Bernhard Kerbl

Curriculum Vitæ

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Education

2014–2018 **Ph.D. Computer Science**, *Graz University of Technology, Austria (TU Graz)*.

2013 **Interim Research Stay**, *Lund University, Sweden*.

2008–2013 **M.Sc. Software Development and Business Management**, *TU Graz*.

1999–2007 **Secondary Education**, *Graz International Bilingual School (GIBS)*.
Graduation (Matura) in 2007 with distinction

Doctoral Thesis

Title *Load Balancing for Hardware and Software Rendering on the GPU*

Supervisors Dieter Schmalstieg, Markus Steinberger

Referee Michael Doggett

Master Thesis

Title *Interactive Decomposition of Large Assemblies*

Supervisors Dieter Schmalstieg, Denis Kalkofen

Bachelor Thesis

Title *Virtual Radiofrequency Ablation Planning for Hepatocellular Carcinoma*

Supervisors Dieter Schmalstieg, Bernhard Kainz

Fields of Interest

- Real-Time and High-Performance Computer Graphics
- GPU Programming and Parallel Processing
- Point-based Rendering
- Physically-based Rendering
- Machine Learning

Current Position

04/2024–ongoing **Visiting Scholar**, *Robotics Institute, Carnegie Mellon University*.
To be determined.

Previous Experience

07/2023–03/2024 **Co-Principal Project Investigator**, *Vienna University of Technology (TU Wien)*.
Administration and research in the IVILPC project on point-based rendering.

10/2020–02/2023 **External Lecturer**, *Fachhochschule Salzburg*.
Teaching rendering, real-time physics and GPU programming courses.

09/2022–07/2023 **Postdoc Researcher**, *INRIA, Université Côte d'Azur*.
Research on fast rendering of point-based radiance fields in the GraphDeco group.

05/2019–09/2022 **Postdoc University Assistant**, *TU Wien*.
Research and teaching at Institute of Visual Computing & Human-Centered Technology.

2019 **Rendering Engineer Internship**, *Epic Games*.
Working on *Nanite*, Unreal Engine's virtual geometry rendering pipeline

01/2014–05/2019 **Research Assistant**, *TU Graz*.
Research on GPU scheduling at Institute for Computer Graphics and Vision.

2011/2012 **Teaching Assistant**, *TU Graz*.
Preparation of lab exercises at Institute for Computer Graphics and Vision.

2009/2010 **Intern**, *Coca-Cola Company/Medical University of Graz*.
Development of several Eclipse plugins/a quizzing application for medical students.

Acquired Funding

2023 **Instant Visualization and Interaction for Large Point Clouds (IVILPC)**, *WWTF*, Fundamental Research Grant, €600k.
Main proposal author and (co-)principal investigator.

Patents

2021 Methods and apparatus for efficient multi-view rasterization, US11132831B1, with and for QUALCOMM Incorporated, San Diego, CA

2016 Method for creating three-dimensional documentation, WO2016046054A1, with and for *Anstalt für Verbrennungskraftmaschinen List* (AVL), Graz, Austria

Prizes, Awards, and Stipends

2024 **International Conference on Computer Graphics Theory and Applications (GRAPP)**, *Best Student Paper Award*.

2023 **SIGGRAPH Technical Papers**, *Best Paper Award (1 of 5)*.

Vulkanised Conference, *Best Presentation (1 of 3)*.

2022 **High-Performance Graphics Conference**, *Wolfgang Straßer Best Paper Award*.

2019 **SIGGRAPH Symposium on Interactive 3D Graphics and Games**, *Best Poster*.

2012 **Erasmus**, *Study Abroad Grant*, Awarded but declined.

Press

2023 "Creating stunning real time 3D scenes: the breakthrough of 3D Gaussian Splatting", *Inria News and Events*, 8 December.

"Where Does A.I. End and We Begin?", *The New York Times*, 6 December.

"3D Gaussian Splatting: Fotorealistische Aufnahmen für Unreal Engine & Co.", *heise.de*, 23 November.

