Kather, Jakob, Prof., MD (A02)

Personal Data

Title	Prof. Dr. med.
First name	Jakob Nikolas
Name	Kather
Current position	Professor (W3) for "*Clinical Artificial Intelligence*"; permanent position
Current institution(s)/site(s), country	Else Kröner Fresenius Zentrum for Digital Health (EKFZ), University Hospital Dresden (UKD) and Faculty of Medicine, Technische Universität Dresden (TUD), Fetscherstr. 74, 01307 Dresden, Germany
Identifiers/ORCID	SCOPUS ID: 16027909600, ORCID-ID: 0000-0002-3730-5348

Qualifications and Career

Stages	**Periods and Details**
Degree programme: Medicine/Medical Physics	2013 – 2016, Medical Faculty Mannheim of Heidelberg University, Germany
Medicine	2009 – 2016, Medical Faculty Mannheim of Heidelberg University, Germany
Doctorate: MD	19.05.2016: Supervisor: Hellmut Augustin, *Vascular Biology and Tumor Angiogene*sis, German Cancer Research Center (DKFZ), Heidelberg; Supervisor: Jens Kroll, *Characterization of Pathological Angiogenesis in the KLEIP Knockout Mouse Model,* University Heidelberg, Germany
Stages of academic / professional career	
Since 2022	Professorship (W3) for "Clinical Artificial Intelligence" at TUD, Dresden, Germany
2021	Board certification *Internal Medicine*
2021 – 2022	Junior (Assistant) Professorship (W1 with tenure track to W2) at the Medical Faculty of RWTH University Aachen, Aachen, Germany
2018 – 2022	Resident Physician in Gastroenterology, Gastrointestinal Oncology, Medical Intensive Care at University Hospital RWTH Aachen, Aachen, Germany
2016 – 2018	Resident Physician, Medical Oncology, National Center for Tumor Diseases (NCT), Heidelberg, Germany
2016 – 2018	Postdoctoral scientist, German Cancer Research Center (DKFZ, "Applied Tumor Immunity", PI: Prof. Dr. Dirk Jaeger)
2016	Medical license

Supplementary Career Information

Parental leave, 11/2021 – 04/2022 (6 months)

Engagement in the Research System

- Coordinator, ODELIA - Open Consortium for Decentralized Medical Artificial Intelligence, (EU Horizon) (2023 – 2027)
- PI, TANGERINE - Artificial-intelligence-based end-to-end prediction of cancer immunotherapy response, Federal Ministry of Education and Research (BMBF) (2023 – 2026)
- Coordinator, Transform Liver - Scaling up Vision Transformers for Biomarkers in Liver Disease, Federal Ministry of Education and Research (BMBF) (2023 – 2026)
- Coordinator, DECADE - Decentralized artificial intelligence for diagnosis, prognostication and response prediction in Colorectal Cancer (German Cancer Aid) (2023 – 2026)
- PI, SWAG - Swarm learning and generative models for synthesising and harnessing high quality data in cancer medicine, Federal Ministry of Education and Research (BMBF) (2022 – 2026)
- Visiting Associate Professor in the School of Medicine, Leeds Institute of Medical Research at St James's, University of Leeds, UK (since 2021)
- Research Group Leader “Computational Oncology” at University Hospital RWTH Aachen, Aachen, Germany (2019 – 2022)
- Visiting Researcher, Hematology and Oncology, University of Chicago Medicine, Chicago, IL, USA (PI: Alexander T. Pearson, MD, PhD) (2019 – 2019)
- Visiting Researcher, Integrated Mathematical Oncology, Moffitt Cancer Center, Tampa, FL, USA (PI: Heiko Enderling, PhD) (2018 – 2018)

Scientific Results

Our team, known as the “*Clinical Artificial Intelligence Research Group*” employs computational methods to extract actionable knowledge from routine clinical data and histopathological images. Our primary tools for research are Artificial Intelligence and Computational Modeling, which are applied in conjunction with a clinical viewpoint regarding health and disease, with a particular emphasis on cancer diagnosis, prognosis, and treatment (1, 3, 7, 8). Our main area of expertise lies in precision oncology of solid tumors, including immunotherapy (1). Through our research, we have demonstrated the potential of deep learning for predicting prognosis and therapy response in gastrointestinal cancers (2, 6, 8), as well as its robustness (5). As part of our methods, we have also implemented a novel and promising approach known as "swarm learning” which allows for fully-decentralized deep learning while preserving data privacy (4). Furthermore, our studies have demonstrated that deep learning is highly effective at detecting biomarkers from histology images and has the potential to be used in clinical practice (6, 9, 10).

Category A, * contributed equally, # open access

1. Ghaffari Laleh N*, Ligero M*, Perez-Lopez R*, **Kather JN***. Facts and Hopes on the Use of Artificial Intelligence for Predictive Immunotherapy Biomarkers in Cancer. **Clin Cancer Res** 2023; 29(2):316-323. doi: 10.1158/1078-0432.CCR-22-0390.
2. Foersch S, Glänner C, Woerl AC, Eckstein M, Wagner DC, Schulz S, Kellers F, Fernandez A, Zerea K., Kloth M, Hartmann A, Heintz A, Weichert W, Roth W, Geppert C, **Kather JN**,

Jesinghaus M. Multistain deep learning for prediction of prognosis and therapy response in colorectal cancer. **Nat Med** 2023; 29(2):430-439. doi: 10.1038/s41591-022-02134-1.

