Dr. Benjamin Hou

Contact Info

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Personal Statement

A technology enthusiast always seeking new and innovative ideas for the betterment of mankind. Quick to grasp new ideas and concepts, and develop innovative and creative solutions to problems. Very capable of working on own initiative, have demonstrated high levels of motivation required to meet the tightest of deadlines while maintaining strong ability to perform effectively.

Education

2015 - 2019 **Imperial College London**, UK
PhD in Machine Learning and Biomedical Image Analysis
Thesis: "Machine Learning for Medical Image Reconstruction and Synthesis"
Supervisor: Dr. Bernhard Kainz

2011 - 2015 **Imperial College London**, UK
MEng, BEng, and ACGI in Electrical and Electronic Engineering
Thesis: "A Wireless Transceiver and GUI for a Chemical/Electrical Sensor"
Supervisor: Prof. Christofer Toumazou
Grade: 2:1 Honors

2004 - 2011 **Dame Alice Owen's School**, Potters Bar, UK
A-Levels: Mathematics (A*), Further Mathematics (A*), Chemistry (A), Physics (A)
11 GCSEs: 8 A*-A grades in STEM subjects

Work Experience

National Institutes of Health, Bethesda MD, USA Jun 2024 – *Current*
Research Fellow in Artificial Intelligence for Bioinformatics (National Library of Medicine)

- Developed AI tools for craniofacial imaging, reducing clinician workload and enabling more scalable assessment of craniofacial abnormalities.
- Key investigations into the role of modern multimodal large language models (MLLMs) in radiology, evaluating their diagnostic accuracy, summarization, and utility in structured reporting workflows.
- Supervised NIH Summer Internship Program students on research projects in AI for medical imaging: 2 student-led publications and presentations at ARVO 2025 and SIIM 2025.
- Piloted integration of AI tools into the Bayer Blackford platform, enabling seamless deployment of image segmentation models, MLLMs, and Chat-based assistants into the clinical PACS environment.

National Institutes of Health, Bethesda MD, USA Jun 2022 – Jun 2024
Visiting Fellow in Artificial Intelligence for Bioinformatics (Clinical Center)

- Designed and implemented an automated segmentation tool for quantifying ascites volume in CT scans, supporting research into disease burden and treatment response.
- Collaborated across multidisciplinary teams on a range of imaging research initiatives, including lymphoma segmentation, MRI-based organ analysis, and development of body composition analysis pipelines to accelerate clinical research and decision-making.

Imperial College London, UK Oct 2019 – *Current*
(Honorary) Research Associate in Artificial Intelligence for Medical Imaging

- Led the development of one of the early deep learning models for automatic chest X-ray report generation, leveraging transformer-based encoder–decoder architectures.

- Supervised multiple undergraduate final-year research projects (FYPs), on machine learning for medical imaging: 9 primary supervisor, 13 co-supervisor, 2 student-authored peer-reviewed publications.
- Actively supported undergraduate and postgraduate teaching as a Graduate Teaching Assistant (GTA), including delivering lab sessions, marking coursework, and providing academic support across modules such as: Software Engineering, Programming, Hardware, Graphics.
- Served as the group deep learning system administrator, responsible for maintaining, building, and configuring multi-GPU servers, system troubleshooting, user onboarding, and managing shared computational resources to ensure efficient resource usage.

Professional Engagement

Social Media: /farrell236, /farrell192, /farrell.236, /farrell236, 🤗/farrell236

Conference Area Chair: MICCAI 2026, 2025, 2024

Workshop/Challenge Organization

- **2025** - Learning with Longitudinal Medical Images and Data (LMID)
- **2025** - Vision-Language Modelling in 3D Medical Imaging (VLM3D)

Invited Talks

- **2022** - National Institutes of Health - "Multi-modal Learning with Chest Radiographs"
- **2020** - {U|I|K}CL Bio-imaging Symposia - "A.I. in Retinopathy Healthcare"
- **2019** - {U|I}CL Bio-imaging Symposia - "Generative Modelling in Medical Image"
- **2017** - Harbin Engineering University XinHai Forum - "Deep Learning in Medical Image Analysis"

