

Steffen Frey

Born 22. November 1982

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Academic Career

- since 2020 **Assistant Professor**, *University of Groningen, Scientific Visualization and Computer Graphics*
- 2014 – 2020 **Postdoctoral Researcher**, *University of Stuttgart, Visualization Research Center (VISUS)*
Visionary Postdoc, *SimTech Cluster of Excellence (SimTech)*
- 2008 – 2014 **Dr. rer. nat.**, *VISUS*, date of defense: 07.11.2014, Supervisor: Prof. Thomas Ertl, "Strategies for Efficient Parallel Visualization" (*summa cum laude*), GS SimTech
- 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

Awards (see appendix for conference abbreviations)

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| 2023 | Best Paper , <i>EGPGV</i> [13] | 2019 | Winner , <i>VIS SciVis Contest</i> [28] |
| 2023 | Teacher of the Year 22/23 (CS) , Runner up | 2019 | Honorable Mention , <i>ISAV</i> [35] |
| 2022 | Best Paper , <i>EG (Education track)</i> [18] | 2019 | Best Paper , <i>EuroVis (Short)</i> [33] |
| 2020 | Best Paper , <i>LDAV</i> [26] | 2018 | Best Paper , <i>IV</i> [38] |

Funding / Principal Investigator (PI)

- 2017 & 21 & 25 **Visualization of Multi-field Processes in Porous Media (SFB 1313)**, *DFG (German Research Foundation); project D01 in Collaborative Research Center 1313 (Interface-Driven Multi-Field Processes in Porous Media – Flow, Transport and Deformation)*, three funding periods, joint proposal writing with one partner from Stuttgart (1st: T. Ertl, €268700, 2nd: G. Reina, €285600, 3rd: G. Reina, €326400 – final decision pending, individual project: "Excellent")
- 2024 **Perception-action integration in brain-computer interfaces, robotic task planning, and adaptive visualization (FSE)**, *FSE Resarch Grant (€375000)*, 2 positions, with A. Sburlea and H. Kazai, based in part on NWO VIDI Science 2022 proposal "Cognitive Model-based Optimization of Visualization for Large Scientific Data", rejected after interview (rating: Very Good)
- 2019 **Machine Learning for Data-driven Visualization (SimTech)**, *DFG project within SimTech*, 4-year PhD student position
- 2019 **Quantifying Visual Computing Systems (SFB TRR 161)**, *DFG; project A02 in Transregional Collaborative Research Center 161 (Quantitative Methods for Visual Computing)*, 2nd funding period, €307100
- 2017 **Model-based Visual Analysis of Large Spatio-Temporal Data**, *DFG project within SimTech*, 4-year PhD student position

Funding / CSC PhD positions China Scholarship Council

2021,23,24,25 **supported proposals of Z. Yin, Y. Xu, J. Wang, C. Li**

Funding / Proposal Involvement

- 2018 **Data-Integrated Simulation Science (SimTech, EXC 2075)**, *Participating Researcher*, proposal for a DFG Cluster of Excellence, PN6: Machine Learning for Simulation, 4-year PhD student position
- 2015 **Quantifying Visual Computing Systems**, *Co-Author*, project A02 in Transregional Collaborative Research Center 161 (Quantitative Methods for Visual Computing) funded by DFG, €280200

2011 **MCSimVis: Many Core Simulation and Visualization**, involvement in proposal for 4-year PhD student position, funded by BMBF (German Federal Ministry of Education and Research), with industry partners INTES GmbH and science+computing AG

PhD Students / Supervisory Team (in Groningen, expected year of graduation +4 from start)

since 2025 **D. Boerema**, *Neural Task Planning for Optimizing Visualization and Robot Interaction*, FSE
 since 2025 **O. Çağrı**, *Context-specific Grasping Control and Adaptive Visual Interfaces*, FSE
 since 2025 **C. Li**, *Multi-modal Medical Image Analysis and Visualization*, CSC
 since 2024 **J. Wang**, *Data- and model-driven differentiable fluid simulation*, CSC
 since 2022 **Z. Yin**, *3D Multimodal Registration and Visualization for Augmented Reality Guided Surgery*, CSC
 2022-25 **Y. Xu**, *Smoothed Particle Hydrodynamics Simulation in Computer Graphics*, CSC, Defense: 21th January 2025
 since 2021 **H. Gadirov**, *Automatic Configuration of Scientific Visualization Systems using Optimization and Machine Learning*, Defense: 14th October 2025

