

Zhijie Dong

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RESEARCH INTERESTS Ultrafast 3D Ultrasound Imaging, Deep Learning in Ultrasound, Signal & Image Processing

EDUCATION **University of Illinois Urbana-Champaign, Urbana, IL** Expected June 2023
Ph.D. candidate in Electrical and Computer Engineering
Advisor: Prof. Pengfei Song
"Innovations in Three-dimensional Ultrafast Ultrasound Imaging"
Sub Field: Biomedical Imaging & Signal Processing
GPA: 4.0/4.0

University of Michigan, Ann Arbor, MI Aug 2017 - Dec 2018
M.S. in Electrical and Computer Engineering
Sub Field: Signal & Image Processing and Machine Learning
GPA: 4.0/4.0

Southeast University, Nanjing, China Aug 2013 - June 2017
B.Eng. in Information Engineering
Honor Student in Chien-Shiung Wu College
GPA: 3.7/4.0

RESEARCH & PROJECTS **Ultrafast 3D Ultrasound Imaging Using Fast-tilting and Redirecting Reflectors** May 2019 - Present
Advisor: Prof. Pengfei Song, University of Illinois Urbana-Champaign
Collaborations with Texas A&M University

- Proposed a new 3D ultrasound imaging technique: Fast Acoustic Steering via Tilting Electromechanical Reflectors (FASTER). The FASTER 3D imaging achieved high volume rates with conventional 1D array transducers, which could make 3D ultrasound imaging to be a possibility wherever 2D ultrasound imaging is used [[Press Coverage](#)] ;
- Apply FASTER 3D imaging in different imaging modalities such as shear wave imaging and ultrasound microvessel imaging.

Ultrafast 3D Ultrasound Imaging Using 2D Row-Column Addressing (RCA) Arrays Dec 2019 - Present
Advisor: Prof. Pengfei Song, University of Illinois Urbana-Champaign
Collaborations with Mayo Clinic

- Achieved high volume-rate 3D imaging with comparable imaging quality using RCA arrays;
- Proposed multiple advanced 3-D ultrasound modes with RCA arrays including 3-D shear wave elastography and 3-D super-resolution ultrasound localization microscopy;
- Developed a deep learning-based 3D adaptive beamforming method to improve spatial resolution and image contrast.

Deep Learning-based Phase Aberration Correction Jan 2022 - Present
Advisor: Prof. Pengfei Song, University of Illinois Urbana-Champaign
Collaborations with Prof. Mark Anastasio

- Proposed a deep learning-based phase aberration correction algorithm that directly operates on the pre-beamformed, raw channel data;
- Achieved beamformed image correction with improved beam width as well as localization error for super-resolution ultrasound localization microscopy application.

X. Chen, M. R. Lowerison, **Z. Dong**, N. V. C. Sekaran, D. A. Llano, and P. Song, “Localization free super-resolution microbubble velocimetry using a long short-term memory neural network,” *IEEE Transactions on Medical Imaging*, pp. 1–1, 2023. DOI: [10.1109/TMI.2023.3251197](https://doi.org/10.1109/TMI.2023.3251197).

Z. Dong, S. Li, X. Duan, M. R. Lowerison, Q. You, S. Chen, J. Zou, and P. Song, “High volume rate 3-d ultrasound imaging using fast-tilting and redirecting reflectors,” *Under Submission*, 2023.

Z. Dong, U.-W. Lok, M. R. Lowerison, C. Huang, S. Chen, and P. Song, “Three-dimensional shear wave elastography using radiation force and a row-column addressing (rca) array,” *Under Submission*, 2023.

X. Chen, M. R. Lowerison, **Z. Dong**, A. Han, and P. Song, “Deep learning-based microbubble localization for ultrasound localization microscopy,” *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*, vol. 69, no. 4, pp. 1312–1325, 2022. DOI: [10.1109/TUFFC.2022.3152225](https://doi.org/10.1109/TUFFC.2022.3152225).