Awards and Accomplishments

National Institutes of Health

- **2025** - NIH Director's Award for Scientific/Medical Research
- **2025** - NIH Clinical Center CEO Award for NIH-AI Team
- **2023** - HHS Distinguished Federal Data Modernization Award for IBCAD Lab
- **2023** - NIH Clinical Center CEO Award for Large Language Model Team
- **2023** - Fellows Award for Research Excellence (FARE)

Imperial College London

- **2022** - Team FIT - 1st Place Fetal Tissue Annotation and Segmentation Challenge (FeTA)
- **2020** - Team FPI - 1st Place Medical Out-of-Distribution (MOOD) Analysis Challenge
- **2019** - MICCAI Student Travel Award for Outstanding Paper
- **2018** - 2nd Place Google Poster Competition
- **2017** - 2nd Place Google Poster Competition
- **2015** - 2nd Place Human Centered Design of Assistive and Rehabilitative Devices Group Project
- **2013** - Dialog Semiconductors Prize for Best 2nd Year Electronic Engineering Group Project
- **2012** - Farnell Prize (First Place) for 1st Year Electronic Engineering EE-Bug Group Project
- **2012** - London 2012 Olympic Volunteer (Games Maker) - Athletics Division

Dame Alice Owens School

- **2011** - Secondary School Prize for services to the school
- **2011** - Student lead research project to deploy student wireless hotspot
- **2010** - Nuffield Bursary Science Scheme at GlaxoSmithKline
- **2007** - Edge Hill University Mathematics Competition UK National Finalist

Skills

- Proficient programmer in C/C++, Python and MATLAB
- High experience in algorithm development for Machine Learning and High Performance Computing using TensorFlow and PyTorch Neural Network Libraries.
- Extensive experience in data science and statistical analysis using Python libraries such as scikit-learn, pandas, NumPy, and statsmodels, and proficient in data management.
- High experience in embedded systems prototyping and development, including; Arduino, mbed, and ARM-based microcontrollers, FPGA development, PCB design and soldering.
- Experienced with tools and libraries such as Intel TBB, OpenCL, OpenGL, FFTW, Qt, and cross-platform CMake build systems.

- Experienced with all kinds of computer Operating Systems (Windows, Mac and Linux)
- Proficient user of Office Applications and LaTeX
- Hands on experience with building, maintaining and troubleshooting computers and networks
- Enjoy other activities such as film, photography, piano, culinary, archery and endurance running
- Spoken Languages: English and Chinese (Mandarin)

Race Results

- **2026** - Marine Corps Marathon (Rank: TBD, Time: TBD)
- **2026** - Army Ten Miler (Rank: 2,911 of 35,000+, Time: 1hr 21min 47sec)
- **2026** - Rock 'n' Roll Washington DC (Rank: 1,835 of 12,481, Time: 1hr 48min 51sec)
- **2025** - Taco Bell DC 50K Ultramarathon (Rank: 118 of 429, Time: 6hr 59min 47sec)
- **2021** - Virtual TCS New York City Marathon (Rank: 813 of 5117, Time: 3hr 45min 24sec)

Publications

Google Scholar: https://scholar.google.com/citations?user=_c3RvvQAAAAJ

Reviewer: IEEE-{TMI|TBME|JBHI|CYBE}, Elsevier-BBE, ACL, CVPR, ICCV, MICCAI, MedNeurIPS