PhD Students / Supervision Involvement

2020-25	H. Tarner , <i>Duisburg-Essen</i> , co-examiner	2018-20	S. Scheller , <i>Stuttgart</i> , SFB 1313, unfinished
2020-24	A. Gupta , <i>Dresden (TU & Max Planck)</i>	2017-22	G. Tkachev , <i>Stuttgart</i> , SimTech, co-examiner
2021-25	A. Straub , <i>Stuttgart</i> , SFB 1313	2016-21	V. Bruder , <i>Stuttgart</i> , SFB TRR 161, co-examiner
2018-19,25	M. Heinemann , <i>Stuttgart</i> , SFB 1313	2014-18	O. Fernandes , <i>Stuttgart</i> , unfinished

Service / Conference & Journal Organization

since 2024	JDSSV , Associate Editor	2022 & 23	LDAV , Paper Chair
since 2016	WOIV , Organizer	2021	LDAV , Poster Chair
since 2020	EGPGV , Steering Committee	2022 & 23	PacificVis , <i>VisNotes Co-Chair</i>
since 2023	EGPGV , Chair of Steering Committee	2021	PacificVis , <i>Poster Co-Chair</i>
2020	EGPGV , Symposium Chair	2023	BigVis , Paper Chair
2019	EGPGV , Program Co-Chair	2018	QiVC , Poster Chair
since 2024	LDAV , Symposium Chair		

Service / Program Committee

2021 & 25	VIS (Short Papers)	2020 & 22	ICPR	2020	BigVis
2025	VIS (Uncertainty Workshop)	2019-22	VINCI	2018-20	INFOCOMP
since 2019	SIBGRAPI	2016-21	ISVC	2018	SC Asia
since 2020	VisAI	2018-2021	ISAV	2017-18	ISC
since 2018	VIS	2016-21	LDAV	2016 & 17	SA Asia Vis
2018 & 23	SC	2018-21	VMV		
2018-23	SEAAA	2017-20	EuroVis (Short Papers)		

Service / PhD Co-Examiner

2025 **Duisburg-Essen**, *H. Tarner*
 2021 & 2022 **Stuttgart**, *V. Bruder & G. Tkachev*
 from 2021 **Groningen**, *G. Hettinga, J. Wang, R. van Veen, F. Vernier, G. Swaroop & X. Wang*

Service / Boards. Committees & Societies

2025 **CS program audit (RUG)**, *Teaching Staff Member*
 2021 & 2023 **Appointment Committee for Assistant Professors**, *Groningen*
 2021-23 **Curriculum Committee Focus Group**, *Data track & Visual Computing, BSc CS (RUG)*

since 2021 **Programme Committee CS**, Groningen
 since 2020 **“Fachgruppe Visualisierung”**, German Informatics Society
 2018-20 **Co-Speaker of task force “Software and data”**, Stuttgart, SFB 1313
 2017 **Appointment Committee for SimTech Professorship in Machine Learning**, Stuttgart

Teaching / Courses in Groningen

from 20/21 **Course**, *Algorithms and Data Structures in C*, BSc, 5 ECTS, Coordinator & Lecturer
 from 21/22 **Course**, *Scientific Visualization*, MSc, 5 ECTS, Coordinator & Lecturer
 from 21/22 **Course**, *Computer Graphics*, BSc, 5 ECTS, Second Evaluator
 from 21/22 **Course**, *Advanced Computer Graphics*, MSc, 5 ECTS, Second Evaluator
 from 24/25 **Course**, *Introduction to Computing Science*, BSc, 5 ECTS, Second Evaluator
 20/21-23/24 **Course**, *Introduction to Computing Science*, Tutor

Teaching / Courses in Stuttgart (Co-Lecturer)

SS 2015–20	Lecture , <i>Scientific Visualization</i> , MSc	WS 2017/18	Seminar , <i>Multifield Problems</i> , MSc/PhD
WS 2019/20	Seminar , <i>Advanced Rendering</i> , MSc	WS 2016/17	Seminar , <i>High-Performance Visualization</i> , MSc
SS 2019	Seminar , <i>Realistische Echtzeitgrafik</i> , BSc	WS 2015/16	Seminar , <i>Virtual Reality</i> , MSc
WS 2018/19	Seminar , <i>Particle Visualization</i> , MSc	WS 2015/16	Lecture , <i>Programming for Media CS</i> , BSc
SS 2018 & 19	Lecture , <i>Simulation Technology B</i> , MSc	SS 2015	Seminar , <i>SimTech</i> , MSc/PhD
WS 2017/18	Seminar , <i>Multifield Visualization</i> , MSc		

Teaching / BSc & MSc Students (since 2021, 1st and 2nd supervisor role indicated where applicable)

