

Shuying Li

1 Brookings Drive
Whitaker Hall 160
St. Louis, MO 63110

✉ lishuying@wustl.edu
☎ 734-239-0168
🌐 shy-li.github.io

EDUCATION

Department of Biomedical Engineering, Washington University in St. Louis Ph.D., Biomedical Engineering	St. Louis, US 05.2023(expected)
Department of Mechanical Engineering, University of Michigan MS, Mechanical Engineering	Ann Arbor, US 04.2018
College of Energy Engineering, Zhejiang University BS, Energy & Environmental Systems Engineering (<i>Outstanding graduates of Zhejiang</i>)	Hangzhou, China 06.2016

RESEARCH EXPERIENCES

Research Interests:

Biomedical Imaging, Computer-aided Diagnosis, Image Processing, Deep Learning

Optical and Ultrasound Imaging Lab

Advisor: Quing Zhu

2018-present	Ultrasound (US)-guided Diffuse Optical Tomography (DOT) for Breast Cancer Imaging
<u>Thesis project</u>	<u>Tools:</u> MATLAB, Python, PyTorch, TensorFlow, scikit-learn <ul style="list-style-type: none">Developed a projection-based outlier removal algorithm and a connect component analysis-based artifact removal algorithm guided with ultrasound segmentation to reduce image artifacts.Designed a multilayer-perceptron (MLP) to generate data for DOT difference imaging to simplify the data acquisition and mitigate mismatch errors.Designed a convolutional autoencoder to extract features from DOT measurements and a Random Forest classifier for real-time breast lesion classification without DOT reconstruction.Developed a two-stage, deep learning-based scheme to classify breast lesions with DOT and US.Involved in developing a CNN to estimate breast tissue optical properties using DOT.Involved in developing a neural network with physical constraints for DOT image reconstruction.
2018-present	Optical Coherence Tomography (OCT) for Colorectal & Ovarian Cancer Diagnosis
	<u>Tools:</u> MATLAB, Python, PyTorch, TensorFlow, Keras, scikit-learn <ul style="list-style-type: none">Calculated statistical features of depth-resolved attenuation maps from OCT images for ovarian cancer diagnosis.Designed a customized ResNet to classify OCT colorectal images and achieved an AUC of 0.97.(Ongoing) Applied weakly-supervised learning to classify OCT images of colorectal polyps.Involved in developing an object detection RetinaNet for colorectal cancer diagnosis.
2018-2020	Spatial Frequency Domain Imaging (SFDI) for Colorectal Tissue Assessment
	<ul style="list-style-type: none">Designed an AdaBoost algorithm for SFDI colorectal image classification.

Optical Imaging Laboratory

Advisor: Xueding Wang, Xinmai Yang

2017-2018	Image-guided Photo-mediated Ultrasound Therapy
	<ul style="list-style-type: none">Simultaneously applied laser and ultrasound treat neovascularization in rabbit eyes guided by OCT & photoacoustic microscopy (PAM).Simulated bubble dynamics under simultaneous laser & ultrasound and validated the simulations with experiments on tubes filled with blood. (<u>Tool:</u> MATLAB)

PUBLICATIONS

First & Co-first Authored

- 2022 • Zhang, M. †, **Li, S. †**, Xue, M., & Zhu, Q. A two-step classification scheme for breast lesion diagnosis using ultrasound-guided diffuse optical tomography and deep learning. (Ready to submit)
- **Li, S. †**, Luo, H. †, Kou, S., Hagemann, I., & Zhu, Q. Depth-resolved attenuation mapping of human ovary and fallopian tube using optical coherence tomography. (Under review at *Journal of Biophotonics*)
 - **Li, S.**, Zhang, M., Xue, M., & Zhu, Q. (2022). Difference imaging from single measurements in diffuse optical tomography: A deep learning approach. *Journal of Biomedical Optics*, 27(8), 086003. **(Promoted on the SPIE WeChat account)**
 - Luo, H. †, **Li, S. †**, Zeng, Y. †, ..., Zhu, Q. (2022). Human colorectal cancer tissue assessment using optical coherence tomography catheter and deep learning. *Journal of Biophotonics*, e202100349. **(Inside cover)**
- 2021 • **Li, S.**, Zhang, M., & Zhu, Q. (2021). Ultrasound segmentation-guided edge artifact reduction in diffuse optical tomography using connected component analysis. *Biomedical Optics Express*, 12(8), 5320-5336.
- **Li, S.**, Huang, K., Zhang, M., Uddin, K. S., & Zhu, Q. (2021). Effect and correction of optode coupling errors in breast imaging using diffuse optical tomography. *Biomedical Optics Express*, 12(2), 689-704. **(Most downloaded papers)**
- 2020 • **Li, S. †**, Zeng, Y. †, Chapman Jr, W. C. †, Erfanzadeh, M., Nandy, S., Mutch, M., & Zhu, Q. (2020). Adaptive Boosting (AdaBoost)-based multiwavelength spatial frequency domain imaging and characterization for ex vivo human colorectal tissue assessment. *Journal of Biophotonics*, 13(6), e201960241. **(Inside cover)**
- 2018 • **Li, S. †**, Qin, Y. †, Wang, X., & Yang, X. (2018). Bubble growth in cylindrically-shaped optical absorbers during photo-mediated ultrasound therapy. *Physics in Medicine & Biology*, 63(12), 125017.