2026

1. B. Hou, K. Almpani, J. S. Lee, and Z. Lu, "Automatic cephalometric landmark localization on CBCT-derived digitally reconstructed radiographs for skeletal malocclusion classification," in *Oral and Dental Image Analysis (ODIN@MICCAI)*, Lecture Notes in Computer Science, Springer, 2026
2. Q. Zhu, Q. Jin, T. S. Mathai, Y. Fang, Z. Wang, Y. Yang, M. Sarfo-Gyamfi, B. Hou, R. Gu, P. T. Balamuralikrishna, *et al.*, "Ct-bench: A comprehensive benchmark for multimodal ai in computed tomography analysis," *Machine Learning for Biomedical Imaging*, vol. 2026, no. Special Issue on MICCAI Open Data 2026, pp. 739–757, 2026
3. Q. Jin, N. Wan, R. Leaman, S. Tian, Z. Wang, Y. Yang, Z. Wang, G. Xiong, P.-T. Lai, Q. Zhu, *et al.*, "Tutorial: guidance on the use of large language models for medical research," *Nature Protocols*, pp. 1–12, 2026
4. T. D. Keenan, R. Gu, B. Hou, M. Hébert, A. Indurkar, E. Y. Chew, and Z. Lu, "Ocularchat: a multimodal large language model for ophthalmology dialogues related to retinal disease," *Investigative Ophthalmology & Visual Science*, vol. 67, no. 7, pp. 2494–2494, 2026
5. Y. Zhou, T. Ninomiya, R. A. Jonas, B. Hou, T. D. Keenan, Z. Lu, W. Hu, Z. Zhu, X. Liu, C. Y. Cheung, *et al.*, "Generalisability and fairness of retinal age prediction models across diverse populations," *Investigative Ophthalmology & Visual Science*, vol. 67, no. 7, pp. 837–837, 2026
6. L. H. Bloom, T. S. Mathai, B. Liu, B. Khoury, N. Patel, O. Wei, P. T. Balamuralikrishna, B. Hou, J. Solomon, D. Pucar, *et al.*, "Analysis of deep learning-based segmentation of lymph nodes on full-dose and reduced-dose body ct," *Abdominal Radiology*, vol. 51, no. 6, pp. 3190–3201, 2026
7. I. E. Hamamci, S. Er, C. Wang, F. Almas, A. G. Simsek, S. N. Esirgun, I. Dogan, O. F. Durugol, B. Hou, S. Shit, W. Dai, M. Xu, H. Reynaud, M. F. Dasdelen, B. Wittmann, T. Amiranashvili, E. Simsar, M. Simsar, E. B. Erdemir, A. Alanbay, A. Sekuboyina, B. Lafci, A. Kaplan, Z. Lu, M. Polacin, B. Kainz, C. Bluethgen, K. Batmanghelich, M. K. Ozdemir, and B. Menze, "Generalist foundation models from a multimodal dataset for 3d computed tomography," *Nature Biomedical Engineering*, feb 2026. https://doi.org/10.1038/s41551-025-01599-y

2025

1. B. Hou, P. Mukherjee, V. Batheja, K. C. Wang, R. M. Summers, and Z. Lu, "One year on: assessing progress of multimodal large language model performance on rsna 2024 case of the day questions," *Radiology*, vol. 316, no. 2, p. e250617, 2025
2. Q. Zhu, B. Hou, T. S. Mathai, P. Mukherjee, Q. Jin, X. Chen, Z. Wang, R. Cheng, R. M. Summers, and Z. Lu, "How well do multimodal llms interpret ct scans? an auto-evaluation framework for analyses," *Journal of Biomedical Informatics*, p. 104864, 2025
3. Q. Chen, T. D. Keenan, E. Agron, A. Allot, E. Guan, B. Duong, A. Elsawy, B. Hou, C. Xue, S. Bhandari, *et al.*, "Ai workflow, external validation, and development in eye disease diagnosis," *JAMA Network Open*, vol. 8, no. 7, pp. e2517204–e2517204, 2025
4. Y. Zhuang, T. S. Mathai, P. Mukherjee, B. Khoury, B. Kim, B. Hou, N. Rabbee, A. Suri, and R. M. Summers, "Mrisegmenter: A fully accurate and robust automated multiorgan and structure segmentation tool for t1-weighted abdominal mri," *Radiology*, vol. 315, no. 1, p. e241979, 2025

