Ziwei Zhao

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EDUCATION

University of Southern California, Los Angeles **Expected: May 2024**
Viterbi School of Engineering
Doctor of Philosophy in Electronic and Computer Engineering, GPA 3.93/4.0
- Advisor: Krishna S. Nayak, Ph.D.

University of Southern California, Los Angeles **May 2019**
Viterbi School of Engineering
Master of Science in Electronic Engineering, GPA 3.93/4.0
- Advisor: Lirong Yan, Ph.D.

Xian Jiaotong University, Xian **June 2017**
Bachelor of Science in Biomedical Engineering, GPA 3.4/4.0 (84.8/100), Major GPA 3.8/4.0 (87/100)

EMPLOYMENT

Research Assistant, Magnetic Resonance Engineering Lab **August 2019 - now**
USC Ming Hsieh Department of Electrical and Computer Engineering
University of Southern California (USC), Los Angeles, CA, USA

Graduate Research Intern, Computational Science Team **May 2023 - August 2023**
Q Bio Inc, Redwood City, CA, USA

Research Assistant, Laboratory of Functional MRI (LOFT) Technology **March 2018 - June 2019**
USC Mark and Mary Stevens Neuroimaging and Informatics Institute
University of Southern California (USC), Los Angeles, CA, USA

Summer Research Intern, R&D and Engineering Department **June 2016 - August 2016**
Alltech Medical Systems LLC., Chengdu, China

RESEARCH EXPERIENCE

Graduate Research Assistant
Magnetic Resonance Engineering Lab, Dynamic Imaging Science Center (DISC)
Signal Analysis and Interpretation Lab, Speech Production and Articulation kNowledge (SPAN) group, USC

3D Volumetric Imaging and Reconstruction
Improved 3D Real-Time MRI for Speech Production
- Main developer of MR acquisition in a cross-functional team of linguists, audio engineers, and MRI scientists.
- Achieved a 3D real-time imaging for speech production; enabled visualizing moving vocal organs during natural speech at 14 fps (13× acceleration).
- Invented a novel MR sequence and reconstruction pipeline based on MR hardware limits and an inherent tradeoff among spatial coverage and temporal resolution.
- Interview featured in MRM Highlight: https://blog.ismrm.org/2021/07/01/qa-with-ziwei-zhao-yongwan-lim-and-krishna-s-nayak/

Image Processing and Analysis
Regional Lung Ventilation Mapping at 0.55T
- Identified the importance of functional ventilation in the clinic, with the leverages of the new tissue contrasts at low field.
- Developed a feature tracking pipeline that extracts the regional ventilation changes from real-time image series based on data-driven algorithm for segmentation, salient point extraction and matching, and landmark-based registration.

RF Pulse Designs and Optimization
Lung Perfusion at 0.55T using Arterial Spin Labeling (ASL)
- Initiated and lead project for quantitatively pulmonary blood flow mapping at low field MR scanner.
- Prototyped in a combination of hardware and software developments.
- Developed and optimized a novel ASL sequence with a quantification model that provides sufficient signal-to-noise ratio, and reliable measurements.

RF Pulse Designs for Velocity-Selective (VS) MR Angiography at Low Field Strengths

- Built a VS pulse design and simulation tool with the consideration of B_0/B_1^+ inhomogeneity and gradient imperfection.

<u>**System Imperfection Correction**</u>

Multidimensional RF Pulse Design with known Gradient System Imperfections

- Invented a new RF pulse design procedure that incorporates concomitant field effects, reduced more than 50% excitation error under several scenarios.

Graduate Research Assistant **March 2018 - June 2019**

Laboratory of Functional MRI (LOFT) Technology Lab,
USC Mark and Mary Stevens Neuroimaging and Informatics Institute, USC

<u>**Image Reconstruction and Analysis**</u>

Direct reconstruction of arterial blood flow (aBF) from non-contrast enhanced dynamic 4D MR angiography

- Proposed a direct reconstruction framework and solved a nonconvex optimization problem of arterial blood flow (aBF) from undersampled radial K-t space data, which mitigated streaking artifacts induced by image-based reconstruction.

Quantification of cerebrovascular hemodynamics using non-contrast enhanced 4-dimensional dynamic MR angiography

- Proposed a robust analytical solution for quantifying aBF in NCE-dMRA, which provided reliable aBF measures, as compared to golden-standard truncated-SVD method.
- Improved the method using radial acquisition combining compressed sensing reconstruction which provides higher SNR.

TEACHING EXPERIENCE

Teaching assistant for EE483: Digital Signal Processing (Fall 2021, Spring 2022)

- Prepare and design homework and solutions; hold weekly office hours; communicate with students.

PUBLICATIONS

[1] **Z Zhao**, NG Lee, KS Nayak. "Multidimensional RF Pulse Design with Consideration of Concomitant Field Effects." Under revision.

[2] **Z Zhao**, Y Yang, Y Tian, RM Kato, SX. Cui, C.-C. J Kuo, KS Nayak. "Regional Lung Ventilation Mapping at 0.55T Tesla Based on Feature Tracking." In preparation.

