

Tianyu Han, PhD

Department of Radiology
Perelman School of Medicine
University of Pennsylvania
3700 Hamilton Walk
Philadelphia, PA 19104
Phone: +1 445 216 2777
tianyu.han@pennmedicine.upenn.edu

petertianyuhan@gmail.com
tianyuhan.ai

EDUCATION

RWTH Aachen University , Aachen, Germany	October 2018 to March 2023
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Ph.D. Physics
Graduate with *summa cum laude* (the highest distinction).
Thesis: Generative Modeling for Medical Image Analysis.
Awarded the *Wilhelm Borchers Plaque* for outstanding doctoral performance.

RWTH Aachen University , Aachen, Germany	October 2015 to May 2018
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M.Sc. Physics
Graduate with Distinction (*mit Auszeichnung*).
Thesis: Sequence Optimization for Parameter Quantification in MR Fingerprinting.

Nankai University , Tianjin, China	September 2010 to June 2014
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B.Sc. Physics

ACADEMIC APPOINTMENTS

Assistant Professor of Radiology (Tenure Track) , University of Pennsylvania	March 2025 to present
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Department of Radiology, Perelman School of Medicine
Core Faculty, Center for Biomedical Image Computing & Analytics (CBICA)
Faculty Member, Center for AI and Data Science for Integrated Diagnostics (AI²D), 2025 to present
Member, Bioengineering Graduate Group, 2025 to present
Member, Institute for Translational Medicine and Therapeutics (ITMAT), 2025 to present
Senior Fellow, Institute for Biomedical Informatics (IBI), 2026 to present

Postdoctoral Fellow , University Hospital RWTH Aachen, Germany	April 2023 to February 2025
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Department of Diagnostic and Interventional Radiology

PENDING GRANT APPLICATIONS

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- **NIH NHLBI R01** (1R01HL190672-01): "Opportunistic Heart Failure and ASCVD Phenotyping from Chest Imaging with Auditable Concept-Grounded Deep Learning."
Role: *Principal Investigator*. **Impact score 30; 13th percentile as an Early Stage Investigator (ESI)**. *Scientific review complete; NHLBI Advisory Council review pending as of July 2026.*
 - **NIH NIBIB R01 A1** (1R01EB039672-01A1): "CLEAR: Auditable AI for Radiology Through Clinical Concept Grounding."
Role: *Principal Investigator*. *Submitted June 30, 2026.*
 - **NIH NLM R01** (1R01LM015772-01): "Building Safety Guards for Trustworthy Multimodal Large Language Models in Clinical Decision Support."
Role: *Principal Investigator*. *Submitted June 2026.*

AWARDS AND HONORS

Wilhelm Borchers Plaque , RWTH Aachen University (<i>awarded for doctoral theses graded summa cum laude</i>)	2024
Paper of the Month Award , Faculty of Medicine, RWTH Aachen University	2024
Best Paper Award , University Hospital RWTH Aachen, €1,000	2023
Outstanding Self-financed Students Abroad Award , \$6,000	2023

PUBLICATIONS

✉ corresponding author. * equal contribution. Complete list: NCBI MyBibliography, Google Scholar.

