Xinyue Huang

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Research Profile

Postdoctoral researcher at the California Institute of Technology with a Ph.D. in Biomedical Engineering and an M.S. in Computer Science. Research experience spans ultrasound-based imaging and sensing, with expertise in experimental instrumentation, signal and image processing, and machine learning.

Education

Georgia Institute of Technology / Emory University | Atlanta, GA, USA
Ph.D. in Biomedical Engineering, GPA: 4.00 **Aug 2021 – Aug 2026**
Dissertation: Development of Ultrasound-based Methods for Multiscale Hemodynamic Assessment

Georgia Institute of Technology | Atlanta, GA, USA
M.S. in Computer Science, GPA: 4.00 **Aug 2023 – Aug 2025**

Johns Hopkins University | Baltimore, MD, USA
M.S.E. in Biomedical Engineering, GPA: 3.93 **Aug 2019 – May 2021**
Thesis: Ultrasound Imaging with Flexible Array Transducer

The Hong Kong Polytechnic University | Hong Kong, China
B.S. with honors in Biomedical Engineering, GPA: 3.35 **Aug 2014 – May 2019**

Washington University in St. Louis | St. Louis, MO, USA
Exchange Student in Biomedical Engineering **Aug 2017 – Dec 2017**

Research Experience

California Institute of Technology | Pasadena, CA, USA
Postdoctoral Scholar Research Associate **Sep 2026 – Present**
Daraio Research Group | Advisor: Chiara Daraio

- Develop ultrasound-based sensing methods through experimental investigation and computational analysis.
- Collaborate across disciplines on the design and evaluation of emerging sensing technologies.

Georgia Tech / Emory University | Atlanta, GA, USA
Graduate Research Assistant **Sep 2021 – Aug 2026**
Ultrasound Imaging and Therapeutics Lab | Advisor: Stanislav Emelianov

- Developed ultrasound-based imaging methods for noninvasive multiscale assessment of hemodynamics.
- Integrated ultrasound elastography, photoacoustic, and optical imaging to characterize skin function.
- Developed algorithms for photoacoustic spectral unmixing and fluence compensation.

Meta Reality Labs | Redmond, WA, USA
Research Scientist Intern **May 2024 – Aug 2024**

- Conducted machine learning research on object tracking for virtual and augmented reality (VR/AR) sensors, with a focus on wearable device responsiveness and user interaction.
- Collaborated with cross-functional teams to optimize sensor data-processing algorithms for real-time VR/AR applications.

Johns Hopkins University | Baltimore, MD, USA
Graduate Research Assistant **Feb 2020 – May 2021**
Carnegie Center for Surgical Innovation | Advisors: Kai Ding and Muyinatu A. Lediju Bell

- Developed deep learning and optimized ultrasound beamforming methods for flexible array transducers as alternatives to conventional delay-and-sum beamforming.
- Applied image registration, segmentation, and feature detection to enable real-time tumor tracking.

Massachusetts General Hospital | Boston, MA, USA
Student Research Intern **Sep 2018 – Feb 2019**
Martinos Center for Biomedical Imaging | Advisor: Sava Sakadžić

- Developed a two-photon microscopy technique for measuring oxygen partial pressure (pO_2) in the brain.
- Assembled optical instrumentation, synchronized and processed NI-DAQ signals, and programmed acquisition and analysis software using LabVIEW and MATLAB.

Washington University in St. Louis | St. Louis, MO, USA
Undergraduate Researcher **Sep 2017 – Dec 2017**
Chen Ultrasound Laboratory | Advisor: Hong Chen

- Contributed to focused-ultrasound research on drug delivery across biological barriers through small-animal experiments, histological analysis, and MATLAB programming.

National University of Singapore | Singapore
Summer Research Assistant **Jun 2017 – Aug 2017**
Advanced Robotics Centre | Advisor: Hongliang Ren

- Independently designed and prototyped a portable, non-contact air-puff tonometer based on infrared imaging, incorporating a robotic soft pneumatic eye massager.

The Hong Kong Polytechnic University | Hong Kong, China
Summer Research Assistant **Jun 2016 – Jul 2016**
Biomechanics Laboratory | Advisor: Ming Zhang

- Conducted research on 3D whole-body scanning and reconstruction using Microsoft Kinect, and created CAD models of health products for biomechanics research.

