in situ visualization," in *2016 New York Scientific Data Summit (NYSDS)*, with talk, abstract review only, 2016, pp. 1–10.

[21] **Frey, S.**, Ertl, T., "Flow-based temporal selection for interactive volume visualization," *Comput. Graph. Forum*, 2016.

[22] Schulz, C., Nocaj, A., El-Assady, M., **Frey, S.**, Hlawatsch, M., Hund, M., Karch, G., Netzel, R., Schätzle, C., Butt, M., Keim, D. A., Ertl, T., Brandes, U., Weiskopf, D., "Generative data models for validation and evaluation of visualization techniques," in *Proceedings of the Sixth Workshop on Beyond Time and Errors on Novel Evaluation Methods for Visualization*, ser. BELIV '16, Baltimore, MD, USA: ACM, 2016, pp. 112–124.

[23] Blom, D. S., Ertl, T., Fernandes, O., **Frey, S.**, Klimach, H., Krupp, V., Mehl, M., Roller, S., Sternel, D. C., Uekermann, B., Winter, T., Van Zuijlen, A. H., "Partitioned fluid-structure-acoustics interaction on distributed data," in *Software for Exascale Computing - SPPEXA 2013-2015*, Springer, Ed., vol. 113, Springer International Publishing, no peer review, 2016, Pages267–291.

[24] Fernandes, O., Blom, D. S., **Frey, S.**, Van Zuijlen, S. H., Bijl, H., Ertl, T., "On in-situ visualization for strongly coupled partitioned fluid-structure interaction," in *VI International Conference on Computational Methods for Coupled Problems in Science and Engineering*, 2015.

[25] **Frey, S.**, Sadlo, F., Ertl, T., "Balanced sampling and compression for remote visualization," in *ACM SIGGRAPH Asia 2015 Symposium on Visualization in High Performance Computing*, with talk, 2015.

[26] Panagiotidis, A., **Frey, S.**, Ertl, T., "Exploratory Performance Analysis and Tuning of Parallel Interactive Volume Visualization on Large Displays," in *EuroVis - Short Papers*, E. Bertini, J. Kennedy, and E. Puppo, Eds., The Eurographics Association, 2015.

[27] Fernandes, O., **Frey, S.**, Sadlo, F., Ertl, T., "Space-time volumetric depth images for in-situ visualization," in *IEEE Symposium on Large Data Analysis and Visualization*, 2014, pp. 59–65.

[28] **Frey, S.**, Sadlo, F., Ma, K., Ertl, T., "Interactive progressive visualization with space-time error control," *IEEE Trans. Visual. Comput. Graphics (SciVis 2014)*, vol. 20, no. 12, pp. 2397–2406, with talk, 2014.

[29] **Frey, S.**, Sadlo, F., Ertl, T., "Explorable volumetric depth images from raycasting," in *Conference on Graphics, Patterns and Images*, with talk, 2013, pp. 123–130.

[30] **Frey, S.**, Sadlo, F., Ertl, T., "Mesh Generation From Layered Depth Images Using Isosurface Raycasting," in *ISVC '13: Proceedings of the 9th International Symposium on Advances in Visual Computing*, Rethymnon, Crete, Greece: Springer-Verlag, with talk, 2013, pp. 373–383.

[31] **Frey, S.**, Reina, G., Ertl, T., "Simt microscheduling: Reducing thread stalling in divergent iterative algorithms," in *IEEE Euromicro International Conference on Parallel, Distributed and Network-based Processing*, with talk, 2012, pp. 399–406.

[32] **Frey, S.**, Sadlo, F., Ertl, T., "Visualization of temporal similarity in field data," *IEEE Trans. Visual. Comput. Graphics (SciVis 2012)*, vol. 18, no. 12, pp. 2023–2032, with talk, 2012.

[33] Ament, M., **Frey, S.**, Sadlo, F., Ertl, T., Weiskopf, D., "Gpu-based two-dimensional flow simulation steering using coherent structures," in *Proceedings of the Second International Conference on Parallel, Distributed, Grid and Cloud Computing for Engineering*, P. Iványi and B. H. V. Topping, Eds., paper 18, Stirlingshire, United Kingdom: Civil-Comp Press, 2011.