Selected first- or corresponding-author publications

- [1] **T. Han**[✉], R. Wu*, Y. Tian, F. Khader, L.C. Adams, K.K. Bresslem, et al. CLEAR: an auditable foundation model for radiology grounded in clinical concepts. *Nature Biomedical Engineering*, published online July 22, **2026**. doi:10.1038/s41551-026-01741-4.
- [2] **T. Han**[✉], L. Žigutytė, L. Huck, M.S. Huppertz, R. Siepmann, Y. Gandelsman, C. Blüthgen, F. Khader, C. Kuhl, S. Nebelung, J.N. Kather, D. Truhn. Reconstruction of patient-specific confounders in AI-based radiologic image interpretation using generative pretraining. *Cell Reports Medicine*, 5(9), 101713 (**2024**).
- [3] **T. Han**[✉], S. Nebelung, F. Khader, T. Wang, G. Müller-Franzes, C. Kuhl, S. Försch, J. Kleesiek, C. Haarbuerger, K.K. Bresslem, J.N. Kather, D. Truhn. Medical large language models are susceptible to targeted misinformation attacks. *NPJ Digital Medicine*, 7(1), 288 (**2024**).
- [4] **T. Han***, L.C. Adams*, K.K. Bresslem, F. Busch, S. Nebelung, D. Truhn. Comparative analysis of multimodal large language model performance on clinical vignette questions. *JAMA*, 331(15), 1320-1321 (**2024**).
- [5] S. Tayebi Arasteh, **T. Han**[✉], M. Lotfinia, C. Kuhl, J.N. Kather, D. Truhn, S. Nebelung. Large language models streamline automated machine learning for clinical studies. *Nature Communications*, 15(1), 1603 (**2024**).
- [6] **T. Han**, S. Nebelung, F. Khader, J.N. Kather, D. Truhn. On instabilities of unsupervised denoising diffusion models in magnetic resonance imaging reconstruction. *MICCAI* (Lecture Notes in Computer Science, vol. 15007), 509-517 (**2024**).
- [7] **T. Han**, L.C. Adams, J.-M. Papaioannou, P. Grundmann, T. Oberhauser, A. Figueroa, A. Löser, D. Truhn, K.K. Bresslem. MedAlpaca: an open-source collection of medical conversational AI models and training data. *arXiv:2304.08247* (**2023**).
- [8] **T. Han**[✉], J.N. Kather, F. Pedersoli, M. Zimmermann, S. Keil, M. Schulze-Hagen, M. Terwoelbeck, P. Isfort, C. Haarbuerger, F. Kiessling, C. Kuhl, V. Schulz, S. Nebelung, D. Truhn. Image prediction of disease progression for osteoarthritis by style-based manifold extrapolation. *Nature Machine Intelligence*, 4(11), 1029-1039 (**2022**).
Selected as the cover of Nature Machine Intelligence volume 4, issue 11. Paper of the Month, Faculty of Medicine, RWTH Aachen.
- [9] **T. Han**[✉], S. Nebelung, F. Pedersoli, M. Zimmermann, M. Schulze-Hagen, M. Ho, C. Haarbuerger, F. Kiessling, C. Kuhl, V. Schulz, D. Truhn. Advancing diagnostic performance and clinical usability of neural networks via adversarial training and dual batch normalization. *Nature Communications*, 12(1), 4315 (**2021**).
- [10] **T. Han**, S. Nebelung, C. Haarbuerger, N. Horst, S. Reinartz, D. Merhof, F. Kiessling, V. Schulz, D. Truhn. Breaking medical data sharing boundaries by using synthesized radiographs. *Science Advances*, 6(49), eabb7973 (**2020**).

Selected co-authored publications (complete list on NCBI / Google Scholar)

- [11] N. Ghaffari Laleh, D. Truhn, G.P. Veldhuizen, **T. Han**, M. van Treeck, R.D. Buelow, R. Langer, B. Dislich, P. Boor, V. Schulz, J.N. Kather. Adversarial attacks and adversarial robustness in computational pathology. *Nature Communications*, 13(1), 5711 (**2022**).
- [12] L. Žigutytė, T. Lenz, **T. Han**, K.J. Hewitt, N.G. Reitsam, S. Foersch, et al. Counterfactual diffusion models provide interpretable explanations of artificial intelligence models in pathology. *Cancer Research*, doi:10.1158/0008-5472.CAN-25-5645 (**2026**).

