

# Katharina V. Hoebel, MD, PhD

POSTDOCTORAL RESEARCH FELLOW · DEPARTMENT OF BIOMEDICAL INFORMATICS

Harvard Medical School, Boston, MA, USA

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Postdoctoral researcher at Harvard Medical School specializing in AI for medical imaging, with a dual background in medicine and computer science. Research focuses on interpretable deep learning methods for oncology applications in computational pathology and radiology.

## Professional Experience

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| 2024 - date | <b>Postdoctoral Research Fellow</b> , Yu Lab, Department of Biomedical Informatics<br><b>Harvard Medical School, Boston, MA, USA</b>   |
| 2023 - 2024 | <b>Postdoctoral Research Fellow</b> , Lotter Lab, Department of Data Science<br><b>Dana-Farber Cancer Institute and Department of Pathology, Harvard Medical School, Boston, MA, USA</b> |
| 2018 - 2023 | <b>PhD Research Assistant</b> , Quantitative Imaging in Medicine Lab<br><b>Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, USA</b>                   |
| 2019 - 2021 | <b>Head Teaching Assistant</b> , HST 030: Human Pathology<br><b>Harvard Medical School, Boston, MA, USA</b>  |
| 2015 - 2016 | <b>Research Assistant</b> , Bouma Lab, Department of Dermatology<br><b>Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, USA</b>                             |
| 2012 - 2013 | <b>Graduate (MD) Research Assistant</b> , Institute for Biochemistry<br><b>Christian-Albrechts Universität zu Kiel, Kiel, Germany</b>  |

## Education

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### PhD Medical Engineering and Medical Physics

Cambridge, MA, USA

#### Harvard-MIT Division of Health Sciences and Technology

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

09/2017 - 02/2023

- Concentration area: Computer Science
- cGPA: 5.0/5.0
- Research advisor: Prof. Jayashree Kalpathy-Cramer, Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, USA
- Thesis title: "Domain and User-Centered Machine Learning for Medical Image Analysis." Access via [MIT Libraries](#)

### Doctor of Medicine (Dr. med.)

Kiel, Germany

KIEL UNIVERSITY

08/2017

- Thesis title (translation): "CANDIS - The Role of ADAM17's Stalk-Region for its Activity and Identification of the Human Interleukin-6 Receptor Binding Epitope to its Sheddase ADAM17", supervisor: Prof. Joachim Grötzinger, Institute for Biochemistry, Christian Albrechts Universität zu Kiel. Access via [University of Kiel Libraries](#) (in German)
- Grade: Magna cum laude

### Doctor of Medicine (MD)

Heidelberg, Germany

HEIDELBERG UNIVERSITY

06/2017

- Medical license Germany (currently inactive)
- With practical traineeships in Perth, Australia and Oslo, Norway
- Grade: 1.33

### Bachelor of Science, Physics

Kiel, Germany

KIEL UNIVERSITY

03/2016

- Minor in Computer Science
- Thesis title: "Modeling and Experimental Validation of *Ex Vivo* Thermal Therapy", supervisor: Prof. Brett Bouma, Wellman Center for Photomedicine, Massachusetts General Hospital

