

Education

<i>Doctor of Philosophy - Electrical and Computer Engineering (4.00/4.00)</i> Purdue University - School of Electrical and Computer Engineering Advisors: Prof. Abolfazl Hashemi and Prof. Behzad Sharif	Aug 2022 - May 2027 West Lafayette, IN
<i>Bachelor of Science - Electrical and Electronics Engineering (3.67/4.00)</i> Bilkent University - Faculty of Engineering	Sep 2018 - Jun 2022 Ankara, Turkey
<i>Minor Degree - Psychology (3.55/4.00)</i> Bilkent University - Faculty of Economics, Administrative, and Social Sciences	Sep 2020 - Jun 2022 Ankara, Turkey

Research Background & Interests

- Diffusion Models and Applications to Inverse Problems
- Vision Foundation Models for Cardiac MRI (2D+Time Data)
- Multimodal Learning for 3D Medical Imaging
- Optimization and Langevin Monte Carlo Sampling Theory

Professional Experiences

Purdue University , <i>Research Assistant</i>	West Lafayette, IN
• <i>Diffusion Models (Advisor: Prof. Abolfazl Hashemi)</i> - Developed the first theoretically grounded algorithm that solves inverse problems using a diffusion model prior, without requiring forward-model derivatives or pseudo-inverses. Demonstrated applications in brain MRI reconstruction, black-hole imaging, and fluid dynamics (Navier–Stokes equations), and established the first convergence guarantees among derivative-free methods to an ε-accurate solution for general inverse problems. Accepted to ICML'26. - Developed a principled posterior sampling algorithm for general inverse problems that integrates variance-reduction techniques with Langevin Monte Carlo sampling and a diffusion model prior to produce lower-variance, accurate reconstructions. Established convergence guarantees for obtaining an ε-accurate solution and demonstrated the effectiveness of the proposed method on MRI and CT reconstruction inverse problems. Accepted to UAI'26.	Jul 2025 - Feb 2026
• <i>Vision Foundation Models for Cardiac MRI (Advisor: Prof. Behzad Sharif)</i> - Built the largest-scale foundation model for cardiac perfusion MRI using a Masked Autoencoder. Pretrained on > 600,000 unlabeled stress/rest images, the model achieved state-of-the-art myocardium segmentation and landmark localization performance using 10× fewer manual labels than supervised baselines, with performance further validated by blood flow quantification analysis. Accepted to ISMRM'26 (Oral). - Adapted a pretrained cardiac cine foundation model for cardiac perfusion MRI, reducing the need for manually labeled training data by 12× for automatic myocardium segmentation. In a separate study, developed a cardiac perfusion MRI-based ischemia detection method that achieved high diagnostic accuracy with limited labeled data. Both works were accepted to SCMR'26 (Oral).	Jul 2025 - Jan 2026

Siemens Healthineers, *Research Internship*

Malvern, PA

- *3D Multimodal Abnormality Classifier*
- Large-scale annotation for 3D brain MRI abnormality classification is highly labor-intensive. To mitigate this, proposed a multimodal classifier that uses the Phi-3 Large Language Model to align radiology reports with brain atlas-defined abnormality regions of interest, which are converted into Gaussian attention maps to guide model training.

May 2024 - Aug 2024

- Employed an efficient 3D state-space Mamba architecture with anatomy-guided connections, achieving improved benchmark performance without requiring any manual annotations. This work was conducted under mentorship of Yoshihisa Shinagawa. Under review for **patent application**, and accepted to a [CVPR'26 workshop \(Oral\)](#).

BAYKAR Technology, Artificial Intelligence Internship

Istanbul, Turkey

• *Anomaly Detection*

May 2021 - Aug 2021

- Designed various anomaly detection models using machine learning for time series data for unmanned aerial vehicles. As the programming language, Python was used; Pandas, Scikit-learn, Keras, and TensorFlow libraries were used for data visualization and building a model.

HAVELSAN, Computer Vision and Deep Learning Internship

Ankara, Turkey

• *Object Detection and Classification*

May 2020 - Aug 2020

- Due to the outbreak of COVID-19, an application was designed to identify unmasked individuals that present a serious health risk to the general public. This application utilized famous YOLO algorithm written in Python with TensorFlow library.

Publications and Preprints

*: denotes equal contribution.

