Jason Hu

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About Me

Current Research

My research is in the area of developing generative AI and ML based algorithms for image processing applications. I primarily focus on using score-based diffusion models coupled with deep learning and optimization techniques to solve computational imaging problems. My research efforts consist of imaging applications with collaborations with researchers in medicine, physics, and computer vision, as well as theoretical and foundational analysis of imaging.

Skills

Deep learning, Diffusion models, Generative AI, Vision-language models, Transformers, Machine learning, Medical imaging, Linear algebra, Prompt engineering, Signal processing, Optimization, PyTorch, Python, Pandas, CUDA, Linux, Matlab, Java, C++, SQL, Large language model, 3D imaging

Education

University of Michigan, Ann Arbor, MI — Apr 2026
Doctor of Electrical and Computer Engineering
Advised by Prof. Jeff Fessler & Prof. Liyue Shen

University of Michigan, Ann Arbor, MI — May 2024
Master of Electrical and Computer Engineering (GPA: 4.0/4.0)
Advised by Prof. Jeff Fessler & Prof. Liyue Shen

University of Michigan, Ann Arbor, MI — Apr 2022
B. S. E. in Electrical Engineering (GPA: 3.96/4.00)
Advised by Prof. Necmiye Ozay & Dr. Brian T.W. Lin

Research Experience

University of Michigan, College of Engineering, Ann Arbor, MI — May 2022-Present
Graduate Research Assistant

- Accepted two first author papers about diffusion models for imaging to NeurIPS 2024
- Improved image quality in computational imaging applications using PyTorch neural networks
- Implemented generative AI models for 3D CT reconstruction, improving results by 4dB
- Developed inverse problem solving algorithm for large-scale images using diffusion models
- Applied NeRF and deep learning to SPECT image reconstruction to decrease mean error by 10%

University of Michigan Transportation Research Institute, Ann Arbor, MI — Sept 2020-Apr 2022
Research Assistant, Undergraduate Research Opportunity Program

- Retrieved time-series data from databases of human driven vehicle trips using SQL
- Processed and organized resulting spreadsheets to search for specific driving scenarios, such as vehicle merge ins, using Matlab
- Developed computational and prediction models assisting in autonomous vehicle design
- Applied machine learning and statistics methods such as random forests and SVM to analyze data

University of Michigan, College of Engineering, Ann Arbor, MI — May 2021-Apr 2022
Research Assistant, Summer Undergraduate Research Experience

- Designed neural networks to solve linear and quadratic programs in Matlab and Python
- Analyzed existing work on differentiable optimization neural network layers
- Collected real image data through robot arm and processed using computer vision techniques
- Reversed engineered intrinsic parameters of camera using optimization models
- Presented results at symposium to other students

Professional Experience

LinkedIn, Sunnyvale, CA May 2025-Aug 2025
Generative AI Intern
- Optimized and compressed embedding data for over 260 million member profiles
- Trained semantic ID autoencoder networks using Python to assist with recommendation systems
- Aligned and finetuned large language models with Llama8B to incorporate semantic ID for ranking tasks
- Applied semantic ID on generative recommender model, improving contribution AUC by 0.6%

Jane Street, New York, NY May 2023-Aug 2023
Quantitative Trading Intern
- Developed pricing model for wildcard options of bonds using Python and Excel
- Priced illiquid international ETFs through analysis of correlated liquid stocks using Python and Excel
- Participated in fast paced mock trading and research exercises with teammates
- Applied machine learning methods such as betas models and gradient boosting trees in small projects

Holocron Technologies, Ann Arbor, MI Oct 2021-Dec 2022
Research, Development, and AI
- Processed time series data from electronic devices using statistical methods in Python
- Compared methods and results from the literature concerning detection of hidden cameras
- Analyzed political documents and news stories using natural language processing tools
- Merged original startup with larger company to win $50,000 from Buckeye Accelerator program

New Century Center for Academic Excellence, Novi, MI Sept 2020-Aug 2021
Class Instructor and Coordinator
- Instructed weekly online classes of 10 students geared towards math competitions independently
- Prepared rigorous coursework of most relevant techniques and tricks with homework assignments
- Tutored and assisted students during weekly office hours and homework feedback
- Established and managed communication methods to students with Piazza and group chats

Greater Memphis Chinese School, Memphis, TN Sept 2020-Aug 2021
Class Instructor and Coordinator
- Instructed two weekly online classes of 10-20 students geared towards math competitions independently
- Prepared rigorous coursework of most relevant techniques and tricks with homework assignments
- Instructed separate summer math class for accelerated students
- Established and managed communication methods to students with Google Forms and group chats