- [13] D. Truhn, S. Tayebi Arasteh, O.L. Saldanha, G. Müller-Franzes, F. Khader, et al., **T. Han**, et al. Encrypted federated learning for secure decentralized collaboration in cancer image analysis. *Medical Image Analysis*, 92, 103059 (2024).
- [14] G. Müller-Franzes, L. Huck, S. Tayebi Arasteh, F. Khader, **T. Han**, V. Schulz, E. Dethlefsen, J.N. Kather, S. Nebelung, T. Nolte, et al. Using machine learning to reduce the need for contrast agents in breast MRI through synthetic images. *Radiology*, 307(3), e222211 (2023).
- [15] F. Khader, G. Müller-Franzes, T. Wang, **T. Han**, S. Tayebi Arasteh, C. Haarburger, J. Stegmaier, K. Bresslem, C. Kuhl, S. Nebelung, et al. Multimodal deep learning for integrating chest radiographs and clinical parameters: a case for transformers. *Radiology*, 309(1), e230806 (2023).
- [16] F. Khader, **T. Han**, G. Müller-Franzes, L. Huck, P. Schad, S. Keil, E. Barzakova, M. Schulze-Hagen, F. Pedersoli, V. Schulz, et al. Artificial intelligence for clinical interpretation of bedside chest radiographs. *Radiology*, 307(1), e220510 (2022/2023).
- [17] F.J. Dorfner, A. Dada, F. Busch, M.R. Makowski, **T. Han**, D. Truhn, J. Kleesiek, M. Sushil, L.C. Adams, K.K. Bresslem. Evaluating the effectiveness of biomedical fine-tuning for large language models on clinical tasks. *Journal of the American Medical Informatics Association (JAMIA)*, 32(6), 1015-1024 (2025).
- [18] F. Busch, **T. Han**, M.R. Makowski, D. Truhn, K.K. Bresslem, L.C. Adams. Integrating text and image analysis: exploring GPT-4V's capabilities in advanced radiological applications across subspecialties. *Journal of Medical Internet Research*, 26, e54948 (2024).
- [19] F. Khader, G. Müller-Franzes, **T. Han**, C. Haarburger, M. Schulze-Hagen, P. Schad, S. Engelhardt, B. Baeßler, S. Foersch, J. Stegmaier, et al. Denoising diffusion probabilistic models for 3D medical image generation. *Scientific Reports*, 13(1), 7303 (2023).
- [20] G. Müller-Franzes, F. Khader, R. Siepmann, **T. Han**, J.N. Kather, S. Nebelung, D. Truhn. Medical slice transformer for improved diagnosis and explainability on 3D medical images with DINOv2. *Scientific Reports*, 15(1), 23979 (2025).
- [21] A. Okolie, T. Dirrichs, L.C. Huck, S. Nebelung, S. Tayebi Arasteh, T. Nolte, **T. Han**, C.K. Kuhl, D. Truhn. Accelerating breast MRI acquisition with generative AI models. *European Radiology*, 35(2), 1092-1100 (2025).

PROFESSIONAL SERVICE AND LEADERSHIP

Academic Leadership: Co-initiator, AI²D Agentic AI Cross-Lab Working Group, 2025.

Selected Translational Program: University of Pennsylvania lead, CARE Notes; selected participant in the Wellcome MEXA Accelerator with approved pre-submission researcher support from Google DeepMind, 2025.

Federal Grant Panel Service:

Department of Defense Congressionally Directed Medical Research Programs (CDMRP), Panel Reviewer, Transforming Diagnosis Award, 2025.

Journal Peer Review (*ad hoc*, 2021 to present):

Nature Medicine, *Nature Biomedical Engineering*, *Nature Health*, *Nature Communications*, *Cell Reports Medicine*, *NPJ Digital Medicine*, *NPJ Digital Public Health*, *NPJ Precision Oncology*, *The Lancet Regional Health*, *eBioMedicine*, *IEEE Transactions on Medical Imaging*, *JAMIA*, *BMJ Digital Health & AI*, *Journal of Controlled Release*, *European Radiology*, *EJNMMI Physics*.

Conference Peer Review: MICCAI 2023 and 2024.

Professional Memberships: MICCAI, 2021 to present. International Society for Magnetic Resonance in Medicine (ISMRM), 2018 to present.