Publications

Peer Reviewed Journal Articles

1. Qin, D., **Huang, X.**, Schoen, S. J. Jr., Emelianov, S. Y., Bouchard, R. R. (2026). Improved quantification of photoacoustic biomarkers through residual-based noise masking. *Photoacoustics*, 51, 100880.
2. Morais, S. M. A., **Huang, X.**, Yu, A. M., Park, J. H., Zopf, D. A., Hollister, S. J., and Emelianov, S. Y. (2026). Shear wave elasticity imaging for monitoring risk of skin breakdown following subcutaneous implantation. *Ultrasound in Medicine & Biology*, 52(10).
3. Feng, Z., **Huang, X.**, Hooshangnejad, H., China, D., Lee, J., McNutt, T., Bell, M. A. L., and Ding, K. (2026). Evaluating curvature-induced variation in deep learning-based beamforming for flexible transducers in ultrasound-guided radiation therapy. *Bioengineering*, 13(4).
4. Yu, A. M., **Huang, X.**, Morais, S. M. A., Park, J. H., Zopf, D. A., Hollister, S. J., and Emelianov, S. Y. (2026). Quantitative photoacoustic tomography of skin vasculature predicts subcutaneous implant exposure. *Journal of Biomedical Optics*, 31(2).

5. **Huang, X.**, Yu, A. M., Morais, S. M. A., Park, J. H., Zopf, D. A., Hollister, S. J., and Emelianov, S. Y. (2025). Ultrasound-guided photoacoustic monitoring of vascular ischemia in implant-induced skin necrosis. *Ultrasound in Medicine & Biology*, 51(12).
6. Long, X., **Huang, X.**, Yang, M., Emelianov, S. Y., and Li, C. (2025). High-resolution three-dimensional quantitative photoacoustic and ultrasound imaging of subcutaneous microvasculature in extremities. *Biomedical Optics Express*, 16(11).
7. **Huang, X.**, Qin, D., Morais, S. M. A., Long, X., and Emelianov, S. Y. (2025). Photoacoustic-strain (PAS) imaging for tissue microcirculation assessment. *IEEE Transactions on Medical Imaging*, 44(8).
8. Qin, D., **Huang, X.**, Sowers, T., VanderLaan, D., and Emelianov, S. Y. (2025). Depth-dependent fluence compensation without a priori knowledge of tissue composition for quantitative ultrasound-guided photoacoustic imaging. *Journal of Biomedical Optics*, 30(7).
9. Kubelick, K. P., Kim, J., Kim, M., **Huang, X.**, Wang, C., Song, S., Xia, Y., and Emelianov, S. Y. (2025). *In vivo* ultrasound and photoacoustic imaging of nanoparticle-engineered T cells and post-treatment assessment to guide adoptive cell immunotherapy. *ACS Nano*, 19(6).
10. Pian, Q., Li, B., Şencan-Eğilmez, I., Cheng, X., Dubb, J., **Huang, X.**, Fu, B., Allu, S. R., Yaseen, M. A., Devor, A., Vinogradov, S. A., Sakadžić, S. (2025). Out-of-focus signal rejection for *in vivo* pO_2 measurements using two-photon phosphorescence lifetime microscopy. *Biomedical Optics Express*, 16(1). **[Editor's Pick]**
11. Feng, Z., Sun, E., China, D., **Huang, X.**, Hooshangnejad, H., González, E. A., Bell, M. A. L., and Ding, K. (2024). Enhancing image-guided radiation therapy for pancreatic cancer: Utilizing aligned peak response beamforming in flexible array transducers. *Cancers*, 16(7).
12. **Huang, X.**, Hooshangnejad, H., China, D., Feng, Z., Lee, J., Bell, M. A. L., and Ding, K. (2023). Ultrasound imaging with flexible array transducer for pancreatic cancer radiation therapy. *Cancers*, 15(13).
13. **Huang, X.**, Bell, M. A. L., and Ding, K. (2021). Deep learning for ultrasound beamforming in flexible array transducer. *IEEE Transactions on Medical Imaging*, 40(11).

Conference Proceedings

1. **Huang, X.**, Iyer, J. V., and Ren, H. (2018). Pilot prototyping and feasibility study of a portable non-contact air-puff tonometer with robotic soft pneumatic eye massager. *2018 IEEE International Conference on Real-time Computing and Robotics*, 579-583.

Conference Presentations

Underlining indicates co-first authorship.

