

Katherine (Katie) L. Bouman

| | | |
|---------------------------------------|--|--|
| CONTACT INFORMATION | 330 South Chester Avenue, Room 346 Pasadena, CA 91125 USA | Website: http://people.csail.mit.edu/klbouman |
| POSITION | Assistant Professor, California Institute of Technology <i>Department of Computing and Mathematical Sciences</i> | |
| RESEARCH INTERESTS | Computational imaging, computational photography, computer vision, image and video processing, inverse problems, and machine learning | |
| EDUCATION | Harvard-Smithsonian Center for Astrophysics , Cambridge, MA, USA <i>Postdoctoral Fellow</i> | 2017 - 2019 |
| | Massachusetts Institute of Technology , Cambridge, MA, USA <i>Ph.D. Student in Electrical Engineering and Computer Science</i> <i>Minor in Brain and Cognitive Sciences</i> <ul style="list-style-type: none">• Thesis: “Extreme Imaging via Physical Model Inversion: Seeing Around Corners and Imaging Black Holes”• Advisor: William Freeman | 2011 - 2017 |
| | Massachusetts Institute of Technology , Cambridge, MA, USA <i>M.S. in Electrical Engineering and Computer Science</i> <ul style="list-style-type: none">• Thesis: “Estimating the Material Properties of Fabric Through the Observation of Motion”• Advisor: William Freeman | 2011 - 2013 |
| | University of Michigan , Ann Arbor, MI, USA <i>B.S.E in Electrical Engineering Summa Cum Laude</i> <i>Minor in Mathematics</i> | 2007 - 2011 |
| SELECTED HONORS AND AWARDS | Ernst A. Guillemin Thesis Prize for the best masters thesis in EE at MIT (2nd place) NSF Graduate Fellowship Irwin and Joan Jacobs Presidential Fellowship Best Poster Awards (ICCP 2017, IPMI 2017) Outstanding Reviewer Awards (CVPR 2017, ECCV 2016) Barry M. Goldwater Scholarship William Harvey Seeley Prize - presented to a student who stands first in the class of electrical engineering in their first year. | |
| SELECTED WORK AND RESEARCH EXPERIENCE | Harvard-Smithsonian Center for Astrophysics <i>Postdoctoral Fellowship with the Event Horizon Telescope</i> | 2017 - Present |
| | Massachusetts Institute of Technology, CSAIL <i>Graduate Research Assistant with Dr. William Freeman</i> | 2011 - 2017 |
| | Microsoft Research - Redmond, WA | Summer 2014 |

Summer Research Intern mentored by Dr. Neel Joshi

Microsoft Research - Cambridge, MA Summer 2012
Summer Research Intern mentored by Dr. Ce Liu

MIT Lincoln Laboratory - Lexington, MA Summer 2011
Summer Research Intern mentored by Nadya Bliss and Dr. Karl Ni

Qualcomm - San Diego, CA Summer 2010
Summer Research Intern mentored by Dr. Sergio Goma

CONFERENCE
PUBLICATIONS

* denotes equal contribution

KL Bouman, V Ye, AB Yedidia, F Durand, GW Wornell, A Torralba, WT Freeman. “Turning Corners into Cameras: Principles and Method”. *International Conference on Computer Vision (ICCV)*, 2017. (Selected for Spotlight Presentation. This work won the “Best Poster” award at ICCV 2017.)

AV Dalca, **KL Bouman**, WT Freeman, MR Sabuncu, NS Rost, P Golland. “Population Based Image Imputation”. *International Conference on Information Processing and Medical Imaging (IPMI)*, 2017. (Won “Best Poster” Award)

T Xue*, J Wu*, **KL Bouman**, WT Freeman. “Visual Dynamics: Probabilistic Future Frame Synthesis via Cross Convolutional Networks”. *The Conference and Workshop on Neural Information Processing Systems (NIPS)*, 2016. (Selected for Oral Presentation).

KL Bouman, MD Johnson, D Zoran, VL Fish, SS Doleman, WT Freeman. “Computational Imaging for VLBI Image Reconstruction”. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016. (Selected for Oral Presentation).

A Davis*, **KL Bouman***, JG Chen, M Rubinstein, F Durand, WT Freeman. “Visual Vibrometry: Estimating Material Properties from Small Motions in Video”. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2015. (Selected for Oral Presentation).

KL Bouman, B Xiao, P Battaglia and W Freeman. “Estimating the Material Properties of Fabric Through Observation of Motion”. *IEEE International Conference on Computer Vision (ICCV)*, 2013.

K Ni, E Phelps, **KL Bouman**, and N Bliss. “Training image classifiers with similarity metrics, linear programming, and minimal supervision”. *Asilomar Conference on Signals, Systems, and Computers. (Asilomar)*, 2012.

KL Bouman, V Ramachandra, K Atanassov, M Aleksic, and SR Goma. “RAW camera DPCM compression performance analysis”. *Proceedings of SPIE-IS&T Electronic Imaging*, 2011.

