HAITAO CHEN

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EDUCATION

Huazhong University of Science and Technology (HUST), School of Engineering Sciences *Wuhan, China*

B. Eng. in Biomedical Engineering | **Cumulative GPA: 3.88** *Sept. 2020 – Present*

Selected Courses

- Linear Algebra, Mathematical Physics Equation and Special Function, Complex Function and Integral Transform;
- Biomedical Photonics, Optics, Neuroscience, Anatomy and Physiology, Brain-inspired Computing and Devices;
- Signal and Systems, Electronic Devices and Circuits, Biomedical Sensor—Testing and Instrumentation;
- Biomedical Digital Signal Processing, Medical Imaging Systems and Algorithms, Machine Learning.

PUBLICATIONS AND PRESENTATIONS

- ***H. Chen***, K. Liu, Y. Jiang, Y. Liu, and Y. Deng, "Real-time and accurate estimation *ex vivo* of four basic optical properties from thin tissue based on a cascade forward neural network," ***Biomedical Optics Express*** 14, 1818-1832 (2023). *https://doi.org/10.1364/BOE.489079*.
- ***H. Chen***, K. Liu, Y. Jiang, W. Li, and Y. Deng, "Full optical properties estimation method for thin *ex vivo* tissues," in *China Biomedical Engineering Conference & Medical Innovation Summit*, ***Oral***, Suzhou, China, May 2023.
- K. Liu, Y. Jiang, W. Li, ***H. Chen***, Q. Luo, and Y. Deng, "High-fidelity mesoscopic fluorescence molecular tomography based on SSB-Net," ***Optics Letters*** 48, 199-202 (2023). *https://doi.org/10.1364/OL.475949*.
- ***H. Chen***†, K. Liu†, Y. Jiang, Y. Dou, W. Li, Q. Luo, and Y. Deng, "3D localization and quantitative sensing of intravital fluorescent labels at sub-centimeter scale," *(Manuscript in preparation)*.

AWARDS AND HONORS

- Innovation and Technology Scholarship *(One student per year in my college)* *Sept. 2023*
- National Second Prize in the Undergraduate Mathematical Contest in Modeling *(Top 2%)* *Sept. 2022*
- National Excellent Innovation Project Award *(One project per year in my college)* *May 2022*

RESEARCH EXPERIENCE

George R. Brown School of Engineering, **Rice University** *Houston, USA*

Visiting Researcher | **Advisors: Dr. Lei Li** and **Dr. Kaiyuan Yang** *Oct. 2023 – Present*

Photoacoustic-induced wearable wireless energy harvester

- Designed and constructed an acoustic metasurface for high depth-of-field plane-wave focusing.

Project Leader | **Advisor: Dr. Lei Li** *Aug. 2023 – Present*

Ultrafast Photoacoustic Computed Tomography (PACT) through a single-element transducer

- Designed and developed a PACT imaging system for single-shot functional photoacoustic imaging.
- Designed and optimized a compact ergodic relay as the spatiotemporal encoder that encodes the spatial information into unique temporal features, which function as thousands of virtual transducers.
- Proposed an adaptive multi-start point self-training reconstruction algorithm based on spatial attention blocks, enabling high-contrast 3D vascular hemodynamic monitoring in deep tissues.

Britton Chance Center for Biomedical Photonics, WNLO, HUST *Wuhan, China*

Research Assistant | **Advisor: Dr. Yong Deng** *Jun. 2022 – Aug. 2023*

Physics-informed learning-enhanced Fluorescence Molecular Tomography (FMT)

- Developed a reflection-mode quantitative FMT/MicroCT dual-modal system for interpretive, non-invasive deep tissue 3D localization and sensing of fluorescent labels *in vivo*.
- Proposed an MMEL-Net to adaptively compensate for the forward modeling errors and depth-dependent detection sensitivity, while improving generalization and relieving the burden of training data quantity and quality.
- Enabled precise intraoperative tumor margin assessment and in situ dynamic quantitative sensing of tumors *in vivo*.

Project leader | **Advisor: Dr. Yong Deng** *Oct. 2021 – Jun. 2022*

Full optical properties (OPs) estimation method for thin *ex vivo* tissues

- Designed and constructed a vertical Double Integrating Spheres system for spectral measurements, which overcomes the precipitation effect of the liquid samples or the wrinkling effect of the soft phantoms.
- Performed the sensitivity analysis of the inverse determinations of each OP using Monte Carlo simulation.
- Proposed a deep learning solution to fully estimate all basic OPs over a wide spectral range, enabling 100,000x faster execution speed with improved accuracy.

Project leader | **Advisor: Dr. Yong Deng** *May 2021 – Oct. 2021*

Modeling light propagation in biomedical tissues — Adding-Doubling method

- Presented a MATLAB solution that implements the core of the Adding-Doubling method.
- Enhanced computational accuracy by modifying the HG phase function with the Delta-M phase function.
- Achieved user-friendly real-time interaction, faster executive speed, and code readability.

TECHNICAL SKILLS

- **Programming & Software**: MATLAB, Pytorch, Python, C++, ImageJ, k-wave, Visio, LabVIEW, and SolidWorks.
- **Design Experiences**: Photoacoustic Computed Tomography (PACT), Fluorescent Molecular Tomography (FMT), FMT/MicroCT dual-modal system, Double Integrating Sphere System (DIS).
- **Tissue Optics**: Monte Carlo, Adding-Doubling, Diffusion approximation, Kubelka-Munk Theory.
- **Computational Imaging**: FISTA, ADMM, Regularization (l_1, l_2, l_p, TV, and low-rank), Split-Breman, Conjugate Gradient, Nelder–Mead method, ISTA, Gradient Decent, Newton's method, PCA, KNN, SVM, MLE.
- **Deep Learning Algorithms**: Model-based Deep Learning, Deep Image Prior, Diffusion models.

EXTRACURRICULAR EXPERIENCE

Member of News Department, School of Engineering Sciences (SES) *Oct. 2020 – Sep. 2022*

- Wrote newsletters about daily life and important news in SES.
- Make posters and take photos at SES social activities.

Member of Admission Counseling Association, HUST *Oct. 2020 – Feb. 2021*

- Return to alma mater to introduce HUST to underclassmen.

HOBBIES & INTERESTS

Photography, Table Tennis, Badminton, Billiards, Riding, Football, Hip-hop Music.