Z. Dong, J. Kim, C. Huang, M. R. Lowerison, U.-W. Lok, S. Chen, and P. Song, “Three-dimensional shear wave elastography using a 2d row column addressing (rca) array,” *BME Frontiers*, vol. 2022, 2022. DOI: [10.1101/2021.11.10.467798](https://doi.org/10.1101/2021.11.10.467798).

J. Kim, M. R. Lowerison, N. V. C. Sekaran, Z. Kou, **Z. Dong**, M. L. Oelze, D. A. Llano, and P. Song, “Improved ultrasound localization microscopy based on microbubble uncoupling via transmit excitation,” *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*, vol. 69, no. 3, pp. 1041–1052, 2022. DOI: [10.1101/2021.10.05.463265](https://doi.org/10.1101/2021.10.05.463265).

Z. Kou, Q. You, J. Kim, **Z. Dong**, M. R. Lowerison, N. V. C. Sekaran, D. A. Llano, P. Song, and M. L. Oelze, “Towards a real-time continuous ultrafast ultrasound beamformer with programmable logic,” *arXiv preprint arXiv:2208.03429*, 2022. DOI: [10.48550/arXiv.2208.03429](https://doi.org/10.48550/arXiv.2208.03429).

M. Lowerison, N. V. C. Sekaran, **Z. Dong**, X. Chen, Q. You, D. A. Llano, and P. Song, “Super-resolution ultrasound imaging of cerebrovascular impairment in a mouse model of alzheimer’s disease,” *bioRxiv*, pp. 2022–10, 2022. DOI: [10.1101/2022.10.05.511008](https://doi.org/10.1101/2022.10.05.511008).

M. R. Lowerison, N. V. C. Sekaran, W. Zhang, **Z. Dong**, X. Chen, D. A. Llano, and P. Song, “Aging-related cerebral microvascular changes visualized using ultrasound localization microscopy in the living mouse,” *Scientific reports*, vol. 12, no. 1, pp. 1–11, 2022. DOI: [10.1101/2021.06.04.447141](https://doi.org/10.1101/2021.06.04.447141).

Q. You, M. Lowerison, Y. Shin, X. Chen, N. V. Chandra Sekaran, **Z. Dong**, D. A. Llano, M. A. Anastasio, and P. Song, “Contrast-free super-resolution doppler (cs doppler) based on deep generative neural networks,” *bioRxiv*, pp. 2022–09, 2022. DOI: [10.1101/2022.09.29.510188](https://doi.org/10.1101/2022.09.29.510188).

Q. You, J. D. Trzasko, M. R. Lowerison, X. Chen, **Z. Dong**, N. V. ChandraSekaran, D. A. Llano, S. Chen, and P. Song, “Curvelet transform-based sparsity promoting algorithm for fast ultrasound localization microscopy,” *IEEE transactions on medical imaging*, vol. 41, no. 9, pp. 2385–2398, 2022. DOI: [10.1109/TMI.2022.3162839](https://doi.org/10.1109/TMI.2022.3162839).

Q. You, **Z. Dong**, M. R. Lowerison, and P. Song, “Pixel-oriented adaptive apodization for plane-wave imaging based on recovery of the complete dataset,” *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*, vol. 69, no. 2, pp. 512–522, 2021. DOI: [10.1109/TUFFC.2021.3124821](https://doi.org/10.1109/TUFFC.2021.3124821).

W. Zhang, M. R. Lowerison, **Z. Dong**, R. J. Miller, K. A. Keller, and P. Song, “Super-resolution ultrasound localization microscopy on a rabbit liver vx2 tumor model: An initial feasibility study,” *Ultrasound in medicine & biology*, vol. 47, no. 8, pp. 2416–2429, 2021. DOI: [10.1016/j.ultrasmedbio.2021.04.012](https://doi.org/10.1016/j.ultrasmedbio.2021.04.012).

Z. Dong, S. Li, M. R. Lowerison, J. Pan, J. Zou, and P. Song, “Fast acoustic steering via tilting electromechanical reflectors (faster): A novel method for high volume rate 3-d ultrasound imaging,” *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*, vol. 68, no. 3, pp. 675–687, 2020. DOI: [10.1109/TUFFC.2020.3020871](https://doi.org/10.1109/TUFFC.2020.3020871).