Publications

1. **M. B. Sahin**, B. Sharif, A. Hashemi, “Zeroth-Order Non-Log-Concave Sampling with Variance Reduction and Applications to Inverse Problems”, International Conference on Machine Learning (ICML), 2026.
Available: <https://arxiv.org/abs/2605.30573>
Code: <https://github.com/mberk-sahin/zo-posterior-sampling>
2. **M. B. Sahin**, A. E. Tanriverdi, B. Sharif, A. Hashemi, “Variance Reduction for Non-Log-Concave Sampling with Applications to Inverse Problems”, Uncertainty in Artificial Intelligence (UAI), 2026.
Available: <https://arxiv.org/abs/2606.16257>
Code: <https://github.com/mberk-sahin/variance-reduced-sampling>
3. **M. B. Sahin***, D. Yalcinkaya*, B. Sharif, A. Hashemi, “Phase-map synthesis from magnitude-only MR images using conditional score-based diffusion models with application in training of accelerated MRI reconstruction models”, Computer Vision and Pattern Recognition (CVPR) Workshop, 2026.
Available: <https://arxiv.org/abs/2605.01185>
Code: <https://github.com/mberk-sahin/phase-map-synthesis-with-SBDM>
4. **M. B. Sahin**, Y. Shinagawa, H. Z. Yerebakan, A. Hashemi, et al., “Multimodal Abnormality Classifier Using Anatomy-Guided Connection for 3D Medical Images”, Computer Vision and Pattern Recognition (CVPR) Workshop, 2026. **(Oral)**
Available: [paper link](#)
5. P. Duan, X. Guo, S. Farhand, **M. B. Sahin**, et al. “AGA3DNet: Anatomy-Guided Gaussian Priors with Multi-view xLSTM for 3D Brain MRI Subtype Classification”, Computer Vision and Pattern Recognition (CVPR) Workshop, 2026.
Available: <https://arxiv.org/abs/2605.07142>
6. **M. B. Sahin**, Z. Li, K. Youssef, A. M. Sohi, et al., “Foundation model for cardiac perfusion MRI enables 10-fold reduction in labeled dataset size for deep-learning analysis”, International Conference on Magnetic Resonance Imaging (ISMRM), 2026. **(Oral)**
7. Z. Li, **M. B. Sahin**, A. M. Sohi, D. Yalcinkaya, et al., “Leveraging a CMR Foundation Model for Automated Classification of Stress Perfusion CMR Datasets: Initial Results Using the SCMR Registry”, Journal of Cardiovascular Magnetic Resonance, 2026. **(Oral)**
Available: [https://www.journalofcmr.com/article/S1097-6647\(25\)00399-0/fulltext](https://www.journalofcmr.com/article/S1097-6647(25)00399-0/fulltext)
8. **M. B. Sahin**, Z. Li, K. Youssef, A. M. Sohi, et al., “Adapting a CMR foundation model for A.I.-powered analysis of perfusion CMR: Enabling 12-fold reduction in manually labeled training dataset for automatic segmentation”, Journal of Cardiovascular Magnetic Resonance, 2026. **(Rapid-Fire)**

Available: [https://www.journalofcmr.com/article/S1097-6647\(25\)00807-5/fulltext](https://www.journalofcmr.com/article/S1097-6647(25)00807-5/fulltext)

9. **M. B. Sahin***, D. M. Yalcinkaya*, R. Dharmakumar, A. Hashemi, B. Sharif, “*Retrospective Phase-map Synthesis for CMR Datasets FBom Magnitude-only DICOM Images Enabled by A.I. Generative Models to Create Large Training Datasets for Deep Learning-based Image Reconstruction*”, Journal of Cardiovascular Magnetic Resonance, 2024. (**Rapid-Fire**)

Available: [https://www.journalofcmr.com/article/S1097-6647\(24\)00978-5/fulltext](https://www.journalofcmr.com/article/S1097-6647(24)00978-5/fulltext)

10. E. C. Kaya*, **M. B. Sahin***, A. Hashemi, “*Communication-constrained exchange of zeroth-order information with application to collaborative target tracking*”, International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023.

Available: <https://ieeexplore.ieee.org/abstract/document/10096148>

Code: https://github.com/mberk-sahin/EF_ZO_SGD

11. E. C. Kaya*, **M. B. Sahin***, A. Hashemi, “*Communication-Efficient Zeroth-Order Distributed Online Optimization: Algorithm, Theory, and Applications*”, IEEE Access, 2023.

Available: <https://ieeexplore.ieee.org/abstract/document/10147304>

Code: <https://github.com/mberk-sahin/FED-EF-ZO-SGD>

Preprints

1. Z. Luo*, **M. B. Sahin***, A. Upadhyay*, B. Sharif, A. Hashemi, “*RAMPAGE: RAndomized Mid-Point for debiAsed Gradient Extrapolation*”, Under Review at NeurIPS 2026.

Available: <https://arxiv.org/abs/2603.22155>

2. Z. Luo, A. Upadhyay, **M. B. Sahin**, S. B. Moon, A. Makur, A. Hashemi, “*Unified High-Probability Analysis of Stochastic Variance-Reduced Estimation*”, Under Review at NeurIPS 2026.

Available: <https://arxiv.org/abs/2605.15388>

Academic Duties

Reviewer Duties

- **Conferences:** UAI '26 (*Top Reviewer*; selected among 35 of 1,149 reviewers, top 3%), AAAI '24-'25, ICASSP '24

Data Science Instructor at Berkeley Coding Academy

Jul 2021 - Jun 2022

- Gave data science and machine learning classes, and prepared course materials, assignments, and code notebooks for students. Also, mentored students in Kaggle machine learning competitions.

Teaching Assistantship at Bilkent University, Computer Science

Sep 2020 - May 2021

- CS115 Introduction to Programming in Python

Software Skills

- **Python:** Professional research and industrial experience based on machine learning. Strong knowledge and experience in libraries such as *PyTorch*, *Tensorflow*, *JAX*, *Pandas*, *Numpy* and *Scikit-Learn*. I have experience with Docker and Git via industrial projects.

- **SLURM:** Proficient in using SLURM to manage multi-GPU computing resources for large-scale machine learning research.

- **MATLAB:** Professional research experience in signal processing and computer vision. Used for projects during courses, research and internships.

- **C/C++/Java:** Intermediate experience in various course projects.

Languages

English: Fluent

Turkish: Native