3. Shmatko A*, Ghaffari Laleh N*, Gerstung M, **Kather JN**. Artificial intelligence in histopathology: enhancing cancer research and clinical oncology. **Nat Cancer** 2022; 3(9):1026-1038. doi: 10.1038/s43018-022-00436-4.
4. Saldanha OL, Quirke P, West NP, James JA, Loughrey MB, Grabsch HI, Salto-Tellez M, Alwers E, Cifci D, Ghaffari Laleh N, Seibel T, Gray R, Hutchins GGA, Brenner H, van Treeck M, Yuan T, Brinker TJ, Chang-Claude J, Khader F, Schuppert A, Luedde T, Trautwein C, Muti HS, Foersch S, Hoffmeister M, Truhn D, **Kather JN**. Swarm learning for decentralized artificial intelligence in cancer histopathology. **Nat Med** 2022; 28(6):1232-1239. doi: 10.1038/s41591-022-01768-5. #
5. Ghaffari Laleh N, Truhn D, Veldhuizen GP, Han T, van Treeck M, Buelow RD, Langer R, Dislich B, Boor P, Schulz V, **Kather JN**. Adversarial attacks and adversarial robustness in computational pathology. **Nat Commun** 2022; 13(1):5711. doi: 10.1038/s41467-022-33266-0. #
6. Muti HS, Heij LR, Keller G, Kohlruss M, Langer R, Dislich B, Cheong JH, Kim YW, Kim H, Kook MC, Cunningham D, Allum WH, Langley RE, Nankivell MG, Quirke P, Hayden JD, West NP, Irvine AJ, Yoshikawa T, Oshima T, Huss R, Grosser B, Roviello F, d'Ignazio A, Quaas A, Alakus H, Tan X, Pearson AT, Luedde T, Ebert MP, Jäger D, Trautwein C, Gaisa NT, GrabschHI*, **Kather JN***. Development and validation of deep learning classifiers to detect Epstein-Barr virus and microsatellite instability status in gastric cancer: a retrospective multicentre cohort study. **Lancet Digit Health** 2021; 3(10):e654-e664. doi: 10.1016/s2589-7500(21)00133-3. #
7. **Kather JN**, Heij LR, Grabsch HI, Loeffler C, Echle A, Muti HS, Krause J, Niehues JM, Sommer KAJ, Bankhead P, Kooreman LFS, Schulte JJ, Cipriani NA, Buelow RD, Boor P, Ortiz-Brüchle NN, Hanby AM, Speirs V, Kochanny S, Patnaik A, Srisuwananukorn A, Brenner H, Hoffmeister M, van den Brandt PA, Jäger D, Trautwein C, Pearson AT, Luedde T*. Pan-cancer image-based detection of clinically actionable genetic alterations. **Nat Cancer 2020**; 1(8):789-799. doi: 10.1038/s43018-020-0087-6. #
8. **Kather JN**, Calderaro J. Development of AI-based pathology biomarkers in gastrointestinal and liver cancer. **Nat Rev Gastroenterol Hepatol** 2020; 17(10):591-592. doi: 10.1038/s41575-020-0343-3.
9. Echle A, Grabsch HI, Quirke P, van den Brandt PA, West NP, Hutchins GGA, Heij LR, Tan X, Richman SD, Krause J, Alwers E, Jenniskens J, Offermans K, Gray R, Brenner H, Chang-Claude J, Trautwein C, Pearson AT, Boor P, Luedde T, Gaisa NT, Hoffmeister M, **Kather JN**. Clinical-Grade Detection of Microsatellite Instability in Colorectal Tumors by Deep Learning. **Gastroenterology** 2020; 159(4):1406-1416.e1411. doi: 10.1053/j.gastro.2020.06.021. #
10. **Kather JN**, Pearson AT, Halama N, Jäger D, Krause J, Loosen SH, Marx A, Boor P, Tacke F, Neumann UP, Grabsch HI, Yoshikawa T, Brenner H, Chang-Claude J, Hoffmeister M, Trautwein C, Luedde T. Deep learning can predict microsatellite instability directly from histology in gastrointestinal cancer. **Nat Med** 2019; 25(7):1054-1056. doi: 10.1038/s41591-019-0462-y. #

Academic Distinctions

- Thannhauser Prize for outstanding and pioneering scientific work in the field of digestive and metabolic diseases (by the German Society for Digestive and Metabolic Diseases (DGVS) (2022)
- German Award for Cancer Prevention, Young Investigator Category by the Manfred Lautenschläger Foundation and the German Cancer Research Center (DKFZ) (2021)
- Heinz Maier-Leibnitz Award by the German Research Foundation (DFG) and the German Federal Ministry of Education and Research (BMBF) (2021)
- Research Award for Colorectal Cancer Prevention (Stiftung Lebensblicke, Ludwigshafen, Germany) (2020)
- Research Award of the German Society for Medical Oncology (Arbeitsgemeinschaft Internistische Onkologie, AIO) (2020)
- Theodor-Frerichs-Award of the German Society for Internal Medicine (Deutsche Gesellschaft für Innere Medizin, DGIM) (2020)
- Member of the Academy of the Sciences and Arts of the State of North-Rhine-Westphalia, Germany) (2020 – 2024)
- Scholarship of the German National Academic Foundation (Studienstiftung des Deutschen Volkes) (2010 – 2016)