Atakan Topcu

Department of Electrical Engineering
Bilkent University
National Magnetic Resonance Research Center

Ankara, Turkey
atakan.topcu@bilkent.edu.tr
attakuan.github.io/

Research Interests

- Computational Imaging
- Magnetic Resonance Imaging
- Inverse Problems
- Physics-based Deep Learning

Education

2022–2025 **Bilkent University**, Ankara,Turkey
M.Sc., Electrical and Electronics Engineering, **CGPA** *:3.91/4.00*
Advisor: Prof. Emine Ulku Saritas
Thesis Title: *Unsupervised deep learning methods for multi-shell diffusion MRI*
Thesis Topic: Developing a subject-specific, physics-driven deep learning model that can accelerate multi-shell diffusion MRI up to 22-fold by interpolating the multi-shell q-space.

2018–2022 **Bilkent University**, Ankara,Turkey
B.Sc., Electrical and Electronics Engineering, **CGPA** *:3.79/4.00*
Graduated with Research Excellence and *Summa Cum Laude*

2019–2022 **Bilkent University**, Ankara,Turkey
Minor, Philosophy

Publications

Journal Papers

A. Topcu, A. Z. Alkilani, T. Çukur and E. U. Saritas, "QUCCI: Unsupervised q-Space Upsampling Using Physics-Constrained Coordinate-Based Implicit Networks" *IEEE Transactions on Medical Imaging*, 2024. (**To be Submitted**)

A. Topcu, A. Alpman, M. Utkur and E. U. Saritas, "Boosting Viscosity Sensitivity of Magnetic Particle Imaging Using Selection Field Gradients" *Applied Physics Letters*, 2024. (**Under Final Review After Minor Revision**)

E. Şimşek*, **A. Topcu***, E. Koç, E. U. Saritas and A. Koç, "Emotion Classification with Visibility Graphs" *IEEE Signal Processing Letters*, 2024. (***Equal Contribution**) (**Under Revision**)

Peer-Reviewed Conference Proceedings

A. Topcu, C. Liao, T. Çukur, K. Setsompop and E. U. Saritas, "Super-resolution across RF-encoding and q-space dimensions via physics-driven neural fields for accelerated gSlider diffusion MRI" *Proceedings of the 33rd Annual Meeting of ISMRM*, Honolulu, May 2025. (**Under Review**)

A. Z. Alkilani, **A. Topcu**, T. Çukur and E. U. Saritas, "Downstream Evaluation on Diffusion Metrics for Susceptibility Artifact Correction via Complex Forward-Distortion Network" *Proceedings of the 40th Annual Meeting of ESMRMB*, Barcelona, October 2024.

A. Topcu, A. Z. Alkilani, T. Çukur and E. U. Saritas, "Unsupervised q-Space Interpolation Using Physics-Constrained Coordinate-Based Implicit Network" *Proceedings of the 32nd Annual Meeting of ISMRM*, Singapore, May 2024.

A. Topcu, A. Alpman, M. Utkur and E. U. Saritas, "Vicinity Effects of Field Free Point on the Relaxation Behavior of MNPs" *11th International Workshop on Magnetic Particle Imaging (IWMPI)*, Virtual Conference, March 2022. Link

Honors & Awards

2022–2025 **Scientific and Technological Research Council of Turkey**, Monthly stipend and accommodation support during M.Sc. (project no: 122E162)

2022–2025 **Bilkent University, Graduate Scholarship**, Full tuition waiver and stipend during M.Sc.

2022 **Research Excellence Award**, From Bilkent University, Faculty of Engineering

2021 **Social Justice and Sustainability Award**, Received 2021 STS Sustainability Award from Bilkent University, Faculty of Engineering. Link

2018–2022 **High Honor Student at Bilkent University**

2019–2022 **Bilkent University Merit Scholarship**, 80% tuition waiver during B.Sc.

2016 **International Genetically Engineered Machine (iGEM) Golden Award**, Nominated for Best Education, Best Applied Design & Public Engagement among 299 teams from 40+ countries, organized by iGEM Foundation. Link

2015–2018 **METU High-school Merit Scholarship**, 70% tuition waiver

Work & Research Experience

Research Experience

2022 – Present **Research Assistant**, National Magnetic Resonance Research Center (UMRAM)
At Saritas Lab, I developed deep learning models for medical imaging and MRI reconstruction, focusing on accelerating diffusion MRI using physics-based AI. Under Prof. Emine Ulku Saritas, I led projects on MRI contrast agents with UNAM and Sorbonne University, collaborated with Hacettepe University Hospital on a diffusion MRI framework for optical nerves, and created our own dMRI metrics framework. Additionally, with Prof. Kawin Setsompop from Stanford, I worked on speeding up whole-brain submillimeter diffusion MRI, enhancing signal quality and reducing scan times.

