

Researcher in deep learning for medicine with seven years of industry experience in computer vision and a strong software engineering background. Passionate about both theory and practice, my research focuses on LLM agents for medicine as well as computer vision for computational pathology.

## Education

- Aug 2021 – Sep 2025 **Doctor of Philosophy (PhD), Computer Science, University of St Andrews, Scotland.**  
During my PhD, I developed novel deep learning models for computational pathology, as well as an agentic framework enabling LLMs to autonomously create research tools in medicine and life sciences, resulting in first-author publications at ECCV, ACL, WACV, and others. My PhD was supervised by Dr Ognjen Arandjelović.
- Sep 2017 – Jun 2021 **Master in Science (MSci), Computer Science, University of St Andrews, Scotland.**  
(2<sup>nd</sup> year direct entry) 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

- Jun 2025 – present **AI Engineer, Synagen AI, Dresden, Germany**  
Developing LLM agents for medicine.
- Nov 2024 – May 2025 **Researcher, Else Kröner Fresenius Center for Digital Health (EKFZ), Dresden, Germany**  
At Kather Lab, I conducted research on LLM agents in medicine and deep learning for computational pathology. Specifically, I developed TOOLMAKER, an LLM agent that autonomously creates research tools from research papers with code repositories (accepted at ACL 2025). I also supervised multiple PhD students (resulting in publications at CVPR & MICCAI), led an LLM agents reading group, and managed the team developing our open-source computational pathology platform STAMP.
- Jul-Oct 2024 **Research Intern, Google, London, UK**  
Statistically evaluated FitBit's activity recognition model across diverse activity classes and demographic groups. Identified and quantified key failure modes, performed an in-depth analysis of root causes, and communicated actionable recommendations for model improvement to cross-functional teams.
- Jul-Sep 2023 **Research Intern, Else Kröner Fresenius Center for Digital Health (EKFZ), Dresden, Germany**  
At Kather Lab, I performed an extensive benchmarking study of self-supervised feature extractors in histopathology (accepted at ECCV), and contributed to various LLM-related projects.
- Jan-Mar 2023 **PhD Placement, Lay Summaries Ltd, Glasgow, Scotland**  
Developed a NLP pipeline for automating the generation of lay summaries of EU clinical trials in a part-time PhD placement funded by The Data Lab.
- 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%.
- Jun-Aug 2019 **Software Engineering Intern, J.P. Morgan, Glasgow, Scotland**  
Developed a data visualisation and reporting dashboard using Python, React, TypeScript, SQL. Gained hands-on experience with Scrum, teamwork, and prioritising requirements from different stakeholders.

## Skills

- Programming Python, C/C++, Java, SQL, JavaScript, TypeScript, Haskell, C#, L<sup>A</sup>T<sub>E</sub>X

Technologies	PyTorch, Triton, TensorFlow, Keras, JAX, Docker, Dask, Apache Spark, Postgres, React
Languages	German, English ( <i>mother tongue</i> ); French ( <i>B1</i> )

## 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; subject awards for maths and computer science
- 2010 – 2017 12x High Honour Roll (GPA over 6.0 of 7) at Dresden International School

## Publications

### Conference papers

- 2025 M. Ligero, T. Lenz, **G. Wölflein**, O. S. M. El Nahhas, D. Truhn, and J. N. Kather, "Abnormality-driven representation learning for radiology imaging," in *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, accepted, Sep. 2025. ([link](#))
- G. Wölflein**, D. Ferber, D. Truhn, O. Arandjelović, and J. N. Kather, "LLM agents making agent tools," in *Proceedings of the Annual Meeting of the Association for Computational Linguistics (ACL)*, accepted, Jul. 2025. ([link](#))
- T. Lenz, P. Neidlänger, M. Ligero, **G. Wölflein**, M. van Treeck, and J. N. Kather, "Unsupervised foundation model-agnostic slide-level representation learning," in *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, accepted, Jun. 2025. ([link](#))
- 2024 O. S. M. El Nahhas, **G. Wölflein**, M. Ligero, T. Lenz, M. van Treeck, F. Khader, D. Truhn, and J. N. Kather, "Joint multi-task learning improves weakly-supervised biomarker prediction in computational pathology," in *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, Springer Nature Switzerland, Oct. 2024, pp. 254–262. ([link](#))
- G. Wölflein**, D. Ferber, A. R. Meneghetti, O. S. M. El Nahhas, D. Truhn, Z. I. Carrero, D. J. Harrison, O. Arandjelović, and J. N. Kather, "A good feature extractor is all you need for weakly supervised pathology slide classification," in *European Conference on Computer Vision (ECCV)*, BioImage Computing Workshop (oral), Springer, Sep. 2024. ([link](#))
- 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, pp. 4997–5007. ([link](#))

