

Hannah R. Kerner
Curriculum Vitae

School of Computing and Augmented Intelligence
Arizona State University, Tempe, AZ

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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 Professor	2022-Present
School of Computing and Augmented Intelligence	Tempe, AZ
Arizona State University	
Adjunct Assistant Professor	2022-Present
Department of Geographical Sciences	College Park, MD
University of Maryland, College Park	
Machine Learning and US Co-Lead	2020-Present
NASA Harvest	College Park, MD
Machine Learning Advisor	2020-Present
World Resources Institute	Washington, DC
Assistant Research Professor	2019-2022
Department of Geographical Sciences	College Park, MD
University of Maryland, College Park	
Onboard Software Engineer	2014-2015
Planet Labs (Planet, Inc.)	San Francisco, CA

HONORS AND AWARDS

2022	Selected participant for 1st US-Africa Frontiers of Science, Engineering, and Medicine Symposium by US National Academies (<10% accept rate)
2021	Top 10 of 100 projects solving problems related to the UN SDGs with AI, International Research Centre on Artificial Intelligence (IRCAI), for NASA Harvest
2021	Outstanding Research Faculty, Geographical Sciences (UMD)
2021	15 Leading Women in ML4EO, Radiant Earth Foundation
2021	Forbes 30 Under 30 in Science
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

GRANTS AND FELLOWSHIPS

2022	“NASA ACRES: A Climate Resilient Ecosystem Approach to Strengthening US Agriculture” (Co-I)
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- NASA, \$15,000,000
- 2022 “NASA Harvest: NASA Food Security and Agriculture Consortium” (Co-I)
NASA, \$15,000,000
- 2022 “EO-Enabled Regional and National Agricultural Monitoring in West Africa” (Co-I)
NASA SERVIR, \$658,000
- 2022 “EO-Enabled Food Security Dashboard to Close Critical Data Gaps in Highly
Food Insecure Maui County” (PI)
NASA Equity and Environmental Justice (EEJ), \$250,000
- 2022 “Optimizing Crop Yield Data Collection for Supply Chain Enhancement” (Co-I)
Bill and Melinda Gates Foundation, \$200,000
- 2021 “Planted Area Change Estimation for East Africa Virtual Crop Tour” (PI)
NASA Goddard Space Flight Center, \$122,225
- 2021 “Earth Observations for Field Level Agricultural Resource Mapping (EO-FARM):
Pilot in Rwanda in Support of NISR” (Co-I)
USDA Foreign Agricultural Service (FAS), \$490,000
- 2021 “Strengthening Agri-Foods Data Systems to Inform Food Security Policies
and Trade in Sub-Saharan Africa” (Co-I)
Alliance for a Green Revolution in Africa (AGRA), \$546,859
- 2021 “Domain-Agnostic Outlier Detection in Science Data Sets” (PI)
NASA SMD ML/AI Cross-Divisional Use Case Demonstration, \$110,475
- 2020 “Quantifying volcanic activity from space with multiple sensors: The CEOS volcano
demonstrator project” (Co-I/Institutional PI)
NASA Earth Surface and Interior (ESI), \$1,156,857
- 2020 “In-Season Crop Monitoring Using Earth Observation in Major Food-Producing
Countries to Mitigate Market Uncertainty Caused by COVID-19 Pandemic” (PI)
NASA Rapid Response and Novel Research in Earth Sciences, \$100,000
- 2020 Microsoft AI for Earth Grant (PI), \$10,000 Azure credits
- 2020 “Earth Observations for Field Level Agricultural Resource Mapping (EO-Farm):
Pilot in Kenya and Mexico in Support of Small Holders” (Co-I)
SwissRe Foundation, \$750,000
- 2019 “Novelty-Driven Onboard Targeting for MSL and Mars 2020 Rovers” (Co-I)
NASA Center Innovation Fund Advanced Concepts, \$200,000

PUBLICATIONS

Peer-Reviewed Conference Proceedings

1. **Kerner, H. R.** and Adler, J. B. (2022). Guiding Field Exploration on Earth and Mars with Outlier Detection. To appear in *Proceedings of the International Geoscience and Remote Sensing Symposium (IGARSS)*.
2. Nakalembe, C. L. and **Kerner, H. R.** (2022). Applications and Considerations for AI-EO for Agriculture in Sub-Saharan Africa. In *Proceedings of the Thirty-Sixth AAAI Conference on Artificial Intelligence*, International Workshop on Social Impact of AI for Africa.
3. Tseng, G., **Kerner, H.**, Rolnick, D. (2022). TIML: Task-Informed Meta-Learning for crop type mapping. In *Proceedings of the Thirty-Sixth AAAI Conference on Artificial Intelligence*, AI for Agriculture and Food Systems (AIAFS) Workshop.
4. Tseng, G., Zvonkov, I., Nakalembe, C., **Kerner, H.** (2021). CropHarvest: a global satellite

