

# Zachary Stoebner

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## Overview

My research interests span **computational imaging & computer vision** and **machine learning & optimization**. Currently, I am working on provable learning methods for solving inverse problems, namely image reconstruction and system identification, in Fourier imaging systems with an emphasis on magnetic resonance imaging.

## Education

### University of Texas at Austin

PhD in Electrical & Computer Engineering

Austin, TX

August 2022-Present

- Advisor: Prof. Jon Tamir
- Graduate Coursework: Convex Optimization, Probability & Stochastic Processes, Computational MRI, Real Analysis, Advanced Computer Vision, Fourier Optics, Digital Signal Processing, Large-Scale Optimization

### Vanderbilt University

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

Nashville, TN

May 2021

MS in Computer Science

August 2022

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

## Research Experience

### IN PROGRESS

"Blind compressive system identification while jointly reconstructing the image in MRI", **Zachary A. Stoebner**, Jonathan I. Tamir.

"Preconditioned non-Cartesian monotone operator learning for fast, memory-efficient, noise-robust compressed sensing MRI", **Zachary A. Stoebner**, Jonathan I. Tamir.

### CONFERENCE

"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 2022: Image Processing* (2022).  
[DOI][arXiv]

- Optimized a high-performing ( $>0.9$  Dice,  $0.8$  Kappa) residual U-Net for video segmentation and deployed in live surgeries
- Built and annotated a novel dataset of endoscopic nephrolithotomy videos

### JOURNAL

"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 to describe the cortex from the longitudinal PREDICT-HD dataset, using a novel index for gyrification, sulcal depth, and cortical thickness
- Discovered new areas of change associated with Huntington's disease and corroborated the degree of change associated with known areas

"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 that predicts which sandboxes will run a stealthy malware sample using its binary image
- Implemented scheduling algorithms to simulate the analysis framework's scalability given the classifier's predictions

## Skills

**Theory:** Optimization, Deep Learning (Score-Based Diffusion, Neural Implicits, Deep Equilibrium, GANs), Fourier Analysis, Inverse Problems

**Practice:** Python (PyTorch, OpenCV), C++ & C (ITK / VTK, OpenCV, LLVM), ML Optimization & Workflow (Lightning, Comet), Visualization (PyPlot, Seaborn), MATLAB, R

**Verbal:** English (native), Portuguese (fluent), Spanish (advanced), French (basic)

**Hobbies:** tennis, trail running, backpacking, climbing, photography