1. **Huang, X.**, Emelianov, S. Y. (2026). Spatially Resolved Pulse Waveform Measurement Using Ultrasound Strain Imaging. *2026 IEEE International Ultrasonics Symposium*.
2. **Huang, X.**, Morais, S. M. A., Yu, A. M., Park, J. H., Zopf, D. A., Hollister, S. J., Emelianov, S. Y. (2026). Photoacoustic and Elasticity Imaging for Early Detection of Craniofacial Implant-Induced Skin Breakdown. *SPIE Photonics West 2026*.
3. **Huang, X.**, Hu, D. L., Emelianov, S. Y. (2025). Understanding the Mechanism of Water-Induced Fingertip Wrinkling via High-Resolution 3D Ultrasound and Photoacoustic Imaging. *Southeast Regional SICB Meeting 2025*.
4. Yu, A. M., **Huang, X.**, Morais, S. M. A., Park, J. H., Zopf, D. A., Hollister, S. J., Emelianov, S. Y. (2025). Ultrasound/Photoacoustic/Shear Wave Imaging of Skin Vasculature and Elasticity to Predict Craniofacial Implant Exposure. *BMES 2025 Annual Meeting*.

5. Jhunjhunwala, A., **Huang, X.**, Chambliss, B., Kim, M., Kim, J., Mun, H., Emelianov, S. Y. (2025). Tunable Gold Nanorods Enable Four-Channel Multiplex Photoacoustic Imaging. *BMES 2025 Annual Meeting*.
6. **Huang, X.**, Emelianov, S. Y. (2025). Noninvasive Estimation of Central Venous Pressure Using Ultrasound-Guided Dual-Mode Elasticity Imaging. *2025 IEEE International Ultrasonics Symposium*.
7. Yu, A. M., **Huang, X.**, Morais, S. M. A., Park, J. H., Zopf, D. A., Hollister, S. J., Emelianov, S. Y. (2025). Predicting Post-Implantation Skin Breakdown Using US/PA/SWE Imaging to Mitigate Craniofacial Implant Complications. *2025 IEEE International Ultrasonics Symposium*.
8. Kubelick, K. P., Kim, J., **Huang, X.**, Kim, M., Cadena, M., Wang, C., Xia, Y., Emelianov, S. Y. (2025). Ultrasound and photoacoustic immunoimaging of nanoengineered T cells to guide and enhance cancer therapies. *SPIE Medical Imaging 2025*.
9. Morais, S. M. A., **Huang, X.**, Yu, A. M., Park, J., Zopf, D. A., Hollister, S. J., Emelianov, S. Y. (2024). Shear Wave Elasticity Imaging on the Assessment of Skin Damage post-Subcutaneous Implantation. *2024 IEEE UFFC Latin America Ultrasonics Symposium*.
10. **Huang, X.**, Qin, D., Morais, S. M. A., Emelianov, S. Y. (2023). Photoacoustic-Strain Imaging for Evaluating Deep Tissue Microcirculation. *2023 IEEE International Ultrasonics Symposium*.
11. Kubelick, K. P., Kim, J., **Huang, X.**, Emelianov, S. Y. (2023). US/PA Imaging Can Detect Antitumor Immune Response of Adoptive T Cell Therapies. *2023 IEEE International Ultrasonics Symposium*.
12. Martirosyan, S., **Huang, X.**, Qin, D., Yu, A. M., Emelianov, S. Y. (2022). SPAU-Net: Voxelwise Spectral Unmixing and Oxygen Saturation Estimation Using Deep Autoencoders. *2022 IEEE International Ultrasonics Symposium*.
13. **Huang, X.**, Bell, M. A. L., Ding, K. (2021). A Novel End-To-End Deep Learning Based Beamformer for Flexible Array Ultrasound Transducer. *2021 AAPM Annual Meeting*.

