

# Yamin Arefeen

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## RESEARCH INTERESTS

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Computational Medical Imaging, Applied Machine Learning, Magnetic Resonance Imaging, Signal Processing, Optimization

## EDUCATION

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### Massachusetts Institute of Technology

Cambridge, MA

Ph.D. in Electrical Engineering and Computer Science

June 2023

Advisors: Elfar Adalsteinsson and Berkin Bilgic

Thesis: Computational Acquisition and Reconstruction Techniques for Applications in Accelerated Magnetic Resonance Imaging

M.S. in Electrical Engineering and Computer Science; GPA: 5.0/5.0

May 2019

Advisor: Elfar Adalsteinsson

Thesis: Acquisition and Reconstruction Techniques for Improving Rapid Magnetic Resonance Imaging

### Rice University

Houston, TX

B.S. in Electrical Engineering; GPA: 4.0/4.33; Magna Cum Laude

May 2017

## RESEARCH EXPERIENCE

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### The University of Texas at Austin | MD Anderson Cancer Center

September 2023 - Present

JCCO Postdoctoral Researcher, Hosts: Jon Tamir and Ken-Pin Hwang

— Improving 3D motion robustness of low-field neonatal MRI by combining 3D motion models and learned generative priors using Diffusion Models [c1, c3, p1, p2].

— Improved imaging in prostate cancer with volumetric multi-contrast, quantitative MRI through combined spin-echo and gradient-echo reconstruction and sequence optimization.

### Massachusetts Institute of Technology | Martinos Center for Biomedical Imaging

September 2017 - June 2023

Graduate Research Assistant

— Optimization of rapid, T2-weighted fetal MRI [c9, c14, c18] with experiments at **Boston Children's Hospital**.

— Scan-Specific machine learning for accelerated neuro-MRI [j5, c15] with experiments at the Martinos Center.

— Learning Latent Signal Models for improved time-resolved MRI [j3, c8].

— Training regularizers with self-supervised learning for time-resolved MRI [j1, c5, c6, c7].

— Auto-differentiation through MRI physics for MRI sequence design with optimization [c4].

— Incoherent spiral trajectories with low-rank priors for accelerated 1H-MRI Spectroscopy with compressed sensing [c13].

### Rice University Senior Design

September 2016 - May 2017

Research Team Member

— Data-driven algorithm to detect irregularities in cardiac signals [c20].

### Schlumberger

May 2016 - August 2016

Software Engineer Intern

— Data-driven algorithm for fracture model comparison

### Rice University Scalable Health Labs

September 2014 - May 2016

Undergraduate Research Assistant, Advisor: Ashutosh Sabhwarwal

— Kalman filtering for improved motion robustness in camera based heart-rate detection.

## TEACHING EXPERIENCE

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### Introduction to Machine Learning: MIT Course 6.036

Fall 2021

Teaching Assistant, Course Instructors: Iddo Drori and Isaac Chuang

### Applied Machine Learning: MIT Course 6.862

Spring 2021

Teaching Assistant, Course Instructor: Iddo Drori

— Mentored 27 machine learning based project teams with one team successfully publishing their work [c12].

### Rice Fundamentals of Electrical Engineering

Fall 2015, Fall 2016

Teaching Assistant, Course Instructor: Don Johnson

### Breakthrough Houston

Summer 2014

— Full-time 7th grade Algebra teacher for underprivileged Houston students.

## RESEARCH MENTORSHIP EXPERIENCE

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<b>Evan Frenklak</b> , PhD student at UT Austin	2023-present
<b>Sidharth Kumar</b> , PhD student at UT Austin	2023-present
<b>Asad Aali</b> , graduate student at UT Austin, (now at Stanford)	2023-2024
<b>Molin Zhang</b> , PhD student at MIT, (now at Apple)	2021-2023
<b>Sebastian Diaz</b> , MIT MSRP, undergraduate student at University of Arizona (now PhD student at MIT HST)	2021-2023

## FUNDING, AWARDS, SERVICE, AND PATENTS

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### Funding:

Awarded the JCCO Postdoctoral Fellowship with collaboration between UT Austin and MD Anderson.	2023 - 2024
Awarded Neuroimaging Training Program NIH Training Grant based on work from [j3, c9]	2022 - 2023
Conceptualized and wrote successfully funded NIH grant R03EB031175, <i>Rapid Fetal HASTE MR Imaging</i> based on publication [c14].	2021- 2023

### Awards:

ISMIRM Magna Cum Laude [c8]	2022
ISMIRM Summa Cum Lauda [c14]	2021
Phi Beta Kappa Honor Society	2017
Texas Society of Professional Engineers Outstanding Senior	2017
Eta Kappa Nu Honor Society	2016
Louise J. Walsh Scholarship	2016
President's Honor Roll (Rice University)	2014 - 2017
Rice ECE Affiliates Day Best Demo	2016
National Merit Scholar	

### Fellowships:

National Science Foundation Graduate Research Fellow	2018 - 2022
Hewlett Packard MIT Graduate Fellowship	2017

### Service:

Session moderator for the International Society of Magnetic Resonance in Medicine, 2024  
Organizer of BART Educational Session at the International Society of Magnetic Resonance in Medicine, 2024  
Reviewer for Magnetic Resonance in Medicine  
Reviewer for IEEE Transactions on Medical Imaging  
Session chair for ISMIRM endorsed Workshop on MRI Acquisition and Reconstruction  
Session chair for the Annual Research Retreat of the Joint Center for Computational Oncology (JCCO)

### Patents:

Provisional patent application submitted for motion-robust, in-NICU neonatal MRI

## PUBLICATIONS

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### Journal Papers

- [j1] Yohan Jun, **Yamin Arefeen**, Jaejin Cho, Shohei Fujita, Xiaoqing Wang, Ellen Grant, Borjan Gagoski, Camilo Jaimes, Michael Gee, Berkin Bilgic. "Zero-DeepSub: Zero-Shot Deep Subspace Reconstruction for Rapid Multiparametric Quantitative MRI Using 3D-QALAS." *Magnetic Resonance in Medicine*, 2024.
- [j2] Asad Aali, Dave Van Veen, **Yamin Arefeen**, Jason Hom, Christian Bluethgen, Eduardo Pontes Reis, Sergios Gatidis, Namun Clifford, Joseph Daws, Arash Tehrani, Jangwoon Kim, Akshay Chaudhari. "A Benchmark of Domain-Adapted Large Language Models for Generating Brief Hospital Course Summaries." *Journal of the American Medical Informatics Association*, 2024.
- [j3] **Yamin Arefeen**, Junshen Xu, Molin Zhang, Zijong Dong, Fuyixue Wang, Jacob White, Berkin Bilgic, Elfar Adalsteinsson. "Latent Signal Models: Learning Compact Representations of Signal Evolution for Improved Time-Resolved, Multi-contrast MRI." *Magnetic Resonance in Medicine*, 2023.
- [j4] Molin Zhang, Nicolas Arango, **Yamin Arefeen**, Georgy Guryev, Jason P Stockmann, Jacob White, Elfar Adalsteinsson. "Stochastic-offset-enhanced restricted slice excitation and 180° refocusing designs with spatially non-linear  $\Delta B_0$  shim array fields." *Magnetic Resonance in Medicine*, 2023.
- [j5] **Yamin Arefeen**, Onur Beker, Jaejin Cho, Heng Yu, Elfar Adalsteinsson, Berkin Bilgic. "Scan-Specific Artifact Reduction in K-space (SPARK) Neural Networks Synergize with Physics-based Reconstruction to Accelerate MRI." *Magnetic Resonance in Medicine*, 2022.

## Preprints

- [p1] **Yamin Arefeen**, Brett Levac, Jonathan Tamir. "Accelerated, Robust Lower-Field Neonatal MRI with Generative Models" arXiv, 2024.
- [p2] Asad Aali, Marius Arvinte, Sidharth Kumar, **Yamin Arefeen**, Jonathan Tamir. "Enhancing Deep Learning-Driven Multi-Coil MRI Reconstruction via Self-Supervised Denoising" arXiv, 2024.