[34] **Frey, S.**, Ertl, T., "Load balancing utilizing data redundancy in distributed volume rendering," in *Eurographics Symposium on Parallel Graphics and Visualization*, with talk, 2011, pp. 51–60.

[35] **Frey, S.**, Schlömer, T., Grottel, S., Dachsbacher, C., Deussen, O., Ertl, T., "Loose capacity-constrained representatives for the qualitative visual analysis in molecular dynamics," in *IEEE Pacific Visualization Symposium*, with talk, 2011, pp. 51–58.

[36] Panagiotidis, A., Kauker, D., **Frey, S.**, Ertl, T., "DIANA: A Device Abstraction Framework for Parallel Computations," in *Proceedings of the Second International Conference on Parallel, Distributed, Grid and Cloud Computing for Engineering*, Stirlingshire, United Kingdom: Civil-Comp Press, 2011.

[37] **Frey, S.**, Ertl, T., "PaTraCo: A Framework Enabling the Transparent and Efficient Programming of Heterogeneous Compute Networks," in *EGPGV, Norrköping, Sweden*, Eurographics Association, with talk, 2010, pp. 131–140.

[38] Kauker, D., Sanftmann, H., **Frey, S.**, Ertl, T., "Memory Saving Fourier Transform on GPUs," in *International Conference on Computer and Information Technology*, IEEE, 2010, pp. 67–75.

[39] Üffinger, M., **Frey, S.**, Ertl, T., "Interactive high-quality visualization of higher-order finite elements," *Comput. Graphics Forum (Eurographics 2010)*, vol. 29, no. 2, pp. 337–346, 2010.

[40] **Frey, S.**, Ertl, T., "Accelerating Raycasting Utilizing Volume Segmentation of Industrial CT Data," in *EG UK Theory and Practice of Computer Graphics, Cardiff University, United Kingdom, 2009.*, W. Tang and J. P. Collomosse, Eds., Eurographics Association, with talk, 2009, pp. 33–40.

[41] **Frey, S.**, Müller, C., Strengert, M., Ertl, T., "Concurrent ct reconstruction and visual analysis using hybrid multi-resolution raycasting in a cluster environment," in *Proceedings of the 5th*

International Symposium on Advances in Visual Computing: Part I, ser. ISVC '09, Las Vegas, Nevada: Springer-Verlag, with talk, 2009, pp. 357–366.

[42] Müller, C., **Frey, S.**, Strengert, M., Dachsbacher, C., Ertl, T., "A compute unified system architecture for graphics clusters incorporating data locality," *IEEE Trans. Visual. Comput. Graphics*, vol. 15, no. 4, pp. 605–617, 2009.

Acquisition of Research Funding

2019 **Machine Learning for Data-driven Visualization (ML4Vis)**, *Principal Investigator*, funded project within the SimTech Cluster of Excellence.

Quantifying Visual Computing Systems, *Principal Investigator*, project A02 in Transregional Collaborative Research Center 161 (Quantitative Methods for Visual Computing), 2nd funding period.

2018 **Visualization of Multi-field Processes in Porous Media**, *Principal Investigator*, project D01 in Collaborative Research Center 1313 (Interface-Driven Multi-Field Processes in Porous Media – Flow, Transport and Deformation).

- Co-Speaker of task force "Software and data"

Data-Integrated Simulation Science (EXC 2075), *Participating Researcher*, proposal for a DFG Cluster of Excellence, PN6: Machine Learning for Simulation.

2017 **Model-based Visual Analysis of Large Spatio-Temporal Data**, *Principal Investigator*, funded project within the SimTech Cluster of Excellence.

2015 **Quantifying Visual Computing Systems**, *Co-Author*, project A02 in Transregional Collaborative Research Center 161 (Quantitative Methods for Visual Computing).

2011 **MCSimVis: Many Core Simulation and Visualization**, *involvement in proposal*, BMBF Project.

Invited Presentations and Articles

2018 **Dagstuhl Seminar (In Situ Visualization for Computational Science)**, *Reduced Representation Tradeoffs, Dynamic Prediction and Adjustment*, Talk.

