Georg Wölflein

I am a PhD student in computer vision who is passionate about both theory and practice. I have four years of computer vision experience in industry, and in my PhD, I am applying computer vision techniques to digital pathology to improve the quality of kidney cancer prognoses based on medical images. I am always excited to apply my knowledge to new problems, not only in terms of developing new computer vision models, but also seeing that these models are deployed efficiently and have a real-world impact.

Education

since Aug 2021 — **Doctor of Philosophy (PhD), Computer Science**, *University of St Andrews*, Scotland.
My PhD is under the supervision of Dr Ognjen Arandjelović and lies at the intersection of deep learning, computer vision, and medical imaging for digital pathology, funded by the NHS.

Sep 2017 – Jun 2021 (2nd year direct entry) — **Master in Science (MSci), Computer Science**, *University of St Andrews*, Scotland.
First-Class Honours, GPA: 95%
Master's thesis: "Determining chess game state from an image" (grade: 20.0/20).
Honours level courses include machine learning, AI principles & practice, language & computation, data-intensive systems, information visualisation, concurrency & multi-core architectures, constraint programming, software architecture, software engineering, complexity, OS, databases, data encoding, component technology, logic, software verification, compiler design & implementation.

2005 – 2017 — **International Baccalaureate and Abitur**, *Dresden International School*, Germany.
IB Diploma: 40 points, German Abitur: 1.3
Valedictorian. Higher level subjects: maths, physics, computer science.

Experience

May 2018 – May 2022 — **Working Student – Computer Vision**, *Robotron Datenbank-Software*, Dresden, Germany
Gained practical experience in deep learning and software engineering by developing deep learning models and deploying them to production in the Realtime Computer Vision (RCV) department.
- Designed and implemented containerised infrastructure for automatically training, evaluating, and deploying TensorFlow and PyTorch models for industrial use cases.
- Selected and trained deep learning models for various industrial use cases, including a system for a car manufacturer that reduced the error rate of detecting faulty parts by 90%.
- Implemented real-time object detection on video streams using TensorFlow.

Jun-Aug 2019 — **Software Engineering Intern**, *J.P. Morgan*, Glasgow, Scotland
Developed a data visualisation and reporting dashboard for an automated testing framework using Python, React, TypeScript, and SQL that gave the team new insights. Gained hands-on experience with Scrum, working in a team, and prioritising requirements from different stakeholders.

Skills

Programming — Python, C/C++, Java, SQL, JavaScript, TypeScript, Haskell, C#, LaTeX, R

Technologies — PyTorch, TensorFlow, Keras, JAX, Docker, Apache Spark, Splunk, mongodb, Postgres, React, D3.js, Tableau

Languages — German, English *(mother tongue)*; French *(B1)*

Prizes and awards

2020 — Adobe Prize (£750) for the highest GPA in Senior Honours Computer Science

2018 – 2021 — 4x Dean's List Award of Academic Excellence at the University of St Andrews

2017 — Valedictorian at Dresden International School

2017 — Subject awards for mathematics and computer science

2010 – 2017 — 12x High Honour Roll (GPA over 6.0 of 7) at Dresden International School

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scholar

Publications

Conference papers

2023 **G. Wölflein**, I. H. Um, D. J. Harrison, and O. Arandjelović, "HoechstGAN: Virtual lymphocyte staining using generative adversarial networks," in *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, Jan. 2023

Journal articles

2022 R. De Filippis*, **G. Wölflein***, I. H. Um, P. D. Caie, S. Warren, A. White, E. Suen, E. To, O. Arandjelović, and D. J. Harrison, "Use of high-plex data reveals novel insights into the tumour microenvironment of clear cell renal cell carcinoma," *Cancers*, vol. 14, no. 21, Nov. 2022. (link)

2021 **G. Wölflein** and O. Arandjelović, "Determining chess game state from an image," *Journal of Imaging*, vol. 7, no. 6, Jun. 2021. (link)

Datasets

2021 **G. Wölflein** and O. Arandjelović, *Dataset of rendered chess game state images*, Open Science Foundation, May 2021. (link)

Talks

Apr 2022 **KATY EU Project**
High-plex data reveal novel insights into the tumour microenvironment of clear cell renal cell carcinoma (presented with Raffaele De Filippis)

Selected projects and coursework

2021 **Determining chess game state from an image**, *master's thesis*, grade: 20.0/20
For my master's thesis, I developed a system for identifying the chess position from a photo of a chess game using deep learning and traditional computer vision techniques. The system improves the state of the art error rate by a factor of 23 and includes a one-shot transfer learning approach to adapt to an unseen chess set based on just two images.

2020 **Recap: configuration management for reproducible research**, *Python package*
Research should be reproducible. Especially in deep learning, it is important to keep track of hyper-parameters and configurations used in experiments. I had to write similar configuration management code in several projects, so I created a Python package and published it on PyPI.

2020 **Freeing neural training through surfing**, *SH project*, grade: 19.0/20
For my undergraduate thesis, I investigated the local minimum problem in neural networks and developed a novel technique for training neural networks. Through this project, I developed independent research and academic writing skills whilst learning a lot about neural networks and machine learning. The report is available here, and a paper is currently in preparation.

Volunteering

2021 – 2022 **Developmental squad representive**, *University of St Andrews Volleyball Club*
I was elected to represent the recreational volleyball team within the committee and club decision-making process. This role helped me improve communication and organisational skills.

2018 – 2020 **Secretary**, *University of St Andrews Muscle and Athletics Sports Society (MASS)*
As secretary of MASS, I was in charge of coordinating meetings, writing minutes, and taking care of administrative tasks. This position has helped me develop teamwork and organisational skills.

2010 – 2017 **Volunteer firefighter**, *Freiwillige Feuerwehr Possendorf*
I am passionate about giving back to the community. Since age eleven, I was a youth fire fighter in my local fire department. In 2015, I completed the training qualification to become a member of the adult fire department, and participated in active service until I moved to Scotland in September 2017.

In my free time, I enjoy playing chess, volleyball, lifting weights, and improvising on the piano.

*equal contribution