[3] **Z Zhao**, Y Lim, D Byrd, S Narayanan, and KS Nayak. "Improved 3D real-time MRI of speech production." Magn Reson Med. 2021;00:1–14. https://doi.org/10.1002/mrm.28651. **The June 2021 MRM Highlights Pick**

[4] Y Tian, SX. Cui, Y Lim, NG Lim, **Z Zhao**, KS Nayak. "Contemporary 0.55T MRI supports contrast-optimal SMS bSSFP cine cardiac imaging." Magn Reson Med. 2022;1-10. http://doi.org/10.1002/mrm.29472.

[5] Y Tian, Y Lim, **Z Zhao**, D Byrd, SS Narayanan, KS Nayak. "Aliasing Artifact Reduction in Spiral Real-Time MRI. Magnetic Resonance in Medicine." 86(2):916-925, August 2021. http://doi.org/10.1002/mrm.28746.

[6] X Shao, **Z Zhao**, DJJ Wang and L Yan. "Quantification of cerebrovascular hemodynamics using non-contrast enhanced four- dimensional dynamic magnetic resonance angiography." Magn Reson Med. 2019;82:449–459. https://doi.org/10.1002/mrm.27712.

ABSTRACTS

[1] Y Tian, NG Lee, **Z Zhao**, KS Nayak. "Rapid 3D lung imaging with bSSFP stack-of-spiral out-in (SoSoi) sampling at 0.55T." Proc. ISMRM 31th Scientific Session, Toronto, Canada, May 2023. (Oral presentation)

[2] **Z Zhao**, NG Lee, SX Cui and KS Nayak. "Lung perfusion at 0.55T using ASL: Feasibility and Initial Results." Proc. ISMRM 30th Scientific Session, London, May 2022. (Oral presentation)

[3] Y Yang, **Z Zhao**, Y Tian, RM Kato, SX Cui, C-C J Kuo and KS Nayak. "Regional lung ventilation mapping at 0.55T based on feature tracking." Proc. ISMRM 30th Scientific Session, London, May 2022. (Digital poster)

[4] NG Lee, K Keskin, **Z Zhao** and KS Nayak. "Higher-order image reconstruction with integrated gradient nonlinearity correction using a low-rank encoding operator." Proc. ISMRM 30th Scientific Session, London, May 2022. (Digital poster)

[5] Y Tian, SX Cui, Y Lim, NG Lee, **Z Zhao** and KS Nayak. "High-performance 0.55T supports contrast-optimal SMS bSSFP cardiac imaging." Proc. ISMRM 30th Scientific Session, London, May 2022. (Digital poster)

[6] **Z Zhao**, NG Lee and KS Nayak. "RF Pulse Designs for Velocity-Selective MRA at Low Field Strengths." Proc. ISMRM 29th Scientific Session, online, May 2021, p3961. (Digital posters)

[7] **Z Zhao**, NG Lee and KS Nayak. "Multidimensional RF pulse design with known Gradient System Imperfections." Proc. ISMRM 29th Scientific Session, online, May 2021, p3954. (Digital posters)

[8] Y Tian, Y Lim, **Z Zhao**, D Byrd, S Narayanan and KS Nayak. "Aliasing artifact reduction in spiral real-time MRI." Proc. ISMRM 29th Scientific Session, online, May 2021, p3522. (Digital posters)

[9] **Z Zhao**, Y Lim, D Byrd, SS Narayanan, and KS Nayak. "Improved 3D Real-Time MRI With Stack-of-Spiral (SOSP) Trajectory & Variable Density Randomized Encoding of Speech Production." Proc. ISMRM 28th Scientific Session, online, May 2020, p0614. (Oral presentation) **Magna Cum Laude Merit Award**
[10] **Z Zhao**, Y Lim, D Byrd, SS Narayanan, and KS Nayak. "Improved 3D Real-Time MRI With Stack-of-Spiral (SOSP) Trajectory & Variable Density Randomized Encoding of Speech Production." ISMRM Workshop on Data Sampling and Image Reconstruction, Sedona, Arizona, January 2020. (Oral presentation)
[11] **Z Zhao**, K Wang, DJJ Wang and L Yan. "Direct reconstruction of arterial blood flow (aBF) from undersampled golden-angle radial non-contrast enhanced dynamic 4D MR angiography," Proc. ISMRM 27th Scientific Session, Montreal, May 2019, p2722. (Digital poster)

HONORS & AWARDS

ISMRM Perfusion Workshop Student Stipend.	**2022**
ISMRM 3rd Data Sampling and Reconstruction Workshop Student Stipend.	**2019**
Phi Kappa Phi fellow.	**2019**
MS Honors Program Student (top 5%).	**2019**
ISMRM Educational Stipend Award.	**2019**
GSG Travel Grant, Graduate Student Government, USC.	**2019**
Outstanding undergraduate graduation thesis (top 10%).	**2017**
Second National Internet Innovation Entrepreneurship Competition, Silver Prize (top 15%).	**2016**
Academic Excellence Scholarship (merit-based, 15% acceptance rate).	**2014 - 2016**
Excellent Student Leader (merit-based, top 2%).	**2014**

OTHER EXPERIENCE

Reviewer of Nature Scientific Reports
Reviewer of ISMRM annual conference

SKILLS

MATLAB, C++, Python, Bash, BART Reconstruction Toolbox, Siemen IDEA Programming, TensorFlow, LATEX.