Dr. Bernhard Kainz

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Qualifications

- **Ph.D.** — Graz, Austria — *2007 - 2011*
  Graz University of Technology
  - Specialization in Computer Science and Medical Visual Computing
  - Dissertation: "Ray-Based Image Generation For Advanced Medical Applications" (Advisor: Prof. Dieter Schmalstieg) (highest distinction)

- **M.Sc.** — Graz, Austria — *2005 - 2007*
  Graz University of Technology
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  - Thesis: "Quantitative Measurement and Visualization of Four-Dimensional Cardiovascular Blood Flow from phase contrast MRI" (highest distinction)

- **B.Sc.** — Graz, Austria — *2001 - 2005*
  Graz University of Technology
  - Course: Telematics (Informatics and Electrical Engineering)

Employment

- **Imperial College London** — London, UK — *10/15 - today*
  University lecturer, Department of Computing

- **King's College London** — London, UK — *04/15 - 10/15*
  Senior Research Fellow, Division of Imaging Sciences and Biomedical Engineering
  - translational research in interactive visualization and high-performance medical real-time data analysis for prenatal imaging and image guided cardiac intervention
  - outreach and teaching

- **Imperial College London** — London, UK — *04/15 - 10/15*
  Honorary Fellow, Department of Computing
  - fostering collaboration with the clinical practice at King's College London,
  - supervision of interdisciplinary students,
  - support of the department's teaching (Graphics 314) and outreach activities (e.g. Imperial Festival).

- **Imperial College London** — London, UK — *2013 - 2015*
  Marie-Curie Fellow, Department of Computing
  - developed a massively parallel reconstruction system for foetal organs from in-utero magnetic resonance imaging (foetal MRI) using Graphics Processing Units (GPUs) and optimization with automatic outlier rejection,
  - applied Machine Learning techniques, especially Random-Forest Classification to organ localization problems in foetal images,
  - published in the Top journals of the field and presented at the top conferences,

- autonomously delivered the lab exercise and co-delivered the lecture for *Graphics 317*,
- supervised MSc, MEng, Ph.D. and CBC student projects,
- several outreach activities at local secondary schools in London.

- **Graz University of Technology** — Graz, Austria
  Senior Research Associate, Institute for Computer Graphics and Vision — 2011 - 2013
    - lead scientist and Co-PI of the FWF funded project *Managed Volume Processing* (P23329),
    - wrote the proposal for *Managed Volume Processing* and led a team of three researchers,
    - implemented an omnidirectional 3D real-time scene capturing system using volumetric reconstruction (OmniKinect),
    - developed innovative volume graphics algorithms for the GPU that can interactively cope with huge datasets while allowing a better utilization of the available GPU capacity,
    - built a toolset that allows harvesting the full GPU power for a general class of real-time GPU accelerated algorithms,
    - proposed a managed volume processing system with key modules like a task model, a workload scheduler with real-time capabilities and a virtual memory management system executed in tandem on the GPU and CPU. The tools from this project are open source and can be downloaded form the project website `http://www.icg.tugraz.at/project/mvp`.

- **Graz University of Technology** — Graz, Austria
  Research Associate, Institute for Computer Graphics and Vision — 2008 - 2011
    - principal engineer and later Co-PI of the EU FP7 project IMPPACT (FP7-223877),
    - developed novel hardware accelerated direct volume rendering techniques for medical applications,
    - proposed a unique way to visualize possible access paths to malicious structures during minimally invasive interventions,
    - designed and implemented a framework for the simulation of radio-frequency tumour ablations, which is currently used by all partners of IMPPACT,
    - published the results about real-time multiple volumetric datasets rendering and approaches to achive guaranteed frame rates for these scenes in prestigious scientific journals.

- **Medical University of Innsbruck** — Innsbruck, Austria
  Research Associate, Department of Urology — 2007 - 2008
    - developed a new way to localize the position of a C-Arm during prostate biopsies with Prof. Georg Bartsch,
    - used GPU acceleration and automatic differentiation of code to allow 3D/2D image registration in real-time.

- **Graz University of Technology** — Graz, Austria
  Research Associate, Institute for Computer Graphics and Vision — 2007
    - started Ph.D. programme and organised a collaboration between Graz University of Technology, Siemens Healthcare and the Medical University of Innsbruck.

- **Versuchsanstalt für Hochspannungstechnik Graz GmbH** — Graz, Austria
  Software and research engineer — 2006 - 2013
    - part-time, responsible for the visualization of HV processes and lightning protection systems,
    - automation of experimental evaluation systems.