Conference Posters

1. Jin, M., **Huang, X.**, Emelianov, S. Y. (2026). Controlled-Compression Photoplethysmography for Characterizing Dynamic Fingertip Vascular Responses. *BMES 2026 Annual Meeting*.
2. Pires, L. Z., Qin, D., Pereira, L., Bordonal, R. R., Carneiro, A. A. O., **Huang, X.**, Schoen, S. J., Emelianov, S. Y., Pavan, T. Z. (2026). A Multimodal Copolymer-in-Oil Phantom for Photoacoustic Imaging Quality Assurance: Inter-Platform Performance Evaluation. *2026 IEEE International Ultrasonics Symposium*.
3. **Huang, X.**, Emelianov, S. Y. (2025). Ultrasound-Based Method for Noninvasive Estimation of Central Venous Pressure. *BMES 2025 Annual Meeting*.
4. **Huang, X.**, Liu, S., Emelianov, S. Y. (2025). Understanding the Mechanism of Water-induced Fingertip Wrinkling via High-resolution 3D Ultrasound and Photoacoustic Imaging. *BMES 2025 Annual Meeting*.
5. **Huang, X.**, Qin, D., Vanderlaan, D., Morais, S. M. A., Lee, J., Chung, E., Zhao, A., Nikolai, R., Lee, J., Emelianov, S. Y. (2022). Combined Ultrasound, Photoacoustic, and Elasticity Imaging on the Vevo F2 Imaging System. *2022 IEEE International Ultrasonics Symposium*.
6. Pian, Q., Li, B., Şencan-Eğilmez, I., Cheng, X., Dubb, J., **Huang, X.**, Fu, B., Allu, S., Yaseen, A., Devor, A., Vinogradov, S., Sakadžić, S. (2022). Background Signal Rejection for pO_2 Measurements Using Adaptive Optics and Two-photon Phosphorescence Lifetime Microscopy. *Neural Imaging and Sensing 2022*.
7. Zhou, J., **Huang, X.**, Endou, H., Sasaki, K., Hooshangnejad, H., Han, D., Ding, K. (2020). Image Quality Assessment from a Curved Flexible Probe for Abdominal Imaging During Proton Therapy. *2020 Joint AAPM | COMP Virtual Meeting*.

Honors and Awards

2026 **FujiFilm VisualSonics Vevo International Student Award** – SPIE 2026

2024 **Poster Competition Award** – Career, Research, and Innovation Development Conference

2023 **FujiFilm VisualSonics Vevo Research Award** – Bioengineering Category

2023 **Student Pitch Competition Gold Award** – IEEE Ultrasonics Symposium

Teaching and Mentoring

Georgia Institute of Technology | Atlanta, GA, USA
Undergraduate Research Mentoring **Feb 2025 – Present**

- Mentor two undergraduate researchers on wearable sensing techniques for hemodynamic assessment.
- Both mentees received Georgia Tech's President's Undergraduate Research Award (PURA).
- Both mentees are preparing research manuscripts, and one has presented a conference poster.

Georgia Institute of Technology | Atlanta, GA, USA
Teaching Assistant, Intro to BME Design **Aug 2022 – May 2023**

- Supported an active-learning course in medical device design, including physiological background research, analysis of existing devices, concept development, and prototype construction and testing.
- Led four laboratory sessions per week and mentored three undergraduate course assistants.

Johns Hopkins University | Baltimore, MD, USA
Course Assistant, Image Processing & Analysis **Sep 2020 – Dec 2020**

- Supported graduate-level instruction in image processing and analysis, covering theoretical foundations and MATLAB-based applications.
- Led weekly two-hour recitation sessions, graded assignments, and held office hours.

Professional Service and Leadership

California Institute of Technology | Pasadena, CA, USA
Board Member and Outreach Co-chair **Sep 2026 – Present**
Caltech Postdoctoral Association (CPA)

- Promote postdoctoral engagement with communities in Pasadena and Los Angeles.
- Coordinate opportunities for tutoring, teaching, mentoring, and community service on and off campus.

Journal Article Reviewer

- Advanced Science; Advanced Ultrasound in Diagnosis and Therapy; IEEE Journal of Biomedical and Health Informatics; IEEE Sensors Journal; IEEE Transactions on Biomedical Engineering; IEEE Transactions on Medical Imaging; IEEE Transactions on Ultrasonics; Journal of the Royal Society Interface; Medical Physics; Photoacoustics; Scientific Data; Tissue Engineering; Ultrasonic Imaging.

Technical Skills and Training

- **Programming:** Python and MATLAB (proficient).
- **Computational Methods:** Statistical analysis; machine learning (scikit-learn); deep learning and computer vision (PyTorch); signal and image processing and analysis.

- **Instrumentation and Prototyping:** LabVIEW, NI-DAQ, Arduino, and SolidWorks.
- **Training and Certificates:** Work with Small Animals in Research (CITI Program); Deep Learning Specialization (Coursera); Basic Life Support (American Heart Association).
- **Languages:** English (proficient); Mandarin Chinese (native); Cantonese (intermediate).