# HE SUN

✍ Wang Kezhen Building, RM 209
Peking University, Beijing
China, 100871

⌁ http://users.cms.caltech.edu/~hesun/
✉ hesun@pku.edu.cn
☎ xxx-xxx-xxxx

**Current Position**    Assistant Professor of Biomedical Engineering, Peking University

**Research Interests**    computational imaging, adaptive optics, inverse problem, machine learning, and astronomy

## Education

| | | | |
|---|---|---|---|
| 06/2016-09/2019 | **Ph.D.** | Mechanical and Aerospace Engineering | **Princeton University** |
| 09/2017-09/2019 | **Certificate** | Statistics and Machine Learning | **Princeton University** |
| | | Computational and Information Science | |
| 09/2014-05/2016 | **M.A.** | Mechanical and Aerospace Engineering | **Princeton University** |
| 01/2014-05/2014 | **Exchange Student** | Mechanical Engineering | **University of Maryland** |
| 09/2011-07/2014 | **B.Sc (Dual)** | Economics | **Peking University** |
| 09/2010-07/2014 | **B.Eng (Major, with honors)** | Engineering Mechanics | **Peking University** |

## Work & Research Experience

10/2019-03/2022    Postdoctoral Researcher at Computing and Mathematical Sciences, California Institute of Technology
*Advisor: Prof. Katherine L. Bouman*

09/2014-09/2019    Research Assistant at High Contrast Imaging Lab, Princeton University
*Thesis: "Efficient wavefront sensing and control for space-based high-contrast imaging"*
*Advisor: Prof. N. Jeremy Kasdin*

06/2018-09/2018    Research Intern at Mitsubishi Electric Research Laboratories - Cambridge, MA
*Host: Dr. Yebin Wang and Dr. Dong Tian*

02/2013-06/2014    Research Assistant at Combustion Lab, Peking University - Beijing, China
*Advisor: Prof. Zheng Chen*

## Honors & Awards

2021    Best Paper Award, Machine Learning for Health Conference
2020    Amazon AI4Science Fellowship, California Institute of Technology
2019    Best Paper Award for Observation Systems and Technologies, IEEE Aerospace Conference, Big Sky
2018    Britt & Eli Harari Fellowship, Princeton University
2017    School of Engineering and Applied Science Award for Excellence, Princeton University. ***"This award is given to SEAS advanced graduate students who have performed at the highest level as scholars and researchers."***
2014    Outstanding Graduate Award, Peking University and Beijing Government (Top 5%)
2013    ExxoMobil Scholarship, Peking University
2012    Boeing Scholarship, Peking University
2011    1987 Alumni Scholarship, Peking University

## Publications

**Peer-reviewed Conference Papers**

1. **Sun, He** and Katherine Bouman (2021). Deep probabilistic imaging: uncertainty quantification and multi-modal solution characterization for computational imaging. In: *35th AAAI Conference on Artificial Intelligence*.
2. Yin, Tianwei, Zihui Wu, **He Sun**, Adrian Dalca, Yisong Yue, and Katherine Bouman (2021). End-to-end sequential sampling and reconstruction for MR Imaging. *Machine Learning for Health Conference*. **Best paper**.
3. **Sun, He**, Adrian Dalca, and Katherine Bouman (2020). Learn a probabilistic strategy for computational imaging sensor selection. In: *International Conference on Computational Photography*. IEEE.
4. **Sun, He**, Jessica Gersh-Range, and N Jeremy Kasdin (2019). Modern wavefront control for space-based exoplanet coronagraph imaging. In: *Aerospace Conference*. IEEE. **Best paper for observation systems and technologies**.
5. Takahashi, Takeshi, **He Sun**, Dong Tian, and Yebin Wang (2019). Learning heuristic functions for mobile robot path planning using deep neural networks. In: *29th International Conference on Automated Planning and Scheduling*.

## Journal Papers

1. **Sun, He**, Paul Tiede, Jason J. Wang, Sarah Blunt, Dimitri Mawet, and Katherine Bouman (2022). $\alpha$-Deep Probabilistic Inference ($\alpha$-DPI): efficient uncertainty quantification from exoplanet astrometry to black hole feature extraction. *Astrophysical Journal (ApJ)*.

2. The Event Horizon Telescope Collaboration, et. al. (2022). First Sagittarius A* Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole in the Center of the Milky Way. *The Astrophysical Journal Letters* **930**(2), L12.

3. — (2022). First Sagittarius A* Event Horizon Telescope Results. II. EHT and Multiwavelength Observations, Data Processing, and Calibration. *The Astrophysical Journal Letters* **930**(2), L13.