- **Siemens Healthcare** — Graz, Austria/Erlangen, Germany
  Software engineer and MSc student — 2004 - 2007
    - implemented research software for evaluation and visualization of the cardiac blood flow, based on four-dimensional volumetric phase-contrast magnetic resonance imaging (4D-PC-MRI),

– organised the cooperation between SIEMENS HealthCare, SIEMENS Corporate Research, Medical University Graz, and Graz University of Technology.

- **Magnasteyr Graz**   Graz, Austria
  Web developer   *2001 - 2004*
  – developed an interactive web based system for documentation in the automotive sector.

Publication summary

- 15 peer reviewed articles in scientific journals
- 20 peer reviewed full papers at international conferences
- 7 popular science contributions

- 12 refereed publications at international conferences (short papers, extended abstracts, posters, etc.)
- 1 patent

A complete list of publications can be found at
`https://www.researchgate.net/profile/Bernhard_Kainz2` and
`http://scholar.google.co.uk/citations?user=Igxq-YEAAAAJ&hl=en&oi=ao`

Research Grants Awarded

- **2013** Marie-Curie Fellowship award: Marie Curie Intra-European Fellowship (FP7-PEOPLE-2012-IEF F.A.U.S.T. Grant No. 325661), approx. 300k €, PI.

- **2013** *EU FP7 ICT: ClinicImppact Grant No. 610886*: I wrote the part for TU-Graz and applied together with my consortium from IMPPACT (EU FP7, Grant No. 223877) and Prof. Schmalstieg as PI (German/Austrian grant management system), overall approx. 3M €, 400k € for TU-Graz, Co-I.

- **2012** FWF Erwin Schrödinger Scholarship at Imperial College London (declined in favour of a Marie-Curie Fellowship), approx. 150k €, PI.

- **2012** *EU FP7: Go-Smart Grant No. 600641*: I wrote the part for TU-Graz and applied together with my consortium from IMPPACT (EU FP7, Grant No. 223877) and Prof. Schmalstieg as PI (German/Austrian grant management system), overall approx. 4M €, 600k € for TU-Graz, Co-I.

- **2011** *"Forum Technology and Society"* research prize, Research price for the best dissertation at Graz University of Technology in 2011 3.5k €.

- **2011** *Ing. F. Schmiedl research prize*, Research price for the best dissertation in human technology and communication technology in 2011, granted by the Ing. F. Schmiedl foundation. 2.5k €.

- **2011** *Managed Volume Rendering on the GPU.* Funded by Austrian Science Fund (FWF) (P23329): I was the main contributor for the proposal and was responsible for the implementation of the project, Prof. Schmalstieg as PI (German/Austrian grant management system), approx. 350k €, Co-I.

- **2010** *FutureLab*, granted by Graz University of Technology, approx. 30k €.

- **2007** *Research grant for students*, Graz University of Technology, approx. 1.5k €.

acquired funds, total .... **approx. 1.8M €**

Languages

- **German**: native
- **English**: fluent
- **French**: basic

Awards & Honours

- **2014** Short-listed for the Nurturing Research Talents Marie Skłodowska-Curie actions prize 2014.
- **2014** Best paper honorable mention award EuroGraphics 2014.
- **2014** Corporate Partnership Programme Award: project award for Chris Bowles, a M.Eng. student at Imperial College London supervised by myself.
- **2013** Short-listed for the OCG Heinz Zemanek Price 2012.
- **2013** *Best poster* honorable mention for IEEE SciVis 2013.
- **2012** VCBM Karl-Heinz-Höhne 3rd award for the paper "Crepuscular Rays for Tumor Accessibility Planning".
- **2012** Short-listed for the GI-dissertation price 2011.
- **2011** *Best paper award*, International Symposium on Non-Photorealistic Animation and Rendering.
- **2011** *Ing. F. Schmiedl research prize*, City of Graz.
- **2011** *"Forum Technology and Society"* research prize. Graz University of Technology.
- **2008** *ACM Honorable Mention*, CGEMS SIGGRAPH Educational Committee.
- **2007** *Award for excellent performance as a student*, Graz University of Technology.