## Publications

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### PUBLISHED

- Alessi, J.V., Lindsay, J.R., Giobbie-Hurder, A., Sharma, B., Felt, K., Kumari, P., Mazor, T., Cerami, E., Lotter, W., Altreuter, J. and Weirather, J., Dryg, I., Hoebel, K., et al. 2025. Immunoprofiling at an Institutional Scale Reveals That High Numbers of Intratumoral CD8+ and PD-1+ Cells Predict Superior Patient Survival Across Major Cancer Types Independent of Major Risk Factors. **JCO Precision Oncology**, 9, p.e2500240.
- Hoebel, K., Bridge, C.P., Kim, A., Gerstner E., Ly, K.I., Deng F., DeSalvo M.N., Diettrich J., Huang R., Huang S.Y., et al., 2024. Not without context - A multiple methods study on evaluation and correction of automated brain tumor segmentations by experts. **Academic Radiology** 31(4)
- Kim, A.E., Lou, K.W., Giobbie-Hurder, A., Chang, K., Gidwani, M., Hoebel, K., Patel, J.B., Cleveland M.C., et al. 2024. Abnormal vascular structure and function within brain metastases is linked to pembrolizumab resistance. **Neuro-oncology**, 26(5)
- Hoebel, K., Bridge, C.P., Ahmed, S., Akintola, O., Chung, C., Huang, R., Johnson, J., Kim, A., Ly, K.I., Chang, K. and Patel, J. et al., 2024. Expert-centered evaluation of deep learning segmentation algorithms for brain tumor segmentation. **Radiology: Artificial Intelligence**, 6(1).
- Deng, B., Gu, H., Zhu, H., Chang, K., Hoebel, K., Patel B., Kalpathy-Cramer J., Carp S., 2023. FDU-Net: Deep Learning-Based Three-Dimensional Diffuse Optical Image Reconstruction. **IEEE Transactions on Medical Imaging**, 42(8)
- Gidwani, M., Chang, K., Patel, J., Hoebel, K., Ahmed, S.R.; Singh, P., Fuller, C., Kalpathy-Cramer, J., 2022. Inconsistent partitioning and unproductive feature associations yield idealized radiomic models. **Radiology**, 220715
- Lemay, A., Hoebel, K., Bridge, C.P., Befano, B., De Sanjosé, S., Egemen, D., Rodriguez, A.C., Schiffman, M., Campbell, J.P. and Kalpathy-Cramer, J., 2022. Improving the repeatability of deep learning models with Monte Carlo dropout. **npj Digital Medicine**, 5(173)
- Arun, N., Gaw, N., Singh, P., Chang, K., Aggarwal, M., Chen, B., Hoebel, K., Gupta, S., Patel, J., Gidwani, M. and Adebayo, J., 2021. Assessing the trustworthiness of saliency maps for localizing abnormalities in medical imaging. **Radiology: Artificial Intelligence**, 3(6).
- Hoebel, K.V., Patel, J.B., Beers, A.L., Chang, K., Singh, P., Brown, J.M., Pinho, M.C., Batchelor, T.T., Gerstner, E.R., Rosen, B.R. and Kalpathy-Cramer, J., 2021. Radiomics repeatability pitfalls in a scan-rescan MRI study of glioblastoma. **Radiology: Artificial Intelligence**, 3(1).
- Beers, A., Brown, J., Chang, K., Hoebel, K., Patel, J., Ly, K.I., Tolaney, S.M., Brastianos, P., Rosen, B., Gerstner, E.R. and Kalpathy-Cramer, J., 2021. DeepNeuro: an open-source deep learning toolbox for neuroimaging. **Neuroinformatics**, 19(1), pp.127-140.
- Chang, K., Beers, A.L., Brink, L., Patel, J.B., Singh, P., Arun, N.T., Hoebel, K.V., Gaw, N., Shah, M., Pisano, E.D. and Tilkin, M., 2020. Multi-institutional assessment and crowdsourcing evaluation of deep learning for automated classification of breast density. **Journal of the American College of Radiology**, 17(12), pp.1653-1662.
- Li, M.D., Chang, K., Bearce, B., Chang, C.Y., Huang, A.J., Campbell, J.P., Brown, J.M., Singh, P., Hoebel, K.V., Erdoğmuş, D. and Ioannidis, S., 2020. Siamese neural networks for continuous disease severity evaluation and change detection in medical imaging. **npj Digital Medicine**, 3(1), pp.1-9.
- Lo, W.C., Uribe-Patarroyo, N., Hoebel, K., Beaudette, K., Villiger, M., Nishioka, N.S., Vakoc, B.J. and Bouma, B.E., 2019. Balloon catheter-based radiofrequency ablation monitoring in porcine esophagus using optical coherence tomography. **Biomedical Optics Express**, 10(4), pp.2067-2089.
- Düsterhöft, S., Höbel, K., Oldefest, M., Lokau, J., Waetzig, G.H., Chalaris, A., Garbers, C., Scheller, J., Rose-John, S., Lorenzen, I. and Grötzinger, J., 2014. A disintegrin and metalloprotease 17 dynamic interaction sequence, the sweet tooth for the human interleukin 6 receptor. **Journal of Biological Chemistry**, 289(23), pp.16336-16348.

### IN PRESS

- Hoebel, K., Lindsay, J., Altreuter, J., Alessi, J., Weirather, J., Dryg, I., Li, K., Yu, K.-H., Awad, M., Rodig, S., Lotter, W., 2026. Graph Neural Network Modeling of Spatial Tumor-immune Interactions Identifies Prognostic Cellular Niches in Non-small Cell Lung Cancer. **npj Precision Oncology**. In press.

## IN PREPARATION

Hoebel, K.\*, Lemay, A.\*, Campbell, J.P., Ostmo, S., Chiang, M., Bridge, C., Li, M., Singh, P., Coyner, A. and Kalpathy-Cramer, J.,  
Leveraging Deep Learning to Infer Continuous Predictions from Ordinal Labels in Medical Imaging.