4. — (2022). First Sagittarius A* Event Horizon Telescope Results. III. Imaging of the Galactic Center Supermassive Black Hole. *The Astrophysical Journal Letters* **930**(2), L14.

5. — (2022). First Sagittarius A* Event Horizon Telescope Results. IV. Variability, Morphology, and Black Hole Mass. *The Astrophysical Journal Letters* **930**(2), L15.

6. — (2022). First Sagittarius A* Event Horizon Telescope Results. V. Testing Astrophysical Models of the Galactic Center Black Hole. *The Astrophysical Journal Letters* **930**(2), L16.

7. — (2022). First Sagittarius A* Event Horizon Telescope Results. VI. Testing the Black Hole Metric. *The Astrophysical Journal Letters* **930**(2), L17.

8. Haffert, Sebastiaan Y., Jared R. Males, Laird M. Close, Kyle van Gorkom, Joseph D. Long, Alex Hedglen, Olivier Guyon, Lauren Schatz, Maggie Kautz, Jennifer Lumbres, Rodack Alex, Knight Justin M., **He Sun**, and Kevin Fogarty (2021). Data-driven subspace predictive control of adaptive optics for high-contrast imaging. *Journal of Astronomical Telescopes, Instruments, and Systems*.

9. Hu, Mengya, Anthony Harness, **He Sun**, and N Jeremy Kasdin (2021). Exoplanet detection in starshade images. *Journal of Astronomical Telescopes, Instruments, and Systems*.

10. Hu, Mengya, **He Sun**, Anthony Harness, and N Jeremy Kasdin (2021). Bernoulli generalized likelihood ratio test for signal detection from photon counting images. *Journal of Astronomical Telescopes, Instruments, and Systems*.

11. Llop-Sayson, Jorge et al. (2021). Constraining the Orbit and Mass of epsilon Eridani b with Radial Velocities, Hipparcos IAD-Gaia DR2 Astrometry, and Multiepoch Vortex Coronagraphy Upper Limits. *The Astronomical Journal* **162**(5), 181.

12. The Event Horizon Telescope Collaboration, et. al. (2021). First M87 Event Horizon Telescope Results VII: Polarization of The Ring. *Astrophysical Journal Letters*.

13. — (2021). First M87 Event Horizon Telescope Results VIII: Magnetic Field Structure Near The Event Horizon. *Astrophysical Journal Letters*.

14. **Sun, He**, Alexei Goun, Susan Redmond, Michael Galvin, Tyler Groff, and N Jeremy Kasdin (2020). High-Contrast Integral Field Spectrograph (HCIFS): multi-spectral wavefront control and reduced-dimensional system identification. *Optics Express*.

15. **Sun, He**, N. Jeremy Kasdin, and Robert Vanderbei (2020). Efficient wavefront sensing for space-based adaptive optics. *Journal of Astronomical Telescopes, Instruments, and Systems*.

16. **Sun, He**, N Jeremy Kasdin, and Robert Vanderbei (2018). Identification and adaptive control of a high-contrast focal plane wavefront correction system. *Journal of Astronomical Telescopes, Instruments, and Systems*.

## Other Conference Proceedings

1. Haffert, Sebastiaan Y, Jared Males, Laird Close, Kyle van Gorkom, Joseph Long, Alexander Hedglen, Lauren Schatz, Jennifer Lumbres, Alexander Rodack, Justin Knight, et al. (2021). Data-driven subspace predictive control: lab and on-sky demonstration. In: *Techniques and Instrumentation for Detection of Exoplanets X*. Vol. 11823. International Society for Optics and Photonics, pp.118231C.

2. Hu, Mengya, **He Sun**, and N Jeremy Kasdin (2019). Sequential generalized likelihood ratio test for planet detection with photon-counting mode. In: *Proceedings of SPIE*.

3. Delacroix, Christian, **He Sun**, Michael Galvin, Mary Anne Limbach, Tyler Groff, Maxime Rizzo, Matthew Grossman, Katherine Mumm, and N Jeremy Kasdin (2018). First light of the High Contrast Integral Field Spectrograph (HCIFS). In: *Proceedings of SPIE*.

4. **Sun, He** and N Jeremy Kasdin (2018). Neural network control of the high-contrast imaging system. In: *Proceedings of SPIE*.

5. **Sun, He**, N Jeremy Kasdin, and Robert Vanderbei (2017). Identification of the focal plane wavefront control system using EM algorithm. In: *Proceedings of SPIE*.

