

# Hannah R. Kerner

Curriculum Vitae

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## EDUCATION

Ph.D. School of Earth and Space Exploration, Arizona State University, 2019

B.S. Department of Computer Science, University of North Carolina at Chapel Hill, 2014

## PROFESSIONAL APPOINTMENTS/EMPLOYMENT

Assistant Research Professor  
Department of Geographical Sciences  
University of Maryland, College Park

2019-Present  
College Park, MD

Onboard Software Engineer  
Planet Labs (Planet, Inc.)

2014-2015  
San Francisco, CA

## PUBLICATIONS

### Peer-Reviewed Journal Articles

1. Kerner, H. R., Wagstaff, K. L., Bue, B. D., Gray, P., Bell III, J. F., Ben Amor, H. (2019). Deep Learning Methods Toward Generalized Change Detection on Planetary Surfaces. *Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 12(10), pp. 3900-3918, <https://doi.org/10.1109/JSTARS.2019.2936771>.
2. Kerner, H. R., Ben Amor, H., Bell III, J. F. (2018). Context-Dependent Image Quality Assessment of JPEG-Compressed Mars Science Laboratory Mastcam Images using Convolutional Neural Networks. *Computers and Geosciences*, 118, pp. 109-121, <https://doi.org/10.1016/j.cageo.2018.06.001>.
3. Kwan, C., Chou, B., Kwan, L., Larkin, J., Ayhan, B., Bell III, J. F., Kerner, H. R. (2017). Demosaicing Enhancement using Pixel-Level Fusion. *Signal, Image and Video Processing*, 12(4), pp. 749-756, <https://doi.org/10.1007/s11760-017-1216-2>.

### Peer-Reviewed Conference Proceedings

4. Kerner, H. R., Wellington, D. F., Wagstaff, K. L., Bell III, J. F., Kwan, C., Ben Amor, H. (2019). Novelty Detection for Multispectral Images with Application to Planetary Exploration. *Innovative Applications of Artificial Intelligence (IAAI/AAAI)*, pp. 9484-9491, <https://doi.org/10.1609/aaai.v33i01.33019484>.

## Manuscripts in Review

5. Kerner, H. R., Wagstaff, K. L., Bue, B. D., Wellington, D. F., Jacob, S., Bell, J. F., Kwan, C. Ben Amor, H. Comparison of Novelty Detection Methods for Multispectral Images in Rover-Based Planetary Exploration Missions. *Data Mining and Knowledge Discovery*.
6. Kerner, H. R., Hardgrove, C., Czarnecki, S., Gabriel, T. S. J., Mitrofanov, I., Litvak, M., Sanin, A., Lisov, D. Analysis of Active Neutron Measurements from the Mars Science Laboratory Dynamic Albedo of Neutrons Instrument: Intrinsic Variability, Outliers, and Implications for Future Investigations. *Journal of Geophysical Research: Planets*.

## Books

7. Kerner, H. R. (2019). Machine Learning on Mars: A New Lens on Data from Planetary Exploration Missions. Ph.D. Dissertation, Arizona State University.

## Manuscripts in Preparation

8. Aye, K. M., D'Amore, M., Helbert, J., Kerner, H. R. (est. 2020). Machine Learning for Planetary Science. In preparation for *Elsevier Science and Technology Books*.

## Opinion Articles

9. Our path to Mars needs to look beyond launch. *Houston Chronicle*, 2016.
10. Space technology can help sustain Earth. *Scientific American*, 2016.

## GRANTS AND FELLOWSHIPS

- 2019 NASA Center Innovation Fund Advanced Concepts  
University of Maryland, College Park; Jet Propulsion Laboratory
- 2019 NASA Small Business Technology Transfer (SBIR/STTR) Phase I  
Arizona State University, Development Seed
- 2018 NASA JPL Strategic University Research Partnership (SURP) Fellowship  
Arizona State University, Jet Propulsion Laboratory
- 2016 NASA Small Business Technology Transfer (SBIR/STTR) Phase I  
Busek Co., Inc.; Arizona State University