## Conference Proceedings

- [c1] **Yamin Arefeen**, Brett Levac, Zach Stoeber, Jonathan Tamir. "INFusion: Diffusion Regularized Implicit Neural Representations for 2D and 3D accelerated MRI reconstruction." Asilomar Conference on Signals Systems and Computers, 2024. *To appear*.
- [c2] Evan Frenklak, **Yamin Arefeen**, Jonathan Tamir. "Parallel Imaging Reconstruction in Public Datasets Biases Downstream Analysis in Retrospective Sampling Studies." International Society for Magnetic Resonance in Medicine, 2024. *Invited Talk*.
- [c3] Asad Aali, Marius Arvinte, Sidharth Kumar, **Yamin Arefeen**, Jonathan Tamir. "GSURE Denoising enables training of higher quality generative priors for accelerated Multi-Coil MRI Reconstruction." International Society for Magnetic Resonance in Medicine, 2024. *Invited Talk*.
- [c4] **Yamin Arefeen**, Borjan Gagoski, Yohan Jun, Berkin Bilgic, Elfar Adalsteinsson. "Improved T1 and T2 mapping in 3D-QALAS using temporal subspaces and flip angle optimization enabled by auto-differentiation." International Society for Magnetic Resonance in Medicine, Toronto, Canada, 2023. *Invited Talk*.
- [c5] Molin Zhang, Junshen Xu, **Yamin Arefeen**, Elfar Adalsteinsson. "Zero-Shot Self-Supervised Joint Temporal Image and Sensitivity Map Reconstruction via Linear Latent Space." Medical Imaging with Deep Learning, Nashville, Tennessee, 2023.
- [c6] Heng Yu, **Yamin Arefeen**, Berkin Bilgic. "SubZero: Subspace Zero-Shot MRI Reconstruction." International Society for Magnetic Resonance in Medicine, Toronto, Canada, 2023.
- [c7] Yohan Jun, **Yamin Arefeen**, Jaejin Cho, Xiaoqing Wang, Michael Gee, Borjan Gagoski, Berkin Bilgic. "Zero-DeepSub: Zero-Shot Deep Subspace Reconstruction for Multiparametric Quantitative MRI Using QALAS." International Society for Magnetic Resonance in Medicine, Toronto, Canada, 2023.
- [c8] **Yamin Arefeen**, Junshen Xu, Molin Zhang, Jacob White, Berkin Bilgic, Elfar Adalsteinsson. "Learning compact latent representations of signal evolution for improved shuffling reconstruction." International Society for Magnetic Resonance in Medicine, 30th Scientific Meeting, London, 2022. *Invited Talk*.
- [c9] **Yamin Arefeen**, Borjan Gagoski, Berkin Bilgic, Ellen Grant, Elfar Adalsteinsson. "Improved Acquisition Efficiency in T2-weighted Fetal MRI with optimized variable flip angles and prospective wave-encoding." International Society for Magnetic Resonance in Medicine, 30th Scientific Meeting, London, 2022. *Invited Talk*.
- [c10] Sebastian Diaz, **Yamin Arefeen**, Borjan Gagoski, Elfar Adalsteinsson. "Design of Novel RF Pulse for Fetal MRI Refocusing Trains using Rank Factorization (SLfRank) to Reduce SAR and Improve Image Acquisition Efficiency." International Society for Magnetic Resonance in Medicine, 30th Scientific Meeting, London, 2022.
- [c11] Molin Zhang, Junshen Xu, **Yamin Arefeen**, Elfar Adalsteinsson. "Zero-Shot Self-Supervised Learning for 2D T2-shuffling MRI Reconstruction." International Society for Magnetic Resonance in Medicine, 30th Scientific Meeting, London, 2022.
- [c12] Ellen Park, Jae Deok Kim, Nadege Aoki, Yumeng Melody Cao, **Yamin Arefeen**, Matthew Beveridge, David Nicholson, Iddo Drori. "Predicting Critical Biogeochemistry of the Southern Ocean for Climate Monitoring." Tackling Climate Change with Machine Learning Workshop at NeurIPS, 2022.
- [c13] **Yamin Arefeen**, Borjan Gagoski, Elfar Adalsteinsson. "Accelerating 3D 1H-MRSI Using Randomly Undersampled Spatial and Spectral Spirals with Low-rank Subspaces." International Society for Magnetic Resonance in Medicine, 29th Scientific Meeting, Virtual, 2021.
- [c14] **Yamin Arefeen**, Tae Hyung Kim, Justin Haldar, Ellen Grant, Borjan Gagoski, Berkin Bilgic, Elfar Adalsteinsson. "Rapid Fetal HASTE imaging using variable flip angles and simultaneous multislice wave-LORAKS." International Society for Magnetic Resonance in Medicine, 29th Scientific Meeting, Virtual, 2021. *Invited Talk*.
- [c15] **Yamin Arefeen**, Onur Beker, Heng Yu, Elfar Adalsteinsson, Berkin Bilgic. "Extending Scan-Specific Artifact Reduction in K-space (SPARK) to Advanced Encoding and Reconstruction Schemes." International Society for Magnetic Resonance in Medicine, 29th Scientific Meeting, Virtual, 2021.
- [c16] Heng Yu, Zijong Dong, **Yamin Arefeen**, Congyu Liao, Kawin Setsompop, Berkin Bilgic. "eRAKI: Fast Robust Artificial Neural Networks for K-space Interpolation (RAKI) with Coil Combination and Joint Reconstruction." International Society for Magnetic Resonance in Medicine, 29th Scientific Meeting, Virtual, 2021.
- [c17] **Yamin Arefeen**, Borjan Gagoski, Esra Turk, Ellen Grant, Kawin Setsompop, Elfar Adalsteinsson. "Single-shot T2-weighted Fetal MRI with variable flip angles, full k-space sampling, and nonlinear inversion: towards improved SAR and sharpness." International Society for Magnetic Resonance in Medicine, 28th Scientific Meeting, Paris, 2020.

