

XIN TONG

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Andrew and Peggy Cherng Department of Medical Engineering, Department of Electrical Engineering
California Institute of Technology, CA 91125

EDUCATION

California Institute of Technology (Caltech) <i>Ph.D. in Electrical and Medical Engineering (GPA: 4.0/4.0)</i> – Advisor: Prof. Lihong V. Wang	Pasadena, CA Jan. 2020 – Present
California Institute of Technology (Caltech) <i>M.S. in Medical Engineering (GPA: 4.0/4.0)</i>	Pasadena, CA Jan. 2020 – Jun. 2021
Peking University (PKU) <i>B.S. in Physics (GPA: 3.8/4.0)</i> – Awards: National Scholarship (top 0.2%), Merit Student Pacesetter (top 0.2%), and Outstanding Graduates (top 1%)	Beijing, China Sep. 2015 – Jun. 2019
University of California, Los Angeles (UCLA) <i>Cross-disciplinary Scholars in Science and Technology summer program (GPA: 4.0/4.0)</i> – Advisor: Prof. Aydogan Ozcan	Los Angeles, CA Jul. 2018 – Sep. 2018

WORK EXPERIENCES

Research scientist intern, advanced display and imaging <i>Reality Labs Research, Meta</i>	Jun. 2024 – Sep. 2024 Redmond, WA
Graduate research associate, quantum-enabled super-resolution and sub-shot-noise imaging <i>Caltech Optical Imaging Laboratory (COIL), Caltech</i>	Sep. 2021 – Present Pasadena, CA
Graduate research associate, photoacoustic computed tomography (PACT) <i>COIL, collaborators: City of Hope, UCLA Medical School, and USC Keck School of Medicine</i>	Jan. 2020 – Present Pasadena, CA
Undergraduate research associate, deep-learning-enabled lens-free holography <i>Computational Imaging Lab, UCLA</i>	Jul. 2018 – Sep. 2018 Los Angeles, CA
Undergraduate research associate, wavefront-shaping-based auto-focusing <i>Institute of Modern Optics, PKU</i>	Sep. 2017 – Jul. 2018 Beijing, China
Undergraduate research associate, spatially resolved photocurrent microscopy <i>Department of Physics, UC Davis</i>	Jul. 2017 – Sep. 2017 Davis, CA

RESEARCH INTERESTS

Optical Imaging and Display, Quantum Imaging, Photoacoustic Imaging, Computational Imaging, Quantum Optics, Tomography Reconstruction, Image Processing, Optical Sensing, Medical Devices, Statistical Learning, Photonics

PUBLICATIONS

Peer-Reviewed Journal Articles (*co-first authors)

- [**Tong, X.***, Liu, C.*, Luo, Y.*, Lin, L.*], Dzubnar, J., Invernizzi, M., Zhang, Y., Cao, R., Hu, P., Torres, J., Kasabyan, A., Lai, L., Yee, L., Wang, L.V., Panoramic photoacoustic computed tomography with learning-based classification enhances breast lesion characterization. *Nature Biomedical Engineering*, 2025.
- Tong, X.**, Zhang, Y., Wang, L.V., Quantum imaging enhances classical counterpart with entangled photons. *Optics & Photonics News*, 2024.
- [Zhang, Y.*, He, Z.*, **Tong, X.***], Garrett, D.C., Cao, R., Wang, L.V., Quantum imaging of biological organisms through spatial and polarization entanglement. *Science Advances*, 2024.
- [Zhang, Y.*, Hu, P.*], Li, L., Cao, R., Khadria, A., Maslov, K., **Tong, X.**, Zeng, Y., Jiang, L., Zhou, Q., Wang, L. V., Single-shot 3D photoacoustic tomography using a single-element detector for ultrafast imaging of

hemodynamics, *Nature Biomedical Engineering*, 2024.

