Zhijie Dong

CONTACT INFORMATION

4031 Beckman Institute
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Urbana, IL 61801

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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 May 2019 - June 2023
Ph.D. in Electrical and Computer Engineering
Advisor: Prof. Pengfei Song
Thesis: *"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

Three-Dimensional Ultrafast 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];
- FASTER technique provides a low-cost, user-friendly, accessible, and functional solution for realizing high volume-rate, multimodal 3D ultrasound imaging [Journal Cover of IEEE TUFFC].

Three-Dimensional Ultrafast 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

- Proposed multiple advanced 3D ultrasound modes with RCA arrays, including 3D shear wave elastography and 3D super-resolution ultrasound localization microscopy;
- Developed a deep learning-based 3D adaptive beamforming method to improve spatial resolution and imaging 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 reduced localization error for super-resolution ultrasound localization microscopy application.

JOURNAL PAPERS

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.

Z. Dong, S. Li, X. Duan, M. R. Lowerison, C. Huang, Q. You, S. Chen, J. Zou, and P. Song, "High-Volume-Rate 3-D Ultrasound Imaging Using Fast-Tilting and Redirecting Reflectors," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 70, no. 8, pp. 799–809, 2023. DOI: 10.1109/TUFFC.2023.3282949.

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," *bioRxiv*, 2023. DOI: 10.1101/2023.05.18.541365.

Z. Kou, Q. You, J. Kim, **Z. Dong**, M. R. Lowerison, N. V. C. Sekaran, D. A. Llano, P. Song, and M. L. Oelze, "High-level synthesis design of scalable ultrafast ultrasound beamformer with single fpga," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 17, no. 3, pp. 446–457, 2023. DOI: 10.1109/TBCAS.2023.3267614.

Y. Shin, M. Lowerison, Y. Wang, X. Chen, Q. You, **Z. Dong**, M. A. Anastasio, and P. Song, "Context-Aware Deep Learning Enables High-Efficacy Localization of High Concentration Microbubbles for Super-Resolution Ultrasound Localization Microscopy," *bioRxiv*, pp. 2023–04, 2023. DOI: 10.1101/2023.04.21.536599.

Y. Tang, **Z. Dong**, N. Wang, A. del Aguila, N. Johnston, T. Vu, C. Ma, Y. Xu, W. Yang, P. Song, *et al.*, "Non-invasive Deep-Brain Imaging with 3D Integrated Photoacoustic Tomography and Ultrasound Localization Microscopy (3D-PAULM)," *arXiv preprint arXiv:2307.14572*, 2023. DOI: 10.48550/arXiv.2307.14572.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

CONFERENCE ABSTRACTS

Z. Dong, S. Li, X. Duan, M. R. Lowerison, C. Huang, Q. You, S. Chen, J. Zou, and P. Song, "Development of a Probe Clip-On Device for Multimodal 3D Ultrasound Imaging with High Volume Rate," *IEEE International Ultrasonics Symposium, Montreal, Canada*, 2023.

Z. Dong, U.-W. Lok, M. R. Lowerison, C. Huang, S. Chen, and P. Song, "Three-dimensional Shear Wave Elastography Using Acoustic Radiation Force and a 2D Row-Column Addressing (RCA) Array," *IEEE International Ultrasonics Symposium, Montreal, Canada*, 2023.

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.

Z. Dong, C. Huang, S. Chen, and P. Song, "3D Shear Wave Elastography Using a 2D Row-Column Addressing (RCA) Array and External Vibration," *IEEE International Ultrasonics Symposium, Xi'an, China*, 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," *IEEE International Ultrasonics Symposium, Xi'an, China*, 2021.

PATENT

P. Song, **Z. Dong**, M. R. Lowerison, J. Zou, and S. Li, *Systems and methods for fast acoustic steering via tilting electromechanical reflectors*, US Patent App. 17/237,011, Oct. 2021.

TALK

High volume rate 3D ultrasound imaging techniques, 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, IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control

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