Other selected

- 2022 • Luo, H., **Li, S.**, Kou, S., Lin, Y., Hagemann, I., & Zhu, Q. Enhanced 3D Visualization of Human Fallopian Tube Morphology Using a Miniature Optical Coherence Tomography Catheter. (Ready to submit)
- Zhang, M., Xue, M., **Li, S.**, Zou, Y., & Zhu, Q. A Fusion Deep Learning Approach Combining Diffuse Optical Tomography and Ultrasound for Improving Breast Cancer Classification. *Biomedical Optics Express* (Accepted)
- 2021 • Zhang, M., **Li, S.**, Zou, Y., & Zhu, Q. (2021). Deep learning-based method to accurately estimate breast tissue optical properties in the presence of the chest wall. *Journal of Biomedical Optics*, 26(10), 106004.
- Zou, Y., Zeng, Y., **Li, S.**, & Zhu, Q. (2021). Machine learning model with physical constraints for diffuse optical tomography. *Biomedical Optics Express*, 12(9), 5720-5735. **(Most downloaded papers)**
 - Zeng, Y., Chapman Jr, W. C., Lin, Y., **Li, S.**, Mutch, M., & Zhu, Q. (2021). Diagnosing colorectal abnormalities using scattering coefficient maps acquired from optical coherence tomography. *Journal of Biophotonics*, 14(1), e202000276. **(Inside Cover)**
- 2020 • Zhang, M., Uddin, K. S., **Li, S.**, & Zhu, Q. (2020). Target depth-regularized reconstruction in diffuse optical tomography using ultrasound segmentation as prior information. *Biomedical Optics Express*, 11(6), 3331-3345.
- Zeng, Y., Xu, S., Chapman, J. W., **Li, S.**, Alipour, Z., Abdelal, H., ... & Zhu, Q. (2020). Real-time colorectal cancer diagnosis using PR-OCT with deep learning. *Theranostics*, 10(6), 2587-2596.
 - Zeng, Y., Nandy, S., Rao, B., **Li, S.**, Hagemann, A. R., Kuroki, L. K., ... & Zhu, Q. (2019). Histogram analysis of en face scattering coefficient map predicts malignancy in human ovarian tissue. *Journal of Biophotonics*, 12(11), e201900115.

AWARDS & HONORS

- 2022 Student Paper Award finalist, Optica Biophotonics Congress 2022 (top 4)
PhD Outstanding Research Awards (3 out of WashU BME PhD students)
- 2020 Best Poster Award at Siteman Cancer Center Research Forum (top 5)
- 2018 Rackham Graduate Student Research Grants (\$1500)
- 2017 Outstanding graduates of Zhejiang Province
- 2016 Excellent Graduation Thesis Award
National Scholarship (top 2%)
- 2015 National Scholarship (top 2%)
- 2014 Second-class Scholarship (top 11%)

PEER REVIEW ACTIVITIES

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| (6) Journal of Biomedical Optics | (3) International Journal of Imaging Systems & Technology |
| (7) Biomedical Optics Express | (3) IEEE Transactions on Biomedical Engineering |
| (3) Journal of Biophotonics | (1) Computer Methods and Programs in Biomedicine |
| (1) Optics Express | (1) Journal of Innovative Optical Health Sciences |
| (1) Medical Physics | |

TEACHING & OUTREACH ACTIVITIES

- High school science coach (Summer 2022)
- Assistant instructor for BME 444/544 – Biomedical Instrumentation (Spring 2020)
- Grader for ME 335 – Heat Transfer (Fall 2017)
- Grader for ME 235 – Thermodynamics I (Spring 2017)