SOFIA KARDONIK

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EDUCATION

University of Michigan — **Ann Arbor, MI**
Ph.D. Candidate in Electrical and Computer Engineering — *Expected Graduation: August 2028*
Signal and Image Processing and Machine Learning — *GPA: 3.91/4.00*

University of Michigan — **Ann Arbor, MI**
Master of Science in Electrical and Computer Engineering — *May 2025*

University of Texas — **Austin, TX**
Bachelor of Science in Electrical and Computer Engineering — *May 2023*
GPA: 3.75/4.00

RESEARCH EXPERIENCE

Research Interests: Inverse problems; Signal and image processing; MRI reconstruction and denoising; Data-driven low-rank methods; Machine learning

fMRI Research Lab and Fessler Research Group — **January 2024 – Present**
Co-Advisors: Dr. Douglas C. Noll and Dr. Jeffrey A. Fessler
Graduate Student Research Assistant

- Developed a signal-adaptive, locally low-rank (LLR) functional MRI denoising method that uses SVD-based temporal subspaces and clustering to reduce false-positive signal spreading
- Derived statistical noise-scaling relationships to calibrate data-dependent tuning parameters
- Evaluated LLR denoising methods on in-vivo fMRI data across SMS-EPI and silent (Looping Star) acquisitions
- Investigated regularized model-based image reconstruction for fMRI, formulating reconstruction as an inverse problem via Tikhonov or low-rank regularization solved via POGM

Computational Sensing and Imaging Research Lab — **September 2021 – May 2023**
Advisor: Dr. Jon Tamir
Undergraduate Researcher

- Built a k-space simulation pipeline applying rigid rotations and translations to generate motion corrupt brain MRI data for training data-driven retrospective motion correction
- Explored effects of mixed precision training on MRI reconstruction, such as speed and memory savings against reconstruction quality

CONFERENCE PROCEEDINGS AND ABSTRACTS

S. Kardonik, D. J. Frey, J. A. Fessler, D. C. Noll, "Signal-Adaptive Local Low-Rank Denoising to Reduce False Signal Spread in fMRI" submitted to *International Society for Magnetic Resonance in Medicine Annual Meeting, Vancouver, BC,* 2027. (Abstract)

S. Kardonik, J. A. Fessler, D. C. Noll, "Activation Spread due to Local Low-Rank Denoising in SMS-EPI Task-Based fMRI Data", *International Society for Magnetic Resonance in Medicine Annual Meeting, Cape Town, South Africa,* 2026. (Abstract)

B. Levac, S. Kumar, **S. Kardonik**, J. Tamir, "FSE Compensated Motion Correction for MRI Using Data Driven Methods", *25th International Medical Image Computing and Computer Assisted Intervention*, 2022, https://doi.org/10.48550/arXiv.2207.00656

WORK EXPERIENCE

Aurora Flight Sciences, A Boeing Company; Software Engineering Intern — **May 2022 – August 2022**

- Built a flight simulator and data collection platform to study pilot fatigue during prolonged commercial flights

- Developed a Python tool to visualize pilot eye-tracking data across cockpit instruments
- Surveyed ML methods for fatigue detection from physiological signals (heart rate variability, blinking rate) and workload measures

Uhnder, Inc.; Software Intern **June 2020 – August 2020**

- Calibrated and validated digital automotive radar units before client delivery
- Extended Python software to support new product releases

INSTRUCTIONAL EXPERIENCE

Graduate Student Instructor, Matrix Methods for Signal Processing and ML **August 2025 – December 2025**
Department of Electrical and Computer Engineering, University of Michigan

- Led weekly discussion sections focused on reinforcement of lecture concepts and coding assignments in Julia
- Held office hours to help students with assignments and clarify course material

PROJECTS

Time Series Forecasting with Prior-Data Fitted Networks

- Delivered a final paper discussing shortcomings and novel contributions to ForecastPFN – a machine learning framework that is trained using synthetic data sampled from a prior distribution and predicts data values in the future

Senior Design Capstone

- Designed a network of non-invasive wearable sensors to detect and monitor dehydration and heat stroke
- Used ECG, galvanic skin response, and body temperature sensors

EXTRACURRICULARS

ECE Graduate Student Council

- Served as president of the BuddEEs committee – a mentorship program designed to enhance the academic and social integration of incoming PhD students in electrical and computer engineering
- Organized social events to foster peer networking among new and current PhD students, promoting a supportive and inclusive environment

Women in Electrical and Computer Engineering (WECE)

- Attended networking events with ECE faculty to learn about their experience in academia

HONORS & AWARDS

- **Excellence in ECE Honor Roll**, University of Michigan ECE (1 of 19 students inducted) 2025-2026**;** *Recognized for leadership of the BuddEEs PhD mentorship program*
- **ISMRM New Entrant Stipend,** ISMRM, 2025; *Travel award and registration waiver for the ISMRM Annual Meeting, Honolulu, HI, USA*

SKILLS

Technical Methods: SVD/low-rank methods, convex optimization, compressed sensing, NUFFT and model-based reconstruction, inverse problems
Programming Languages: Python, Julia, MATLAB, C/C++
Tools: NumPy/SciPy, Linux, Git, Jupyter Notebook
Languages: fluent in Russian, some understanding of Hebrew

Relevant Coursework: Machine Learning; Optimization in Signal Processing and ML; Matrix Methods for Signal Processing; Probability and Random Processes; Medical Imaging Systems; Detection, Estimation, and Filtering; Real-Time Digital Signal Processing; Algorithms; Digital Image Processing; Discrete Math