Cheng Zheng

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Education

- **Massachusetts Institute of Technology** — Cambridge
  Ph.D. in Mechanical Engineering; Advisor: Peter So — *Sep. 2018 - Present*
- **The Chinese University of Hong Kong** — Hong Kong
  Research Assistant; Advisor: Renjie Zhou — *June 2018 - August 2018*
- **Zhejiang University** — Hangzhou, China
  M.S. in Opical Engineering; Advisor: Cuifang Kuang — *Sep. 2015 - March 2018*
- **Zhejiang University** — Hangzhou, China
  B.S. in Optical Engineering — *Sep. 2011 - June 2015*

Research Interest

Computational imaging/fabrication. Optical system inverse design.

Research Experience

- **Massachusetts Institute of Technology** — Cambridge
  Graduate researcher, Computational microscopy and fabrication — *Sep. 2018 - Present*
  - **De-scattering in deep brain** We develop a computational method to remove the scattered photons in two-photo temporal focusing microscopy. By projecting random illumination patterns, seven scattering lengths in brain is achieved in a wide-field detection manner.
  - **Neural lithography with high precision and throughput** We aim to highlight the merits of two-photon lithography of nanoscale precision and skip the point-by-point process. At the same time, we aim to build a more accurate relation between mask and target during lithography with online learning.
- **Zhejiang University** — Hangzhou
  Graduate researcher, Computational Super-resolution imaging — *Sep. 2015 - March 2018*
  - **Point spread function (PSF) engineering for super-resolution imaging** We achieve the first computational imaging method in point scanning regime to gain an image resolution comparable to STED (the method won the 2014 Nobel Prize). By combining the phase-based PSF engineering and multiview reconstruction, we enable our system to be much cheaper in expense, tender to bio-sample, and more flexible in operation than STED.
  - **Polarized multi-angle total internal reflection fluorescence (TIRF) imaging** We utilize the polarization information to gain a lateral super-resolution and TIRF to estimate the depth map. We develop a two-step sparse reconstruction pipeline and enable video-rate 3D super-resolved imaging.
  - **DMD based quantitative phase imaging** We developed novel quantitative phase imaging method to achieve state-of-the-art lateral and temporal resolution without sacrificing phase precision by the flexible use of digital micromirror device (DMD). We demonstrate the applications in real-time material manufacturing monitoring for quality control and biology study.

Selected Publications

- **Cheng Zheng***, Jong Kang Park* et al., "De-scattering with Excitation Patterning enables rapid wide-field imaging through scattering media" Science Advances (2021), EAAY5496. * equal contribution
- Guangyuang Zhao*, **Cheng Zheng***, Cuifang Kuang, et al., "Nonlinear Focal Modulation Microscopy," *Physical review letters* 120.19 (2018): 193901. * equal contribution [On the cover] [Reviewers' Comments])
- **Cheng Zheng**, Guangyuan Zhao et al., "3D super-resolved multi-angle TIRF via polarization modulation," *Optics Letters*,(2018). [Editor's pick] [Presentation Slides]
- **Cheng Zheng**, Renjie Zhou, Cuifang Kuang, et al., "Digital micromirror device-based common-path quantitative phase imaging," *Optics Letters*, (2017).

Skills

- **Programming Languages and framework**: Python, MATLAB, PyTorch, Julia