RUG **MSc**, E. Waterink (1st, 2022), J. Boonstra (1st, 2022), S. Rouzbahani (1st, 2022), H. Stegenga (2nd, 2021), A. Feltham (1st, 2023), D. Boerema (1st, 2024), S. Bruin (2nd, 2022), L. D. Grandis (1st, 2025), J. M. van Eijk (2nd, 2025)

RUG **BSc**, H. Stegenga (2nd, 2021), W. V. de la Houssaije [14], [18] (2nd, 2021), C. van Wezel [14], [18] (2nd, 2021), A. Thioux (1st, 2022), M. R. Westra (1st, 2022), P. J. Blok (2nd, 2022), R. Rosema (2nd, 2022), B. Yilmaz (2nd, 2022), J. R. van der Zwaag (2nd, 2022), L. van der Wal [3] (1st, 2023), T. Couperus (2nd, 2023), V. Gaya (2nd, 2023), T. de Vries (2nd, 2023), P. Blesinger [3] (1st, 2024), A. Georgiadou (2nd, 2024), I. Bodola (2nd, 2024), A. Aaen (2nd, 2024), C. Panagioutou (1st, 2025), C. N. Iacob (1st, 2025), J. Trooster (1st, 2025), P.-T. Mocanu (2nd, 2025), B. W. Robertson (2nd, 2025), A. van Smoorenburg (2nd, 2025)

RUG **MSc (Intern)**, E. Waterink [24] (1st, 2021), A. Bredenbals (2nd, 2022), J. de Baat (1st, 2023), M. R. Westra (1st, 2023), S. J. Hilhorst (1st, 2023), L. Manuel (1st, 2024), T. Couperus (2nd, 2024), L. v. d. Wal (1st, 2025)

RUG **Honors College**, A. Dibajeh (1st, 2022), E. Landsaat (1st, 2022), S. J. van Schagen (1st, 2022)

Stuttgart **MSc**, A. Zeyfang (2021), M. Kleber (2025), N. Hauf (2025)

Invitations / Presentations

2024 **DEEA**, *Visualization of Large Spatio-Temporal Data Collections*
 2024 **RUG Applied AI Symposium**, *Machine Learning for Large Data Visualization*
 2024 **RUG Comp Num Mat Seminar**, *Methods and Design Approaches for Fluid Dynamics Visualization*
 2023 **TU/e (Eindhoven) Visualization Seminar**, *Scientific Visualization from an Optimization Perspective*
 2022 **BigVis**, *Visual Mapping, Comparison and Exploration of Large Multifield Data*
 2021 **Pretty Porous Lecture Series (SFB 1313)**, *Visualization of Multifield Data — Layouts, Features, and Systems*
 2017 **NVIDIA GTC**, *Fast Flow-based Distance Quantification and Interpolation for High-Resolution Density Distributions*

- 2017 **China-Germany Visualization Workshop**, *High Performance Visualization of Volume and Time Series Data*
- 2015 **ISC (Workshop)**, *Reduced Representations for In-Situ Visualization*
- 2014 **GI BDVC**, *Quantifying Visual Computing Systems*
- 2013 **ParCo (Workshop)**, *Parallel Interactive Visualization: Strategies and Examples*
- 2009 **NVIDIA GTC**, *Memory Saving Fourier Transform on GPUs*

Invitations / Other

- 2022 **Dagstuhl Seminar**, *Anticipatory Human-Machine Interaction*
- 2018 **Dagstuhl Seminar**, *In Situ Visualization for Computational Science*
- 2012 **High Performance Visualization: Enabling Extreme-Scale Scientific Insight**, *book chapter*

Professionalization and Training Courses

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| 2026 Academic Leadership , <i>registered</i> | 2021 Dutch Language , $\rightarrow A2 \& A2 \rightarrow B1$ |
| 2023 University Teaching Qualification (UTQ) | 2021 How to select PhD students |
| 2023 Coaching PhD students | 2021 ERC Starting and Consolidator |

Outreach

- 2024 **Periodiek**, *Article*, Tursun, C., Frey, S., Kosinka, J., "On Foveated Rendering," *Periodiek*, no. 1, 2024
- 2024 **Zpannend Zernike**, *Interactive Demonstration*, Presentation of Virtual Volume Raycaster (VVRT)
- 2024 **European Researchers' Night**, *Interactive Demonstration*, Virtual Ray Tracer in VR
- 2023 **European Researchers' Night**, *Interactive Demonstration*, Virtual Ray Tracer (VRT)
- 2022,23 **Zpannend Zernike**, *Interactive Demonstration*, Virtual Ray Tracer (VRT)
- 2022 **Zpannend Zernike**, *Interactive Demonstration*, Webtool for heat data visualization
- 2020 **"Pretty Porous–Alles Porös" Science Exhibition**, *Interactive Demonstrator*, Integrated porous media simulation and visualization at Planetarium Stuttgart from 18th June to 30th August