CONFERENCE PROCEEDINGS

J. Kim, **Z. Dong**, M. R. Lowerison, N. V. C. Sekaran, Q. You, D. A. Llano, and P. Song, “Deep learning-based 3d beamforming on a 2d row column addressing (rca) array for 3d super-resolution ultrasound localization microscopy,” in *2022 IEEE International Ultrasonics Symposium (IUS)*, IEEE, 2022, pp. 1–4. DOI: [10.1109/IUS54386.2022.9958375](https://doi.org/10.1109/IUS54386.2022.9958375).

Z. Dong, S. Li, M. R. Lowerison, J. Zou, and P. Song, “High volume rate 3d ultrasound imaging using fast-tilting reflectors,” in *2020 IEEE International Ultrasonics Symposium (IUS)*, IEEE, 2020, pp. 1–4. DOI: [10.1109/IUS46767.2020.9251559](https://doi.org/10.1109/IUS46767.2020.9251559).

Z. Dong, J. Shi, W. Wang, and X. Gao, “Machine learning based link adaptation method for mimo system,” in *2018 IEEE 29th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC)*, IEEE, 2018, pp. 1226–1231. DOI: [10.1109/pimrc.2018.8580924](https://doi.org/10.1109/pimrc.2018.8580924).

CONFERENCE ABSTRACTS

Z. Dong, K. Jihun, M. R. Lowerison, U.-W. Lok, S. Chen, and P. Song, “Deep-learning based 3d adaptive beamforming using a 2d row-column addressing (rca) array,” *Annual Integrative Ultrasound Meeting, San Diego, CA*, 2022.

Z. Dong, Y. Shin, X. Chen, Q. You, M. R. Lowerison, M. Anastasio, and P. Song, “Raw channel data-based phase aberration correction for ultrasound localization microscopy using conditional generative adversarial networks,” *The Journal of the Acoustical Society of America*, vol. 152, no. 4, A113–A113, 2022. DOI: [10.1121/10.0015723](https://doi.org/10.1121/10.0015723).

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| | Z. Dong , C. Huang, S. Chen, and P. Song, “3d shear wave elastography using a 2d row-column addressing (rca) array and external vibration,” <i>IEEE International Ultrasonics Symposium, Xi’an, China</i> , 2021. |
| | Z. Dong , S. Li, M. R. Lowerison, J. Cario, J. Zou, and P. Song, “High volume rate 3d ultrasound imaging using fast-tilting and redirecting reflectors,” <i>IEEE International Ultrasonics Symposium, Xi’an, China</i> , 2021. |
| PATENT | P. Song, Z. Dong , M. R. Lowerison, J. Zou, and S. Li, <i>Systems and methods for fast acoustic steering via tilting electromechanical reflectors</i> , US Patent App. 17/237,011, Oct. 2021. |
| TALK | <i>High volume rate 3D ultrasound imaging techniques</i> , Graduate Student Seminar, Beckman Institute, Urbana, IL, 2021. |
| TEACHING EXPERIENCE | Teaching Assistant, Advanced Topics in Biomedical Ultrasound Imaging (ECE 598PS) University of Illinois Urbana-Champaign Spring 2023 |
| SERVICE | Reviewer Ultrasonics, Ultrasound in Medicine & Biology Spring 2023 |
| AWARDS & SCHOLARSHIPS | Knight Fellowship in Electrical and Computer Engineering for 2022-2023 May 2022 Spring 2022 conference travel award Mar 2022 Merit Student in Southeast University Nov 2015 & 2016 Meritorious Winner in Interdisciplinary Contest in Modeling Apr 2016 President Scholarship, top 1%, Southeast University Nov 2015 The First Prize of the tenth Freescale Cup Intelligent Car Contest East China Region Aug 2015 Zhiwei Zhang Scholarship, top 1%, Southeast University June 2015 |
| SKILLS & LANGUAGES | High-level languages: Python, C/C++, Julia Algorithm development: MATLAB Libraries Toolkit: TensorFlow, Pytorch Hardware description language: Verilog HDL Others: Linux, git Languages: native in Chinese (Mandarin), fluent in English |