KL Bouman, G Abdollahian, M Boutin, and EJ Delp. “A low complexity method for detection of text area in natural images”. *International Conference on Acoustics Speech and Signal Processing (ICASSP)*, 2010.

JOURNAL
PUBLICATIONS

S. Issaoun, MD. Johnson, L Blackburn, CD Brinkerink, M Moscibrodzka, A Chael, C Goddi, I Marti-Vidal, J Wagner, SS Doleman, H Falcke, TP Krichbaum, K Akiyama, U Bach, **KL Bouman**, GC Bower, A Broderick, I Cho, G Crew, J Dexter, V Fish, R Gold, JL Gomez, K Hada, A Hernandez-Gomez, M Janssen, M Kino, M Kramer, L Loinard, R-S Lu, S Markoff, DP Marrone, LD Matthews,

JM Moran, C Muller, F Roelofs, E Ros, H Rottmann, S Sanchez, RP. J Tilanus, P de Vicente, M Wielgus, JA Zensus, G-Y Zhao. “The Size, Shape, and Scattering of Sagittarius A* at 86 GHz: First VLBI with ALMA”. *The Astrophysics Journal*, 2019.

AV Dalca, **KL Bouman**, WT Freeman, MR Sabuncu, NS Rost, P Golland. “Medical Image Imputation from Image Collections published in IEEE Transactions on Medical Imaging”. *IEEE Transactions on Medical Imaging*, 2018.

T Xue*, J Wu*, **KL Bouman**, WT Freeman. “Visual Dynamics: Stochastic Future Generation via Layered Cross Convolutional Networks”. (*TPAMI*), 2018.

KL Bouman, MD Johnson, AV Dalca, A Chael, F Roelofs, SS Doeleman, WT Freeman. “Reconstructing Video of Time-Varying Sources from Radio Interferometric Measurements”. *IEEE Transactions on Computational Imaging*, 2018.

A Chael, , MD Johnson, **KL Bouman**, L Blackburn, K Akiyama, R Narayan. “Interferometric Imaging Directly with Closure Phases and Closure Amplitudes”. *The Astrophysics Journal*, 2018.

MD Johnson, **KL Bouman**, L Blackburn, A Chael, J Rosen, H Shiokawa, F Roelofs, K Akiyama, VL Fish, SS Doeleman. “Dynamical Imaging with Interferometry”. *The Astrophysics Journal*, 2017.

K Akiyama, K Kuramochi, S Ikeda, VL Fish, F Tazaki, M Honma, SS Doeleman, A Broderick, J Dexter, M Mocibrodzka, **KL Bouman**, A Chael, M Zaizen. “Imaging the Schwarzschild-radius-scale Structure of M87 with the Event Horizon Telescope using Sparse Modeling”. *The Astrophysical Journal*, 2017.

A Davis*, **KL Bouman***, JG Chen, M Rubinstein, O Buyukozturk, Durand, WT Freeman. “Visual Vibrometry: Estimating Material Properties from Small Motions in Video”. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2017.

VL Fish, K Akiyama, **KL Bouman**, A Chael, MD Johnson, SS Doeleman, L Blackburn, JFC Wardle, WT Freeman, “Observing and Imaging Active Galactic Nuclei with the Event Horizon Telescope”. *Galaxies*, 2016.

A Chael, MD Johnson, R Narayan, SS Doeleman, JFC Wardle, **KL Bouman** “High Resolution Linear Polarimetric Imaging for the Event Horizon Telescope”. *The Astrophysical Journal*, 2016.

VL Fish, MD Johnson, R Lu, S. Doeleman, **KL Bouman**, D Zoran, WT Freeman, D Psaltis, R Narayan, V Pankratius, A Broderick, C Gwinn, L Vertatschitsch. “Imaging an Event Horizon: Mitigation of Scattering toward Sagittarius A*”. *The Astrophysical Journal*, 2014.

KL Bouman, G Abdollahian, M Boutin, and EJ Delp. “A low complexity sign detection and text localization method for mobile applications”. *IEEE Transactions on Multimedia*, 2011.

RESEARCH GRANTS AND CONTRACTS Principal Investigator: “Beyond Interstellar: Extracting Science from Black Hole Images,” Keck Institute for Space Studies (KISS)

PATENTS K Ni, **KL Bouman**, and N Bliss. “Sparse Class Representation with Linear Programming”. MIT12-01(15271L). 2012.

INVITED TALKS & PANELS Imaging a Black Hole with the Event Horizon Telescope. *Stanford University* Palo Alto, CA. April 2019.

Imaging a Black Hole with the Event Horizon Telescope. *Harvard University* Cambridge, MA. April 2019.

Recovering Movies of Black Holes (by Expanding the Event Horizon Telescope to Space). *Computational Imaging workshop at ICERM, Brown University* Providence, RI. March 2019.

Data Science Everywhere. *Harvard University* Cambridge, MA. March, 2019.