Consulting

- **Exscitec - provider of STEM outreach activities** — London, UK
  Teaching – Computer Science teaching for secondary schools — *2014 - present*
- **Graz University of Technology** — Graz, Austria
  Management – EU project management and research proposal design — *2013 - present*
- **Perception Park Graz GmbH - hyperspectral imaging** — Graz, Austria
  Technology – GPU technology and high-performance computing methods — *2011 - 2013*

Professional activities

Keynote talks:

- *Visualization for Medical AR.* A 'Look Into' Medical Augmented Reality Tutorial, International Symposium on Mixed and Augmented Reality, September 2014

Conference organising:

- **2015** International program committee member Eurographics Workshop on "Visual Computing for Biology and Medicine" (VCBM'15)

- **2015** Co-organizer "Tutorial on Medical Visualization" at MICCAI'15
- **2014** International program committee member "Augmented Environments for Computer Assisted Interventions" (AE-CAI) at MICCAI'14
- **2014** best paper committee member Eurographics Workshop on "Visual Computing for Biology and Medicine" (VCBM'14)
- **2014** International program committee member Eurographics Workshop on "Visual Computing for Biology and Medicine" (VCBM'14)
- **2013** International program committee member "Computer- und Roboter-assistierte Chirurgie" (CURAC'13)
- **2012** International program committee member "Augmented Environments for Computer Assisted Interventions" (AE-CAI) at Medical Image Computing and Computer Assisted Intervention (MICCAI'12)
- **2012** International program committee member "Computer- und Roboter-assistierte Chirurgie" (CURAC'12)

Selected regular reviewing activities: Medical Image Computing and Computer Aided Intervention (MICCAI), Engineering and Physical Sciences Research Council (EPSRC), IEEE Computer, International Journal, International Symposium on Biomedical Imaging: From Nano to Macro (ISBI), Visual Computing for Biology and Medicine (VCBM), CURAC, CARS (Computer Assisted Radiology and Surgery), Elsevier International Journal of Computerized Medical Imaging and Graphics (CMIG), ACM Symposium on Virtual Reality Software and Technology, ACM SIGGRAPH and SIGGRAPH Asia, EG EuroGraphics (International Journal Computer Graphics forum), EG EuroVIS (International Journal Computer Graphics forum), Augmented Environments for Computer Assisted Interventions (MICCAI AE-CAI), IEEE PacificVis, Elsevier International Journal of Computer Methods and Programs in Biomedicine, IEEE International conference on Robotics and Automation (ICRA), International Journal of Computer Assisted Radiology and Surgery, International Conference on Advances in Computer Entertaiment Technology, IEEE Virtual Reality (VR), International Journal of Design Engineering, Elsevier International Journal of Computers & Graphics, High-Performance Medical Image Computing and Computer Aided Intervention (HP-MICCAI), Central European Seminar on Computer Graphics (CESCG)

Associations: ACM, IEEE, MICCAI, OCG, CURAC, EG

Teaching

- **2014 – present** Graphics 317, Imperial College London – co-delivering lecture with Prof. Daniel Rueckert. I am Course Support Leader and co-lecturer, i.e., independent preparation and delivering of 6 lecture units, organization, and marking of the computer-based coursework (∼100 students)
- **2009 – 2013** Selected Chapters Computer Graphics 710.086, Graz University of Technology – co-delivered lecture (∼25 students)
- **2009 – 2012** Real-time Graphics 2 710.092, Graz University of Technology – co-delivered lecture (∼30 students)
- **2008 – 2013** Computer Graphics 1 710.003, Graz University of Technology – marking (∼400 students)
- **2009 – 2009** Medical Image Analysis 710.076, Graz University of Technology – co-delivered lecture (∼30 students)

- **2008 – 2009** Augmented Reality 710.008, Graz University of Technology – Course Support Leader and organised computer-based coursework (∼20 students)
- **2007 – 2010** Real-time Graphics 710.078, Graz University of Technology – Course Support Leader and organised computer-based coursework (∼60 students)
- **2008 – 2009** Virtual Reality 710.096, Graz University of Technology – Course Support Leader and organised computer-based coursework (∼25 students)

Outreach activities

1. **Bernhard Kainz**, Amir Alansary, Emma Robinson, Kerstin Pannek: Fetal Motion Compensation for Magnetic Resonance Imaging. Imperial Festival 2015, Imperial College London, May 2015 (coordinated a team of four; present our work to an audience of more than 15,000 visitors during an exhibit lasting for three days)

2. **Bernhard Kainz**: Medical Augmented Reality, Interview "European Hospital" 5/2014 (bimonthly Magazine, Nov. 2014) `http://www.healthcare-in-europe.com/en/article/13028-navigated-augmented-reality-enhances-medical-applications.html`

3. **Bernhard Kainz**: Medical Image Analysis, Reaching Further (program to promote STEM fields at schools in London); autonomously prepared and delivered several 1h–2h activities for 20-30 school students per session. Imperial College London (2014)