List of Publications (peer-reviewed; given corresponding talks at conferences as indicated)

- [1] **Frey, S.**, "Agri: Adaptive thumbnails for grid-based visualizations," in *Proceedings of the IEEE Visualization Conference (Short Papers)*, To appear, with talk at IEEE VIS 25, 2025.
- [2] Gadirov, H., Roerdink, J. B., **Frey, S.**, "Flint: Learning-based flow estimation and temporal interpolation for scientific ensemble visualization," *IEEE Transactions on Visualization and Computer Graphics*, pp. 1–16, 2025. doi: 10.1109/TVCG.2025.3561091.
- [3] Wal, L., Blesinger, P., Kosinka, J., **Frey, S.**, "VVRT: Virtual Volume Raycaster," in *EuroVis 2025 - Education Papers*, The Eurographics Association, 2025. doi: 10.2312/eved.20251021.
- [4] Wang, J., Wang, H., Wang, X., Zhang, Y., Kosinka, J., **Frey, S.**, Telea, A., Ban, X., "Peridynamics-based simulation of viscoelastic solids and granular materials," in *Proc. CASA/AniNex*, Springer, 2025.
- [5] Bauer, R., Ngo, Q. Q., Reina, G., **Frey, S.**, Sedlmair, M., "Voronoi cell interface-based parameter sensitivity analysis for labeled samples," *Computer Graphics Forum*, vol. 44, no. 3, 2025. doi: 10.1111/cgf.70122.
- [6] **Frey, S.**, "Sca2Gri: Scalable gridified scatterplots," *Computer Graphics Forum*, vol. 44, no. 3, 2025, with talk at EuroVis 25. doi: 10.1111/cgf.70141.
- [7] Gadirov, H., Wu, Q., Bauer, D., Ma, K.-L., Roerdink, J., **Frey, S.**, "HyperFLINT: Hypernetwork-based flow estimation and temporal interpolation for scientific ensemble visualization," *Computer Graphics Forum*, vol. 44, no. 3, 2025. doi: 10.1111/cgf.70134.
- [8] Shen, L., Zhang, Y., **Frey, S.**, Telea, A., Kosinka, J., Wang, X., Ban, X., "Visual simulation of bone cement blending and dynamic flow," *IEEE Computer Society*, 2024, pp. 6226–6233. doi: 10.1109/BIBM62325.2024.10822238.
- [9] Zhang, Y., Long, S., Xu, Y., Wang, X., Yao, C., Kosinka, J., **Frey, S.**, Telea, A., Ban, X., "Multiphase viscoelastic non-newtonian fluid simulation," *Computer Graphics Forum*, vol. 43, no. 8, e15180, 2024. doi: <https://doi.org/10.1111/cgf.15180>.