Artificial Intelligence and Machine Learning. *Caltech Board of Trustees Annual Meeting* Newport Coast, CA. October, 2018.

Turning Corners into Cameras. *Allerton Conference on Communication, Control, and Computing* Allerton, IL. October, 2018.

The Event Horizon Telescope. *SMA Advisory Committee Meeting* Cambridge, MA. July 2018.

Imaging the Invisible. *The Optical Society's Meeting on Computational Optical Sensing and Imaging (COSI)* Orlando, FL. June, 2018.

Corner Cameras. *International Conference on Computational Photography (ICCP)*. Pittsburgh, OH. May, 2018.

Imaging the Invisible. *Interferometry Workshop*. Lexington, MA. April, 2018.

How to Take a Picture of a Black Hole. *New England Computer Vision Workshop (NECV)*. Boston, MA. November, 2017.

Reconstructing a Movie of SgrA* with the EHT. *Astrostatistics Day*. Cambridge, MA. September, 2017.

Photographing a Black Hole. *Boston Museum of Science*. Boston, MA. May, 2017.

The EHT Imaging Challenges. *Event Horizon Telescope Meeting*. Cambridge, MA. November, 2016.

How to Take a Picture of a Black Hole. *TEDx Beacon Street*. Boston, MA. November, 2016.

High Resolution Astronomical Radio Image Reconstruction. *ICCV's Extreme Imaging Workshop*. Santiago, Chile. December 17, 2015.

Visual Vibrometry: Estimating Material Properties from Small Motions in Video". *Rising Stars in EECS: An Academic Workshop for Women*. Boston, MA. November 9, 2015.

A Bayesian Algorithm and Dataset for mm-VLBI Image Reconstruction. *mm-VLBI Data Processing Workshop*. Liden, Netherlands. June 9, 2015.

Object Recognition and Detection in Natural Images. *IEEE Imaging Technology Processing and Applications Course*. MIT Lincoln Laboratory. Lexington, MA. November 26, 2012

TEACHING

Teaching Assistant

Spring 2015

6.098/6.882: Computational Photography, MIT

- Held office hours to answer questions and clarify (approx. 20 students per session)
- Developed new problem sets as well as adapted previous questions from Python to C++
- Answered questions on MIT's online class forum website, Piazza

MEng Thesis Supervision 01/2017-Present

Advised Vickie Ye in her Master's Thesis

- Worked together to develop a method to passively see around corners by interpreting lighting variations in shadows.

Undergraduate Research Supervision Fall 2016

Advised Vickie Ye in her Undergraduate Advanced Project

- Worked together to develop a method to estimate fluid properties, such as temperature, surface tension, or density, passively from video.

MEng Thesis Supervision 2015 - 2016

Advised Victoria Gunning in her Master's Thesis

- Worked together to develop a method to estimate fluid properties, such as temperature, surface tension, or density, passively from video.

Undergraduate Research Supervision 2014 - 2015

Advised Victoria Gunning in her Undergraduate Advanced Project

- Worked together to develop an algorithm to detect tampered regions in a video or set of images by looking at statistics in the noise patterns across frames/images.

ACADEMIC
SERVICE

Technical Committee for IEEE Computational Imaging

Organizer, KISS Study on "Beyond Interstellar: Extracting Science from Black Hole Images," 2019. Pasadena, CA

Organizer, CVPR's Computational Cameras and Displays, 2019. Long Beach, CA

Organizer, CVPR's Computational Cameras and Displays, 2019. Long Beach, CA

Organizer, Event Horizon Telescope Imaging Workshop, August, 2018. Cambridge, MA.

Organizer, Event Horizon Telescope Imaging Workshop, November, 2017. Cambridge, MA.

Organizer, Poster/demo chair for ICCP, May, 2017. Stanford, CA.

Organizer, Help to organize ICCV's Extreme Imaging Workshop, 2015. Santiago, Chile

Organizer, Computer Vision Meetings at MIT, 2015-2017

Area Chair, International Conference on Image Processing (ICIP), 2019

Program Chair, OSA Computational Optical Sensing and Imaging (COSI), 2019

Program Chair, OSA Mathematics in Imaging, 2019

Reviewer, CVPR, 2019
Reviewer, ECCV, 2018
Reviewer, ICCV, 2017
Reviewer, IEEE Transactions on Computational Imaging
Reviewer, CVPR, 2017 - **Outstanding Reviewer Award**
Reviewer, Advances in Space Research
Reviewer, ECCV, 2016 - **Outstanding Reviewer Award**
Reviewer, CVPR, 2016
Reviewer, IEEE Transactions on Visualization and Computer Graphics (TVCG), 2016
Reviewer, Transactions on Applied Perception, 2016
Reviewer, Optics Express, 2015
Reviewer, SPIE Optical Engineering, 2015
Reviewer, ACM SIGGRAPH, 2013
Reviewer, Eurographics, 2013
Reviewer, MIT Graduate Admissions 2014-2016