- dataset for crop type classification. *Neural Information Processing Systems (NeurIPS), Datasets and Benchmarks Track*, <https://openreview.net/forum?id=JtjzUXPEaCu>.
5. Lacoste, A., Sherwin, E., **Kerner, H.**, Alemohammad, H., Lutjens, B., Irvin, J., Dao, D., Chang, A., Gunturkun, M., Drouin, A., Rodriguez, P., Vazquez, D. (2021). Toward Foundation Models for Earth Monitoring: Proposal for a Climate Change Benchmark. *Proceedings of the Neural Information Processing Systems (NeurIPS) Workshops, Tackling Climate Change with AI*, <https://www.climatechange.ai/papers/neurips2021/73/paper.pdf>.
 6. Huppertz, R., Nakalembe, C., **Kerner, H.** (2021). Using transfer learning to study burned area dynamics: A case study of Refugee settlements in West Nile, Northern Uganda. *Proceedings of the ACM/SIGKDD Conference on Knowledge Discover and Data Mining (KDD) Workshops, Humanitarian Mapping*, <https://arxiv.org/abs/2107.14372>.
 7. Paliyam, M., Nakalembe, C., **Kerner, H.** (2021). Street2Sat: A Machine Learning Pipeline for Generating Ground-truth Geo-referenced Labeled Datasets from Street-Level Images. *Proceedings of the International Conference on Machine Learning (ICML) Workshops, Tackling Climate Change with AI*, <https://www.climatechange.ai/papers/icml2021/74.html>.
 8. Tseng, G., **Kerner, H.**, Nakalembe, C., and Becker-Reshef, I. (2021). Learning to predict crop type from heterogeneous sparse labels using meta-learning. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, EarthVision 2021*, https://openaccess.thecvf.com/content/CVPR2021W/EarthVision/papers/Tseng_Learning_To_Predict_Crop_Type_From_Heterogeneous_Sparse_Labels_Using_CVPRW_2021_paper.pdf.
 9. Horton, P., **Kerner, H.**, Jacobs, S., Cisneros, E., Wagstaff, K. L., and Bell III, J. F. (2021). Integrating Novelty Detection Capabilities with MSL Mastcam Operations to Enhance Data Analysis. *IEEE Aerospace Conference, Big Sky, Montana, March 6-13*, <https://arxiv.org/abs/2103.12815>.
 10. Tseng, G., **Kerner, H.**, Nakalembe, C., and Becker-Reshef, I. (2020). Annual and in-season mapping of cropland at field scale with sparse labels. *Neural Information Processing Systems (NeurIPS) Workshops, Tackling Climate Change with AI*, <https://www.climatechange.ai/papers/neurips2020/29/paper.pdf>.
 11. Wagstaff, K. L., Francis, R., **Kerner, H.**, Lu, S., Nerrise, F. (2020). Novelty-Driven Onboard Targeting for Mars Rovers. *International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS)*, <https://www.hou.usra.edu/meetings/isairas2020fullpapers/pdf/5056.pdf>.
 12. **Kerner, H. R.**, Sahajpal, R., Skakun, S., Becker-Reshef, I., Barker, B., Hosseini, M. (2020). Resilient In-Season Crop Type Classification in Multispectral Satellite Observations using Growth Stage Normalization. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining Workshops*, <https://arxiv.org/abs/2009.10189>.
 13. **Kerner, H. R.**, Tseng, G., Becker-Reshef, I., Barker, B., Munshell, B., Paliyam, M., Hosseini, M. (2020). Rapid Response Crop Maps in Data Sparse Regions. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining Workshops*, <https://arxiv.org/abs/2006.16866>.
 14. **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>.

15. **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>.

