

Mehmet Efe Tiryaki, PhD

Date of Birth / Nationality: 20.04.1993 / Turkish

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[Google Scholar](#) / [GitHub](#) / [LinkedIn](#) / [Webpage](#)

Objective

Robotics researcher with 8+ years of experience committed to developing medical image-guided robotic platforms by exploring the physical principles of novel sensing mechanisms and robotic actuation and integrating control, perception, and intelligence for medical robotic autonomy.

Research Interest

Robotics, Medical robots, Magnetic actuation, Medical imaging, Surgical robots, Control, Learning

Education

- 2018-2023** Ph.D. in Institute for Biomedical Engineering, ETH, Zürich, *Switzerland*
Thesis title: MRI-powered magnetic microrobotics
Advisor: Prof. Dr. Metin Sitti
- 2016-2018** M.Sc. Robotics, Systems and Control, ETH Zürich, *Switzerland*
Thesis: Skating with a force-controlled quadrupedal robot
- 2011-2016** B.Sc. Physics, Middle East Technical University (METU), Ankara, *Türkiye*,
Thesis: Simulation of short pulse laser beams in a nonlinear medium
- 2011-2015** B.Sc. Mechanical Engineering, Middle East Technical University (METU), Ankara, *Türkiye*,
Graduation Project: Design of a Frequency Adjustable Tuned Vibration Absorber
- 2015-2016** B.S. Physics (Exchange), Technische Universität Darmstadt, Darmstadt, *Germany*
- 2000-2011** TED Ankara College, Ankara, *Türkiye*

Research Experience

- 2023-2024** Postdoctoral researcher, Max-Planck Institute for Intelligent Systems, Stuttgart, *Germany*
Research on MRI-guided robotic systems
- 2019-2023** Ph.D. researcher, Max-Planck Institute for Intelligent Systems, Stuttgart, *Germany*
4.5 years of Ph.D. research on MRI-powered magnetic microrobotic systems
- 2018** Research Internship, Nanyang Technological University (NTU), *Singapore*
6 months research internship on concrete 3D printing with mobile robotic printers

Awards

- 2024** **Marie Skłodowska-Curie Actions (MSCA) Seal of Excellence**
Received for MR-Strokebot project with evaluation score 93.8/100
- 2023** **IEEE ICRA Best Paper Runner in Healthcare and Medical Robotics**
ME Tiryaki, F Doğançün, CB Dayan, P Wrede, M Sitti “MRI-powered magnetic miniature capsule robot with HIFU-controlled on-demand drug delivery,”

Grants & Scholarships

- 2024-2025 MPI-IS Grassroot Internal Funding Program**
ME Tiryaki, P Esmaceli-Dokht, K. Prüssmann, M Sitti, “*Ultrahigh Field Magnetic Positioning System for MRI-guided Stereotactic Neurosurgery Robot,*” Grant Amount: 20,000 €
- 2024-2025 MAX!mize Start-up Incubation Program**
SO Demir, SF Baltaci, ME Tiryaki, I Bianchini, *start-up incubation of Max Planck Innovation for science-based entrepreneurship,* Grant Amount: 50,000 €
- 2023-2024 MPI-IS Grassroot Internal Funding Program**
ME Tiryaki, P Esmaceli-Dokht, K. Prüssmann, M Sitti, “*NMR Magnetometer Array for Magnetic Microrobot Tracking and Control in MRI Scanner,*” Grant Amount: 22,000 €
- 2016 TEV-DAAD-Master’s Degree Scholarship**
Scholarship for master’s students to study in Germany by the Turkish Education Foundation (TEV) and German Academic Exchange Service (DAAD): declined to pursue other opportunities.
- 2013-2016 TÜBİTAK 2205- National Undergraduate Scholarship Program**
Scholarship for double-major students in areas of fundamental science by the Scientific and Technological Research Council of Türkiye (TÜBİTAK)

Publications (ORCID ID :0000-0002-2646-1775)

First Author Papers (*: equal contribution)

- 2023** ME Tiryaki, Y.G. Elmacioğlu, M Sitti “Magnetic Guidewire Steering at Ultrahigh Magnetic Fields,” **Science Advances**, **2023**, 9 (17), eadg6438
- 2023** ME Tiryaki, F Doğangün, CB Dayan, P Wrede, M Sitti “MRI-powered magnetic miniature capsule robot with HIFU-controlled on-demand drug delivery,” **2023 IEEE International Conference on Robotics and Automation (ICRA)**, 5420-5425, **Best paper runner in Healthcare and Medical Robotics.**
- 2022** MB Bilgin*, ME Tiryaki*, J Lazovic, M Sitti “RF sensing-based in-situ temperature measurements during MRI interventional procedures,” **Advanced Material Technologies** **2022**, 7 (9), 2101625.
- 2022** ME Tiryaki, SO Demir, M Sitti “Deep learning-based 3D magnetic microrobot tracking using 2D MR images”, **IEEE Robotic Automation Letters**, **2022**, 7 (3), 6982-6989.
- 2022** ME Tiryaki, M Sitti “Magnetic resonance imaging-based tracking and navigation of submillimeter-scale wireless magnetic robots,” **Advanced Intelligent Systems**, **2022**, 4 (4), 2100178
- 2020** ME Tiryaki, O Erin, M Sitti “A realistic simulation environment for MRI-based robust control of untethered magnetic robots,” **IEEE Robotic Automation Letters**, **2020**, 5 (3), 4501-4508.
- 2019** ME Tiryaki, Z Xu, QC Pham “Printing-while-moving: a new paradigm for large-scale robotic 3D Printing”, **2019 IEEE/RSJ International Conference on Intelligent Robots and Systems**, 2286-2291.