### Journal articles

- 2025 D. Ferber, O. S. M. El Nahhas, **G. Wölflein**, I. C. Wiest, J. Clusmann, M.-E. Leßman, S. Foersch, J. Lammert, M. Tschochohei, D. Jäger, M. Salto-Tellez, N. Schultz, D. Truhn, and J. N. Kather, "Development and validation of an autonomous artificial intelligence agent for clinical decision-making in oncology," *Nature Cancer*, Jun. 2025. ([link](#))
- 2024 D. Ferber, **G. Wölflein**, I. C. Wiest, M. Ligero, S. Sainath, N. G. Laleh, O. S. M. El Nahhas, G. Müller-Franzes, D. Jäger, D. Truhn, and J. N. Kather, "In-context learning enables multimodal large language models to classify cancer pathology images," *Nature Communications*, vol. 15, no. 1, p. 10104, Nov. 2024. ([link](#))
- O. S. M. El Nahhas, M. van Treeck, **G. Wölflein**, M. Unger, M. Ligero, T. Lenz, S. J. Wagner, K. J. Hewitt, F. Khader, S. Foersch, D. Truhn, and J. N. Kather, "From whole-slide image to biomarker prediction: End-to-end weakly supervised deep learning in computational pathology," *Nature Protocols*, Sep. 2024. ([link](#))

\*equal contribution

- D. Ferber, I. C. Wiest, **G. Wölflein**, M. P. Ebert, G. Beutel, J.-N. Eckardt, D. Truhn, C. Springfield, D. Jäger, and J. N. Kather, "GPT-4 for information retrieval and comparison of medical oncology guidelines," *NEJM AI*, vol. 1, no. 6, Alcs2300235, May 2024. ([link](#))
- 2023 **G. Wölflein\***, I. H. Um\*, D. J. Harrison, and O. Arandjelović, "Whole-slide images and patches of clear cell renal cell carcinoma tissue sections counterstained with Hoechst 33342, CD3, and CD8 using multiple immunofluorescence," *Data*, vol. 8, no. 2, Feb. 2023. ([link](#))
- 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](#))

### Preprints

- 2024 D. Ferber, L. Hilgers, I. C. Wiest, M.-E. Leßmann, J. Clusmann, P. Neidlinger, J. Zhu, **G. Wölflein**, J. Lammert, M. Tschochohei, H. Böhme, D. Jäger, M. Aldea, D. Truhn, C. Höper, and J. N. Kather, *End-to-end clinical trial matching with large language models*, under review, Jul. 2024. ([link](#))
- G. Wölflein**, D. Ferber, A. R. Meneghetti, O. S. M. El Nahhas, D. Truhn, Z. I. Carrero, D. J. Harrison, O. Arandjelović, and J. N. Kather, *Benchmarking pathology feature extractors for whole slide image classification*, Jun. 2024. ([link](#))
- 2023 **G. Wölflein**, L. C. Magister, P. Liò, D. J. Harrison, and O. Arandjelović, *Deep multiple instance learning with distance-aware self-attention*, May 2023. ([link](#))

### Abstracts

- 2023 D. Alouges, **G. Wölflein**, I. H. Um, D. Harrison, O. Arandjelović, C. Battail, and S. Gazut, *Performance comparison between federated and centralized learning with a deep learning model on Hoechst stained images*, ISMB/ECCB Abstracts, Jul. 2023. ([link](#))

### Datasets

- 2022 **G. Wölflein**, I. H. Um, D. J. Harrison, and O. Arandjelović, *Whole slide images and patches of clear cell renal cell carcinoma counterstained with multiple immunofluorescence for Hoechst, CD3, and CD8*, Biolimage Archive, Dec. 2022. ([link](#))
- 2021 **G. Wölflein** and O. Arandjelović, *Dataset of rendered chess game state images*, Open Science Foundation, May 2021. ([link](#))

### Invited talks

- Sep 2025 **AI in Medicine Summer School 2025, TU Dresden**  
LLM agents for biomedical research
- Mar 2025 **Center for Scalable Data Analytics and Artificial Intelligence (SCADS.AI), Dresden**  
LLM agents for autonomously creating research tools in medicine and life sciences ([link](#))
- Feb 2024 **Tissue Image Analytics (TIA) Centre, University of Warwick**  
A good feature extractor is all you need for weakly supervised learning in histopathology ([link](#), [video](#))
- Apr 2022 **KATY EU Project**  
High-plex data reveal novel insights into the tumour microenvironment of clear cell renal cell carcinoma (with Raffaele De Filippis)

### Courses and training

- Dec 2023 Focus on Peer Review, *Nature Masterclasses*.
- Mar 2023 **Clinicum Digitale, Dresden University of Technology**: attended a two-week interdisciplinary spring school on medicine and technology.

- Jun 2020 Deep Learning Specialisation, *Coursera*.  
May 2020 PyTorch for Deep Learning and Computer Vision, *Udemy*.  
Sep 2019 Mathematics for Machine Learning Specialisation, *Coursera*.  
Sep 2019 TensorFlow 2.0: A Complete Guide on the Brand New TensorFlow, *Udemy*.  
2013 – 2014 C/C++ Course, *Volkshochschule Dresden (Community College Dresden)*.

## Service

- 2025 Reviewer for *MICCAI, MICCAI COMPAYL*  
2024 Reviewer for *ECCV BIC*  
2023 Reviewer for *CVPR* and *npj Precision Oncology*

## Volunteering

- 2021 – 2022 **Developmental squad representative**, *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.