## Conference Proceedings

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Hoebel, K., Fernando, J., Lotter W., 2024, July. Beyond Structured Attributes: Image-Based Predictive Trends for Chest X-Ray Classification. In **Proceedings of Machine Learning Research VOLUME 250 (MIDL) 2024**

Hoebel, K., Bridge, C.P., Ahmed, S., Akintola, O., Chung, C., Huang, R., Johnson, J., Kim, A., Ly, K.I., Chang, K. and Patel, J., 2022, April. Is this good enough? On expert perception of brain tumor segmentation quality. In **Medical Imaging 2022: Image Perception, Observer Performance, and Technology Assessment** (Vol. 12035, pp. 165-175). SPIE.

Hoebel, K., Bridge, C., Lemay, A., Chang, K., Patel, J., Rosen, B. and Kalpathy-Cramer, J., 2022, April. Do I know this? Segmentation uncertainty under domain shift. In **Medical Imaging 2022: Image Processing** (Vol. 12032, pp. 261-276). SPIE.

Lu, C., Lemay, A., Chang, K., Hoebel, K. and Kalpathy-Cramer, J., 2022. Fair conformal predictors for applications in medical imaging. **Proceedings of the AAAI Conference on Artificial Intelligence 2022**

Hoebel, K., Andrearczyk, V., Beers, A., Patel, J., Chang, K., Depeursinge, A., Müller, H. and Kalpathy-Cramer, J., 2020, March. An exploration of uncertainty information for segmentation quality assessment. In **Medical Imaging 2020: Image Processing** (Vol. 11313, pp. 381-390). SPIE.

## Presentations

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### ORAL CONFERENCE PRESENTATIONS

Hoebel, K.\*, Fernando, J.\*, Lotter W., Beyond Structured Attributes: Image-Based Predictive Trends for Chest X-Ray Classification. Oral Presentation at **Medical Imaging with Deep Learning 2024**, Paris, France (watch a [recording](#) of my talk)

Hoebel, K., Bridge, C.P., Ahmed, S., Akintola, O., Chung, C., Huang, R., Johnson, J., Kim, A., Ly, K.I., Chang, K., Patel, J. et al., Is this good enough? On expert perception of brain tumor segmentation quality.  
Oral Presentation at **SPIE medical imaging 2022**, San Diego, CA

Hoebel, K., Bridge, C., Lemay, A., Chang, K., Patel, J., Rosen, B. and Kalpathy-Cramer, J., Do I know this? segmentation uncertainty under domain shift.  
Oral Presentation at **SPIE medical imaging 2022**, San Diego, CA

Hoebel, K., Andrearczyk, V., Beers, A., Patel, J., Chang, K., Depeursinge, A., Müller, H. and Kalpathy-Cramer, J., An exploration of uncertainty information for segmentation quality assessment.  
Oral Presentation at **SPIE Medical Imaging 2020**, Houston, TX

Hoebel, K., Beers, A., Chang, K., Patel, J., Pinho, M., Brown, J., Rosen, B., Batchelor, T., Gerstner, E., Kalpathy-Cramer, J., How not to do radiomics - Observations from a double baseline study in glioblastoma  
Oral Presentation at **RSNA Annual Meeting 2019**, Chicago, IL

Hoebel, K., Kollar, B., Chang, K., Beers, A., Brown, J., Patel, J., Pomahac, B. and Kalpathy-Cramer, J., Deep Learning Vessel Segmentation for Microsurgical Free Tissue Transfer.  
Oral presentation at **American Physical Society March Meeting 2019**, Boston, MA

### POSTER PRESENTATIONS (SELECTION)

Hoebel, K., Lindsay, J., Alessi, J., Weirather, J., Dryg, I., Altreuter, J., Awad, M., Rodig, S., Lotter, W. Deep-learning model trained on multiplex immunofluorescence-stained tissue samples predicts the survival of patients with non-small cell lung cancer better than PD-L1 TPS alone  
Poster Presentation at **AACR Annual Meeting 2024**, San Diego, CA

Hoebel, K., Bridge, C., Patel, J., Chang, K., Pinho, M., Ma, X., Rosen, B., Batchelor, T., Gerstner, E., Kalpathy-Cramer, J., Do you agree? An Exploration of Inter-rater Variability and Deep Learning Segmentation Uncertainty  
Poster Presentation at **ISMRM Annual Meeting 2021**, virtual

