Bernhard Kerbl
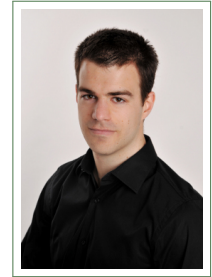
Curriculum Vitæ

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8047 Graz
Austria
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✉ *kerbl@cg.tuwien.ac.at*
📱 *snosixtyboo.github.io*

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 Graphics
○ Physically-based Rendering
○ Machine Learning

Current Positions & Activities

04/2024–ongoing	**Visiting Scholar**, *Carnegie Mellon University, Robotics Institute*. Research on visual computing in the Human Sensing Lab.
07/2023–ongoing	**Co-Principal Project Investigator**, *Vienna University of Technology (TU Wien)*. Administration and research in the IVILPC project on high-speed point-based rendering.
07/2023–ongoing	**External Collaborator**, *Institut National de la Recherche Scientifique (INRIA)*. Research on image-based rendering and 3D reconstruction in the GraphDeco group.

Previous Experience

09/2022–07/2023   **Postdoc Researcher**, *INRIA, Université Côte d'Azur*.
Developed 3D Gaussian Splatting and interactive NeRF deformation in the GraphDeco group.

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

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

07/2019–09/2019   **Rendering Engineer Internship**, *Epic Games*.
Worked 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.

Funding & Revenue Generation   Entries with Outreach as Clickable Links

2023–2026   **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

Awards & Prizes

2024   **The Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)**, *Best Paper*.

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

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

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

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

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

In the Media

2024   "Une technique révolutionnaire de création de scènes en 3D", *LeMonde*, 8 May.

"3D Gaussian Splatting!", *Computerphile, Youtube*, 14 Mar.

2023   "Where Does A.I. End and We Begin?", *The New York Times*, 6 Dec.

"Navigating The Digital Future: How Cutting-Edge Technologies Are Revolutionizing Marketing And Content Creation", *Forbes*, 19 Dec.

"Wow, NVIDIA's Rendering, But 10× Faster!", *Two Minute Papers, Youtube*, 2 Sept.

"Creating Stunning Real Time 3D Scenes: The Breakthrough of 3D Gaussian Splatting", *INRIA News and Events*, 8 Dec.

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

Conference Comittees

2024	SIGGRAPH Asia '24 (Technical Papers)
	Eurographics Annual Conference, EG '24 (Short Papers)
2022	SIGGRAPH Asia '22 (Posters and Technical Communications)
	Foundations of Digital Games, FDG '22 (Technical Papers)
	High-Performance Graphics, HPG '22 (Technical Papers)
	Eurographics Annual Conference, EG '22 (Short Papers)
2021	Eurographics Annual Conference, EG '21 (Short Papers)
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
	IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
	IEEE Transactions on Circuits and Systems for Video Technology
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)
	Central European Seminar on Computer Graphics (CESCG)
Other	SIGGRAPH Technical Papers Conflict-of-Interest Coordination

Teaching Activities Entries with Outreach as Clickable Links

TU Wien	**Rendering**, *10–20 students*, Lecture and Exercises.
	Scientific Research and Writing, *10–20 students*, Exercises.
FH Salzburg	**GPU-based Simulation**, *10–20 participants*, Classroom Teaching.
	Game Physics, *10–20 students*, Classroom Teaching.
TU Graz	**Real-Time Graphics**, *20–40 students*, Lecture and Exercises.
	GPU Programming, *10–20 students*, Exercises.
	Virtual Reality, *10–20 students*, Exercises.
	Introduction to Computer Graphics, *60–100 students*, Exercises.
	Introduction to Scientific Working, *10–20 students*, Exercises.

Thesis Supervision

PhD (co-supervised)

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

Johannes Unterguggenberger, *TU Wien*, "High Geometry Loads in Real-Time Rendering on Modern GPUs".

Lukas Herzberger, *TU Wien*.

Adam Celarek, *TU Wien*.

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 Entries with Outreach as Clickable Links

2024 **3D Gaussian Splatting—Theory and Practice**, *3D Vision Summer School, IIIT Bangalore*, hosted by Prof. Avinash Sharma.

High-Speed Rendering for Point Clouds and Radiance Fields, *Facebook Reality Labs, Pittsburgh*, hosted by Dr. Michael Zollhöfer.

3D Gaussian Splatting, *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.