2024

1. Y. Yang, Q. Jin, Q. Zhu, Z. Wang, F. Erramuspe Álvarez, N. Wan, B. Hou, and Z. Lu, "Beyond multiple-choice accuracy: Real-world challenges of implementing large language models in healthcare," *Annual Review of Biomedical Data Science*, vol. 8, 2024
2. P. Mukherjee, B. Hou, A. Suri, Y. Zhuang, C. Parnell, N. Lee, O. Stroie, R. Jain, K. C. Wang, K. Sharma, *et al.*, "Evaluation of gpt large language model performance on rsna 2023 case of the day questions," *Radiology*, vol. 313, no. 1, p. e240609, 2024
3. B. Hou, S.-W. Lee, J.-M. Lee, C. Koh, J. Xiao, P. J. Pickhardt, and R. M. Summers, "Deep learning segmentation of ascites on abdominal ct scans for automatic volume quantification," *Radiology: Artificial Intelligence*, p. e230601, 2024
4. B. Hou, T. S. Mathai, J. Liu, C. Parnell, and R. M. Summers, "Enhanced muscle and fat segmentation for ct-based body composition analysis: a comparative study," *International journal of computer assisted radiology and surgery*, pp. 1–8, 2024
5. Q. Zhu, X. Chen, Q. Jin, B. Hou, T. S. Mathai, P. Mukherjee, X. Gao, R. M. Summers, and Z. Lu, "Leveraging professional radiologists' expertise to enhance llms' evaluation for ai-generated radiology reports," in *2024 IEEE 12th International Conference on Healthcare Informatics (ICHI)*, pp. 402–411, IEEE, 2024

2023

1. P. Mukherjee, B. Hou, R. B. Lanfredi, and R. M. Summers, "Feasibility of using the privacy-preserving large language model vicuna for labeling radiology reports," *Radiology*, vol. 309, no. 1, p. e231147, 2023. PMID: 37815442
2. Y. Zhuang, B. Hou, T. S. Mathai, P. Mukherjee, B. Kim, and R. M. Summers, "Semantic image synthesis for abdominal CT," in *DGM4MICCAI*, vol. 14533 of *Lecture Notes in Computer Science*, pp. 214–224, Springer, 2023
3. X. Zhao and B. Hou, "High-fidelity image synthesis from pulmonary nodule lesion maps using semantic diffusion model," in *Medical Imaging with Deep Learning, short paper track*, 2023
4. L. Liu, B. Hou, M. Nag, J. Liu, N. Hasani, T. Shen, Y. Zhu, F. Farhadi, T. Delie, M. A. Morris, B. Saboury, J. Xiao, and R. M. Summers, "Improving automatic segmentation of lymphoma with additional medical knowledge priors," in *2023 IEEE 20th International Symposium on Biomedical Imaging (ISBI)*, pp. 1–4, 2023
5. B. Hou, "High-fidelity diabetic retina fundus image synthesis from freestyle lesion maps," *Biomed. Opt. Express*, vol. 14, pp. 533–549, Feb 2023
6. M. K. Nag, J. Liu, S. Y. Shin, B. Hou, L. Liu, P. J. Pickhardt, J.-M. Lee, and R. M. Summers, "Improved ascites segmentation with bladder identification using anatomical location residual U-Net," in *Medical Imaging 2023: Computer-Aided Diagnosis* (K. M. Iftekharuddin and W. Chen, eds.), vol. 12465, p. 1246517, International Society for Optics and Photonics, SPIE, 2023

2022

1. B. Hou, M. K. Nag, J.-M. Lee, C. Koh, and R. M. Summers, "Segmentation of ascites on abdominal ct scans for the assessment of ovarian cancer," *MedNeurIPS Workshop*, 2022
2. L. Schmidtke, B. Hou, A. Vlontzos, and B. Kainz, "Self-supervised 3d human pose estimation in static video via neural rendering," in *ECCV Workshops (3)*, vol. 13803 of *Lecture Notes in Computer Science*, pp. 704–713, Springer, 2022
3. H. M. Schlüter, J. Tan, B. Hou, and B. Kainz, "Natural synthetic anomalies for self-supervised anomaly detection and localization," in *ECCV (31)*, vol. 13691 of *Lecture Notes in Computer Science*, pp. 474–489, Springer, 2022
4. J. Tan, B. Hou, J. Batten, H. Qiu, and B. Kainz, "Detecting outliers with foreign patch interpolation," *Machine Learning for Biomedical Imaging*, vol. 1, 2022
5. D. Zimmerer, P. M. Full, F. Isensee, P. Jäger, T. Adler, J. Petersen, G. Köhler, T. Roß, A. Reinke, A. Kascenas, B. S. Jensen, A. Q. O'Neil, J. Tan, B. Hou, J. Batten, H. Qiu, B. Kainz, N. Shvetsova, I. Fedulova, D. V. Dylov, B. Yu, J. Zhai, J. Hu, R. Si, S. Zhou, S. Wang, X. Li, X. Chen, Y. Zhao, S. N. Marimont, G. Tarroni, V. Saase, L. Maier-Hein, and K. H. Maier-Hein, "MOOD 2020: A public benchmark for out-of-distribution detection and localization on medical images," *IEEE Trans. Medical Imaging*, vol. 41, no. 10, pp. 2728–2738, 2022

