

Tao Hong

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RESEARCH PROFILE

A fundamental question in imaging science is: how much information can we reliably recover from limited and imperfect measurements, and at what computational cost? My research tackles this question by leveraging *imaging physics* and *mathematical structure*, together with data-driven learning, to develop *theoretically grounded*, computationally *efficient*, and *reliable* reconstruction methods.

My research brings together computational imaging, numerical optimization, and machine learning, with applications spanning MRI, photoacoustic and optical imaging, and computed tomography. My long-term vision is to advance the [computational foundations of next-generation imaging systems](#), expanding what can be resolved, tracked, and quantified from increasingly complex imaging data.

RESEARCH INTERESTS

- Numerical Optimization & Scientific Computing & Inverse Problems
- Computational Imaging & Model-Based and Learning-Based Reconstruction
- Computational MRI & Photoacoustic & Optical Imaging

ACADEMIC APPOINTMENTS

Boston Children's Hospital/Harvard Medical School Jun. 2026 - present

Postdoctoral Fellow with Prof. [Xiaoqing Wang](#)

- **Computational MRI:** model-based reconstruction, motion correction, and quantitative imaging.

Oden Institute, The University of Texas at Austin Mar. 2025 - May 2026

Postdoctoral Fellow with Prof. [Umberto E. Villa](#)

- **Large-scale computational imaging:** large-scale optimization and low-dimensional modeling for high-dimensional dynamic photoacoustic imaging.

EECS, University of Michigan (UMich), Ann Arbor Dec. 2021 - Feb. 2025

Postdoctoral Fellow with Prof. [Jeffrey A. Fessler](#) and Dr. [Luis Hernandez-Garcia](#)

- **Computational MRI:** model-based and learning-based reconstruction, numerical optimization, and acquisition design for accelerated and quantitative MRI.

EPFL, Lausanne, Switzerland Aug. 2019 - Nov. 2019

Visiting Student with Prof. [Michael Unser](#)

- **Computational optical imaging:** multigrid and scalable optimization for nonlinear three-dimensional optical tomography.

Zhejiang University of Technology Sep. 2012 - Feb. 2016

Research Assistant with Prof. [Gang Li](#)

- **Signal processing and compressed sensing:** filter design, sensing matrix optimization, and hardware implementation.

EDUCATION

Ph.D. in Computer Science (Direct Track), Technion

2016 - 2021

- Title of thesis: [Numerical Optimization and Multigrid Computational Methods with Applications](#)
- Advisors: Prof. [Irad Yavneh](#) and Dr. [Michael Zibulevsky](#)
- Thesis committee: [Irad Yavneh](#), [Michael Zibulevsky](#), [Michael Elad](#), and [Hans De Sterck](#)

Zhejiang University of Technology (ZJUT)

2008 - 2012

- Major: Telecommunications Engineering
- Title of thesis: High-Performance FFT Implementation on FPGA Platforms
- Advisor: Prof. Gang Li

PUBLICATIONS

Journals (___ indicates corresponding author)