- [10] Straub, A., Karadimitriou, N., Reina, G., **Frey, S.**, Steeb, H., Ertl, T., ``Visual Analysis of Displacement Processes in Porous Media using Spatio-Temporal Flow Graphs," *IEEE Transactions on Visualization and Computer Graphics*, vol. 30, no. 1, pp. 759–769, 2024. doi: 10.1109/TVCG.2023.3326931.
- [11] Bauer, R., Ngo, Q. Q., Reina, G., **Frey, S.**, Flemisch, B., Hauser, H., Ertl, T., Sedlmair, M., ``Visual Ensemble Analysis of Fluid Flow in Porous Media Across Simulation Codes and Experiment," *Transport in Porous Media*, 2023. doi: 10.1007/s11242-023-02019-y.
- [12] Gupta, A., Günther, U., Incardona, P., Reina, G., **Frey, S.**, Gumhold, S., Sbalzarini, I. F., ``Efficient Raycasting of Volumetric Depth Images for Remote Visualization of Large Volumes at High Frame Rates," in *2023 IEEE 16th Pacific Visualization Symposium (PacificVis)*, ISSN: 2165-8773, 2023, pp. 61–70. doi: 10.1109/PacificVis56936.2023.00014.
- [13] Gupta, A., Incardona, P., Brock, A., Reina, G., **Frey, S.**, Gumhold, S., Günther, U., Sbalzarini, I. F., *Parallel Compositing of Volumetric Depth Images for Interactive Visualization of Distributed Volumes at High Frame Rates*. The Eurographics Association, 2023. doi: 10.2312/pgv.20231082.
- [14] Wezel, C. S., Verschoore de la Houssaije, W. A., **Frey, S.**, Kosinka, J., ``Virtual Ray Tracer 2.0," *Computers & Graphics*, vol. 111, pp. 89–102, 2023. doi: 10.1016/j.cag.2023.01.005.
- [15] Bruder, V., Larsen, M., Ertl, T., Childs, H., **Frey, S.**, ``A hybrid in situ approach for cost efficient image database generation," *IEEE Transactions on Visualization and Computer Graphics*, vol. 29, no. 9, pp. 3788–3798, 2023, with talk at IEEE VIS 2023, doi: 10.1109/TVCG.2022.3169590.
- [16] Tarner, H., Bruder, V., **Frey, S.**, Ertl, T., Beck, F., *Visually Comparing Rendering Performance from Multiple Perspectives*. The Eurographics Association, 2022. doi: 10.2312/vmv.20221211.
- [17] Tkachev, G., Cutura, R., Sedlmair, M., **Frey, S.**, Ertl, T., ``Metaphorical Visualization: Mapping Data to Familiar Concepts," in *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems*, ser. CHI EA '22, New York, NY, USA: Association for Computing Machinery, 2022, pp. 1–10. doi: 10.1145/3491101.3516393.
- [18] Verschoore de la Houssaije, W. A., Wezel, C. S. v., **Frey, S.**, Kosinka, J., *Virtual Ray Tracer*. The Eurographics Association, 2022, Accepted: 2022-04-22T07:16:05Z ISSN: 1017-4656. doi: 10.2312/eged20221045.
- [19] **Frey, S.**, ``Optimizing Grid Layouts for Level-of-Detail Exploration of Large Data Collections," *Computer Graphics Forum*, vol. 41, no. 3, pp. 247–258, 2022, with talk at EuroVis 2022, doi: 10.1111/cgf.14537.
- [20] **Frey, S.**, Scheller, S., Karadimitriou, N., Lee, D., Reina, G., Steeb, H., Ertl, T., ``Visual Analysis of Two-Phase Flow Displacement Processes in Porous Media," *Computer Graphics Forum*, vol. 41, no. 1, pp. 243–256, 2022. doi: 10.1111/cgf.14432.
- [21] Gadirov, H., Tkachev, G., Ertl, T., **Frey, S.**, ``Evaluation and Selection of Autoencoders for Expressive Dimensionality Reduction of Spatial Ensembles," in *ISVC '21: Proceedings of the 16th International Symposium on Advances in Visual Computing*, Berlin, Heidelberg: Springer-Verlag, 2021.
- [22] Heinemann, M., **Frey, S.**, Tkachev, G., Straub, A., Sadlo, F., Ertl, T., ``Visual analysis of droplet dynamics in large-scale multiphase spray simulations," *Journal of Visualization*, 2021. doi: 10.1007/s12650-021-00750-6.
- [23] Tkachev, G., **Frey, S.**, Ertl, T., ``S4: Self-supervised learning of spatiotemporal similarity," *IEEE Transactions on Visualization and Computer Graphics*, pp. 1–1, 2021. doi: 10.1109/TVCG.2021.3101418.
- [24] Waterink, E., Kosinka, J., **Frey, S.**, ``Visual Analysis of Popping in Progressive Visualization," in *Smart Tools and Apps for Graphics - Eurographics Italian Chapter Conference*, P. Frosini, D. Giorgi, S. Melzi, and E. Rodolà, Eds., The Eurographics Association, 2021. doi: 10.2312/stag.20211485.
- [25] **Frey, S.**, ``Temporally dense exploration of moving and deforming shapes," *Computer Graphics Forum*, vol. 40, no. 1, pp. 7–21, 2021. doi: <https://doi.org/10.1111/cgf.14092>.
- [26] Frieß, F., Braun, M., Bruder, V., **Frey, S.**, Reina, G., Ertl, T., ``Foveated encoding for large high-resolution displays," *IEEE Transactions on Visualization and Computer Graphics*, vol. 27, no. 2, pp. 1850–1859, 2021. doi: 10.1109/TVCG.2020.3030445.
- [27] Tkachev, G., **Frey, S.**, Ertl, T., ``Local Prediction Models for Spatiotemporal Volume Visualization," *IEEE Transactions on Visualization and Computer Graphics*, vol. 27, no. 7, pp. 3091–3108, 2021. doi: 10.1109/TVCG.2019.2961893.
- [28] Schatz, K., Müller, C., Gralka, P., Heinemann, M., Straub, A., Schulz, C., Braun, M., Rau, T., Becher, M., **Frey, S.**, Reina, G., Sedlmair, M., Weiskopf, D., Ertl, T., Diehl, P., Marcello, D., Frank, J., Müller, T., ``2019 IEEE scientific visualization contest winner: Visual analysis of structure formation in cosmic evolution," *IEEE Computer Graphics and Applications*, pp. 1–1, 2020. doi: 10.1109/MCG.2020.3004613.