Peer-Reviewed Journal Articles

16. Rice, M.S., Seeger, C., Bell, J., Calef, F., St Clair, M., Eng, A., Fraeman, A.A., Hughes, C., Horgan, B., Jacob, S., Johnson, J., **Kerner, H.**, Kinch, K., Lemmon, M., Million, C., Starr, M., and Wellington, D. (2022). Spectral diversity of rocks and soils in Mastcam observations along the Curiosity rover's traverse in Gale crater, Mars. *Journal of Geophysical Research: Planets*, p.e2021JE007134, <https://doi.org/10.1029/2021JE007134>.
17. Manheim, M. R., Henriksen, M. R., Robinson, M. S., **Kerner, H. R.**, Karas, B. A., Becker, K. J., Chojnacki, M., Sutton, S. S., Blewett, D. T. (2022). High-Resolution Regional Digital Elevation Models and Derived Products from MESSENGER MDIS Images. *Remote Sensing*, 14, 3564, <https://doi.org/10.3390/rs14153564>.
18. **Kerner, H. R.**, Sahajpal, R., Pai, D. B., Skakun, S., Puricelli, E., Hosseini, M., Meyer, S., and Becker-Reshef, I. (2022). Phenological normalization can improve in-season classification of maize and soybean: A case study in the central US Corn Belt. *Science of Remote Sensing*, 6, 100059, <https://doi.org/10.1016/j.srs.2022.100059>.
19. **Kerner, H. R.**, Rebbapragada, U., Wagstaff, K. L., Lu, S., Dubayah, B., Huff, E., Raman, V., and Kulshrestha, S. (2022). Domain-Agnostic Outlier Ranking Algorithms—A Configurable Pipeline for Facilitating Outlier Detection in Scientific Datasets. *Frontiers in Astronomy and Space Sciences*, 9, 867947, <https://doi.org/10.3389/fspas.2022.867947>.
20. Handwerger, A. L., Jones, S. Y., Amatya, P., **Kerner, H. R.**, Kirschbaum, D. B., and Huang, M. H. (2021). Strategies for landslide detection using open-access synthetic aperture radar backscatter change in Google Earth Engine. *Natural Hazards and Earth System Sciences Discussions*, 22, pp. 753-773, <https://doi.org/10.5194/nhess-22-753-2022>.
21. Shirzaei, M., Khoshmanesh, M., Ojha, C., Werth, S., **Kerner, H.**, Carlson, G., Sherpa, S. F., Zhai, G., and Lee, J. (2021). Persistent impact of spring floods on crop loss in U.S. Midwest. *Weather and Climate Extremes*, 34, 100392, <https://doi.org/10.1016/j.wace.2021.100392>.
22. Gray, P. C., Chamorro, D. F., Ridge, J. T., **Kerner, H. R.**, Ury, E. A., and Johnston, D. W. (2021). Temporally Generalizable Land Cover Classification: A Recurrent Convolutional Neural Network Unveils Major Coastal Change through Time. *Remote Sensing*, 13(19), 3953, <https://doi.org/10.3390/rs13193953>.
23. Lawal, A., **Kerner, H.**, Becker-Reshef, I., Meyer, S. (2021). Mapping the Location and Extent of 2019 Prevent Planting Acres in South Dakota Using Remote Sensing Techniques. *Remote Sensing*, 13(13), 2430, <https://www.mdpi.com/2072-4292/13/13/2430>.
24. Hosseini, M., **Kerner, H.**, Sahajpal, R., Puricelli, E., Lu, Y-H., Lawal, A., Humber, M. L., Mitkish, M., Meyer, S., Becker-Reshef, I. (2020). Evaluating the Impact of the 2020 Iowa Derecho on Corn and Soybean Fields Using Synthetic Aperture Radar. *Remote Sensing*, 12(23), 3878, <https://www.mdpi.com/2072-4292/12/23/3878>.

25. **Kerner, H. R.**, Wagstaff, K. L., Bue, B. D., Wellington, D. F., Jacob, S., Horton, P., Bell, J. F., Kwan, C. Ben Amor, H. (2020). Comparison of Novelty Detection Methods for Multispectral Images in Rover-Based Planetary Exploration Missions. *Data Mining and Knowledge Discovery*, 34, pp. 1642–1675, <https://doi.org/10.1007/s10618-020-00697-6>.
26. **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>.
27. **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>.
28. **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>.
29. 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>.

Books and Book Chapters

30. Becker-Reshef, I., Bandaru, V., Barker, B., Coutu, S., Deines, J. M., Doorn, B., Eilerts, G., Franch, B., Galvez, A. S., Hosseini, M., Humber, M., Husak, G., Guan, K., Justice, C., Keniston, J., **Kerner, H.**, Mitkish, M., Mobley, K., Munshell, B., Nakalembe, C., Puricelli, E., Sahajpal, R., Skakun, S., Vermote, E., Whitcraft, A., Hansen, M., Salas, B., and Justice, C. (2022). The NASA Harvest Program on Agriculture and Food Security. In: Vadrevu, K.P., Le Toan, T., Ray, S.S., Justice, C. (eds) *Remote Sensing of Agriculture and Land Cover/Land Use Changes in South and Southeast Asian Countries*. Springer, Cham. https://doi.org/10.1007/978-3-030-92365-5_3.
31. Aye, K. M., D’Amore, M., Helbert, J., **Kerner, H. R.** (2022). *Machine Learning for Planetary Science*. Elsevier Science and Technology Books, <https://doi.org/10.1016/C2018-0-04220-6>.
32. **Kerner, H.**, Campbell, J., and Strickland, M. (2022). Chapter 1 - Introduction to machine learning. In: Helbert, J., D’Amore, M., Aye, K. M., Kerner, H. R. (eds), *Machine Learning for Planetary Science*, pp. 1-24, <https://doi.org/10.1016/B978-0-12-818721-0.00007-0>.

Other Publications

33. Nakalembe, C., Justice, C., **Kerner, H.**, Justice, C., and Becker-Reshef, I. (2021). Sowing seeds of food security in Africa, *Eos*, 102, <https://doi.org/10.1029/2021E0153329>.

34. Azari, A. R., Biersteker, J. B., Dewey, R. M., Doran, G., Forsberg, E., Harris, C. D. K., **Kerner, H. R.**, Skinner, K. A., Smith, A. W. (2020). Integrating Machine Learning for Planetary Science: Perspectives for the Next Decade. *A White Paper to the NRC Planetary Science and Astrobiology Decadal Survey 2023-2032*, <https://arxiv.org/pdf/2007.15129.pdf>.
35. **Kerner, H. R.** (2019). Machine Learning on Mars: A New Lens on Data from Planetary Exploration Missions. Ph.D. Dissertation, Arizona State University.

Conference Abstracts

36. **Kerner, H. R.**, Sundar, S., and Sadeh, Y. (2022). Multi-region, Cross-Sensor Transfer Learning for Segmentation of Crop Field Boundaries in Satellite Images with Limited Labels. American Geophysical Union (AGU) Fall Meeting, Chicago, December 12-16. (Poster presentation)
37. **Kerner, H. R.**, Zvonkov, I., Tseng, G., Yang, A., Nakalembe, C., and Becker-Reshef, I. (2022). Scalable Cropland and Crop Type Mapping with Machine Learning and Earth Observations for Field-scale Agriculture and Food Security Monitoring. American Geophysical Union (AGU) Fall Meeting, Chicago, December 12-16. (Oral presentation)
38. Zvonkov, I., Tseng, G., Nakalembe, C., **Kerner, H.**, and Becker-Reshef, I. (2022). CropHarvest: a global satellite dataset for crop type classification. ESA Living Planet Symposium, Bonn, Germany, May 23-27. (Oral presentation)
39. Nakalembe, C., Paliyam, M., Zvonkov, I., and **Kerner, H.** (2022). Helmets Labeling Crops- An innovative citizen-science enabled approach filling training data gaps leveraging AI to accelerate ML4EO Applications. ESA Living Planet Symposium, Bonn, Germany, May 23-27. (Oral presentation)
40. Becker-Reshef, I. **et al.** (2022). GEOGLAM the First Decade: Progress in Operational Agricultural Monitoring. ESA Living Planet Symposium, Bonn, Germany, May 23-27. (Oral presentation)
41. Tseng, G., **Kerner, H.**, Rolnick, D., and Becker-Reshef, I. (2022). Task-Informed Meta-Learning for global crop type mapping. ESA Living Planet Symposium, Bonn, Germany, May 23-27. (Oral presentation)
42. Wagner, J., Becker-Reshef, I., **Kerner, H.**, Barker, B., Sahajpal, R., Rehbinder, and J., Nerry, F. (2022). Wheat yield and phenological response under occurrence of extreme weather or climate events during growing season. ESA Living Planet Symposium, Bonn, Germany, May 23-27. (Poster presentation)
43. b, Zvonkov, I., Tseng, G., Utzschneider, E., Lopez, A., Nakalembe, C., McNally, A., and Becker-Reshef, I. (2022). Earth Observations and Machine Learning for Planted Area Estimation in Inaccessible Regions for Remote Food Security Assessments. ESA Living Planet Symposium, Bonn, Germany, May 23-27. (Oral presentation)
44. Prieur, N.C., Rubanenko, L., Xiao, Z., **Kerner, H.**, Werner, S. C., Lapotre, M. G. A (2022). A large training dataset of boulder sizes and shapes as a first step towards the automated detection of rock fragments on planetary surfaces. 53rd Lunar and Planetary Science Conference, The Woodlands, TX, March 7-11, Abstract #1835.
45. **Kerner, H. R.**, Rebbapragada, U., Wagstaff, K., Lu, S., Huff, E., Dubayah, B., Raman, V., Kulshrestha, S. (2021). Domain-agnostic Outlier Ranking Algorithms (DORA): A

- Configurable Pipeline for Outlier Detection in Scientific Datasets. American Geophysical Union (AGU) Fall Meeting, New Orleans, December 13-17. (Oral presentation)
46. Hosseini, M., **Kerner, H. R.**, Sahajpal, R., Puricelli, E., Lu, Y-H., Humber, M., Mitkish, M., Meyer, S., Becker-Reshef, I. (2021). Evaluating the Impacts of 2020 Iowa Derecho Over Agricultural Fields Using Synthetic Aperture Radar. American Geophysical Union (AGU) Fall Meeting, New Orleans, December 13-17. (Oral presentation)
 47. Handwerger, A., Huang, M.-H., Amatya, P. M., Jones, S. Y., **Kerner, H. R.**, Kirschbaum, D. (2021). Generating satellite SAR-based landslide density heatmaps for rapid landslide detection in Google Earth Engine. American Geophysical Union (AGU) Fall Meeting, New Orleans, December 13-17. (Oral presentation)
 48. Hosseini, M., **Kerner, H. R.**, Sahajpal, R., Puricelli, E., Lu, Y-H., Lawal, A. F., Humber, M., Mitkish, M., Meyer, S., Becker-Reshef, I. (2021). Evaluating the Impacts of 2020 Iowa Derecho Over Agricultural Fields Using Synthetic Aperture Radar. International Society for Photogrammetry and Remote Sensing (ISPRS) Congress, July 5-9.
 49. **Kerner, H. R.**, Wagstaff, K. L., Lu, S., Francis, R., Kulshrestha, S. (2021). Novelty-Driven Onboard Target Selection in Grayscale and Color Mars Rover Images. Lunar and Planetary Science Conference, Virtual, March 15-19. (Poster presentation)
 50. Nakalembe, C., **Kerner, H. R.**, and Becker-Reshef, I. (2020). Urgent and critical need for developing countries to invest in Earth observation-based agricultural early warning and monitoring systems to achieve Zero Hunger (SDG-2). American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17. (Poster presentation)
 51. Horton, P., Ravichandar, S., Lee, J., **Kerner, H.**, Natha, A., Soliman, T. K., Grimes, K., Wagstaff, K., Verma, R., and McAuley, J. (2020). Novelty and Discovery Content Analysis Methods for the Planetary Data System Image Atlas. American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17. (Poster presentation)
 52. Nerrise, F., **Kerner, H.**, Wagstaff, K., Lu, S., Francis, R., Rebbapragada, U., Bell III, J. F. (2020). Evaluation of Machine Learning Methodologies for Novelty-based Target Selection in Planetary Imaging Data Sets: Examples from the Mars Science Laboratory Mission. American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17. (Poster presentation)
 53. **Kerner, H.**, Tseng, G., Becker-Reshef, I., and Nakalembe, C. (2020). Post-season and in-season crop type classification for smallholder farms: reducing reliance on labeled data by learning latent features in unlabeled data. American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17. (Poster presentation)
 54. Tseng, G., **Kerner, H.**, Becker-Reshef, I., and Nakalembe, C. (2020). Leveraging Global Crop-Land Datasets to Improve Model Performance for Crop Classification in Data-Sparse Regions. American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17. (Poster presentation)
 55. Shirzaei, M., Khoshmanesh, M., Ojha, C., Werth, S., **Kerner, H.**, Carlson, G., Sherpa, S. F., Zhai, G., and Lee, J. (2020). Unprecedented Crop Loss in the U.S. Midwest Caused by 2019 Flooding. American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17.
 56. Gold, K., Galvan, F. R., **Kerner, H.**, Whitcraft, A., Cadle-Davidson, L., and Jiang, Y. (2020). Deep learning enabled detection of low incidence plant disease with integrated

- proximal and remote sensing. American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17.
57. Nakalembe, C., Becker-Reshef, I., **Kerner, H.**, Sahajpal, R., and Skakun, S. (2020). Using Satellites and Machine Learning to Enhance and Protect Food Security in Africa. Geological Society of America (GSA) Annual Meeting, Virtual Conference, October 26-30.
 58. Becker-Reshef, I., Whitcraft, A. K., Justice, C., Nakalembe, C., Barker, B., Justice, C., Sahajpal, R., Humber, M., **Kerner, H.**, Hansen, M., Husak, G., Skakun, S., Vermote, E., Franch, B., Deines, J., Doorn, B., Lobell, D., Guan, K., Torbick, N., Coutu, S., Puricelli, E., and Verdin, J. (2020). NASA Harvest: Earth Observations for Informed Agricultural Decisions. EO for Agriculture Under Pressure Workshop, Virtual, October 5-9. (Oral presentation)
 59. **Kerner, H. R.**, Wagstaff, K. L., Bue, B. D., Gray, P. C., Bell III, J. F., Ben Amor, H. (2019). Toward Generalized Change Detection on Planetary Surfaces with Deep Learning. American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, December 9-14. (Poster presentation)
 60. **Kerner, H. R.**, Wagstaff, K. L., Bue, B. D., Wellington, D. F., Jacob, S., Bell III, J. F., Ben Amor, H. (2019). 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. (Oral presentation)
 61. **Kerner, H. R.**, Hardgrove, C., Czarnecki, S. (2019). 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. (Poster presentation)
 62. **Kerner, H. R.**, Wagstaff, K. L., Bue, Ben Amor, H. (2018). Change Detection on Mars: A Deep Learning Approach. Women in Machine Learning Workshop, NeurIPS, Montreal, Quebec, December 3. (Poster presentation)
 63. Wronkiewicz, M., **Kerner, H. R.**, Harrison, T. (2018). Autonomous Mapping of Surface Features on Mars. American Geophysical Union (AGU) Fall Meeting, Washington, DC, December 10-14. (Poster presentation)
 64. **Kerner, H. R.**, Wagstaff, K. L., Bue, B. D., Wellington, D. F., Bell III, J. F., Ben Amor, H. (2018). Novelty Detection for Multispectral Planetary Images. American Geophysical Union (AGU) Fall Meeting, Washington, DC, December 10-14. (Oral Presentation)
 65. **Kerner, H. R.**, Wagstaff, K. L., Bue, B. D., Wellington, D. F., Bell III, J. F., Ben Amor, H. (2018). 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. (Poster presentation)
 66. **Kerner, H. R.**, Bell III, J. F., Ben Amor, H. (2017). 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. (Oral presentation)
 67. **Kerner, H. R.**, Bell III, J. F., Ben Amor, H. (2017). Detecting and characterizing compression-related artifacts in Mars Science Laboratory Mastcam images. 48th Lunar and Planetary Science Conference, The Woodlands, TX, March 20-24. (Oral presentation)

Editing

- Aye, K. M., D’Amore, M., Helbert, J., Kerner, H. R. (est. 2021). Machine Learning for Planetary Science. In preparation for *Elsevier Science and Technology Books*.
- Guest editor, “Monitoring Climate Impacts on Agriculture Using Remote Sensing Techniques,” special issue in *Remote Sensing* (2020-2021)
- Guest editor, “Recent Advances in Crop Mapping and Monitoring Using Remote Sensing Data,” special issue in *Remote Sensing* (2020-2021)
- Guest editor, “Advances in AI applications for small-scale agricultural systems,” special issue in *Frontiers in AI in Food, Agriculture, and Water* (2020-2021)

PUBLIC DATASETS

- 2021 CropHarvest: A global dataset for crop type mapping
<https://zenodo.org/record/5567762>
- 2021 Kenya 10m Cropland Map and Labels (2019)
<https://zenodo.org/record/4271144#.YIAzqpNKhFc>
- 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>

SELECTED INVITED TALKS

- 2022 “AI and Earth Observations for Global Agricultural Monitoring and Food Security.” AI Helps Ukraine fundraiser conference, Virtual.
- 2022 “Supporting Food Security in Africa using Machine Learning and Earth Observations.” Computer Vision for Ecology Summer School, Caltech/Virtual.
- 2022 “Street2Sat: turning roadside images into ground-truth labeled datasets for machine learning.” AgricultureVision workshop, IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans.
- 2022 “AI for Earth Observations and Food Security—going beyond test metrics.” AI4FoodSecurity Awards Ceremony (keynote), Virtual.
- 2022 “Advancing Global Food Security and Sustainable Development with ML and Earth Observations.” Remote Sensing Interdisciplinary Graduate Education Program (IGEP) Seminar, Virginia Tech, Blacksburg, VA.
- 2022 “Advancing Global Food Security and Sustainable Development with ML and Earth Observations.” AI Seminar, Oregon State University, Virtual.
- 2021 “Advancing Global Food Security and SDGs with Machine Learning and Earth Observations.” Computer Science Department Seminar, University of Maryland, College Park, MD.
- 2021 “Advancing Global Food Security and SDGs with Machine Learning and Earth Observations.” Forward Summit, Puerto Rico Science Trust, Virtual.

- 2021 “Advancing Global Food Security and SDGs with Machine Learning and Earth Observations.” iCube Institute Seminar, Strasbourg, France.
- 2021 “Advancing Global Food Security and SDGs with Machine Learning and Earth Observations.” NASA Marshall Space Flight Center, IMPACT Tech Talk, Virtual.
- 2021 “Novelty-guided onboard targeting and tactical planning for Mars rovers.” Applications of Statistical Methods and Machine Learning in the Space Sciences, Space Science Institute, Virtual.
- 2021 “Enhancing Global Food Security with Machine Learning and Planet Data.” Planet Colloquium, Virtual.
- 2021 “Mars, Machine Learning, and the Search for Life beyond Earth: How the Mars Perseverance and Curiosity rovers can use machine learning to detect the unknown.” Ubiquity Ventures Public Event, Virtual.
- 2021 “Enhancing Global Food Security with Machine Learning and Earth Observations.” World Resources Institute AI for Impact Series, Virtual.
- 2021 “The Power of ML and EO to Enhance Global Food Security.” ESIP Winter Meeting, Virtual.
- 2020 “Eyes in the sky without boots on the ground: Using satellites and machine learning to monitor agriculture and food security during COVID-19.” NeurIPS Workshop on AI for Earth Science, Virtual.
- 2020 “How to Shape Your Career.” IEEE GRSS and IGARSS Webinar Series.
- 2020 “Using Machine Learning in Space.” Ubiquity Extended Team Webinar, Virtual.
- 2020 “Monitoring Agriculture at the Field Scale using Satellite Data and Machine Learning.” Measuring Development 2020: Data Integration and Data Fusion, Virtual.
- 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.

CONFERENCE SERVICE

- 2022 Session Chair/Co-Convener, “Machine Learning for Planetary Science,” American Geophysical Union (AGU) Fall Meeting, Chicago, December 12-16.
- 2022 Organizer/Speaker, Machine Learning for Remote Sensing and Applications in Agriculture and Food Security tutorial (invited) at Computer Vision and Pattern Recognition (CVPR) 2022, New Orleans, June 19-24.
- 2022 Co-organizer, “3rd International Workshop and Prize Challenge on Agriculture-Vision:

- Challenges & Opportunities for Computer Vision in Agriculture,” Computer Vision and Pattern Recognition (CVPR) 2022, New Orleans, June 19-24.
- 2021 Organizing Committee Member, “On the Pathway to a Digital Earth”, Joint AI/ML Workshop between UMD and NASA Goddard Space Flight Center, College Park, September 22.
- 2021 Session Chair/Co-Convener, “Machine Learning for Planetary Science,” American Geophysical Union (AGU) Fall Meeting, New Orleans and Online, December 13-17.
- 2021 Program Committee, Humanitarian Mapping Workshop, KDD, August 14-18.
- 2021 Organizer/Session Chair, The Trillion Pixel Challenge Workshop, Virtual (hosted by ORNL), April 21-22.
- 2020 Session Chair/Co-Convener, “Machine Learning for Planetary Science,” American Geophysical Union (AGU) Fall Meeting, Virtual Conference, December 1-17.
- 2020 Co-Chair, “Robots in the Wild: Challenges in Deploying Robust Autonomy for Robotic Exploration,” Workshop at Robotics: Science and Systems (RSS), Virtual Conference, 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.

TEACHING EXPERIENCE

Courses Taught

Data Mining (CSE 572)	Fall 2022
School of Computing and Artificial Intelligence, Arizona State University	
Open Source GIS (GEOG 670)	Spring 2022
Department of Geographical Sciences, University of Maryland	
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

Computer Vision for Ecology (CV4E) Summer School	Summer 2022
California Institute of Technology	
PRAIRIE AI Summer School (PAISS)	Summer 2021
PRAIRIE Institute	
Remote Sensing for Sustainable Development	Spring 2021
University of Strasbourg (Instructor: Inbal Becker-Reshef)	

Coding for Exploration	Fall 2019, 2020, 2021
School of Earth and Space Exploration, Arizona State University (Instructor: Jnaneshwar Das)	
Remote Sensing	Spring 2020
Department of Geology, University of Maryland (Instructor: Mong-Han Huang)	
Artificial Intelligence	Fall 2019+
School of Computing, Informatics, and Decision System Engineering, Arizona State University (Coursera)	

RESEARCH EXPERIENCE

Appointments

Assistant Professor	2022-Present
School of Computing and Augmented Intelligence	Tempe, AZ
Arizona State University	
Assistant Research Professor	2019-2022
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

Opinion Articles

1. Sowing Seeds of Food Security in Africa. *Eos*, 2021.
2. Too many AI researchers think real-world problems are not relevant. *MIT Technology Review*, 2020.
3. Our path to Mars needs to look beyond launch. *Houston Chronicle*, 2016.
4. Space technology can help sustain Earth. *Scientific American*, 2016.
5. What's The Point? The Real Reason Scientists Study Space. *Space.com*, 2015.
6. The Space Destination Debate Gets Us Nowhere... Literally. *Space.com*, 2015.
7. It's Not Them It's You: Why Top Tech Talent Isn't Going to the Satellite Industry. *Via Satellite*, 2015.

Featured Articles, Podcasts, and Other Media

8. AskSME: Dr. Hannah Kerner - Artificial Intelligence Lead, Close-up with a NASA Subject Matter Expert, NASA eClips Video, 2021.
9. Real World: Food Security - Monitoring Crops from Space, NASA eClips Video, 2021.