- [22] **Tao Hong**, Thanh-an Pham, Irad Yavneh, and Michael Unser, “A mini-batch quasi-Newton proximal method for constrained total-variation nonlinear image reconstruction,” *SIAM Journal on Imaging Sciences*, vol. 19, no. 3, pp. 1864–1894, 2026. [\[link\]](#)[\[pdf\]](#)[\[poster\]](#)[\[code\]](#)
- [21] **Tao Hong**, Umberto Villa, and Jeffrey A. Fessler, “A convergent generalized Krylov subspace method for compressed sensing MRI reconstruction with gradient-driven denoisers,” *IEEE Transactions on Computational Imaging*, vol. 12, pp. 378–390, Jan. 2026. [\[link\]](#)[\[pdf\]](#)
- [20] **Tao Hong**, Zhaoyi Xu, Se Young Chun, Luis Hernandez-Garcia, and Jeffrey A. Fessler, “Convergent complex quasi-Newton proximal methods for gradient-driven denoisers in compressed sensing MRI reconstruction,” *IEEE Transactions on Computational Imaging*, vol. 11, pp. 1534–1547, Oct. 2025. [\[link\]](#)[\[pdf\]](#)[\[website\]](#)[\[code\]](#)
- [19] **Tao Hong**, Zhaoyi Xu, Jason Hu, and Jeffrey A. Fessler, “Using randomized Nyström preconditioners to accelerate variational image reconstruction,” *IEEE Transactions on Computational Imaging*, vol. 11, pp. 1630–1643, Oct. 2025. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [18] **Tao Hong**, Xiaojian Xu, Jason Hu, and Jeffrey A. Fessler, “Provable preconditioned plug-and-play approach for compressed sensing MRI reconstruction,” *IEEE Transactions on Computational Imaging*, vol. 10, pp. 1476–1488, Oct. 2024. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [17] **Tao Hong**, Luis Hernandez-Garcia, and Jeffrey A. Fessler, “A complex quasi-Newton proximal method for image reconstruction in compressed sensing MRI,” *IEEE Transactions on Computational Imaging*, vol. 10, pp. 372–384, Feb. 2024. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [16] **Tao Hong** and Irad Yavneh, “On adapting Nesterov’s scheme to accelerate iterative methods for linear problems,” *Numerical Linear Algebra with Applications*, vol. 29, no. 2, e2417, 2022. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [15] **Tao Hong**, Irad Yavneh, and Michael Zibulevsky, “Solving RED with weighted proximal methods,” *IEEE Signal Processing Letters*, vol. 27, pp. 501–505, 2020. [\[link\]](#)[\[pdf\]](#)[\[slides\]](#)[\[code\]](#)
- [14] **Tao Hong**, Yaniv Romano, and Michael Elad, “Acceleration of RED via vector extrapolation,” *Journal of Visual Communication and Image Representation*, vol. 63, no. 102575, 2019. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [13] **Tao Hong**, Xiao Li, [Zhihui Zhu](#), and Qiuwei Li, “Optimized structured sparse sensing matrices for compressive sensing,” *Signal Processing*, vol. 159, pp. 119–129, 2019. [\[link\]](#)[\[pdf\]](#)
- [12] **Tao Hong** and Zhihui Zhu, “An efficient method for robust projection matrix design,” *Signal Processing*, vol. 143, pp. 200–210, 2018. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [11] **Tao Hong** and Zhihui Zhu, “Online learning sensing matrix and sparsifying dictionary simultaneously for compressive sensing,” *Signal Processing*, vol. 153, pp. 188–196, 2018. [\[link\]](#)[\[pdf\]](#)[\[code\]](#)
- [10] **Tao Hong**, Huang Bai, Sheng Li, and Zhihui Zhu, “An efficient algorithm for designing projection matrix in compressive sensing based on alternating optimization,” *Signal Processing*, vol. 125, pp. 9–20, 2016. [\[link\]](#)[\[code\]](#)

Preprints

- [9] **Tao Hong**, Thanh-an Pham, Eran Treister, and Michael Unser, *Diffraction tomography with Helmholtz equation: Efficient and robust multigrid-based solver*, 2021. arXiv: [2107.03679](#)
- [8] **Tao Hong**, Irad Yavneh, and Michael Zibulevsky, *Merging multigrid optimization with SESOP*, 2018. arXiv: [1812.06896](#)

Conference Proceedings and Abstracts

- [7] **Tao Hong**, Jenil Shah, Luke Lozenski, Refik Cam, Mark Anastasio, and Umberto Villa, “A low-rank promoting image prior for accurate estimation of tumor perfusion rates in dynamic contrast-enhanced photoacoustic tomography,” *SPIE Medical Imaging (Oral)*, 2026.
- [6] **Tao Hong**, Luis Hernandez-Garcia, and Jeffrey A. Fessler, “Fast double stochastic proximal method for CS-MRI reconstruction with multiple wavelets,” *ISMRM*, 2024.
- [5] **Tao Hong**, Luis Hernandez-Garcia, and Jeffrey A. Fessler, “Complex quasi-Newton proximal methods for the image reconstruction in compressed sensing MRI,” *ISMRM*, 2023.
- [4] **Tao Hong**, Huang Bai, Sheng Li, Chaogeng Huang, and Liping Chang, “A new method for designing allpass filters with equiripple group delay errors,” *2014 9th IEEE Conference on Industrial Electronics and Applications*, pp. 1024–1028, 2014.
- [3] **Tao Hong**, Huang Bai, Yabin Wei, Jie Yang, and Zhihui Zhu, “Sparse two-dimensional FIR digital filters design using FISTA,” *2014 7th International Congress on Image and Signal Processing*, pp. 815–819, 2014.
- [2] **Tao Hong**, Chaogeng Huang, Gang Li, and Yong Ching Lim, “A Hessenberg-based input balanced realization for all-pass systems,” *2013 9th International Conference on Information, Communications & Signal Processing*, pp. 1–5, 2013.
- [1] **Tao Hong**, Si Tang, Gang Li, Xiongxiang He, and Liping Chang, “All-pass based efficient and robust structures for finite precision implementation of digital filters,” *Proceedings of the 32nd Chinese Control Conference*, pp. 4517–4522, 2013.