- [29] Schneider, M., Flemisch, B., **Frey, S.**, Hermann, S., Iglezakis, D., Ruf, M., Schembera, B., Seeland, A., Steeb, H., ``Datenmanagement im SFB 1313," *Bausteine Forschungsdatenmanagement*, no. 1, pp. 28–38, 2020. doi: 10.17192/bfdm.2020.1.8085.
- [30] Childs, H., Ahern, S. D., Ahrens, J., Bauer, A. C., Bennett, J., Bethel, E. W., Bremer, P.-T., Brugger, E., Cottam, J., Dorier, M., Dutta, S., Favre, J. M., Fogal, T., **Frey, S.**, Garth, C., Geveci, B., Godoy, W. F., Hansen, C. D., Harrison, C., Hentschel, B., Insley, J., Johnson, C. R., Klasky, S., Knoll, A., Kress, J., Larsen, M., Lofstead, J., Ma, K.-L., Malakar, P., Meredith, J., Moreland, K., Navrátil, P., O'Leary, P., Parashar, M., Pascucci, V., Patchett, J., Peterka, T., Petruzza, S., Podhorszki, N., Pugmire, D., Rasquin, M., Rizzi, S., Rogers, D. H., Sane, S., Sauer, F., Sisneros, R., Shen, H.-W., Usher, W., Vickery, R., Vishwanath, V., Wald, I., Wang, R., Weber, G. H., Whitlock, B., Wolf, M., Yu, H., Ziegeler, S. B., ``A terminology for in situ visualization and analysis systems," *The International Journal of High Performance Computing Applications*, vol. 34, no. 6, pp. 676–691, 1, 2020, Publisher: SAGE Publications Ltd STM. doi: 10.1177/1094342020935991.
- [31] 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. doi: 10.1109/TVCG.2019.2898435.
- [32] Bruder, V., Kurzhals, K., **Frey, S.**, Weiskopf, D., Ertl, T., ``Space-time volume visualization of gaze and stimulus," in *Proceedings of the 11th ACM Symposium on Eye Tracking Research & Applications*, ser. ETRA '19, Denver, Colorado: Association for Computing Machinery, 2019. doi: 10.1145/3314111.3319812.
- [33] Bruder, V., Schulz, C., Bauer, R., **Frey, S.**, Weiskopf, D., Ertl, T., ``Voronoi-Based Foveated Volume Rendering," in *EuroVis 2019 - Short Papers*, J. Johansson, F. Sadlo, and G. E. Marai, Eds., The Eurographics Association, 2019. doi: 10.2312/evs.20191172.
- [34] Fernandes, O., **Frey, S.**, Reina, G., Ertl, T., ``Visual representation of region transitions in multi-dimensional parameter spaces," in *Italian Chapter Conference 2019 - Smart Tools and Apps in computer Graphics, STAG 2019, Cagliari, Italy, November 14-15, 2019*, M. Agus, M. Corsini, and R. Pintus, Eds., Eurographics Association, 2019, pp. 89–100. doi: 10.2312/STAG.20191367.
- [35] Rau, T., Gralka, P., Fernandes, O., Reina, G., **Frey, S.**, Ertl, T., ``The impact of work distribution on in situ visualization: A case study," in *Proceedings of the Workshop on In Situ Infrastructures for Enabling Extreme-Scale Analysis and Visualization*, ser. ISAV '19, Denver, Colorado, USA: Association for Computing Machinery, 2019, pp. 17–22. doi: 10.1145/3364228.3364233.
- [36] 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. 106485, 2019. doi: <https://doi.org/10.1016/j.engfracmech.2019.106485>.
- [37] Zhang, H., **Frey, S.**, Steeb, H., Uribe, D., Ertl, T., Wang, W., ``Visualization of bubble formation in porous media," *IEEE Transactions on Visualization and Computer Graphics*, vol. 25, no. 1, pp. 1060–1069, 2019. doi: 10.1109/TVCG.2018.2864506.
- [38] Bruder, V., Hlawatsch, M., **Frey, S.**, Burch, M., Weiskopf, D., Ertl, T., ``Volume-based large dynamic graph analytics," in *2018 22nd International Conference Information Visualisation (IV)*, 2018, pp. 210–219. doi: 10.1109/iV.2018.00045.
- [39] **Frey, S.**, ``Spatio-Temporal Contours from Deep Volume Raycasting," *Comput. Graph. Forum*, 2018, with talk at EuroVis 2018, doi: 10.1111/cgf.13438.
- [40] Frieß, F., Landwehr, M., Bruder, V., **Frey, S.**, Ertl, T., ``Adaptive encoder settings for interactive remote visualisation on high-resolution displays," in *2018 IEEE 8th Symposium on Large Data Analysis and Visualization (LDAV)*, 2018, pp. 87–91. doi: 10.1109/LDAV.2018.8739215.
- [41] Bruder, V., **Frey, S.**, Ertl, T., ``Prediction-based load balancing and resolution tuning for interactive volume raycasting," *Visual Informatics*, 2017. doi: <https://doi.org/10.1016/j.visinf.2017.09.001>.
- [42] 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. doi: <https://doi.org/10.1016/j.cag.2017.05.003>.
- [43] 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. doi: 10.1007/978-3-319-51954-8_2.
- [44] Fernandes, O., **Frey, S.**, Ertl, T., ``Transportation-based visualization of energy conversion," in *Proceedings of the 12th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications*, Springer, 2017. doi: 10.5220/0006098200520063.