2021

1. B. Hou, G. Kaissis, R. M. Summers, and B. Kainz, "RATCHET: medical transformer for chest x-ray diagnosis and reporting," in *MICCAI (7)*, vol. 12907 of *Lecture Notes in Computer Science*, pp. 293–303, Springer, 2021
2. J. Tan, T. Kart, B. Hou, J. Batten, and B. Kainz, "Metadetector: Detecting outliers by learning to learn from self-supervision," in *MIDOG/MOOD/Learn2Reg@MICCAI*, vol. 13166 of *Lecture Notes in Computer Science*, pp. 119–126, Springer, 2021
3. J. Tan, B. Hou, T. Day, J. M. Simpson, D. Rueckert, and B. Kainz, "Detecting outliers with poisson image interpolation," in *MICCAI (5)*, vol. 12905 of *Lecture Notes in Computer Science*, pp. 581–591, Springer, 2021
4. H. Reynaud, A. Vlontzos, B. Hou, A. Beqiri, P. Leeson, and B. Kainz, "Ultrasound video transformers for cardiac ejection fraction estimation," in *MICCAI (6)*, vol. 12906 of *Lecture Notes in Computer Science*, pp. 495–505, Springer, 2021
5. J.-H. Son, A. Alansary, D. Rueckert, B. Kainz, and B. Hou, "Synthesis of diabetic retina fundus images using semantic label generation," in *Medical Imaging with Deep Learning*, Lübeck, 2021

2020

1. A. Vlontzos, S. Budd, B. Hou, D. Rueckert, and B. Kainz, "3d probabilistic segmentation and volumetry from 2d projection images," in *TIA@MICCAI*, vol. 12502 of *Lecture Notes in Computer Science*, pp. 48–57, Springer, 2020
2. N. Miolane, N. Guigui, A. L. Brigant, J. Mathe, B. Hou, Y. Thanwerdas, S. Heyder, O. Peltre, N. Koep, H. Zaatiti, H. Hajri, Y. Cabanes, T. Gerald, P. Chauchat, C. Shewmake, D. Brooks, B. Kainz, C. Donnat, S. Holmes, and X. Pennec, "Geomstats: A python package for riemannian geometry in machine learning," *Journal of Machine Learning Research*, vol. 21, no. 223, pp. 1–9, 2020
3. N. Miolane, N. Guigui, H. Zaatiti, C. Shewmake, H. Hajri, D. Brooks, A. Le Brigant, J. Mathe, B. Hou, Y. Thanwerdas, S. Heyder, O. Peltre, N. Koep, Y. Cabanes, T. Gerald, P. Chauchat, B. Kainz, C. Donnat, S. Holmes, and X. Pennec, "Introduction to Geometric Learning in Python with Geomstats," in *SciPy 2020 - 19th Python in Science Conference* (M. Agarwal, C. Calloway, D. Niederhut, and D. Shupe, eds.), (Austin, Texas, United States), pp. 48–57, July 2020