- Hoebel, K., Chang, K., Patel, P., Singh, P. and Kalpathy-Cramer, J., Give me (un)certainty - An exploration of parameters that affect segmentation uncertainty  
Extended Abstract Poster Presentation at **NeurIPS ML4Health Workshop 2019**, Vancouver, Canada
- Hoebel, K., Beers, A., Brown, J., Chang, K., Patel, J., Pinho, M., Rosen, B., Batchelor, T., Gerstner, E., Kalpathy-Cramer, J., Repeatability of radiomics features in double baseline MR imaging of glioblastomas  
Poster Presentation at **ISMRM Annual Meeting 2019**, Montreal, Canada

## INVITED TALKS

- January 2025. *From Development to Deployment - Enhancing Trust & Performance in AI for Medical Imaging* Invited by Prof. Claus Glüer; i2-Lab Seminar, Kiel University, Kiel, Germany
- May 2024. *Bridging the Discrete and Continuous - Towards Reliable and Fair Algorithms in Medical Imaging*. Invited talk at Society for Industrial and Applied Mathematics Conference on Imaging Science, Mini-symposium “Increasing Fairness in ML Through Improved Data Assessment and Standardization in Medical Imaging and Beyond,” Atlanta, GA
- April 2024. *Unveiling Immune Microenvironments: Analysis of NSCLC using Multiplex Immunofluorescence Imaging and Graph Neural Networks*. Invited by Prof. F. Stephen Hodi; Center for Immuno-Oncology Lecture Series, Dana-Farber Cancer Center, Boston, MA
- October 2023. *Unveiling Immune Microenvironments: Analysis of NSCLC using Multiplex Immunofluorescence Imaging and Graph Neural Networks*. Invited by Prof. Peter Schueffler; Special Research Seminar, Department of Pathology, Technical University of Munich, Munich, Germany
- October 2023. *Expert-Centered Evaluation of Deep Learning Brain Tumor Segmentation*. Invited by Prof. Michael Ingrisch; Clinical Data Science Research Seminar, Klinikum Großhadern, Ludwig-Maximilians University, Munich, Germany
- May 2023. *Expert Perception and Evaluation Criteria for Deep Learning-Based Brain Tumor Segmentation*. Invited by Dr. Christian Guthier, Brigham and Women’s/Dana-Farber Cancer Institute Medical Physics Seminar, Boston, MA.
- February 2020. *Give me uncertainty - The role of segmentation uncertainty in automatic quality assessment*. Invited by Prof. Carlos Cardenas, MD Anderson Medical Physics/Auto-planning Systems Seminar, Houston, TX.

## Grants and Funding

2025–2026	<b>NIH/NLM BIRT Postdoctoral Fellowship</b> , Fellow, National Library of Medicine–supported Biomedical Informatics and Data Science Research Training (BIRT) program; training in biomedical informatics and data science <i>Offered and accepted; program subsequently discontinued due to federal funding cancellation</i>	
2024–2026	<b>National Cancer Center Postdoctoral Fellowship</b> , For my work on spatial and genetic interactions in the tumor microenvironment of non-small cell lung cancer using graph neural networks	\$ 122’000
2018–2019	<b>Martinos Family Research Scholar</b> , Martinos Center for Biomedical Imaging	
2017–2018	<b>HST First-year Graduate Student Fellowship</b> , Harvard-MIT Division of Health Sciences and Technology	
2015	<b>Research Fellowship</b> , German Academic Exchange Service (DAAD), PROMOS Program for International Mobility	
2012	<b>Graduate Research Fellowship</b> , German Research Foundation (DFG), Program supporting graduate students in the Integrated Research Training Group Program	

## Awards & Fellowships

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- 2025 **RSNA Honored Educator Award**, Recognized by the Radiological Society of North America for significant contributions to radiologic education through teaching, mentorship, and educational content development.
- 2023, 2024 **Radiology: Artificial Intelligence Editor's Recognition Award**, Honored for outstanding contributions to the peer review process, demonstrating exceptional expertise, diligence, and commitment to advancing the quality of published research in the field of medical imaging and artificial intelligence.
- 2022 **Image Processing Student Paper Award, Runner up**, SPIE Medical Imaging 2022, For my submission: "Do I know this? Segmentation uncertainty under domain shift."
- 2021 **Best Project Award, Runner up**, Hamlyn Winter School on Surgical Imaging and Vision at Imperial College London
- 2020 **Early Career Medical Physicist Scholarship Award**, Winter Institute of Medical Physics
- 2012-2017 **German National Academic Foundation Scholarship**, German National Academic Foundation, Scholarship granted to the best 0.5% of German university students

## Teaching

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- 2022 **Kaufman Teaching Certificate Program, Massachusetts Institute of Technology**, workshop series intended for late-program graduate students and postdocs interested in enhancing their teaching skills
- 2019-2021 **Head Teaching Assistant and Instructor, HST.030 Human Pathology, Harvard Medical School**, Developed and taught a range of lectures, interactive case discussions, and lab-based courses for medical and PhD students, covering biomedical assays, histology, immunology, and oncology.