5. Luo, Y., Huang, H., Sastry, K., Hu, P., **Tong, X.**, Kuo, J., Na, S., Villa, U., Anastasio, M. A., Wang, L. V., Full-wave Image Reconstruction in Transcranial Photoacoustic Computed Tomography using a Multiphysics Finite Element Method. *IEEE Transactions on Medical Imaging*, 2024.
6. [**Tong, X.***, Lin, L.*], Hu, P., Cao, R., Zhang, Y., Olick-Gibson, J., Wang, L.V., Non-Invasive 3D Photoacoustic Tomography of Angiographic Anatomy and Hemodynamics of Fatty Livers in Rats. *Advanced Science*, 2023.
7. [**Tong, X.***, He, Z.*, Zhang, Y.*], Solomon, S., Lin, L., Song, Q., Wang, L.V., Experimental full-domain mapping of quantum steering and nonlocality. *Physical Review Applied*, 2023.
8. [He, Z.*, Zhang, Y.*, **Tong, X.***], Li, L., Wang, L.V., Quantum Microscopy of Cancer Cells at the Heisenberg Limit. *Nature Communications*, 2023.
9. [Lin, L.*, **Tong, X.***], Cavallero, S., Zhang, Y., Na, S., Cao, R., Hsiai, T.K., Wang, L.V., Non-invasive photoacoustic computed tomography of rat heart anatomy and function. *Light: Science & Applications*, 2023.
10. Sastry, K., Zhang, Y., Hu, P., Luo, Y., **Tong, X.**, Na, S., Wang, L. V., A method for the geometric calibration of ultrasound transducer arrays with arbitrary geometries. *Photoacoustics*, 2023.
11. [Lin, L.*, Hu, P.*, **Tong, X.***, Na, S.*], Cao, R., Yuan, X., Garrett, D.C., Shi, J., Maslov, K., Wang, L.V., High-speed three-dimensional photoacoustic computed tomography for preclinical research and clinical translation. *Nature Communications*, 2021.
12. [Lin, L.*, **Tong, X.***], Hu, P., Invernizzi, M., Lai, L., Wang, L. V., Photoacoustic Computed Tomography of Breast Cancer in Response to Neoadjuvant Chemotherapy. *Advanced Science*, 2021.
13. Wu, Y., Ray, A., Wei, Q., Feizi, A., **Tong, X.**, Chen, E., Luo, Y., Ozcan, A., Deep learning enables high-throughput analysis of particle-aggregation-based biosensors imaged using holography. *ACS Photonics*, 2018.
14. Hou, Y., Xiao, R., **Tong, X.**, Dhuey, S., Yu, D., In situ visualization of fast surface ion diffusion in vanadium dioxide nanowires. *Nano letters*, 2017.

Journal Articles Under Peer Review (*co-first authors)

1. [Zhang, Y.*, Na, S.*, Russin, J.*], Sastry, K., Lin, L., Zheng, J., Luo, Y., **Tong, X.**, An, Y., Hu, P., Maslov, K., Tan, T., Liu, C., Wang, L. V., Rotational ultrasound and photoacoustic tomography of the human body. *Nature Biomedical Engineering* (under review after revision).
2. [**Tong, X.***, He, Z.*, Zhang, Y.*], Wang, L.V., Quantum super-resolution microscopy beyond Heisenberg scaling. *Science Advances* (under review after revision).
3. [Huang, C.*, **Tong, X.***, Zhang, Y.*], Wang, L.V., Disrupting the Memory in Bell Tests. *Optics Letters* (under review).
4. Hu, P., **Tong, X.**, Lin, L., Wang, L.V., Data-driven System Matrix Manipulation Enabling Fast Functional Imaging in Tomography. *IEEE Transactions on Medical Imaging* (under review after revision), 2025.
5. Sternbach, S., Nadiya, A., **Tong, X.**, Wang, L.V., Russin, J., Liu, C., Visualizing the Microvasculature of the Peripheral Nervous System – A Review of Neuroimaging Techniques. *Neurosurgery* (under review), 2025.

Preprint Articles (*co-first authors)

1. Hu, P., **Tong, X.**, Lin, L., Wang, L. V., Data-driven system matrix manipulation enabling fast functional imaging and intra-image nonrigid motion correction in tomography. *bioRxiv*, 2024.
2. [Cao, R.*, Luo, Y.*], Xu, J., Luo, X., Geng, K., Aborahama, Y., Cui, M., Davis, S., Na, S., **Tong, X.**, Liu, C., Sastry, K., Maslov, K., Hu, P., Zhang, Y., Lin, L., Zhang, Y., Wang, L. V., Single-shot 3D photoacoustic computed tomography with a densely packed array for transcranial functional imaging. *arXiv preprint*, 2023.
3. Zhang, Y., Na, S., Sastry, K., Russin, J.J., Hu, P., Lin, L., **Tong, X.**, Jann, K.B., Wang, D.J., Liu, C.Y., Wang, L.V., Transcranial photoacoustic computed tomography of human brain function. *arXiv preprint*, 2022.

