Hannah R. Kerner

Curriculum Vitae
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University of Maryland, College Park
4321 Hartwick Rd.
College Park, MD 20740

hkerner at umd dot edu
+1 (301) 405-8165
hannah-rae.github.io

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 — 2019-Present
Department of Geographical Sciences — College Park, MD
University of Maryland, College Park

Machine Learning and Domestic Strategy Lead — 2020-Present
NASA Harvest — College Park, MD

Machine Learning Advisor — 2020-Present
World Resources Institute — Washington, DC

Onboard Software Engineer — 2014-2015
Planet Labs (Planet, Inc.) — San Francisco, CA

PUBLICATIONS

Peer-Reviewed Journal Articles

1. Kerner, H. R., Hardgrove, C., Czarnecki, S., Gabriel, T. S. J., Mitrofanov, I., Litvak, M., Sanin, A., Lisov, D. (2020). 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, 125(5)*, e2019JE006264, https://doi.org/10.1029/2019JE006264.

2. 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.

3. 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.

4. 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

5. Kerner, H. R., Nakalembe, C., Becker-Reshef, I. (2020). Field-Level Crop Type Classification with k-Nearest Neighbors: A Baseline for a New Kenya Smallholder Dataset. *Proceedings of the International Conference on Learning Representations (ICLR) Workshops*, https://arxiv.org/abs/2004.03023.

6. 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. *Proceedings of the AAAI Conference on Artificial Intelligence*, pp. 9484-9491, https://doi.org/10.1609/aaai.v33i01.33019484.

Manuscripts in Review

7. 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.*

8. Kerner, H. R., Sahajpal, R., Skakun, S., Becker-Reshef, I., Barker, B., Hosseini, M. Resilient In-Season Crop Type Classification in Multispectral Satellite Observations using Growth Stage Normalization. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining Workshops.*

9. Kerner, H. R., Tseng, G., Becker-Reshef, I., Barker, B., Munshell, B., Paliyam, M., Hosseini, M. Rapid Response Crop Maps in Data Sparse Regions. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining Workshops.*

Books

10. 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.*

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

PUBLIC DATASETS

2020 Togo 10m Cropland Map and Labels (2019)
https://doi.org/10.5281/zenodo.3836628
2020 Mars Novelty Detection Mastcam Labeled Dataset
https://doi.org/10.5281/zenodo.1486195
2019 Dynamic Albedo of Neutrons (DAN) Simulated and Observed Die-Away Data
https://doi.org/10.5281/zenodo.3592014
2019 Planetary Surface Features Change Detection Dataset
https://doi.org/10.5281/zenodo.2373797

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 "Monitoring Agriculture at the Field Scale using Satellite Data and Machine Learning." Measuring Development 2020: Data Integration and Data Fusion, Washington, DC (held virtually).

2020 "Machine Learning for Agricultural Monitoring." NASA Harvest Emerging Technologies workshop, National Agricultural Library, Beltsville, MD.

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 "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

2020 Kerner, H. R., Nakalembe, C., Becker-Reshef, I. (2020). Field-Level Crop Type Classification with k-Nearest Neighbors: A Baseline for a New Kenya Smallholder Dataset. International Conference on Learning Representations (ICLR) Workshop on Computer Vision for Agriculture.

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

2020 Session Chair/Co-Convener, "Machine Learning for Planetary Science," American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 7-11.

2020 Co-Chair, "Robots in the Wild: Challenges in Deploying Robust Autonomy for Robotic Exploration," Workshop at Robotics: Science and Systems (RSS), Corvallis, OR, July 12.

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

Introduction to Machine Learning for Remote Sensing Spring 2020
Department of Geology, University of Maryland

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

MEDIA

1. Smart Machines: Enabling a New Era of Planetary Exploration. *CuttingEdge*, 2020.
2. Harvest Hub: Food Security from Space. *Via Satellite*, On Orbit podcast, 2020.
3. Our path to Mars needs to look beyond launch. *Houston Chronicle*, 2016.
4. Space technology can help sustain Earth. *Scientific American*, 2016.

SERVICE

Reviewing

2020 Women in Machine Learning Scholarships for ICLR 2020
2020- *Remote Sensing of Environment*
2020- *Journal of Selected Topics in Applied Earth Observations and Remote Sensing*
2020- *Agronomy*
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

2020- Technical Advisory Panel, Universal Labeling Project
Meridian Institute and Rockefeller Foundation
2020 Technical Committee, 2020 NSF CPS Challenge "SoilScope – Mars edition"
2020- Co-organizer, Machine Learning for Remote Sensing
Online Discussion Group, `https://bit.ly/2KoEX7K`
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

Advising and Mentoring

2020	Mentor, NASA COVID-19 Space Apps Challenge (SDGs category)
2020	Advisor for Madhava Paliyam, undergraduate student researcher (UMD)
2020	Advisor for Favour Nerrise, undergraduate student researcher (UMD)
2017	Mentor for Julia Odden, high school summer intern (ASU)

Outreach

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)