Haocheng Dai

CONTACT INFORMATION
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SUMMARY

My research interest is centered on developing specialized computational tools tailored for shape analysis and inverse problems in medical imaging, along with discriminative and generative models for general computer vision. My focus extends to, but is not limited to:

- Text Inpainting with Diffusion Models
- Visual Document Understanding via Multimodal Transformers
- Physics-Informed (PDE) Machine Learning for Imaging
- Geometric Deep Learning, Shape Modeling, Metric Estimation

EDUCATION

University of Utah *Salt Lake City, UT*
Ph.D. Student in Computer Science *2025*
Committee: *SC Joshi (Chair), M Bauer, S Elhabian, PT Fletcher, RM Kirby*

Tongji University *Shanghai, China*
B.Eng in Computer Science *2019*

Institut de Mathématiques de Toulouse *Toulouse, France*
Exchange Student *2019*

Technion - Israel Institute of Technology *Haifa, Israel*
Exchange Student *2018*

PUBLICATIONS

High-Fidelity CT on Rails-Based Characterization of Delivered Dose Variation in Conformal Head and Neck Treatments, H. Dai, V. Sarkar, C. Dial, M. Foote, Y. Hitchcock, S. C. Joshi, B. J. Salter, *Applied Radiation Oncology (ARO) 2023*, 🔗.

Neural Operator Learning for Ultrasound Tomography Inversion, H. Dai*, M. Penwarden*, R. M. Kirby, S. C. Joshi (*equal contribution), *International Conference on Medical Imaging with Deep Learning (MIDL) 2023*, 🔗.

Modeling the Shape of the Brain Connectome via Deep Neural Networks, H. Dai, M. Bauer, P. T. Fletcher, S. C. Joshi, *International Conference on Information Processing in Medical Imaging (IPMI) 2023*, Oral Presentation, 🔗.

Integrated Construction of Multimodal Atlases with Structural Connectomes in the Space of Riemannian Metrics, K. M. Campbell, H. Dai, Z. Su, M. Bauer, P. T. Fletcher, S. C. Joshi, *Journal of Machine Learning for Biomedical Imaging (MELBA) 2022*, 🔗.

Structural Connectome Atlas Construction in the Space of Riemannian Metrics, K. M. Campbell, H. Dai, Z. Su, M. Bauer, P. T. Fletcher, S. C. Joshi, *International Conference on Information Processing in Medical Imaging (IPMI) 2021*, François Erbsmann Prize (**Best Paper Award**), 🔗.

Industry Experience

Amazon, Inc *Seattle, WA*
Applied Scientist Intern *2023*

- Mitigated the diffusion model's deterioration in tiny text generation, irrespective of resolution, by implementing a multi-stage generation approach and utilizing templates;
- Utilized the diffusion model for manipulating text information in visual documents, facilitating efficient data generation for fraud image detection;
- Implemented a "legal-edit invariant, illegal-edit variant" fine-tuning strategy to bolster the detection model's resilience against common customer edits;
- Found that GradCAM heatmap masking can fool the detection model substantially, underscoring the significance of this technique in fraud media prevention.

Amazon, Inc *Seattle, WA*
Applied Scientist Intern *2022*

- Designed a multimodal transformer model to understand visual documents in various formats;
- Our model manifested strong generalization capability beyond human supervision — outperforming the AWS Textract query;
- Developed a partially masked visual document understanding framework by incorporating a semantic segmentation module along with the transformer model, standing at a recall rate of 0.85.

Services

Reviewer

- Conferences: *ACM MM, CVPR, MIDL*
- Journals: *Medical Image Analysis, Scientific Reports*
- Workshop: *ICLR Workshop on AI for Differential Equations in Science*

Teaching Experience

Teaching Mentor *University of Utah*

- CS 4150: *Algorithms* *2022*
- CS 3190: *Foundations of Data Analysis* *2021*

Guest Lecturer *University of Utah*

- CS 4150: *Algorithms* *2022*

Honors& Awards

François Erbsmann Prize (Best Paper Award), *IPMI 2021*
Department Fellowship, *School of Computing, University of Utah*
Chinese Government Scholarship, *Chinese Scholarship Council*
Tongji Scholarship of Excellence (2016, 2017, 2018), *Tongji University*

Technical Skills

`Python, MatLab, C++, PyTorch, Jax`