Patents

1. Peng, F., Gollier, J., Hsu, Y-Y., Upton, R., Charisoulis, T., Wang, Y., Hamel-Bissell, B., Yu, Z., Cobb, J., Friedman, B. M. H., Tyagi, A., DeFranco, J., **Tong, X.**, Zonal Illuminated Reflective Display with Multiple Path Illumination, US Patent Application (filed on Oct. 22, 2024).
2. Wang, L. V., **Tong, X.**, He, Z., Zhang, Y., Hyper-Heisenberg limit quantum microscopy, US Provisional Patent Application (filed on Sep. 20, 2023).

Peer-Reviewed Conference Proceedings

1. Lin, L., Hu, P., **Tong, X.**, Na, S., Cao, R., Yuan, X., Garrett, D.C., Shi, J., Maslov, K., Wang, L. V., Three-dimensional photoacoustic computed tomography for preclinical research and clinical translation. In *Photons Plus Ultrasound: Imaging and Sensing*, International Society for Optics and Photonics (SPIE), 2021.
2. Lin, L., **Tong, X.**, Hu, P., Invernizzi, M., Lai, L., Wang, L. V., Clinical photoacoustic computed tomography of breast cancer treated with neoadjuvant chemotherapy. In *Photons Plus Ultrasound: Imaging and Sensing*, SPIE, 2021.
3. Wu, Y., Ray, A., Wei, Q., Feizi, A., **Tong, X.**, Chen, E., Luo, Y., Ozcan, A., Particle-Aggregation Based Virus Sensor Using Deep Learning and Lensless Digital Holography. In *CLEO: Applications and Technology*, Optica, 2019.
4. Hou, Y., Xiao, R., **Tong, X.**, Dhuey, S., Yu, D., Direct Visualization of Fast Surface Ion Diffusion in Vanadium Dioxide Nanowires. In *APS March Meeting Abstracts*, 2018.

GRANTS

1. **R01 Research Projects, National Institute of Health (NIH)** 2023 – 2028
 – Role: Co-Investigator
 – Total budget: \$2,434,297
2. **S2I Early- or Mid-Stage Research Projects, Center for Sensing to Intelligence (S2I)** 2023 – 2025
 – Role: Co-Investigator
 – Total budget: \$90,000

PROFESSIONAL ACTIVITY

Conference Oral Presentations

1. Photoacoustic and quantum enhanced imaging (invited talk). *22nd Annual Neurotech Convention*, SBMT, 2025.
2. Integrating machine learning with panoramic photoacoustic computed tomography for improved breast lesion analysis. In *Photons Plus Ultrasound: Imaging and Sensing*. SPIE Photonics West, 2025.
3. Super-resolution quantum microscopy at the Heisenberg limit. In *Quantum Sensing, Imaging, and Precision Metrology II*. SPIE Quantum/Photonics West, 2024.
4. Experimental full-domain mapping of quantum correlation in Clauser-Horne-Shimony-Holt scenarios, In *Quantum Computing, Communication, and Simulation IV*. SPIE Quantum/Photonics West, 2024.
5. Non-invasive photoacoustic computed tomography of cardiac anatomy and function in rats. In *Photons Plus Ultrasound: Imaging and Sensing*. SPIE Photonics West, 2023.
6. Three-dimensional photoacoustic tomography of angiographic anatomy and hemodynamics for fatty liver study, In *Photons Plus Ultrasound: Imaging and Sensing*. SPIE Photonics West, 2023.

Guest Editor Services

- Technical Program Committee Member, special issue “Advanced Optical Detection and Imaging Systems”, *Electronics*.

Peer Review Services

- 100+ peer review records in *Light: Science & Applications*, *IEEE Transactions on Medical Imaging*, *Photoacoustics*, etc.

Teaching Activity

- Teaching assistant, MedE 168: Biomedical Optics: Principles and Imaging, Caltech
- Teaching assistant, MedE/EE 268: Medical Imaging, Caltech

- Teaching assistant, APh/Ph 138b: Quantum Hardware and Techniques, Caltech

TECHNICAL SKILLS

- **Programming languages and APIs:** MATLAB, Python, C/C++, LaTeX; Numpy, TensorFlow, XGBoost, etc.
- **Software:** LabVIEW, Zemax OpticsStudio, SolidWorks, ImageJ, Adobe Photoshop, Lightroom, Premiere Pro, etc.