Conference Comittees

2024	Eurographics Annual Conference, EG '24 (Short Papers IPC)
2022	SIGGRAPH Asia '22 (Poster and Technical Communications IPC)
	Foundations of Digital Games, FDG '22 (IPC)
	High-Performance Graphics, HPG '22 (IPC)
	Eurographics Annual Conference, EG '22 (Short Papers IPC)
2021	Eurographics Annual Conference, EG '21 (Short Papers IPC)
2020	High-Performance Graphics, HPG '20 (Poster Chair)

Services

Journal Review	ACM Transactions on Graphics (TOG)
	IEEE Transactions on Visualization and Computer Graphics (TVCG)
	Computer Graphics Forum (CGF)
	Computer-Aided Design (CAD)
	Computers and Graphics (CG)
	Journal of Systems and Software (JSS)
	Mathematics
	IEEE Sensors
Conference Review	ACM SIGGRAPH
	Eurographics (EG)
	Pacific Graphics (PG)
	High-Performance Graphics (HPG)
	International Symposium on Mixed and Augmented Reality (ISMAR)
	ACM Symposium on Virtual Reality and Software Technology (VRST)
	IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)
Other	SIGGRAPH Technical Papers Conflict-of-Interest Coordination

Teaching

TU Wien	Physically-Based Rendering
	Scientific Research and Writing
FH Salzburg	GPU-based Simulations with Vulkan and CUDA
	Game Physics: Light Transport and Rigid Body Animation
TU Graz	Parallel Programming for GPUs with CUDA
	Real-Time Graphics using OpenGL
	Virtual Reality for Computer Graphics
	Introduction to Computer Graphics
	Introduction to Scientific Working

Miscellaneous Activities

2009–2012	Volunteer paramedic with the Austrian Red Cross
2008	Mandatory military service in Graz and Klagenfurt (Austria)

Student Supervision

PhD (co-supervised)

João Cardoso, *TU Wien*, "Approaching Untackled Image-Space Problems with Optimization".

Johannes Unterguggenberger, *TU Wien*, "GPU Algorithms for Efficient Rendering of Massive Geometry Workloads".

Lukas Herzberger, *TU Wien*, Thesis title to be determined.

Adam Celarek, *TU Wien*, Thesis title to be determined.

Master's

Slavko Ivanovic, *FH Salzburg*, "GPU-based Procedural Content Generation with Wave Function Collapse".

Johannes Schatteiner, *FH Salzburg*, "Accelerating Particle-based Physics for Games via Techniques from Smoothed Particle Hydrodynamics".

Bachelor's

Elias Kristmann, *TU Wien*, "Occluder Frequency Analysis for Occludee LODs".

Linus Horváth, *TU Wien*, "Fast Triangle Encoding for Cached Tessellation".

Alexandra Gamsjäger, *TU Wien*, "Procedural Models with Parser Generators".

Pascal Hann, *TU Wien*, "Incremental Path-Tracing of Editable Scenes".

Moritz Roth, *TU Wien*, "View-Dependent Impostors for Procedural Buildings".

Martin Rumpelnik, *TU Wien*, "Planetary Rendering with Mesh Shaders".

Jakob Pernsteiner, *TU Wien*, "Ensuring Effectiveness of CHC++ in Vulkan".

Benedikt Mayr, *TU Graz*, "Representative Lightcuts".

Tutorials & Invited Talks

2024 **3D Gaussian Splatting**, *Facebook Reality Labs, Pittsburgh*.

3D Gaussian Splatting in Practice, *3DV '24*, Tutorial.

Software Rendering Across the Board: Meshes, Point Clouds, Radiance Fields, *LORIA, Université de Lorraine*, hosted by Prof. Dmitry Sokolov.

Software Rendering Across the Board: Meshes, Point Clouds, Radiance Fields, *IDEAS NCBR, Warsaw*, hosted by Prof. Przemyslaw Musialski.

2023 **Software Rendering Across the Board: Meshes, Point Clouds, Radiance Fields**, *VISUS, University of Stuttgart*, hosted by Prof. Dieter Schmalstieg.

Software Rendering Across the Board: Meshes, Point Clouds, Radiance Fields, *Max-Planck Institute for Informatics, Saarbrücken*, hosted by Prof. Christian Theobalt.

Teaching Vulkan, *SIGGRAPH '23*, Birds of a Feather Talk, Vulkan: Forging Ahead.

A Gentle Introduction to Vulkan for Compute Workloads, *HPG '23*, Invited Talk.

Transitioning to Vulkan for Compute, *Vulkanised '23*, Invited Talk.

2022 **CUDA and Applications to Task-based Programming**, *Eurographics '22*, Tutorial.

2021 **CUDA and Applications to Task-based Programming**, *Eurographics '21*, Tutorial.