2017 **NVIDIA GPU Technology Conference (GTC)**, *Fast Flow-based Distance Quantification and Interpolation for High-Resolution Density Distributions*, Talk.

2017 **ChinaVis (China-Germany Visualization Workshop)**, *High Performance Visualization of Volume and Time Series Data*, Talk.

2017 **EuroVis**, *Power Efficiency of Volume Raycasting on Mobile Devices*, Poster.

2017 **Eurographics**, *Flow-Based Temporal Selection for Interactive Volume Visualization*, Invited Talk of CGF paper.

2015 **ISC - Workshop on Software Frameworks for Scalable Scientific Simulations**, *Reduced Representations for In-Situ Visualization*, Talk.

2014 **GI BDVC**, *Quantifying Visual Computing Systems*, Talk.

2013 **ParCo**, *Interaction and HPC: Multi-Scale / Multi-Physics Applications*, Parallel Interactive Visualization: Strategies and Examples, Talk.

2012 **High Performance Visualization: Enabling Extreme-Scale Scientific Insight**, *GPU-Accelerated Visualization*, Book Chapter.

2009 **NVIDIA GPU Technology Conference (GTC)**, *Memory Saving Fourier Transform on GPUs*, Talk.

2009 **VIS**, *CUDA-Accelerated Continuous 2-D Scatterplots*, Poster.

Supervised PhD Students (together with Prof. Ertl)

since 2018 **Moritz Heinemann**, *SFB TRR 75*, "Interactive Visualization of Droplet Dynamics".

since 2018 **Stefan Scheller**, *SFB 1313*, "Visualization of Multi-field Processes in Porous Media".

since 2017 **Gleb Tkachev**, *SimTech Cluster of Excellence*, "Model-based Visual Analysis of Large Spatio-Temporal Data".

since 2016 **Valentin Bruder**, *SFB TRR 161*, "Quantifying Visual Computing Systems".

Supervised Bachelor and Master Theses

2018 **Generating field data with GANs for evaluation of visualization performance**, *Elias Fauser*, Master.

Volume data interpolation using neural networks, *Hanna Bader*, Bachelor.

Foveated Volume Rendering, *Ruben Bauer*, Bachelor.

Machine Learning-based Analysis of Droplet Behavior in Multiphase Flow Simulations, *Moritz Heinemann*, Master.

2017/18 **Analysis of Spatiotemporal Ensemble Data using Machine Learning**, *Stefan Scheller*, Master.

Encoding Quality Prediction for Interactive Remote Visualization, *Mathias Landwehr*, Master.

2017 **Investigation of Volume Rendering Performance through Active Learning and Visual Analysis**, *Stephan Roth*, Master.

Investigation of State-of-the-Art Compression Algorithms for Densely Recorded Light Fields, *Clemens Sigel*, Bachelor.

2016/17 **Investigation and prediction of distributed volume rendering performance**, *Gleb Tkachev*, Master.

Progressive Sparse Coding for In Situ Volume Visualisation, *Gratian Berian*, Master.

2015/16 **Performance Quantification of Volume Visualization**, *Valentin Bruder*, Master.

Real-time Ray Tracing of Volumetric Data, *Marcus Richter*, Bachelor.

2014/15 **Dynamic Acceleration Structures for the Visualization of Time-Dependent Volume Data on the GPU**, *Hajun Jang*, Diplom.

2014 **Adaptive Frameless Raycasting for Interactive Volume Visualization**, *Constantin Weisser*, Bachelor.

2012/13 **Extraction of High Quality Isosurfaces from Large Volume Data**, *Thomas Mezger*, Diplom.

2010 **Distributed Raytracing on GPU Clusters**, *Jochen Puff*, Diplom.

2009/2010 **Algorithm Design and Algorithmic-Level Optimization of Video / Image Algorithm using an Abstract Common Interface for NVIDIA CUDA and Intel Larrabee Platforms**, *Daniel Kauker*, Diplom, in collaboration with Sony Deutschland.

Parallel Computation of Volumetric Illumination of Astrophysical Nebulae on GPU Clusters, *Manuel Moser*, Diplom.

Lectures, Courses and Seminars

2019/20 **Advanced Seminar**, *Advanced Rendering*, Master (2 SWS).

