

Education

Massachusetts Institute of Technology (MIT)	CAMBRIDGE, MA USA
PhD student in Electrical Engineering and Computer Science (EECS)	2019 – present
Advisor: Prof. Frédo Durand.	
Tsinghua University	BEIJING, CHINA
Master of Engineering in Control Science and Engineering	2016 – 2019
Advisor: Prof. Qionghai Dai. I also worked with Prof. Jinli Suo.	
Tsinghua University	BEIJING, CHINA
Bachelor of Engineering in Automation	2012 – 2016
Thesis advisor: Prof. Qionghai Dai. GPA 92/100, ranking 3/136.	

Research Interests

Computational Imaging & Photography: Imaging and sensing beyond human vision (in terms of dimensionality and visibility) by combining optical imaging systems with compressive sensing and machine learning techniques. Typical topics that I am currently enthusiastic about are high-dimensional visual computing from low-dimensional samplings, such as high-throughput imaging and single-pixel imaging, and non-line-of-sight imaging.

Generative AI: Most recent project **Structured Diffusion Image Synthesis from Scene Graphs**, which draws inspiration from scene graphs as structured data structure for rendering-based image synthesis in computer graphics. I am broadly enthusiastic about artificial intelligence for addressing social demands (structured visual generation large visual-language models; revealing imaging privacy threats from an ambient light sensor; and robust error correction and recognition system for COVID-19 vaccine record), and building novel tools for both scientific discovery (high-throughput microscopes for neural activities and cell biology). [spotlight by MIT CSAIL]

Publications

 ([†]Equal contributions; [✉]Corresponding author(s))

Preprints

1. Maria Kanelli[†], Jooli Han[†], **Yang Liu**, John Daristotle, Apurva Pardeshi, Timothy Forster, Ari Karchin, Brandon Folk, Lukas Murmann, Lisa Tostanoski, Sebastian Carrasco, Linzixuan Zhang, Behnaz Eshaghi, Shahad Alsaiani, Sydney Pyon, Collin Perkinson, Mounqi Bawendi, Dan Barouch, Frédo Durand, Robert Langer[✉], Ana Jaklenec[✉]. Deep Learning-assisted On-patient Medical Record and mRNA Therapeutics Delivery using Microneedles. [submitted] (2023).

Journal Articles

8. **Yang Liu**[✉], Gregory W. Wornell, William T. Freeman, and Frédo Durand[✉]. Imaging Privacy Threats from an Ambient Light Sensor. *Science Advances*, **10** (2), eadj3608, doi:10.1126/sciadv.adj3608 (2024).
7. Xin Yuan[†], **Yang Liu**[†], Jinli Suo, Frédo Durand, and Qionghai Dai. Plug-and-Play Algorithms for Video Snapshot Compressive Imaging. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, **44** (10), 7093–7111, doi:10.1109/TPAMI.2021.3099035 (2022).
6. Zhihong Zhang[†], Chao Deng[†], **Yang Liu**, Xin Yuan, Jinli Suo[✉], and Qionghai Dai. Ten-mega-pixel snapshot compressive imaging with a hybrid coded aperture. *Photonics Research*, **9** (11), 2277–2287, doi:10.1364/PRJ.435256 (2021).
5. Meng Li, Liheng Bian[✉], Guoan Zheng, Andrew Maiden, **Yang Liu**, Yiming Li, Jinli Suo, Qionghai Dai, and Jun Zhang. Single-pixel ptychography. *Optics Letters*, **46** (7), 1624–1627, doi:10.1364/OL.417039 (2021).
4. Siming Zheng[†], **Yang Liu**[†], Ziyi Meng, Mu Qiao, Zhishen Tong, Xiaoyu Yang, Shensheng Han, and Xin Yuan. Deep Plug-and-Play Priors for Spectral Snapshot Compressive Imaging. *Photonics Research*, **9** (2), B18–B29, doi:10.1364/PRJ.411745 (2021).
3. **Yang Liu**[†], Xin Yuan[†], Jinli Suo, David J. Brady, and Qionghai Dai[✉]. Rank Minimization for Snapshot Compressive Imaging. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, **41** (12), 2990–3006, doi:10.1109/TPAMI.2018.2873587 (2019).
2. **Yang Liu**, Jinli Suo, Yuanlong Zhang, and Qionghai Dai. Single-pixel Phase and Fluorescence Microscope. *Optics Express*, **26** (25), 32451–32462, doi:10.1364/OE.26.032451 (2018).
1. Yuwang Wang, **Yang Liu**, Jinli Suo, Guohai Situ, Chang Qiao, and Qionghai Dai. High Speed Computational Ghost Imaging via Spatial Sweeping. *Scientific Reports*, **7**, 45325, doi:10.1038/srep45325 (2017).

Conference Proceedings

3. Xin Yuan, **Yang Liu**, Jinli Suo, and Qionghai Dai. Plug-and-Play Algorithms for Large-scale Snapshot Compressive Imaging. in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* [Oral], 1447–1457, doi:10.1109/CVPR42600.2020.00152 (2020).
2. Xukang Wang, **Yang Liu**, Xiaofei Han, Jinli Suo, and Qionghai Dai. Snapshot Compressive Volumetric Light-sheet Microscopy. in *OSA Biophotonics Congress, BODA, JW5A.5*, doi: 10.1364/BODA.2019.JW5A.5 (2019).
1. **Yang Liu**, Jinli Suo, Yuanlong Zhang, and Qionghai Dai. Simultaneous Fluorescence and Quantitative Phase Microscopy with Single-pixel Detectors. in *Proc. SPIE 10503, Quantitative Phase Imaging IV, 105032K*, doi: 10.1117/12.2286757 (2018).