4. **Bernhard Kainz**: Medical Image Analysis, Silver Crest Award (A-level science projects at schools in London), Imperial College London (2014)

5. **Bernhard Kainz**: TU entwickelte Methode für bessere OP-Bilder. Radiointerview 03.01.2012 `http://steiermark.orf.at/news/stories/2515046/`

6. Stephan Pack, **Bernhard Kainz**: Project day in the high voltage engineering lab with primary schools. 2009–2012

7. **Bernhard Kainz**: Volume rendering, Augmented reality, medical image analysis, OpenLabNight, ICG, Graz University of Technology, once a year 2008–2012

8. Alexander Bornik, **Bernhard Kainz**: Stereoscopic Volume Rendering. Graz:CSI VITAL 2010, Graz, Austria, (2010)

9. **Bernhard Kainz**, Dieter Schmalstieg: GPU Visualization of Four-Dimensional Cardiovascular Bood Flow ECR IMAGINE 2008 for the Austrian Image Processing Group, European Society of Radiology, Vienna (2008)

10. **Bernhard Kainz**, Dieter Schmalstieg: Live Demo of GPU Acceleration for Medical Visualization Significant Advances in Computer Science (SACS), Graz Universtiy of Technology, Graz (2007)

Student supervision

Degree	Year	Role	Subject	Present / Last Known Position
Ph.D. in CS	2014-date	Co-Supervisor	Reconstruction of foetal MRI	Imperial College London
Ph.D. in CS	2014-2015	Co-Supervisor	Fast cardiac catheter segmentation and tracking based on X-ray and echocardiography	Imperial College London

Degree	Year	Role	Subject	Present / Last Known Position
M.Eng. in CS	2014-2015	Supervisor	Uncertainty visualization for foetal motion compensation	Imperial College London
M.Sc. in CS	2014	Co-Supervisor	An Interface for Image-Based Relighting and Editing	Imperial College London
M.Sc. in CS	2014	Co-Supervisor	Visualization of the Human Connectom using Oculus Rift	Imperial College London
M.Eng. in CS	2013-2014	Supervisor	Tracking of foetal movements in-utero from MRI	Imperial College London
M.Eng. in CS	2013-2014	Co-Supervisor	Interior 3D reconstruction with KinectFusion	Imperial College London
M.Eng. in CS	2013-2014	Co-Supervisor	An infinite 3D world creation tool	Imperial College London
Ph.D. in CS	2013-2015	Co-Supervisor	Fast catheter segmentation and tracking	Imperial College London
Ph.D. in CS	2011-2013	Co-Supervisor	Natural phenomenons for scientific visualization	King's College London
Ph.D. in CS	2011-2013	Co-Supervisor	Scheduling strategies on GPUs	Graz University of Technology
M.Sc. in CS	2012	Supervisor	Particle tracing for gas-insulated high-voltage fields	Graz University of Technology
M.Sc. in CS	2012	Supervisor	GPU scheduled volume rendering	Graz University of Technology
M.Sc. in CS	2012	Supervisor	Flexible air traffic controller information systems	Graz University of Technology
M.Sc. in CS	2011	Supervisor	Automatically generated design galleries for volume transfer functions	Graz University of Technology
B.Sc. in CS	2011	Supervisor	Augmented reality tumor accessibility visualization	Graz University of Technology
B.Sc. in CS	2011	Supervisor	A whole RFA simulation pipeline	Graz University of Technology
CS project	2011	Supervisor	Light emission-absorption approximation for direct volume rendering	Graz University of Technology
CS project	2010	Supervisor	Automatic peak detection in volumetric histograms	Graz University of Technology
M.Sc. in CS	2009	Supervisor	The Studierstube Builder	Nokia Qt, Oslo, Norway
B.Sc. in CS	2009	Co-Supervisor	CranUS II – neonatal cranial ultrasound simulator	Graz University of Technology
CS project	2009	Supervisor	Detecting pulmonary hypertension with 3D-4D LIC	Nokia Qt, Oslo, Norway
M.Sc. in CS	2008	Co-Supervisor	CranUS - neonatal cranial ultrasound simulator	DLR - Institute of Aerospace Medicine

Additional Skills

- **Programming**: C, C++, CUDA, OpenCL, Python, Matlab, Java, Fortran, Perl, R, PHP, SQL, javascript

- **In vivo preclinical data acquisition**: magnetic resonance imaging (MRI) including dynamic PC-MRI and fast cine sequences in animals and humans, contrast enhanced computed tomography (CT, CE-CT) and image guided intervention in animals and humans, ultrasound in humans, Electrocardiogram (ECG), Electroencephalography (EEG)