

# Vincent Bürgin

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## Education

### M.Sc. Informatics

Technical University of Munich (TUM)

Grade: 1,0 / *passed with high distinction*

October 2020 – March 2024

- Master's program in Computer Science with focus on research projects (*Data Innovation Lab, Guided Research*)
- Area of Specialization: *Machine Learning and Analytics* (20 + 8\* ECTS)
- Supplemental Areas ( $\geq 8$  ECTS): *Algorithms* (12 + 5\* ECTS), *Computer Graphics and Vision* (8 + 5\* ECTS), *Scientific Computing and HPC* (10 ECTS)
- Master's Thesis: *Topology-Aware 3D Medical Image Segmentation via Persistent Homology* (Grade: 1,0). Supervision: Prof. Daniel Rückert, Prof. Ulrich Bauer, Dr. Johannes Paetzold, Nico Stucki

\* Voluntary additional credits

### B.Sc. Computer Science

University of Passau

Grade: 1,0 / *mit Auszeichnung* ("with distinction")

October 2016 – September 2020

- Bachelor's Thesis: *Distribution-Valued Games: Overview, Analysis, and a Segmentation-Based Approach* (Grade: 1,0). Supervision: Prof. Fabian Wirth, Prof. Hermann de Meer
- Semester abroad at Waterford Institute of Technology, Ireland (September 2018 – December 2018)

### B.Sc. Mathematics

University of Passau

Grade: 1,0 / *mit Auszeichnung* ("with distinction")

April 2019 – September 2020

- Studied jointly with B.Sc. Computer Science, joint Bachelor's Thesis

### Abitur (*general university entrance qualification*)

Goethe-Gymnasium Regensburg

Grade: 1,0

September 2008 – June 2016

## Work Experience

### Research Internship

ImFusion GmbH, Munich

November 2022 – April 2023

- Researching applications of graph neural networks (GNNs) for vertebra identification task on CT scans
- Training GNNs processing the output of a vertebra keypoint localisation CNN (*Python, PyTorch, PyTorch Geometric*)
- Integrating GNN inference into ImFusion Suite (*C++*)
- Research resulted in publication at MICCAI conference (*Robust vertebra identification using simultaneous node and edge predicting Graph Neural Networks*, MICCAI 2023).

### Student assistant

Chair of Computer Networks, University of Passau

March 2019 – December 2019

- Integrating the ns-3 network simulator with the mosaik co-simulation framework for simulation of smart power grid algorithms (*Python*)

### Internship/vacation jobs in Software Engineering

Vector Informatik GmbH, Regensburg

July 2013; April 2014, April 2015, August 2015, August 2016

- A one-week highschool student internship and several two-week vacation jobs
- Writing small tools for internal use (*C# & WPF, Java*)

## Volunteering

### EnHands

October 2022 – present

Accredited student initiative at TUM developing hand prosthesis prototypes for low-income countries

- Founding member, leading marketing/student outreach and event organization (*HANDSFORUM*), and contributing to funding applications and organizational tasks
- Elected treasurer of EnHands e.V. (association, in process of being legally registered)

## Academic Publications

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### 1. Remarks on the tail order on moment sequences.

V. Bürgin, J. Epperlein, and F. Wirth (2022). Journal of Mathematical Analysis and Applications, Vol. 512 (1). doi:10.1016/j.jmaa.2022.126135.

### 2. Robust vertebra identification using simultaneous node and edge predicting Graph Neural Networks.

V. Bürgin, R. Prevost, and M. F. Stollenga (2023). Medical Image Computing and Computer Assisted Intervention (MICCAI) 2023. doi:10.1007/978-3-031-43996-4\_46.

### 3. S3M: Scalable Statistical Shape Modeling through Unsupervised Correspondences.

L. Bastian\*, A. Baumann\*, E. Hoppe, V. Bürgin, H. Y. Kim, M. Saleh, B. Busam, and N. Navab (2023). Medical Image Computing and Computer Assisted Intervention (MICCAI) 2023. doi:10.1007/978-3-031-43999-5\_44.

### 4. On the Localization of Ultrasound Image Slices within Point Distribution Models.

L. Bastian\*, V. Bürgin\*, H. Y. Kim\*, A. Baumann, B. Busam, M. Saleh, and N. Navab (2023). International Workshop on Shape in Medical Imaging (ShapeMI), 2023. doi:10.1007/978-3-031-46914-5\_11.

### 5. Topologically faithful multi-class segmentation in medical images.

A. Berger, N. Stucki, L. Lux, V. Bürgin, S. Shit, A. Banaszak, D. Rückert, U. Bauer, and Johannes C. Paetzold (2024). Accepted for publication at: Medical Image Computing and Computer Assisted Intervention (MICCAI) 2024. Preprint available as arXiv:2403.11001.

### 6. Efficient Betti Matching Enables Topology-Aware 3D Segmentation via Persistent Homology.

N. Stucki, V. Bürgin, Johannes C. Paetzold, and U. Bauer (2024). Preprint, arXiv:2407.04683.

## Scholarships and Achievements

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### **relAI: Konrad Zuse School of Excellence in Reliable AI**

October 2022 – September 2024

Scholarship and program for Master's and Ph.D. students focusing on reliable AI

### **best.in.tum, Technical University of Munich**

April 2022

Award for top 2% students of the TUM Informatics faculty

### **Faculty Prize, University of Passau**

May 2022

Award for the two highest-scoring graduates per degree program

- Faculty Prize for B.Sc. Computer Science, Faculty Prize for B.Sc. Mathematics

### **Max Weber-Programm**

2016 – 2022

Scholarship for talented students (awarded after highschool and confirmed after two years)

### **Bundeswettbewerb Informatik/Bundeswettbewerb Mathematik**

2013 – 2016

National highschool student computer science/mathematics competitions

- *Bundeswettbewerb Informatik*: participated three times (2013/14, 2014/15, 2015/16), final round participant in 2016
- *Bundeswettbewerb Mathematik*: participated two times (2014/15, 2015/16), second prize in second round 2016

## Skills

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### Language Skills

- **German**: Native speaker
- **English**: Fluent and experienced speaker (C1–C2), TOEFL score 118/120 (June 2020)
- **Spanish**: Basic to advanced knowledge (B1–B2), university courses until B2.1 level
- **French**: Basic knowledge

### Programming Languages and Software

- **Python**: Extensive experience through research projects, research internship, university projects and personal projects. Libraries used include *Numpy*, *SciPy*, *PyTorch*, *PyTorch Geometric*.
- **C++**: Experience through research internship and Master's thesis project.
- **Rust**: Experience through personal projects. Technologies used include *Tokio*, Rust with Web Assembly, *SixtyFPS* (now *Slint*).
- **JavaScript/NodeJS**: Experience through university projects (full-stack web development) and personal projects (interactive visualizations and algorithmic art). Libraries used include *Vue.js*, *Express*, *p5.js*.
- **C#**: Experience through personal projects (2010 – 2016, including *Bundeswettbewerb Informatik* projects, XNA/Windows Phone games, puzzle solvers etc.) and highschool student jobs.

Other technologies: *Git* / *Java*, *C*, *Haskell*, *Julia* / *LaTeX*, *Typst* / *AWS* / *SageMath*, *Mathematica*, *MATLAB*, *R*.