Madeline C. Hayes

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EDUCATION:

Master of Science in Remote Sensing and Geospatial Sciences   May 2022
Boston University, Boston, MA

Bachelor of Science in Environmental Sciences   May 2019
University of Vermont, Burlington, VT
Concentration: Environmental Analysis and Assessment | **Minor**: Geospatial Technologies

PROFESSIONAL EXPERIENCE:

Consultant, Geospatial Scientist   November 2024 - Present
Consulting Senior Associate   November 2023 - November 2024
Consulting Associate   June 2022 - November 2023
ERM, Boston MA
- Create, edit, and curate spatial data products for clients on complex multiyear projects in over 15 industries, including oil and gas, manufacturing, pharmaceutical, and chemical.
- Develop and deploy Python, R, and SQL geoprocessing scripts and tools to optimize data-driven processing workflows, resulting in an average annual operational cost savings of $200k.
- Publish and maintain 50+ web-based map servers and applications, including ArcGIS Web Apps and Microsoft Power BI dashboards.
- Engineer and execute a comprehensive data management system utilizing SQL and EQuIS for analytical, geological, and geographical data from 50,000+ field samples.

Research Assistant, NASA MEaSUREs   January 2022 - March 2023
Boston University, Center for Remote Sensing
- Collected training and validation data in Google Earth Engine for global annual land cover mapping, achieving an initial model accuracy of 77% through comprehensive satellite imagery analysis, advancing crucial environmental research objectives.
- Conducted in-depth research on land cover information to ensure detailed characterization and accuracy.

Remote Sensing Analyst and Researcher   December 2019 - August 2021
Duke University, Marine Robotics and Remote Sensing Lab
- Executed drone operations to collect high-resolution imagery for structure from motion processing, resulting in the creation of detailed 3D models and orthomosaics, to support environmental monitoring and land management.
- Developed, validated, and deployed neural network models for the detection and enumeration of seabirds from drone imagery with 92% average accuracy.
- Created a Python-based method to monitor turbidity from multispectral drone imagery, resulting in a forecasting model with high accuracy and reducing manual labor costs by 80%.

GIS Team Lead and Drone Pilot   June 2018 - November 2019
University of Vermont, Spatial Analysis Lab
- Directed drone operations, leading flight planning, data acquisition, processing, and GIS integration for multifaceted projects in agriculture, transportation, construction, and conservation, resulting in streamlined workflows and enhanced project outcomes.
- Developed and integrated geospatial data layers to refine high-resolution land cover data for Vermont, advancing landscape analysis capabilities with a dataset 900 times more detailed than previously available data.
- Trained and mentored a team of 20 technicians and drone pilots.

RESEARCH EXPERIENCE:

Remote Sensing for Water Quality Research   July 2020 - July 2021
Duke University, Marine Robotics and Remote Sensing Lab
- Collaborated with the North Carolina Department of Environmental Quality to determine the utility of drone technology for water quality assessment
- Conducted multispectral drone flight operations before, during, and after dredging events
- Created a Python programming workflow to extract turbidity measurements from raw images, including radiometric calibration and georeferencing of imagery
- Generated turbidity heat maps and image mosaics for comparison to in-situ measurements

Artificial Intelligence for Seabird Population Monitoring Research   January 2020 - May 2021
Duke University, Marine Robotics and Remote Sensing Lab
- Processed drone imagery collected by the Wildlife Conservation Society in Argentina to generate orthorectified maps with photogrammetric techniques
- Built, trained, validated, and deployed a convolutional neural network for the automated detection and enumeration of seabirds in the Falkland Islands, Argentina
- Ran inference on entire seabird colony areas to generate automated detections
- Evaluated geostatistical techniques for breeding pair and active nest analysis

PRESENTATIONS

Hayes, M.C. (April 2021). "Deep learning and drones to automate seabird population counts," ESRI Imagery and Remote Sensing Educators Summit.

Hayes, M.C. (March 2021). "Deep learning and drones to automate seabird population counts," Drones in the Coastal Zone Workshop.

Hayes, M.C. (November 2019). "Mapping water chestnut from above," North American Lake Management Society Symposium, Burlington, VT.

Hayes, M.C. (April 2019). "Mapping water chestnut from above," University of Vermont Student Research Conference, Burlington, VT.

PAPERS

Hayes, M.C., P.C. Gray, G. Harris, W.C. Sedgwick, V.D. Crawford, N. Chazal, S. Crofts, and D.W. Johnston (2021). Drones and deep learning produce accurate and efficient monitoring of large-scale seabird colonies. *Ornithological Applications, 123*, 1-16. DOI: 10.1093/ornithapp/duab022

Hayes, M.C., B. Puckett, C. Deaton, J.T. Ridge (2021). Estimating dredge-induced turbidity using drone imagery. *Preprints, 2022010424*. DOI: 10.20944/preprints202201.0424.v1

TEACHING EXPERIENCE:

Teaching Fellow, Crises of Planet Earth   January 2022 - May 2022
Boston University, College of Arts and Sciences
Teaching Fellow, