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 — 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., 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*, https://doi.org/10.1007/s10618-020-00697-6.

2. 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.

3. 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.

4. 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.

5. 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

6. 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*, https://arxiv.org/abs/2006.16866.

7. 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.

8. 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

9. 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*.

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 MSL Curiosity Rover Images with Science and Engineering Classes
`https://doi.org/10.5281/zenodo.3892023`
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

2020 "Earth Obseravtions for Field Level Agricultural Resource Mapping (EO-Farm): Pilot in Kenya and Mexico in Support of Small Holders" (Co-I)
SwissRe Foundation
2019 "Novelty-Driven Onboard Targeting for MSL and Mars 2020 Rovers" (Co-I)
NASA Center Innovation Fund Advanced Concepts
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

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 — 2016-2020
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- Europlanet 2024 Research Infrastructure (RI) Virtual Access Review Board (VARB)
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, The Lacuna Fund: Our Voice on Data
Meridian Institute and Rockefeller Foundation
2020- Co-organizer, Machine Learning for Remote Sensing
Online Discussion Group, `https://bit.ly/2KoEX7K`
2020 Technical Committee, 2020 NSF CPS Challenge "SoilScope – Mars edition"
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

Advising and Mentoring

2020- Advisor for Madhava Paliyam, undergraduate student researcher (UMD)
2020- Advisor for Favour Nerrise, undergraduate student researcher (UMD)
2020- Tutor for multiple scholars (anonymous), From Prison Cells to PhD (P2P)
2020 Advisor for Cassie Conklin, McNair Scholars summer research project (Frostburg State University)
2020 Advisor for Students for the Exploration and Devlopment of Space (SEDS) Grad School Application Virtual Bootcamp
2020 Mentor & Judge, NASA COVID-19 Space Apps Challenge (SDGs category)
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)