HONORS AND AWARDS

Travel Awards

- 2026 ICERM – Stochastic and Randomized Algorithms in Scientific Computing: Foundations and Applications – long term visitor (Jan. 20 - Apr. 24), Award for Traveling and Lodging, Brown University
- 2025 IPAM – Research Collaboration Workshop, Randomized Numerical Linear Algebra (RNLA), Award for Traveling and Lodging, UCLA
- 2025 ICERM – Scientific Machine Learning for Gravitational Wave Astronomy, Award for Traveling and Lodging, Brown University
- 2024 Computational Imaging Workshop, Award for Traveling and Lodging, IMSI, University of Chicago
- 2023 MTMI workshop, Award for Traveling and Lodging, University of Chicago
- 2023 ICERM – Acceleration and Extrapolation Methods, Award for Traveling and Lodging, Brown University

Scholarships and Awards

- 2014 National Scholarship for Graduate Students, the Ministry of Education, China
- 2014 2nd Class Academic Scholarship of ZJUT
- 2013 2nd Class Academic Scholarship of ZJUT
- 2012 New Graduate Scholarship of ZJUT
- 2011 2nd Class Academic Scholarship of ZJUT

- 2011 1st Prize of the Third National College Students' Mathematical Contest

TEACHING EXPERIENCE

Guest Lecture

- Numerical Methods for BME, UT Austin, Spring 2026.

Teaching Assistant

- Graduate course: *Advanced Signal Processing* (ZJUT, Fall 2013, taught by Prof. Gang Li, 48 hours).
- Graduate course: *Signal Analysis* (ZJUT, Spring 2013, taught by Prof. Gang Li, 32 hours).
- Undergraduate course: *Signal and System* (ZJUT, Spring 2012, taught by Prof. Gang Li, 64 hours).

STUDENT MENTORING

- David Frey (Sep. 2024 - present, main advisor: Dr. Douglas Noll) PhD student, BME, UMich, Topic: Silent MRI.
- Jason Hu (Sep. 2022 - Jun. 2026, main advisor: Dr. Jeffrey Fessler) PhD, EECS, UMich, Topic: Diffusion models in inverse problems. (publications: [19] [18])
- Jenil Shah (Mar. 2025 - Aug. 2025, main advisor: Dr. Umberto Villa) Master in UT Austin CSEM program, Thesis title: *Low-rank-based image reconstruction methods for dynamic contrast-enhanced multispectral optoacoustic tomography*. (publication: [7])

INVITED TALKS

- 2024 UT Austin, Oden Institute, OPTIMUS center
- 2024 SIAM Conference on Imaging Science, Advanced Approaches in Inverse Problems and Applications
- 2024 Chinese University of Hong Kong, Mathematics Department Seminar
- 2024 Nanjing University, Mathematics Department Seminar
- 2024 Southeast University, Mathematics Department Seminar
- 2023 Zhejiang University, College of Control Science and Engineering Seminar
- 2023 Xi'an Jiaotong-Liverpool University, Mathematics Department Seminar
- 2023 ShanghaiTech University, School of Information Science and Technology Seminar
- 2021 University of Michigan, Ann Arbor, Image and Signal Processing Group and fMRI Lab
- 2021 Rice University, Computational Imaging Lab
- 2021 Duke University, Computational Optics Lab
- 2021 Caltech, Computational Cameras
- 2019 EPFL, Biomedical Imaging Group

PROFESSIONAL SERVICE

Journal Reviewer: SIAM Journal on Imaging Sciences, SIAM Journal on Scientific Computing, IEEE Open Journal of Signal Processing, IEEE Signal Processing Letters, IEEE Trans. Signal Processing, IEEE Trans. Computational Imaging, IEEE Trans. Biomedical Engineering, IEEE Trans. Circuits and Systems for Video Technology, IEEE Trans. CAS-II, Journal of Computational and Applied Mathematics, Magnetic Resonance in Medicine, Medical Image Analysis, Signal Processing, Digital Signal Processing.

Conference Reviewer: ICICS, ICIEA, ISBI, CPAL, and others.

Membership: IEEE and SIAM