Detailed Geometry for Cloud and Edge Real-Time Rendering, *Cloud InnovWave '21*, Invited Talk.

Languages (CEFR)

German	**C2 (Proficient User)**	*Mother Tongue*
English	**C1 (Advanced Level)**	*Cambridge Certificate in Advanced English*
French	**B2 (Independent User)**	

Publications

5 Representative Publications (* denotes equal contribution)

B. Kerbl*, G. Kopanas*, T. Leimkühler, and G. Drettakis, "3D Gaussian Splatting for Real-Time Radiance Field Rendering," *ACM Trans. Graph.*, 2023.

M. Schütz, **B. Kerbl**, and M. Wimmer, "Rendering Point Clouds with Compute Shaders and Vertex Order Optimization," *Computer Graphics Forum*, 2021.

B. Kerbl, M. Kenzel, J. H. Mueller, D. Schmalstieg, and M. Steinberger, "The Broker Queue: A Fast, Linearizable FIFO Queue for Fine-Granular Work Distribution on the GPU," in *Proceedings of the International Conference on Supercomputing*, 2018.

P. Mohr, **B. Kerbl**, M. Donoser, D. Schmalstieg, and D. Kalkofen, "Retargeting Technical Documentation to Augmented Reality," in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 2015.

P. Papantonakis, G. Kopanas, **B. Kerbl**, A. Lanvin, and G. Drettakis, "Reducing the Memory Footprint of 3D Gaussian Splatting," *Proc. ACM Comput. Graph. Interact. Tech.*, 2024.

Further Peer-Reviewed Publications

A. Ulschmid, **B. Kerbl**, K. Krösl, and M. Wimmer, "Real-Time Editing of Path-Traced Scenes with Prioritized Re-Rendering," in *Proceedings of the 19th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications*, 2024.

M. Schütz, **B. Kerbl**, P. Klaus, and M. Wimmer, "GPU-Accelerated LOD Generation for Point Clouds," *Computer Graphics Forum*, 2023.

P. Voglreiter, **B. Kerbl**, A. Weinrauch, J. H. Mueller, M. Steinberger, and D. Schmalstieg, "Trim Regions for Online Computation of From-Region Potentially Visible Sets," *ACM Trans. Graph.*, July 2023.

C. Jambon, **B. Kerbl**, G. Kopanas, S. Diolatzis, T. Leimkuehler, and G. Drettakis, "NeRFshop: Interactive Editing of Neural Radiance Fields," *Proc. ACM Comput. Graph. Interact. Tech.*, 2023.

J. Unterguggenberger, **B. Kerbl**, and M. Wimmer, "Vulkan All the Way: Transitioning to a Modern Low-level Graphics API in Academia," *Computers & Graphics*, 2023.

J. Hladky, M. Stengel, N. Vining, **B. Kerbl**, H.-P. Seidel, and M. Steinberger, "Quadstream: A quad-based scene streaming architecture for novel viewpoint reconstruction," *ACM Trans. Graph.*, Nov 2022.

M. Schütz, **B. Kerbl**, and M. Wimmer, "Software Rasterization of 2 Billion Points in Real Time," *Proc. ACM Comput. Graph. Interact. Tech.*, 2022.

J. L. Cardoso, **B. Kerbl**, L. Yang, Y. Uralsky, and M. Wimmer, "Training and predicting visual error for real-time applications," *Proc. ACM Comput. Graph. Interact. Tech.*, 2022.

J. Unterguggenberger, **B. Kerbl**, and M. Wimmer, "The Road to Vulkan: Teaching Modern Low-Level APIs in Introductory Graphics Courses," in *Eurographics 2022 - Education Papers*, 2022.

B. Kerbl, L. Horváth, D. Cornel, and M. Wimmer, "An Improved Triangle Encoding Scheme for Cached Tessellation," in *Eurographics 2022 - Short Papers*, 2022.

A. Celarek, P. Hermosilla, **B. Kerbl**, T. Ropinski, and M. Wimmer, "Gaussian Mixture Convolution Networks," in *International Conference on Learning Representations*, 2022.

B. Kerbl, M. Kenzel, M. Winter, and M. Steinberger, "CUDA and Applications to Task-based Programming," in *Eurographics 2022 - Tutorials*, 2022.

