

# Yang Liu

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Office 32-D412 • The Stata Center • 32 Vassar Street • Cambridge • MA 02139  
yliu@csail.mit.edu • yangliu.mit.edu

## Education

Massachusetts Institute of Technology (MIT)

PhD student in Electrical Engineering and Computer Science (EECS)

Advisor: Prof. Frédo Durand.

CAMBRIDGE, MA USA

2019 – present

Tsinghua University

Master of Engineering in Control Science and Engineering

Advisor: Prof. Qionghai Dai. I also worked with Prof. Jinli Suo.

BEIJING, CHINA

2016 – 2019

Tsinghua University

Bachelor of Engineering in Automation

Thesis advisor: Prof. Qionghai Dai. GPA 92/100, ranking 3/136.

BEIJING, CHINA

2012 – 2016

## 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

**Preprints** (<sup>✉</sup>Corresponding author(s))

2. **Yang Liu**<sup>✉</sup>, Gregory W. Wornell, William T. Freeman, and Frédo Durand<sup>✉</sup>. Imaging Privacy Threats from an Ambient Light Sensor. *Science Advances* [*accepted*], doi:10.1126/sciadv.adj3608 (2023).
1. Maria Kanelli<sup>†</sup>, Jooli Han<sup>†</sup>, **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<sup>✉</sup>, Ana Jaklenec<sup>✉</sup>. Deep Learning-assisted On-patient Medical Record and mRNA Therapeutics Delivery using Microneedles. [*submitted*] (2023).

**Journal Articles** (<sup>†</sup>Equal contributions)

7. Xin Yuan<sup>†</sup>, **Yang Liu**<sup>†</sup>, 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<sup>†</sup>, Chao Deng<sup>†</sup>, **Yang Liu**, Xin Yuan, Jinli Suo<sup>✉</sup>, 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<sup>✉</sup>, 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<sup>†</sup>, **Yang Liu**<sup>†</sup>, 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**<sup>†</sup>, Xin Yuan<sup>†</sup>, Jinli Suo, David J. Brady, and Qionghai Dai<sup>✉</sup>. 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://patents.google.com/patent/US20230360327A1) (2023).

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## 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).

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## 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: 5.0/5.0.

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, badminton, ping pong, and running.

**Hobbies:** Landscape photography, design, [making](#), and  $\LaTeX$ ing.

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## References

[Prof. Frédo Durand](#), Professor  
Department of Electrical Engineering and Computer Science (EECS), MIT, Cambridge, MA 02139, USA  
fredo@mit.edu

[Prof. Qionghai Dai](#), Professor  
Department of Automation, Tsinghua University, Beijing, China  
qhdai@tsinghua.edu.cn

[Prof. Jinli Suo](#), Associate Professor  
Department of Automation, Tsinghua University, Beijing, China  
jlsuo@tsinghua.edu.cn

[Prof. Xin Yuan](#), Associate Professor  
Westlake University, Hangzhou, Zhejiang, China  
xyuan@westlake.edu.cn