6. **Sun, He**, N Jeremy Kasdin, Robert Vanderbei, AJ Eldorado Riggs, and Tyler Groff (2017). Improved high-contrast wavefront controllers for exoplanet coronagraphic imaging systems. In: *Proceedings of SPIE*.

7. **Sun, He**, AJ Eldorado Riggs, N Jeremy Kasdin, Robert Vanderbei, and Tyler Groff (2016). Modified deformable mirror stroke minimization control for direct imaging of exoplanets. In: *Proceedings of SPIE*.

## Invited Talks

1. "Computational astronomical imaging: inference and sensing algorithms for future black hole observations."
    (a) *UCLA Warren Grundfest Memorial Lectures.* October 2021.
    (b) *TU Delft Imaging Physics Department.* February 2021.
2. "Computational scientific imaging: from astronomy to biomedicine." *Peking University National Biomedical Imaging Center.* August 2021.
3. "Efficient wavefront sensing and control with system identification and deformable mirror sensing command optimization." *UCSB Direct Imaging Tech Webinar.* July 2020.
4. "Adaptive optics for space-based high-contrast imaging." *Peking University, Aero&Astro Department.* May 2020.
5. "Adaptive optics with online system identification." *Center for Adaptive Optics (CfAO) Fall Science Retreat* Lake Arrowhead, CA. November 2019.
6. "Wavefront sensing and control for high-contrast imaging in space." *Caltech CMS Department.* June 2019.

## Teaching Experience

| | |
|---|---|
| 07/2016-present | Undergraduate Student Research Mentor |
| | *Mentees: Henry Ha (Princeton), Cathleen Kong (Princeton), Brendan Hollaway (Caltech), Johanna Karras (Caltech), Tianwei Yin (Rice), Hugo Chacon (PCC)* |
| 05/2020&05/2021 | Guest Lecturer for Computational Cameras (CS 101C), Caltech |
| | *Instructor: Prof. Katie Bouman, Topic: "Phase sensing: methods, applications and beyond"* |
| 05/2020 | Guest Lecturer for Data-Driven Algorithm Design (CS 159), Caltech |
| | *Instructor: Prof. Yisong Yue, Topic: "Data-driven solvers for inverse problems"* |
| 09/2018-01/2019 | Assistant Instructor for Automatic Control System (MAE 433), Princeton |
| | *Instructor: Prof. Clancy W. Rowley* |
| 01/2018-05/2018 | Assistant Instructor for Introduction to Dynamics (MAE 206), Princeton |
| | *Instructor: Prof. N. Jeremy Kasdin* |
| 09/2017-01/2018 | Assistant Instructor for Space Flight (MAE 341), Princeton |
| | *Instructor: Prof. N. Jeremy Kasdin* |
| 09/2016-01/2017 | Assistant Instructor for Mathematics in Engineering (MAE 305/MAT 391), Princeton |
| | *Instructor: Prof. Howard A. Stone* |

## Research Grants

1. **PI**, Amazon AI4Science Fellowship, "Reliable Scientific Imaging with Accurate Noise Modeling and Uncertainty Quantification", 2020-2022

2. **Co-I**, Sensing to Intelligence (S2I) Initiative, Caltech, "AI Meets Real-World Science: Optimal Sequential Sensing for Next-Generation Imaging", 2020-2021 (PI: Katherine L. Bouman)

## Academic Service

| | |
|---|---|
| Reviewer | *Astronomy & Astrophysics, Journal of Astronomical Telescopes, Instruments, and Systems, Optics Letters, IEEE Transactions on Image Processing, IEEE/CAA Journal of Automatica Sinica, ICCV 2021, ECCV 2022, CVPR 2022, ICCP 2021 & 2022, ICASSP 2020 & 2021 & 2022* |
| Organizing Committee | International Conference on Computational Photography (ICCP) 2022 |
| | Computational Cameras and Displays (CCD) Workshop, CVPR 2022 |
| Affiliate Member | IEEE Technical Committee for Computational Imaging, 2019-present |

## Leadership

| | |
|---|---|
| 11/2020-03/2022 | Member of Committee on CMS Graduate Admissions, California Institute of Technology |
| 09/2017-05/2018 | Member of Priorities Committee of the Council of the Princeton University Community |
| | *Led by Provost Deborah Prentice, working on reviewing the operating budget and plans for the development of the University* |
| 01/2018-05/2018 | Organizer of Robotics Reading Group at Princeton University |
| | *With Desmond Yaofeng Zhong, Vincent Pacelli, and Renato Pagliara Vasquez* |
| 04/2015-04/2016 | President of Association of Chinese Students and Scholars at Princeton University |