2020 – 2022 **Undergraduate Researcher**, National Magnetic Resonance Research Center (UMRAM)
Analyzed the DC magnetic field effects on the relaxation behavior of magnetic nanoparticles (MNPs) and analyzing how they alter Magnetic Particle Imaging (MPI) signal properties using Magnetic Particle Spectroscopy (MPS).

Teaching Experience

2022–Present **Teaching Assistant**, Bilkent University, Electrical and Electronics Engineering Department

- **Fall'24: EEE 473/573: Medical Imaging**
  Served as the Head Teaching Assistant responsible for the entire coursework, including preparation and grading of homework, projects.
- **Spring'23, Spring'24: EEE 212: Microprocessors**
  Prepared microcontroller labs and graded lab assignments to support undergraduate students in understanding microprocessor architecture and applications.
- **Fall'22, Fall'23: EEE 211: Analog Electronics**
  Attended analog electronics labs and graded lab assignments, assisting undergraduate students in designing and analyzing analog circuits.

Work Experience

June 2021 – July 2021 **Engineering Intern**, ROKETSAN
Developed a LabVIEW program in RS-485 protocol with an easy-to-use interface for testing the Electronic Safety Arming and Ignition Unit that is responsible for the safety of warhead, rocket engine and other components of a missile.

Conferences & Presentations

ISMRM - International Society for Magnetic Resonance in Medicine

May 2024 **Oral Presentation with Poster**, *Singapore*

Oral/Poster Presentation for the paper: Unsupervised q-Space Interpolation Using Physics-Constrained Coordinate-Based Implicit Network

International Workshop on Magnetic Particle Imaging

May 2022 **Oral Presentation**, *Virtual Conference*

Oral Presentation for the paper: Vicinity Effects of Field Free Point on the Relaxation Behavior of MNPs

Bilkent Graduate Research Conferences

Jan 2024 **Oral Presentation**, *Ankara*

Oral Presentation for the paper: Physics-Guided Unsupervised Neural Implicit Representation for Accelerated Diffusion MRI

Jan 2023 **Poster Presentation**, *Ankara*

Poster Presentation for Relaxation Dynamics of MNPs in Magnetic Particle Imaging

Other Notable Projects

2023 **Self-Supervised Multimodal Image Super Resolution in StyleGAN2 Manifold**

Proposed a way to further upgrade the PULSE framework which already does a self-supervised image super-resolution by traversing the real image manifold. Optimized the code for PULSE with StyleGAN2 and multi-shot image generation as well as adjustable random noise layers for image style diversity. (GitHub Link)

2023 **Double Inversion Recovery (DIR) for SSFP**

Implemented Double Inversion Recovery (DIR) for balanced and non-balanced SSFP using open source Pulseq framework. The designed pulse sequence is tested and implemented on UMRAM's Siemens MAGNETOM Trio 3T MRI. (GitHub Link)

2022– 2023 **Comparative Study of Medical Image Segmentation Algorithms**

Implemented four classic segmentation tasks: K-means clustering, Mean-shift clustering, GrabCut, and Conditional Random Field (CRF) for brain tumour segmentation using Medical Segmentation Decathlon dataset. (GitHub Link)

2021– 2022 **Comparative Study of Image Captioning Methods**

A fused computer vision and natural language processing framework was implemented using Tensorflow for the task of producing meaningful captions for a given natural image. Proposed model includes variations of CNN, LSTM, GRU and RNN models. (GitHub Link)

2021– 2022 **Deep Learning for Multi-Coil Undersampled MRI Reconstruction**

CycleGAN model was implemented for generating a robust MRI image from undersampled multi-coil MRI data and compared with classical approaches (SENSE and SPIRiT) using the fastMRI database. (Youtube Link)

Skills

Programming	Python, MATLAB, VHDL, LabVIEW, Assembly, C
Frameworks	Pulseq, PyTorch, TensorFlow, NumPy, Matplotlib, OpenCV, Git
Tools	LaTeX, Conda, Adobe Photoshop, Adobe Illustrator, Docker, DICOM, FSL, MRtrix3
Languages	Turkish (native), English (fluent), German (intermediate), Korean (beginner)