US Patents

1. Sai Bi, **Yang Liu**, Zexiang Xu, Fujun Luan, and Kalyan Sunkavalli. Generating Three-Dimensional Representations for Digital Objects Utilizing Mesh-based Thin Volumes. [US20230360327A1](#) (2023).

Honors and Awards

Honors: Outstanding Master’s Thesis of Tsinghua University (2019), Outstanding Postgraduate of Tsinghua University and Automation Department (2019), Special Honor of Automation Department for Postgraduate Students (3/~600, 2018), Outstanding Graduate of Beijing and Tsinghua University (2016).

Scholarships: Takeda Fellowship from MIT-Takeda Program (2022), MIT Stata Family Presidential Fellowship (2019), Jiang Nanxiang Scholarship (finalist of Top-10 Graduate Scholarship of Tsinghua University, 30/~30,000, 2018), Samvo-Chan Shung Fai Scholarship (2014), National Endeavor Scholarship (2013 & 2015), Cyrus Tang Scholarship (2013, 2014 & 2015), and HAGE Scholarship (2013, 2014 & 2015).

Competitions: Second Prize in the 33-th Challenge Cup of Tsinghua University (2015), Honorable Mention in Mathematical Contest in Modeling (2015), and Second Prize in Contemporary Undergraduate Mathematical Contest in Modeling (2014).

Research Experience

CSAIL, Massachusetts Institute of Technology (MIT)

CAMBRIDGE, MA USA

Research Assistant

Sep 2019 – present

I work on structured visual generation large visual-language models based on Stable Diffusion as well as imaging and sensing beyond human vision, specifically passive non-line-of-sight imaging and sensing with ubiquitous non-imaging devices. Advisor: Prof. Frédo Durand. Working closely with Prof. Bill Freeman and Prof. Greg Wornell on imaging topics.

CSAIL and Chemical Engineering, MIT

CAMBRIDGE, MA USA

Research Assistant

Apr 2021 – Apr 2022

I worked on COVID-19 vaccine record system, partially designing a 2D error-correction and privacy-preserving subdermal barcode while maximizing the information capacity and a robust deep-learning-based recognition system. Advisors: Prof. Frédo Durand, Prof. Robert Langer, Dr. Ana Jaklenec. Working closely with Dr. Jooli Han.

Adobe Research [remote]

SAN JOSE, CA USA

Research Intern

May 2021 – Aug 2021

Worked on efficient neural rendering using a mesh-guided thin volume/shell representation. Mentors: Dr. Sai Bi, Dr. Zexiang Xu, and Dr. Kalyan Sunkavalli.

Department of Automation, Tsinghua University

BEIJING, CHINA

Research Assistant

Sep 2015 – Jul 2019

At Broadband and Digital Media Laboratory, I emphasize on computational imaging combined with compressive sensing and machine learning techniques. My current interests include high-throughput imaging, imaging through scattering media and single-pixel imaging. Advisor: Prof. Qionghai Dai.

Chemical and Biological Engineering, University of British Columbia

VANCOUVER, BC CANADA

Research Intern

Jun 2015 – Aug 2015

At Data Analytics and Intelligent Systems Laboratory, I worked on estimation and optimal control of Li-ion batteries. Advisors: Prof. Bhushan Gopaluni and Prof. Brian Wetton (UBC Math).

Teaching Experience

- Digital and Computational Photography 6.815/6.865 lectured by Prof. Frédo Durand MIT
Teaching Assistant Fall 2020
Problem sets, online Q&A, and office hours [*virtual*]. MIT TA Evaluation: 7.0/7.0.
- Computer Language and Programming (using C) lectured by Prof. Jinli Suo TSINGHUA UNIVERSITY
Teaching Assistant Fall 2018
Deploy and maintain an online judge system, design problem sets, and review the solutions of midterm and final exams.
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Academic Service

- Co-Organizer of MIT Graphics Seminars (weekly lunch format) with Karima Ma** 2023 – 2024
- Organizer of MIT Vision and Graphics Seminars (bi-weekly graphics side)** 2022 – 2023
- Co-Organizer of the first MIT Visual Computing Workshop – topic “Failures”** 2021.02
- Reviewer** for IEEE Transactions on Computational Imaging (TCI), Transactions on Neural Networks and Learning Systems (TNNLS), Journal of Selected Topics in Signal Processing (JSTSP), and Optica Publishing Group (previously known as OSA) Photonics Research, Optics Express (OE), Optics Letters (OL), Biomedical Optics Express (BOE), Applied Optics (AO).
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Skills

- Programming Languages:** Python, MATLAB, C/C++ (*proficient*), Java, R, and LabVIEW (*competent*).
- Natural Languages:** Chinese (*native*) and English.
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Interests

- Sports:** Tennis, snowboarding, climbing, backpacking / camping.
- Hobbies:** Landscape photography, design, making, and L^AT_EXing.
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References

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- Prof. Jinli Suo, Associate Professor
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- Prof. Xin Yuan, Associate Professor
Westlake University, Hangzhou, Zhejiang, China
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