2019

1. B. Hou, A. Vlontzos, A. Alansary, D. Rueckert, and B. Kainz, "Flexible conditional image generation of missing data with learned mental maps," in *MLMIR@MICCAI*, vol. 11905 of *Lecture Notes in Computer Science*, pp. 139–150, Springer, 2019
2. H. Qiu, C. Qin, L. L. Folgoc, B. Hou, J. Schlemper, and D. Rueckert, "Deep learning for cardiac motion estimation: Supervised vs. unsupervised training," in *STACOM@MICCAI*, vol. 12009 of *Lecture Notes in Computer Science*, pp. 186–194, Springer, 2019
3. A. Alansary, O. Oktay, Y. Li, L. L. Folgoc, B. Hou, G. Vaillant, K. Kamnitsas, A. Vlontzos, B. Glocker, B. Kainz, and D. Rueckert, "Evaluating reinforcement learning agents for anatomical landmark detection," *Medical Image Anal.*, vol. 53, pp. 156–164, 2019
4. Q. Meng, J. Housden, J. Matthew, D. Rueckert, J. A. Schnabel, B. Kainz, M. Sinclair, V. A. Zimmer, B. Hou, M. Rajchl, N. Toussaint, O. Oktay, J. Schlemper, and A. Gómez, "Weakly supervised estimation of shadow confidence maps in fetal ultrasound imaging," *IEEE Trans. Medical Imaging*, vol. 38, no. 12, pp. 2755–2767, 2019

2018

1. A. Alansary, O. Oktay, Y. Li, L. Le Folgoc, B. Hou, G. Vaillant, B. Glocker, B. Kainz, and D. Rueckert, "Evaluating reinforcement learning agents for anatomical landmark detection," in *Medical Imaging with Deep Learning*, Amsterdam, 2018
2. B. Hou, N. Miolane, B. Khanal, M. C. H. Lee, A. Alansary, S. G. McDonagh, J. V. Hajnal, D. Rueckert, B. Glocker, and B. Kainz, "Computing CNN loss and gradients for pose estimation with riemannian geometry," in *MICCAI (1)*, vol. 11070 of *Lecture Notes in Computer Science*, pp. 756–764, Springer, 2018
3. Y. Li, B. Khanal, B. Hou, A. Alansary, J. J. Cerrolaza, M. Sinclair, J. Matthew, C. Gupta, C. L. Knight, B. Kainz, and D. Rueckert, "Standard plane detection in 3d fetal ultrasound using an iterative transformation network," in *MICCAI (1)*, vol. 11070 of *Lecture Notes in Computer Science*, pp. 392–400, Springer, 2018
4. B. Hou, B. Khanal, A. Alansary, S. G. McDonagh, A. Davidson, M. A. Rutherford, J. V. Hajnal, D. Rueckert, B. Glocker, and B. Kainz, "3-d reconstruction in canonical co-ordinate space from

arbitrarily oriented 2-d images," *IEEE Trans. Medical Imaging*, vol. 37, no. 8, pp. 1737–1750, 2018

5. A. Alansary, L. L. Folgoc, G. Vaillant, O. Oktay, Y. Li, W. Bai, J. Passerat-Palmbach, R. Guerrero, K. Kamnitsas, B. Hou, S. G. McDonagh, B. Glocker, B. Kainz, and D. Rueckert, "Automatic view planning with multi-scale deep reinforcement learning agents," in *MICCAI (1)*, vol. 11070 of *Lecture Notes in Computer Science*, pp. 277–285, Springer, 2018
6. Q. Meng, C. F. Baumgartner, M. Sinclair, J. Housden, M. Rajchl, A. Gómez, B. Hou, N. Toussaint, V. A. M. Zimmer, J. Tan, J. Matthew, D. Rueckert, J. A. Schnabel, and B. Kainz, "Automatic shadow detection in 2d ultrasound images," in *DATRA/PIPPI@MICCAI*, vol. 11076 of *Lecture Notes in Computer Science*, pp. 66–75, Springer, 2018
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2017

1. B. Hou, A. Alansary, S. G. McDonagh, A. Davidson, M. A. Rutherford, J. V. Hajnal, D. Rueckert, B. Glocker, and B. Kainz, "Predicting slice-to-volume transformation in presence of arbitrary subject motion," in *MICCAI (2)*, vol. 10434 of *Lecture Notes in Computer Science*, pp. 296–304, Springer, 2017
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References

References are available upon request.