Yamin Arefeen

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Research Interests

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

Education

Massachusetts Institute of Technology Cambridge, MA

Ph.D. in Electrical Engineering and Computer Science *June 2019 - 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

University of Texas at Austin | MD Anderson Cancer Center *September 2023 - Present*

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

— 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 [10], [15], [18] with experiments at **Boston Children's Hospital**.
— Scan-Specific machine learning for accelerated neuro-MRI [3], [16] with experiments at the Martinos Center.
— Latent signal modeling for improved time-resolved MRI [1], [9].
— Training regularizors with self-supervised learning for time-resolved MRI [4], [6], [7], [8].
— Auto-differentiation through MRI physics for MRI sequence design with optimization [2], [5].
— Incoherent spiral trajectories with low-rank priors for accelerated 1H-MRI Spectroscopy with compressed sensing [14].

Rice University Senior Design *September 2016 - May 2017*

Research Team Member

— Data-driven algorithm to detect irregularities in cardiac signals [21].

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

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 [13].

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.

Funding, Service, and Awards

Funding:

Awarded Neuroimaging Training Program NIH Training Grant based on work from [1], [10]. 2022 - 2023

Conceptualized and wrote successfully funded NIH grant R03EB031175, *Rapid Fetal HASTE MR Imaging* based on publication [15]. 2021- 2023

Service:

Reviewer for Magnetic Resonance in Medicine

Session chair for ISMRM endorsed Workshop on MRI Acquisition and Reconstruction

Awards:

ISMRM Magna Cum Laude [9]	2022
ISMRM Summa Cum Lauda [15]	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

Journal Papers

[1] **Yamin Arefeen**, Junshen Xu, Molin Zhang, Zijing 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.

[2] 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 ΔB_0 shim array fields" Magnetic Resonance in Medicine, 2023.

[3] **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

[4] Yohan Jun, **Yamin Arefeen**, Jaejin Cho, Shohei Fujita, Xiaoqing Wang, P. Ellen Grant, Borjan Gagoski, Camilo Jaimes, Michael S. Gee, Berkin Bilgic. "Zero-DeepSub: Zero-Shot Deep Subspace Reconstruction for Rapid Multiparametric Quantitative MRI Using 3D-QALAS", arXiv, 2023. (in review for Magnetic Resonance in Medicine)

Conference Proceedings

[5] **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*.

[6] 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.

[7] Heng Yu, **Yamin Arefeen**, Berkin Bilgic. "SubZero: Subspace Zero-Shot MRI Reconstruction" International Society for Magnetic Resonance in Medicine, Toronto, Canada, 2023.

[8] 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.

[9] **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*.

[10] **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*.

[11] 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.

[12] 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.

[13] 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.

[14] **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.

[15] **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*.

[16] **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.

[17] Heng Yu, Zijing 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.

[18] **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.

[19] **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.

[20] **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.

[21] **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*.

Skills and Citizenship

Languages: Python, Matlab, Mathematica, C **Software**: PyTorch, Latex **Citizenship**: US