- [45] **Frey, S.**, Ertl, T., ``Fast flow-based distance quantification and interpolation for high-resolution density distributions," in *Proceedings of the European Association for Computer Graphics: Short Papers*, ser. EG '17, with talk, Lyon, France: Eurographics Association, 2017, pp. 37–40. doi: 10.2312/egsh.20171009.
- [46] Scharnowski, K., **Frey, S.**, Raffin, B., Ertl, T., ``Spline-based decomposition of streamed particle trajectories for efficient transfer and analysis," in *Proceedings of the European Association for Computer Graphics: Short Papers*, ser. EG '17, Lyon, France: Eurographics Association, 2017, pp. 41–44. doi: 10.2312/egsh.20171010.
- [47] 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. doi: 10.2312/pgv.20171089.
- [48] **Frey, S.**, Ertl, T., ``Progressive direct volume-to-volume transformation," *IEEE Trans. Visual. Comput. Graphics (SciVis 2016)*, vol. 23, no. 1, pp. 921–930, 2017, with talk at IEEE VIS 2016, doi: 10.1109/TVCG.2016.2599042.
- [49] **Frey, S.**, ``Sampling and estimation of pairwise similarity in spatio-temporal data based on neural networks," *Informatics*, vol. 4, no. 27, 2017. doi: 10.3390/informatics4030027.
- [50] Fernandes, O., **Frey, S.**, Ertl, T., ``Interpolation-based extraction of representative isosurfaces," vol. 10072, 2016, pp. 403–413. doi: 10.1007/978-3-319-50835-1_37.
- [51] 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. doi: 10.1145/3002151.3002156.
- [52] **Frey, S.**, Ertl, T., ``Auto-tuning intermediate representations for in situ visualization," in *2016 New York Scientific Data Summit (NYSDS)*, 2016, pp. 1–10. doi: 10.1109/NYSDS.2016.7747807.
- [53] **Frey, S.**, Ertl, T., ``Flow-based temporal selection for interactive volume visualization," *Comput. Graph. Forum*, 2016, presented at EuroVIS 2017. doi: 10.1111/cgf.13070.
- [54] 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. doi: 10.1145/2993901.2993907.
- [55] 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, 2016, Pages267–291. doi: 10.1007/978-3-319-40528-5.
- [56] 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.
- [57] **Frey, S.**, Sadlo, F., Ertl, T., ``Balanced sampling and compression for remote visualization," in *SIGGRAPH Asia 2015 Visualization in High Performance Computing*, ser. SA '15, with talk, Kobe, Japan: Association for Computing Machinery, 2015. doi: 10.1145/2818517.2818529.
- [58] 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. doi: 10.2312/eurovisshort.20151118.
- [59] Fernandes, O., **Frey, S.**, Sadlo, F., Ertl, T., ``Space-time volumetric depth images for in-situ visualization," in *2014 IEEE 4th Symposium on Large Data Analysis and Visualization (LDAV)*, 2014, pp. 59–65. doi: 10.1109/LDAV.2014.7013205.
- [60] **Frey, S.**, Sadlo, F., Ma, K.-L., Ertl, T., ``Interactive progressive visualization with space-time error control," *IEEE Transactions on Visualization and Computer Graphics*, vol. 20, no. 12, pp. 2397–2406, 2014, with talk at VIS14, doi: 10.1109/TVCG.2014.2346319.
- [61] **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*, with talk, Rethymnon, Crete, Greece: Springer-Verlag, 2013, pp. 373–383.
- [62] **Frey, S.**, Sadlo, F., Ertl, T., ``Explorable volumetric depth images from raycasting," in *2013 XXVI Conference on Graphics, Patterns and Images*, with talk, 2013, pp. 123–130. doi: 10.1109/SIBGRAPI.2013.26.