Honors and Awards

- J. Robert Beyster Computational Innovation Graduate Fellowship Jul 2025
- NSF GRFP Honorable Mention Apr 2024
- 6 semester Dean's List Dec 2019-Mar 2022
- 6 semester University Honors Dec 2019-Mar 2023
- William J. Branstrom Freshman prize Apr 2020
- 3-time USA Math Olympiad Qualifier 2017-2019
- HMMT Combinatorics Top 25 Feb 2019
- Second place in Michigan Math Prize Competition Mar 2018
- USA Physics Olympiad Gold Medal Apr 2017
- USA Junior Math Olympiad Qualifier Apr 2016

Publications and Preprints

Highlights

[1] **J. Hu**, B. Song, X. Xu, L. Shen, J. A. Fessler. "Learning Image Priors through Patch-based Diffusion Models for Solving Inverse Problems", Advances in Neural Information Processing Systems, 2024

[2] **J. Hu***, B. Song*, Z. Luo, J. A. Fessler, L. Shen. "DiffusionBlend: Learning 3D Image Prior through Position-aware Diffusion Score Blending for 3D Computed Tomography Reconstruction", Advances in Neural Information Processing Systems, 2024

In preparation
[3] B. Song, Y. Xu, **J. Hu**, L. Shen, "Data-Efficient Video Restoration through Fine-Tuning of Foundational Video Diffusion Models", Advances in Neural Information Processing Systems, 2025
[4] **J. Hu,** L. Shen, J. A. Fessler, "Quadratic Majorizer Methods for CT Reconstruction Using a Mismatched 3D Diffusion Prior", IEEE Trans. On Comp. Imag. (TCI) (in preparation), 2025

Journals
[5] T. Hong, X. Xu, **J. Hu,** J. A. Fessler, "Provable Preconditioned Plug-and-Play Approach for Compressed Sensing MRI Reconstruction", IEEE Trans. On Comp. Imag. (TCI), 2024
[6] **J. Hu,** B. Song, J. A. Fessler, L. Shen, "Test-Time Adaptation Improves Inverse Problem Solving with Patch-Based Diffusion Models", IEEE Trans. On Comp. Imag (TCI), 2025
[7] T. Hong, Z. Xu, **J. Hu,** J. A. Fessler, "On-the-Fly Randomized Nystrom Preconditioners for Accelerating Image Restoration", IEEE Trans. On Comp. Imag. (TCI) (under review), 2025
[8] X. Xu, M. Klasky, M. T. McCann, **J. Hu,** J. A. Fessler, "Swap-Net: A Memory-Efficient 2.5D Network for Sparse-View 3D Cone Beam CT Reconstruction", IEEE Trans. On Comp. Imag. (TCI), 2025
[9] Z. Li, Y. Jia, X. Xu, **J. Hu,** J. A. Fessler, Y. Dewaraja, "Shorter SPECT Scans Using Self-supervised Coordinate Learning to Synthesize Skipped Projection Views", European Journal of Nuclear Medicine and Molecular Imaging (EJNMMI), 2025
[10] **J. Hu*,** Z. Li*, X. Xu, L. Shen, and J. A. Fessler, "Accelerated Wirtinger Flow with Score-based Diffusion Image Prior for Poisson-Gaussian Holographic Phase Retrieval", IEEE Trans. on Comp. Imag. (TCI) 2024.
[11] **J. Hu**, B. T.-W. Lin, J. H. Vega, and N. R.-L. Tsiang, "Predictive models of driver deceleration and acceleration responses to lead vehicle cutting in and out," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2677, no. 5, pp. 92–102, Nov. 2022. doi:10.1177/03611981221128277

Conferences
[12] **J. Hu,** Z. Li, B. Song, L. Shen, J. A. Fessler, "SPAR: Refining a Single Pretrained Diffusion Model to Solve Inverse Problems in Many Modalities", Advances in Neural Information Processing Systems (under review), 2025
[13] B. Song, G. Wang, Z. Zhang, Z. Luo, W. Yuan, **J. Hu,** J. Jia, Z. Tang, L. Shen, "CCS: Controllable and Constrained Sampling with Diffusion Models via Noise Perturbation", International Conference on Machine Learning (under review), 2025
[14] B. Song*, Z. Luo*, **J. Hu,** L. Shen, "PriorFuseLDM: Image Restoration with Spatial-Temporal Fusion by Prior-Constrained Latent Diffusion Models", Conference on Computer Vision and Pattern Recognition (under review), 2025
[15] B. Song, Y. Xu, **J. Hu,** L. Shen, "Stable-VR: Efficient Real-World Video Restoration via Video Diffusion Priors with Conditional Fine-Tuning and Sampling", Advances in Neural Information Processing Systems (under review), 2025
[16] **J. Hu,** J. Fessler**.** Generalizability of patch-based image models," *BASP Frontiers*, Switzerland, Feb. 2023

References

Jeffrey A. Fessler, William L. Root Collegiate Professor
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