Co-author Papers

- 2024** SO Demir, ME Tiryaki, AC Karacakol M Sitti “Learning Soft Millirobot Multimodal Locomotion with Sim-to-Real Transfer,” **Advanced Science**, under revision.
- 2023** RH Soon, Z Yin, MA Dogan, NO Dogan, ME Tiryaki, et al. “Pangolin-inspired untethered magnetic robot for on-demand biomedical heating applications,” **Nature Communication** **2023**, 14 (1), 3320.

- 2022** M Phelan, ME Tiryaki, J Lazovic, M Sitti “Heat-mitigated design and Lorentz force-based steering of an MRI-driven microcatheter toward minimally invasive surgery,” **Advanced Science**, **2022**, 9 (10), 2105352
- 2022** U Bozuyuk, E Suadiye, A Aghakhani, NO Dogan, J Lazovic, ME Tiryaki *et al.* “High-performance magnetic FePt (L10) surface microrollers towards medical imaging-guided endovascular delivery applications”, **Advanced Functional Materials**, **2022**, 32 (8), 2109741.
- 2021** O Erin, M Boyvat, J Lazovic, ME Tiryaki, M Sitti “Wireless MRI-powered reversible orientation-locking capsule robot,” **Advanced Science**, **2021**, 2100463.
- 2020** O Erin*, D Antonelli*, ME Tiryaki*, M Sitti “Towards 5-dof control of an untethered magnetic millirobot via MRI gradient coils”, **2020 IEEE International Conference on Robotics and Automation (ICRA)** , 6551-6557.
- 2020** O Erin, M Boyvat, ME Tiryaki, M Phelan, M Sitti “Magnetic resonance imaging system-driven medical robotics,” **Advanced Intelligent Systems**, **2020**, 2 (2), 1900110.
- 2019** BB Kocer, ME Tiryaki, M Pratama, T Tjahjowidodo, GGL Seet “Aerial robot control in close proximity to ceiling: A Force Estimation-based Nonlinear MPC,” **2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)**, 2286-2291.
- 2018** M Bjelonic, CD Bellicoso, ME Tiryaki, M Hutter, “Skating with a force controlled quadrupedal robot,” **2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)**, 7555-7561

Teaching Experience

Teaching

- 2018** ROS Tutorial for undergraduates, Nanyang Technological University
2015 Undergrad. Assistantship, Mechanical Engineering Department, METU

Supervising & Mentoring

- Ph.D. Mentee** (Junior Ph.D. students I mentored with)
2022 P Esmaili-Dokht: "NMR Magnetometer array design."
Master's Theses (Six months full-time research project)
2021 MB Bilgin: "Remote sensing, tracking, and imaging inside MRI systems."
Bachelor Interns (Three months full-time research project)
2023 YK Molla: "MR angiography imaging method for UHF catheters."
2023 K Kelam: "UHF concentric tube actuation mechanism."
2023 AF Sahin: "Deep learning-based multi-magnet tracking in MR images."
2022 YG Elmacioğlu: "Magnetic guidewire actuation in MRI scanner."
2022 F Doğançün: "HIFU-controlled on-demand drug delivery"
2022 EH Molu: "MRI-powered guidewire insertion mechanism."
2019 B Gümüş: "3D position estimation of MRI actuated microrobot"
2019 B Bulguroğlu: "Electromagnetic tracker design for wireless localization."
2019 C Yumuk: "Magnetic capsule camera robot design."

Invited Talks

- 2023** Young Researcher Seminar in Bilkent University Ankara, “MRI-powered Magnetic Robotics”
2023 ROMER Seminar in METU Ankara, “MRI-powered magnetic microrobotics”
2022 MR Seminar in ETH Zurich, “MRI-powered magnetic microrobotics”

Conferences

- IEEE ICRA, 2023 London, 2020 Paris
- IEEE/RSJ IROS, 2022 Kyoto, 2020 Vegas, 2019 Macao, 2018 Madrid
- Hamlyn Symposium on Medical Robotics, 2023, London
- Material Research Society, 2023 Boston
- European Ph.D. days on Miniaturized Robotics, 2022
- Turkish Robotics Conference, 2018 Istanbul

Professional Activities

Memberships

- IEEE Robotics and Automation Society Membership

Reviewer

- Advanced Science
- IEEE Robotic and Automation Letter (RA-L)
- Scientific Reports
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- International Symposium on Robotics Research (ISRR)

Skills

Language skills

Turkish (native), English (fluent), German (B1 level)

Technical Skills

Robotics/Programming: C++ (over +8 years of experience with real-time robotic applications), python (over +8 year experience), Git, Docker, ROS, robotic simulation (Gazebo, OpenRAVE), leg robotics (ANYmal), mobile robotics (Clearpath), robotic manipulators (Denso), deep learning (PyTorch, libtorch), image processing (OpenCV), controller design, estimator design, robot kinematics/dynamics, magnetic actuation

Medical imaging: MRI and sequence programming (Biospec 70/30 Bruker), ultrasound imaging (Vevo 3100)

Animal Experiments: Felasa B certificate for planning and participating in small animal experiments

Others: 3D design, vibrating-sample magnetometer, finite element analysis (COMSOL), additive manufacturing, micro-fabrication/assembly, two-photon lithography (Nanoscribe), focus ultrasound, radioactive material and x-ray radiation handling (certificated)