- [63] **Frey, S.**, Reina, G., Ertl, T., ``SIMT microscheduling: Reducing thread stalling in divergent iterative algorithms," in *2012 20th Euromicro International Conference on Parallel, Distributed and Network-based Processing*, with talk, 2012, pp. 399–406. doi: 10.1109/PDP.2012.62.
- [64] **Frey, S.**, Sadlo, F., Ertl, T., ``Visualization of temporal similarity in field data," *IEEE Transactions on Visualization and Computer Graphics*, vol. 18, no. 12, pp. 2023–2032, 2012, with talk at IEEE VIS 2012, doi: 10.1109/TVCG.2012.284.
- [65] 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*, 2011. doi: 10.4203/ccp.95.18.
- [66] **Frey, S.**, Ertl, T., ``Load balancing utilizing data redundancy in distributed volume rendering," in *Proceedings of the 11th Eurographics Conference on Parallel Graphics and Visualization*, ser. EGPGV '11, with talk, Llandudno, UK: Eurographics Association, 2011, pp. 51–60. doi: 10.5555/2386230.2386238.
- [67] **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 *2011 IEEE Pacific Visualization Symposium*, with talk, 2011, pp. 51–58. doi: 10.1109/PACIFICVIS.2011.5742372.
- [68] 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. doi: 10.4203/ccp.95.20.
- [69] **Frey, S.**, Ertl, T., ``PaTraCo: A Framework Enabling the Transparent and Efficient Programming of Heterogeneous Compute Networks," in *Eurographics Symposium on Parallel Graphics and Visualization*, J. Ahrens, K. Debattista, and R. Pajarola, Eds., with talk, The Eurographics Association, 2010. doi: 10.2312/EGPGV/EGPGV10/131–140.
- [70] Kauker, D., Sanftmann, H., **Frey, S.**, Ertl, T., ``Memory saving discrete fourier transform on gpus," in *2010 10th IEEE International Conference on Computer and Information Technology*, 2010, pp. 1152–1157. doi: 10.1109/CIT.2010.209.
- [71] Üffinger, M., **Frey, S.**, Ertl, T., ``Interactive high-quality visualization of higher-order finite elements," *Computer Graphics Forum*, vol. 29, no. 2, pp. 337–346, 2010. doi: <https://doi.org/10.1111/j.1467-8659.2009.01603.x>.
- [72] **Frey, S.**, Ertl, T., ``Accelerating Raycasting Utilizing Volume Segmentation of Industrial CT Data," in *Theory and Practice of Computer Graphics*, W. Tang and J. Collomosse, Eds., with talk at TPCG09, The Eurographics Association, 2009. doi: 10.2312/LocalChapterEvents/TPCG/TPCG09/033–040.
- [73] **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, with talk, Las Vegas, Nevada: Springer-Verlag, 2009, pp. 357–366. doi: 10.1007/978-3-642-10331-5_34.
- [74] Müller, C., **Frey, S.**, Strengert, M., Dachsbacher, C., Ertl, T., ``A compute unified system architecture for graphics clusters incorporating data locality," *IEEE Transactions on Visualization and Computer Graphics*, vol. 15, no. 4, pp. 605–617, 2009. doi: 10.1109/TVCG.2008.188.

Appendix: Conference & Journal Abbreviations

Abbreviation	Full Name
BigVis	Workshop on Big Data Visual Exploration and Analytics
EuroVis	Eurographics/IEEE Symposium on Visualization
EG	Conference of the European Association for Computer Graphics
EGPGV	Eurographics Symposium on Parallel Graphics and Visualization
ICPR	International Conference on Pattern Recognition
INFOCOMP	International Conference on Information and Computing Science
ISC	International Supercomputing Conference
ISAV	In Situ Infrastructures for Enabling Extreme-Scale Analysis and Visualization
ISVC	International Symposium on Visual Computing
IV	International Conference on Information Visualisation
JDSSV	Journal of Data Science, Statistics, and Visualization
LDAV	IEEE Symposium on Large Data Analysis and Visualization
PacificVis	IEEE Pacific Visualization Symposium
QiVC	International Conference on Quantification in Visual Computing
SA Asia Vis	SIGGRAPH Asia Visualization / Asia Visualization Workshop
SC	International Conference for High Performance Computing, Networking, Storage and Analysis
SC Asia	Supercomputing Asia Conference
SEAAA	EUROMICRO Conference on Software Engineering and Advanced Applications
SIBGRAPI	Conference on Graphics, Patterns and Images
VIS	IEEE Visualization Conference
VisAI	Workshop on Visualization for AI Explainability
VINCI	International Symposium on Visual Information Communication and Interaction
VMV	Vision, Modeling, and Visualization
WOIV	International Workshop on In Situ Visualization