## HONORS AND AWARDS

- 2019 ASU College of Liberal Arts and Sciences Graduate Excellence Award
- 2018 Google Women Techmakers Scholarship
- 2018 ASU College of Liberal Arts and Sciences Student Leader
- 2018 ASU Graduate and Professional Student Association Outstanding Mentor Award
- 2017 ASU College of Liberal Arts and Sciences Doctoral Fellowship for First-Generation College Graduates
- 2017 Space Frontier Foundation Service to the Frontier Award

## INVITED TALKS

- 2020 “Enhancing Planetary Exploration Mission Planning and Data Analysis using Machine Learning.” Solar System Exploration Division Seminar, NASA Goddard Space Flight Center, Greenbelt, MD.
- 2020 “Machine Learning for Agricultural Monitoring.” Advancing Application of Machine Learning Tools for NASA’s Earth Observation Data, Washington, DC.
- 2019 “Actionable Insights from Remote Sensing Enabled by Machine Learning, from Earth to Mars.” International Space University, Strasbourg, France.
- 2019 “Actionable Insights from Remote Sensing Enabled by Machine Learning, from Earth to Mars.” Arizona State University, Tempe, AZ.
- 2019 “Space for Earth.” SpaceVision 2019, Tempe, AZ.
- 2019 “Actionable Insights from Remote Sensing Enabled by Machine Learning, from Earth to Mars.” Women in Data Science at Stanford Earth, Palo Alto, CA.
- 2019 “Machine Learning for Remote Sensing.” Committee on Seismology and Geodynamics (COSG) Fall Meeting, National Academies of Science, Engineering, and Medicine, Washington, DC.
- 2019 “AI and Machine Learning.” Space4Earth Hackathon, 70th International Astronautical Congress, Washington, DC.
- 2018 “Machine Learning on Mars.” Google Scholar Retreat, Mountain View, CA.
- 2016 “Planetary Exploration, Machine Intelligence, and Gender Bias.” CU Cafe, Boulder, CO.

## CONFERENCE ACTIVITIES

### Oral Presentations

- 2019 Kerner, H. R., Wagstaff, K. L., Bue, B. D., Wellington, D. F., Jacob, S., Bell III, J. F., Ben Amor, H. Comparison of Novelty Detection Methods for Multispectral Images from the Mastcam Instrument Onboard Mars Science Laboratory. 3rd Planetary Data Workshop, Flagstaff, AZ, June 18-20.
- 2019 Kerner, H. R., Wagstaff, K. L., Bue, B. D., Wellington, D. F., Jacob, S., Bell III, J. F., Ben Amor, H. Novelty Detection for Multispectral Images with Application to Planetary Exploration. Innovative Applications of Artificial Intelligence (IAAI), 33rd AAAI Conference on Artificial Intelligence, Honolulu, HI, January 27-31.
- 2018 Kerner, H. R., Wagstaff, K. L., Bue, B. D., Wellington, D. F., Bell III, J. F., Ben Amor, H. Novelty Detection for Multispectral Planetary Images. American Geophysical Union (AGU) Fall Meeting, Washington, DC, December 10-14.
- 2017 Kerner, H. R., Bell III, J. F., Ben Amor, H. Context-dependent image quality assessment of JPEG compressed Mars Science Laboratory Mastcam Curiosity images using convolutional neural networks. American Geophysical Union (AGU) Fall Meeting, New Orleans, LA, December 11-15.
- 2017 Kerner, H. R., Bell III, J. F., Ben Amor, H. Detecting and characterizing compression-related artifacts in Mars Science Laboratory Mastcam images. 48th Lunar and Planetary Science Conference, The Woodlands, TX, March 20-24.

### Poster Presentations

- 2019 Kerner, H. R., Wagstaff, K. L., Bue, B. D., Gray, P. C., Bell III, J. F., Ben Amor, H. Toward Generalized Change Detection on Planetary Surfaces with Deep Learning. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 9-14.
- 2019 Kerner, H. R., Hardgrove, C., Czarnecki, S. Analysis of Intrinsic Variability and Outliers in Pulsed Neutron Data using the Mars Science Laboratory Dynamic Albedo of Neutrons Instrument. 50th Lunar and Planetary Science Conference, The Woodlands, TX, March 18-22.
- 2018 Wronkiewicz, M., Kerner, H. R., Harrison, T. Autonomous Mapping of Surface Features on Mars. American Geophysical Union (AGU) Fall Meeting, Washington, DC, December 10-14.
- 2018 Kerner, H. R., Wagstaff, K. L., Bue, Ben Amor, H. Change Detection on Mars: A Deep Learning Approach. Women in Machine Learning Workshop, NeurIPS, Montreal, Quebec, December 3.
- 2018 Kerner, H. R., Wagstaff, K. L., Bue, B. D., Wellington, D. F., Bell III, J. F., Ben Amor, H. Novelty Detection for Multispectral Images with Application to Planetary Exploration. IMA Workshop on Recent Advances in Machine Learning and Computational Methods for Geoscience, Minneapolis, MN, October 22-26.