10. Remote Sensing with ML and Starting Your Professorship, How to Do Grad School, 2021.
11. Cracking the Code for Healthy Crops with Hannah Kerner, NASA Applied Sciences Profile, 2021.
12. Hannah Kerner on Remote Sensing with Machine Learning, Time Horizons Podcast, 2021.
13. Space Scientists Naia Butler-Craig and Hannah Kerner Make Forbes' Under 30 List, Via Satellite, 2020.
14. How Farmers Can Help NASA Assess the Impacts of the Derecho in Iowa, AgriTalk Radio, 2020.
15. NASA Funds Eight New Projects Exploring Connections Between the Environment and COVID-19. *NASA Earth Sciences Division*, 2020.
16. Smart Machines: Enabling a New Era of Planetary Exploration. *CuttingEdge*, 2020.
17. Harvest Hub: Food Security from Space. *Via Satellite*, On Orbit podcast, 2020.

SERVICE

Reviewing

- 2021 Climate Change AI Innovation Grants
- 2021 Humanitarian Mapping Workshop (KDD)
- 2021 Climate Change AI Workshop (ICML)
- 2021- *Precision Agriculture*
- 2020- External Reviewer, NASA ROSES
- 2020- External Reviewer, Puerto Rico Science Trust
- 2020- *Remote Sensing of Environment*
- 2020- *Journal of Selected Topics in Applied Earth Observations and Remote Sensing*
- 2020- *Frontiers in Sustainable Food Systems*
- 2020- *Hydrology and Earth System Science*
- 2020- *Agronomy*
- 2020- *Agriculture*
- 2020- *Remote Sensing*
- 2020 Europlanet 2024 Research Infrastructure (RI) Virtual Access Review Board (VARB)
- 2020 Women in Machine Learning Scholarships for ICLR 2020
- 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

Internal (UMD Geographical Sciences)

- 2022 Graduate Committee (ASU School of Computing and Augmented Intelligence)
- 2021 Unlearning Racism in the Geosciences (URGE) Pod (University of Maryland)
- 2020-2022 Diversity, Equity, Inclusion, and Anti-Racism Committee (University of Maryland)
- 2020-2022 Graduate Committee (UMD Department of Geographical Sciences)
- 2020-2021 Department Committee Voting Representative (UMD Department of Geographical Sciences)

External

- 2020-2021 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”
- 2019-2020 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

Thesis committees

- 2022- Manthan Satish (ASU Robotics and Autonomous Systems, Masters)
- 2022- Ujjwala Anantheswaran (ASU Computer Science, Masters)
- 2022- Paul Horton (ASU Exploration Systems Design, PhD)
- 2021- Ivan Zvonkov (UMD Computer Science, Masters)
- 2020- Yiming Zhang (UMD Geographical Sciences, PhD)

Research advising and mentorship

- 2022- Advisor for Aditya Shrivastava, graduate student researcher (ASU CS, Masters)
- 2022- Advisor for Aditya Mohan, graduate student researcher (ASU CS, Masters)
- 2021- Advisor for Saketh Sundar, high school student researcher (River Hill High School)
- 2020- Doctoral Committee Member for Yiming Zhang (UMD Geog)
- 2020- Advisor for Dhruv Pai, high school student researcher (Montgomery Blair High School)
- 2020- Advisor for Gabriel Tseng, graduate student researcher (McGill University, PhD)
- 2022 Advisor for Maryann Vazhapilly, undergraduate student researcher (UMD CS)
- 2022 Advisor for Arushi Patel, undergraduate student researcher (UMD CS)
- 2021-2022 Advisor for Vinay Raman, high school student researcher (Montgomery Blair High School)
- 2021-2022 Advisor for Eva Utzschneider, undergraduate student researcher (UMD CS)
- 2020-2022 Advisor for Madhava Paliyam, undergraduate student researcher (UMD CS)
- 2020-2022 Faculty Advisor, Students for the Exploration and Development of Space (SEDS) at UMD
- 2020- Tutor for multiple scholars (anonymous), From Prison Cells to PhD (P2P)
- 2021 Advisor for Kevin Liu, undergraduate student researcher (UMD CS)
- 2021 Advisor for Bryce Dubayah, undergraduate student researcher (UMD CS)
- 2021 Advisor for Sakshum Kulshrestha, undergraduate student researcher (UMD CS)
- 2021 Advisor for Yao Poudima, undergraduate student researcher (UMD iSchool)
- 2020-2021 Advisor for William Cao, undergraduate student researcher (UMD CS)
- 2020-2021 Advisor for Bissaka Kenah, undergraduate student researcher (UMD CS)
- 2020-2021 Advisor for Avi Grant, undergraduate student researcher (UMD Geog)

2020-2021 Advisor for Favour Nerrise, undergraduate student researcher (UMD CS)
 2020-2021 Advisor for Afolarin Lawal, graduate student researcher (UMD Geog)
 2020 Advisor for Students for the Exploration and Development 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)