I. Murturi, C. Jia, **B. Kerbl**, M. Wimmer, S. Dustdar, and C. Tsigkanos, "On Provisioning Procedural Geometry Workloads on Edge Architectures," in *Proceedings of the 17th International Conference on Web Information Systems and Technologies - WEBIST*, 2021.

J. Unterguggenberger, **B. Kerbl**, J. Pernsteiner, and M. Wimmer, "Conservative Meshlet Bounds for Robust Culling of Skinned Meshes," *Computer Graphics Forum*, 2021.

S. Stappen, J. Unterguggenberger, **B. Kerbl**, and M. Wimmer, "Temporally Stable Content-Adaptive and Spatio-Temporal Shading Rate Assignment for Real-Time Applications," in *Pacific Graphics Short Papers, Posters, and Work-in-Progress Papers*, 2021.

C. Jia, M. Roth, **B. Kerbl**, and M. Wimmer, "View-Dependent Impostors for Architectural Shape Grammars," in *Pacific Graphics Short Papers, Posters, and Work-in-Progress Papers*, 2021.

J. Unterguggenberger, **B. Kerbl**, M. Steinberger, D. Schmalstieg, and M. Wimmer, "Fast Multi-View Rendering for Real-Time Applications," in *Eurographics Symposium on Parallel Graphics and Visualization*, 2020.

W. Tatzgern, B. Mayr, **B. Kerbl**, and M. Steinberger, "Stochastic Substitute Trees for Real-Time Global Illumination," in *Symposium on Interactive 3D Graphics and Games*, 2020.

F. Michelic, M. Kenzel, K. Haubenwallner, **B. Kerbl**, and M. Steinberger, "From Ground to Space: Real-time Rendering of Procedural Planets at Arbitrary Altitudes," *I3D '19 Poster Presentation*, May 2019.

B. Kerbl, M. Kenzel, E. Ivanchenko, D. Schmalstieg, and M. Steinberger, "Revisiting the Vertex Cache: Understanding and Optimizing Vertex Processing on the modern GPU," *Proc. ACM Comput. Graph. Interact. Tech.*, Aug. 2018.

M. Kenzel, **B. Kerbl**, W. Tatzgern, E. Ivanchenko, D. Schmalstieg, and M. Steinberger, "On-the-fly Vertex Reuse for Massively-Parallel Software Geometry Processing," *Proc. ACM Comput. Graph. Interact. Tech.*, Aug. 2018.

M. Kenzel, **B. Kerbl**, D. Schmalstieg, and M. Steinberger, "A High-Performance Software Graphics Pipeline Architecture for the GPU," *ACM Trans. Graph.*, July 2018.

B. Kerbl, J. Müller, M. Kenzel, D. Schmalstieg, and M. Steinberger, "A Scalable Queue for Work Distribution on GPUs," in *Proceedings of the 23rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, 2018.

B. Kerbl, M. Kenzel, D. Schmalstieg, and M. Steinberger, "Effective Static Bin Patterns for Sort-middle Rendering," in *Proceedings of High Performance Graphics*, 2017.

B. Kerbl, M. Kenzel, D. Schmalstieg, H.-P. Seidel, and M. Steinberger, "Hierarchical Bucket Queuing for Fine-Grained Priority Scheduling on the GPU," *Computer Graphics Forum*, 2016.

B. Kerbl, D. Kalkofen, M. Steinberger, and D. Schmalstieg, "Interactive Disassembly Planning for Complex Objects," *Computer Graphics Forum*, 2015.

M. Steinberger, M. Kenzel, P. Boechat, **B. Kerbl**, M. Dokter, and D. Schmalstieg, "Whippletree: Task-based Scheduling of Dynamic Workloads on the GPU," *ACM Trans. Graph.*, Nov. 2014.

B. Kerbl, P. Voglreiter, R. Khlebnikov, D. Schmalstieg, D. Seider, M. Moche, P. Stiegler, R. Portugaller, and B. Kainz, "Intervention Planning of Hepatocellular Carcinoma Radio-Frequency Ablations," in *Clinical Image-Based Procedures. From Planning to Intervention*, Lecture Notes in Computer Science, 2013.

M. Steinberger, B. Kainz, **B. Kerbl**, S. Hauswiesner, M. Kenzel, and D. Schmalstieg, "Softshell: Dynamic Scheduling on GPUs," *ACM Trans. Graph.*, 2012.

Vienna, Austria, March 17, 2024