### **Conference Service**

- 2019 Session Chair/Co-Convener, “Machine Learning for Planetary Science,” American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 9-13.
- 2018 Session Co-Convener, “Machine Learning in Planetary Science: Introductions and Applications,” American Geophysical Union (AGU) Fall Meeting, Washington, DC, December 10-14.
- 2017 Session Co-Convener, “Rise of Machine Learning: Salvation for Planetary Science in Times of Increasing Data Volume and Complexity,” American Geophysical Union (AGU) Fall Meeting, New Orleans, LA, December 11-15.
- 2017 Co-Chair, NewSpace Europe Conference, Luxembourg City, November 16-17.
- 2015 Chair, NewSpace Conference, San Jose, CA, July 16-18.

## **TEACHING EXPERIENCE**

### **Courses Taught**

CS for People Who Don’t Know CS (Yet!) Spring 2015  
 Department of Computer Science, University of North Carolina at Chapel Hill

### **Courses Assisted**

Introduction to Programming Spring 2014  
 Department of Computer Science, University of North Carolina at Chapel Hill

Introduction to Scientific Programming Fall 2013  
 Department of Computer Science, University of North Carolina at Chapel Hill

## Guest Lectures

Coding for Exploration	Fall 2019
School of Earth and Space Exploration, Arizona State University	
Artificial Intelligence	Fall 2019+
School of Computing, Informatics, and Decision System Engineering, Arizona State University (Coursera)	

## RESEARCH EXPERIENCE

### Appointments

Assistant Research Professor	2019-Present
Department of Geographical Sciences	College Park, MD
University of Maryland, College Park	
Graduate Research Assistant	2015-2019
School of Earth and Space Exploration	Tempe, AZ
Arizona State University	
Research Intern	2018, 2019
Machine Learning and Instrument Autonomy Group	Pasadena, CA
Jet Propulsion Laboratory, California Institute of Technology	

### Mission Experience

Science Team Member, Mars Science Laboratory	2016-Present
Payload Downlink Lead, Opportunity Mars Exploration Rover	2016-2019

## SERVICE

### Reviewing

2019- *IEEE Transactions on Geoscience and Remote Sensing*  
2019- Brooke Owens Fellowship  
2019 SpaceVision Conference Student Scholarships  
2019 Women in Machine Learning Workshop, NeurIPS  
2018 NASA Frontier Development Lab

### Organizations and Committees

2019-	Volunteer, Board of Directors, Research & Policy Committee
	Women in Machine Learning (WiML)
2019-	Member (advising early-stage investments)
	Ubiquity Ventures Extended Team (UXT)
2015-	Member, Board of Advisors
	Students for the Exploration and Development of Space (SEDS) USA
2018-2019	Co-Chair, Women in Science Program
	School of Earth and Space Exploration, Arizona State University
2015-2019	Member, Colloquium Committee
	School of Earth and Space Exploration, Arizona State University
2015-2016	Executive Director
	Space Frontier Foundation

**Extracurricular Service**

- 2018-2019 Curriculum Development, Prison Education Program  
School of Earth and Space Exploration, Arizona State University
- 2018 Algebra 1A and GED Math Instructor  
Adobe Mountain School, Arizona Department of Juvenile Corrections
- 2018-2019 President, Devil Divers (Scuba Club)  
Arizona State University
- 2016-2019 Instructor, Girls Who Code  
Maie Bartlett Heard K-8 School

**Professional Membership**

- Member, Association for the Advancement of Artificial Intelligence (AAAI)
- Member, American Geophysical Union (AGU)
- Member, Women in Machine Learning (WiML)