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

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

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

Organization

2019–2023 Member of interdisciplinary Center for Geometry and Design (GCD) at TU Wien

Miscellaneous Activities

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

Full List of Publications

* denotes equal contribution

S. Mallick*, R. Goel*, **B. Kerbl**, F. Carrasco, M. Steinberger, and F. de la Torre, "Taming 3DGS: High-Quality Radiance Fields with Limited Resources," in *Proceedings of SIGGRAPH Asia*, 2024.

C. Wang, K. Wolski, **B. Kerbl**, A. Serrano, M. Bemama, K. Myszkowski, H.-P. Seidel, and T. Leimkühler, "Cinematic Gaussians: Real-Time HDR Radiance Fields with Depth of Field," *Computer Graphics Forum (PG)*, 2024.

A. Jain, **B. Kerbl**, J. Gain, B. Finley, and G. Cordonnier, "FastFlow: GPU Acceleration of Flow and Depression Routing for Landscape Simulation," *Computer Graphics Forum (PG)*, 2024.

R. Goel, M. Schütz, P. Narayanan, and **B. Kerbl**, "Real-Time Decompression and Rasterization of Massive Point Clouds," *Proc. ACM Comput. Graph. Interact. Tech. (HPG)*, 2024.

A. Gauthier, **B. Kerbl**, J. Levallois, R. Faury, J.-M. Thiery, and T. Boubekeur, "MatUp: Repurposing Image Upsamplers for SVBRDFs," *Computer Graphics Forum (EGSR)*, 2024.

B. Kerbl*, A. Meuleman*, G. Kopanas, M. Wimmer, A. Lanvin, and G. Drettakis, "A Hierarchical 3D Gaussian Representation for Real-Time Rendering of Very Large Scenes," *ACM Trans. Graph. (SIGGRAPH)*, 2024.

L. Radl*, M. Steiner*, M. Parger, A. Weinrauch, **B. Kerbl**, and M. Steinberger, "StopThePop: Sorted Gaussian Splatting for View-Consistent Real-time Rendering," *ACM Trans. Graph. (SIGGRAPH)*, 2024.

J. Unterguggenberger, L. Lipp, **B. Kerbl**, M. Wimmer, and M. Schütz, "Fast Rendering of Parametric Objects on Modern GPUs," in *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, 2024.

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. (I3D)*, 2024.

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 (GRAPP)*, 2024.

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

B. Kerbl*, G. Kopanas*, T. Leimkühler, and G. Drettakis, "3D Gaussian Splatting for Real-Time Radiance Field Rendering," *ACM Trans. Graph. (SIGGRAPH)*, 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. (SIGGRAPH)*, 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. (I3D)*, 2023.

J. Unterguggenberger, **B. Kerbl**, and M. Wimmer, "Vulkan All the Way: Transitioning to a Modern Low-level Graphics API in Academia," *Computers & Graphics (C&G)*, 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. (SIGGRAPH Asia)*, Nov 2022.

M. Schütz, **B. Kerbl**, and M. Wimmer, "Software Rasterization of 2 Billion Points in Real Time," *Proc. ACM Comput. Graph. Interact. Tech. (HPG)*, 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. (I3D)*, 2022.

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

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

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

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

J. Unterguggenberger, **B. Kerbl**, J. Pernsteiner, and M. Wimmer, "Conservative Meshlet Bounds for Robust Culling of Skinned Meshes," *Computer Graphics Forum (PG)*, 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 (PG Short)*, 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 (PG Short)*, 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 (EGPGV)*, 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 (I3D)*, 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, 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 (ICS)*, 2018.

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. (HPG)*, 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. (HPG)*, Aug. 2018.

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

B. Kerbl, M. Kenzel, D. Schmalstieg, and M. Steinberger, "Effective Static Bin Patterns for Sort-middle Rendering," in *Proceedings of High Performance Graphics (HPG)*, 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 (CGF)*, 2016.

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 (CHI)*, 2015.

B. Kerbl, D. Kalkofen, M. Steinberger, and D. Schmalstieg, "Interactive Disassembly Planning for Complex Objects," *Computer Graphics Forum (EG)*, 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. (SIGGRAPH Asia)*, 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 (MICCAI CLIP)*, 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. (SIGGRAPH Asia)*, 2012.

Pittsburgh, Pennsylvania, September 9, 2024