2019 **Seminar**, *Realistische Echtzeitgrafik*, Bachelor (2 SWS).

2018/19 **Advanced Seminar**, *Particle Visualization*, Master (2 SWS).

2018 & 19 **Lecture**, *Simulation Technology B (interdisciplinary SimTech lecture, together with Jun.-Prof. Hansen, Jun.-Prof. Fyta & Prof. Mehl)*, Master (4 SWS).

2015–19 **Lecture**, *Scientific Visualization (together with Prof. Ertl)*, Master (4 SWS).

2017/18 **Advanced Seminar**, *Multifield Visualization*, Master (2 SWS).

SimTech Seminar, *Multifield Problems*, Master / Ph.D (2 SWS).

2016/17 **Advanced Seminar**, *High-Performance Visualization*, Master (2 SWS).

2015/16 **Advanced Seminar**, *Virtual Reality*, Master (2 SWS).

2015/16 **Lecture**, *Programming for Media Computer Science (together with Dr. Reina, Dr. Krone, and Dr. Dingler)*, Bachelor (4 SWS).

2015 **Advanced Seminar**, *SimTech*, Master / Ph.D (2 SWS).

2012/13 **Advanced Seminar**, *Advanced Visualization Techniques*, Master (2 SWS).

2012/13 **Advanced Seminar**, *Volume Rendering*, Master (2 SWS).

2011 **Seminar**, *Interactive Visualization Techniques*, Master (2 SWS).

2010 **Advanced Seminar**, *Volume Rendering*, Master (2 SWS).

2009/10 **Lecture (Exercises)**, *Visual Computing*, Master (4 SWS).

2009 **Lecture (Exercises)**, *Image Synthesis/Rendering*, Master (4 SWS).

2008/09 **Lecture (Exercises)**, *Visual Computing*, Master (4 SWS).

2008/09 **Practical Course**, *Graphics and GPU programming lab*, Master (4 SWS).

Professional Service

Conference Organization

2020 **EG Symposium on Parallel Graphics and Visualization (EGPGV)**, Symposium Chair.

2019 **EG Symposium on Parallel Graphics and Visualization (EGPGV)**, Program Co-Chair.

ISC Workshop on In Situ Visualization (WOIV), Organizer.

2018 **International Conference on Quantification in Visual Computing**, Poster Chair.

2016–17 **ISC Workshop on In Situ Visualization (WOIV)**, Organizer.

Program Committee

2020 **Visualization Meets AI (VisAI)**, workshop held in conjunction with PacificVis.

2019 **International Symposium on Visual Information Communication and Interaction (VINCI)**.

Conference on Graphics, Patterns, and Images (SIBGRAPI).

VIS, *SciVIS track*.

Euromicro Conference on Software Engineering and Advanced Applications (SEAAA), *Special Track on Software and Big Data Analytics*.

International Symposium on Vision, Modeling, and Visualization (VMV).

In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV).

EuroVis, *Short Papers Track*.

International Symposium on Visual Computing (ISVC).

Symposium on Large Data Analysis and Visualization (LDAV).

2018 **VIS**, *SciVIS track*.

Euromicro Conference on Software Engineering and Advanced Applications (SEAAA), *Special Track on Software and Big Data Analytics*.

International Symposium on Vision, Modeling, and Visualization (VMV).

In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV).

EuroVis, *Short Papers Track*.

International Symposium on Visual Computing (ISVC).

Symposium on Large Data Analysis and Visualization (LDAV).

Supercomputing (SC), *Data Analytics, Visualization & Storage track*.

Supercomputing Asia.

ISC Workshop on In Situ Visualization (WOIV).

International Supercomputing Conference (ISC).

2017 **EuroVis**, *Short Papers Track*.

International Symposium on Visual Computing (ISVC).

Symposium on Large Data Analysis and Visualization (LDAV).

International Supercomputing Conference (ISC).

SIGGRAPH ASIA Symposium on Visualization.

2016 **International Symposium on Visual Computing (ISVC)**.

Symposium on Large Data Analysis and Visualization (LDAV).

SIGGRAPH ASIA Symposium on Visualization.