TEACHING EXPERIENCE

Guest Lecturer, BMIN 5210, University of Pennsylvania

April 2, 2026

- *AI II: Advanced Methods and Health Applications in Machine Learning*. Delivered “Towards transparent radiological AI via LLM-embedded concept spaces with radiologist grounding.”

- Co-instructor**, Biomedical Big Data Processing (92.00046), RWTH Aachen University 2021 to 2022
- Co-taught the class with Prof. Daniel Truhn. Delivered lectures on classical radiomic analysis and deep learning.
- Co-instructor**, Medical Imaging (92.03221), RWTH Aachen University 2019 to 2022
- Co-taught the class with Prof. Volkmar Schulz. Delivered lectures on nuclear magnetic resonance and magnetic resonance imaging (MRI).

Research and Thesis Supervision

- **Postdoctoral Researcher**, Dr. Haifan Gong (University of Pennsylvania, Department of Radiology).
Topic: Concept-based multimodal foundation models for clinical cardiology and disease-trajectory modeling. 2025 to present
- **Incoming Ph.D. Student**, Tiancheng Bao (University of Pennsylvania, Bioengineering Graduate Group). Starting Fall 2026
- **Master's Research Mentee**, Yicheng Li (University of Pennsylvania). January 2026 to present
- **Ph.D. Research Mentor**, Akis Giannoukos (University of Pennsylvania, Computer and Information Science). May 2026 to present
- **Postdoctoral Researcher**, Dr. Yuqi Wang (University of Pennsylvania). 2025 to 2026
- **M.Sc. Supervisor**, Sviatoslav Sakharov (RWTH Aachen).
Topic: "Drug Design using Conditional Diffusion Modelling". Investigated self-conditioned diffusion models for protein-ligand interactions. 2023 to 2024
- **M.Sc. Supervisor**, Zhengyang Zeng (RWTH Aachen).
Topic: "Diffusion Model based Image Super-Resolution in Counterfactual Chest Radiograph Generation for Explainability in Clinical Practice". Developed a tool enabling radiologists to visualise graded disease severity on radiographs via diffusion models. 2023 to 2024
- **M.Sc. Supervisor**, Simon Liu (RWTH Aachen).
Topic: "Contrastive Pretraining Using Multimodal Data for Lung Cancer Diagnostics". Developed a contrastive learning framework that transfers 3D CT features from 2D radiographic supervision. 2021 to 2022
- **M.Sc. Supervisor**, Arne Schneuing (RWTH Aachen).
Topic: "Reconstruction of Undersampled Magnetic Resonance Fingerprinting Data Using Artificial Neural Networks". Developed learned reconstruction of relaxation times from accelerated MRI. 2019 to 2020

INVITED TALKS AND PRESENTATIONS

Invited Lectures and Seminars

1. **T. Han**. Invited speaker, *AI in Medicine Symposium*, University of Pennsylvania, April 17, **2026**.
2. **T. Han**. "Towards Transparent Medical AI via LLM-embedded Concept Spaces with Radiologist Grounding." Biomedical Data Science Seminar Series, AI²D, University of Pennsylvania, September 24, **2025**.
3. **T. Han**. "Predicting disease progression by using style-based latent extrapolation." Jülich Aachen Research Alliance (JARA) Umbrella Symposium, **2021**.

Conference Presentations

1. **T. Han**, et al. "On instabilities of unsupervised denoising diffusion models in MRI reconstruction." MICCAI, **2024** (poster).

LANGUAGES AND TECHNICAL SKILLS

Languages: Mandarin Chinese (native), English (professional), German (elementary).

ML/AI frameworks: HuggingFace Transformers, Diffusers, DeepSpeed, vLLM, Anthropic/OpenAI APIs, Weights & Biases, Docker, Hydra.

Programming: Python (PyTorch, JAX, NumPy, SciPy, Pandas), C/C++, MATLAB, CUDA, SLURM, Bash.