[c18] **Yamin Arefeen**, Fei Han, Borjan Gagoski, Jacob White, Elfar Adalsteinsson. "Improving cartesian single-shot 2D T2 shuffling and reducing radial streaking artifacts with golden angle radial T2 shuffling." International Society for Magnetic Resonance in Medicine, 28th Scientific Meeting, Paris, 2020.

[c19] **Yamin Arefeen**, Nick Arango, Siddharth Iyer, Borjan Gagoski, Kawin Setsompop, Jacob White, Elfar Adalsteinsson. "Refined-subspaces for two iteration single shot T2-Shuffling using dictionary matching." International Society for Magnetic Resonance in Medicine, 27th Scientific Meeting, Montreal, 2019.

[c20] **Yamin Arefeen**, Philip Taffet, Daniel Zdeblick, Jorge Quintero, Greg Harper, Behnaam Aazhang, Joe Cavallaro, Mehdi Razavi, "Real-time Data-driven System to Learn Parameters for Multisite Pacemaker Beat Detection." Asilomar Conference on Signals Systems and Computers, 2017. *Invited Talk*.

## In Preparation

**Yamin Arefeen**, Brett Levac, Bhairav Patel, Chang Ho, Jonathan Tamir. "Diffusion Probabilistic Generative Models for Accelerated, Permanent Magnet Neonatal MRI." *In preparation for Magnetic Resonance in Medicine*, 2024.

**Yamin Arefeen**, Ken-Pin Hwang, Tharakeswara Bathala, Jonathan Tamir. "A Shuffling Acquisition for Single-scan, Multi-contrast, Volumetric MRI for Prostate Cancer." *In preparation for Journal of Magnetic Resonance Imaging*, 2024.

Sidharth Kumar, **Yamin Arefeen**, Hamidreza Saber, Jonathan Tamir. "Accelerating MRI for Stroke Patients with Generative Models." *In preparation for Magnetic Resonance in Medicine*, 2024.

## SKILLS AND CITIZENSHIP

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**Languages:** Python, Matlab, Mathematica, C

**Software:** PyTorch, Latex

**Citizenship:** US