Zachary Stoebner

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Overview

I am working on provably efficient, scalable, and robust algorithms for inverse problems. Broadly, I'm interested in **machine learning**, **signal processing**, **optimization**, **probability**, **statistics**, and **control**.

Education

University of Texas at Austin *Austin, TX*

PhD in Electrical & Computer Engineering (Advisor: Prof. Jon Tamir) *August 2022 - Present*

- Coursework: Convex Optimization, Probability & Stochastic Processes, Computational MRI, Real Analysis, Advanced Computer Vision, Fourier Optics, Digital Signal Processing, Large-Scale Optimization, Advanced Probability, Tensor Methods

Vanderbilt University *Nashville, TN*

BS with Honors in Computer Science & Neuroscience, Minor in Applied Mathematics *May 2021*

MS in Computer Science (Advisor: Prof. Ipek Oguz) *August 2022*

- Thesis: A deep learning-enabled automatic segmentation system for surgical endoscopy
- Coursework: Statistical ML, Systems Theory, Computational Game Theory, Intelligent Systems & Robotics

Work

Adobe *Bay Area, CA*

AI/ML Research Intern (Advisors: Abhishek Tandon, Sid Iyer, Oliver Brdiczka) *May 2025 - Sep 2025*

- Developed state-space models for sequence compression in long-form text-to-image/video generation.
- Won the Firefly intern research showcase.

Research

In Progress

"Preconditioning for monotone operator learning", **Zachary A. Stoebner**, Jonathan I. Tamir. (2025-Present)

- Developing theory and methods for preconditioning for monotone forward-backward splitting to expedite and ensure convergence of high-dimensional, non-uniform image reconstruction.

"Generative Koopman Method for Nonlinear System Identification and Signal Recovery in Computational Imaging", **Zachary A. Stoebner**, Jonathan I. Tamir. (2024-Present)

- Developing theory and methods for joint system identification and signal recovery using state-space models, probability flows, Koopman operators, and variational inference.

Conference

"INFusion: diffusion regularized implicit neural representations for 2D and 3D accelerated MRI reconstruction", Yamin Arefeen, Brett Levac, **Zachary A. Stoebner**, Jonathan I Tamir. *IEEE-Asilomar* (2024).
[DOI][pdf]

- Contributed a [library] for generally defining implicit neural representations for inverse problems using PyTorch and Lightning.

"Segmentation of kidney stones in endoscopic video feeds", **Zachary A. Stoebner**, Daiwei Lu, Seok Hee Hong, Nicholas L. Kavoussi, and Ipek Oguz. *SPIE Medical Imaging: Image Processing* (2022).
[DOI][arXiv]

- Optimized a high-performing (>0.9 Dice, 0.8 Kappa) residual U-Net with PyTorch and Comet for video segmentation and deployed it in live surgeries with OpenCV in Python.
- Built and annotated a novel dataset of endoscopic nephrolithotomy videos using OpenCV in C++.

Journal

"Reducing malware analysis overhead with coverings", Michael Sandborn, **Zachary A. Stoebner**, Westley Weimer, Stephanie Forrest, Ryan Dougherty, Jules White, Kevin Leach. *IEEE-TDSC* (2023).
[DOI][GitHub]

- Developed a high-performing (>90% hit rate) deep multilabel CNN classifier using PyTorch and Comet that predicted which sandboxes will run a stealthy malware sample using its binary image.
- Implemented scheduling algorithms in Python to simulate the analysis framework's scalability given the classifier's predictions and evaluated the algorithms' performance in simulation using NumPy.

"Comprehensive shape analysis of the cortex in Huntington's disease", **Zachary A. Stoebner**, Kilian Hett, Ilwoo Lyu, Hans Johnson, Jane S. Paulsen, Jeffrey Long, Ipek Oguz. *Human Brain Mapping* (2023).
[DOI][GitHub]

- Formulated a linear-mixed model with lme4 in R to describe the cortex from the longitudinal PREDICT-HD dataset, using a novel index for gyrification, sulcal depth, and cortical thickness.
- Investigated novel areas of change associated with Huntington's disease and corroborated the degree of change reported in known areas using SufStat in MATLAB.

Poster

"Generalized system identification and joint signal reconstruction with implicit neural representations, with application to MRI", **Zachary A. Stoebner**, Jonathan I. Tamir. *{6G@UT, Oden SciML Workshop}* (2024)

- Investigated implicit neural representations for joint image reconstruction and nonlinear system identification.
- Wrote a [library] for generally defining implicit neural representations for inverse problems using PyTorch and Lightning.

Patents

"Systems and Methods for Navigation and Identification during Endoscopic Surgery", Nicholas L. Kavoussi, Ipek Oguz, Jie Ying Wu, **Zachary A. Stoebner**, Daiwei Lu, Ayberk Acar.
U.S. Patent Application No. 18/622,134.

Accolades

2022-Present **Cockrell Engineering Doctoral Fellowship**, University of Texas at Austin

2017-2021 **Dean's List**, Vanderbilt University

Teaching

Assistant **held weekly office hours and graded homework*

Spring 2022	**Projects in ML**, CS 3892	*Vanderbilt*
Fall 2021	**Artificial Intelligence**, CS 4260	*Vanderbilt*
Spring 2021	**Deep Learning**, CS 3891	*Vanderbilt*
Fall 2020	**Operating Systems**, CS 3281	*Vanderbilt*
Spring 2020	**Discrete Math**, CS 2212	*Vanderbilt*
Fall 2019	**Discrete Math**, CS 2212	*Vanderbilt*

Skills

Theory: Optimization, Deep Learning, Inverse Problems, Digital Signal Processing, Fourier Analysis, Probability
Practice: Python (PyTorch, OpenCV), C++ & C (OpenCV, ITK, VTK), Git, ML Workflow (Jupyter, Lightning, Comet, W&B), Visualization (PyPlot, Seaborn), MATLAB, R

Verbal: English (native), Portuguese (fluent), Spanish (advanced), French (basic)
Hobbies: climbing, lifting, trail running, backpacking, photography

References

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