## Mentoring

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Mentored students across undergraduate, masters and PhD levels, including supervision of research theses, internships, and year-long research projects. Several mentees have successfully secured competitive fellowships and recognitions, including an award to participate in the AAAI Undergraduate Consortium (E. Saxena).

- 2025 **Johanna Topalis**, Visiting PhD student (Ludwig-Maximilians-Universität München); six-month research project in the Yu Lab, Harvard Medical School
- 2024-date **Siavash Rassi**, Master student, Medical Sciences in Biomedical Informatics at Harvard Medical School
- 2023 **Kim Li**, Master student, Medical Sciences in Biomedical Informatics at Harvard Medical School
- 2023 **Jesseba Fernando**, Research intern, now PhD student in Network Science at Northeastern University
- 2021 **Andreanne Lemay**, Master student intern, now AI engineer at Sony AI
- 2019-2022 **Eshika Saxena**, Undergraduate student, Harvard College, now research engineer at Meta (FAIR - Fundamental AI Research team)

## Service & Professional Development

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### SERVICE

- 2024-date **German Academic International Network (GAIN)**, Member of the Advisory Board. A collaborative initiative supported by the Alexander von Humboldt Foundation, the German Academic Exchange Service (DAAD), and the German Research Foundation (DFG) to foster international academic exchange and promoting excellence and innovation in science.
- 2022 **Health Sciences and Technology MD Curriculum Innovation Task Force at Harvard Medical School**, Committee member
- 2020-2022 **Harvard Medical School Health Sciences and Technology MD Curriculum Committee**, Committee member
- 2018-2019 **Topical Group on Medical Physics, American Physical Society**, Student representative
- 2018-2020 **Harvard German American Conference**, Co-chair; Student-led conference on science, society, and entrepreneurship

### PROFESSIONAL DEVELOPMENT

- 2024 **Harvard Catalyst Clinical and Translational (C/T) Research Academy Grant Bootcamp**, 15-week program to guide through the preparation process of a first competitive grant application
- 2023-2025 **Trainee Editorial Board, Radiology: Artificial Intelligence**, 2-year program designed as an introduction to the editorial process including education in peer review, research design and journalistic ethics, participation in the editorial process and mentored peer-review
- 2023-2024 **Career Catalyst**, yearlong intensive career mentoring program for early career researchers; selected among 50 participants from a highly competitive pool of more than 150 postdoctoral fellows and researchers at Harvard Medical School
- 2021-2022 **Introduction to Designing and Conducting Mixed Methods Research, Harvard Catalyst Education Program**, 3-month introductory program to qualitative and mixed methods research for quantitative researchers
- 2021 **The Hamlyn Winter School on Surgical Imaging and Vision, Imperial College London**, one-week winter school covering current topics in computer vision for surgical applications

### PEER REVIEW

#### CONFERENCES

- Machine Learning for Health (ML4H) workshop at NeurIPS/conference (2019, 2021)
- Neural Information Processing Systems (NeurIPS) (2020, 2021)
- Conference on Health, Inference, and Learning (CHIL) (2020, 2021, 2023)

#### JOURNALS

- Radiology: Artificial Intelligence
- Medical Image Analysis
- British Journal of Radiology (BJR)
- Journal of Digital Imaging (JDI)
- Nature Communications Medicine
- Computer Methods and Programs in Biomedicine
- Neurocomputing
- GigaScience

## MEMBERSHIP IN PROFESSIONAL SOCIETIES

- 2025-date **Sigma Xi, The Scientific Research Honor Society**, Full Member (elected by invitation only to recognize research achievements)
- 2024-date **American Association for Cancer Research (AACR)**, Associate Member
- 2023-date **Radiological Society of North America (RSNA)**, Member-in-Training

## SCIENCE COMMUNICATION

**Panelist, GAIN Conference in San Francisco (August 2024)** Invited by the German Academic Exchange Service (DAAD) to share insights on career pathways for postdocs in the life sciences and medicine. Provided a brief personal career overview and engaged in interactive roundtable discussions about moving into artificial intelligence research after medical school.

**Interview with Onc Live (April 2024)** about my work on modeling spatial interactions in non-small cell lung cancer [video and article](#)

**Invited contribution to Springer Nature Research Communities**, discussing our paper titled "Improving the repeatability of deep learning models with Monte Carlo dropout." [blog post](#)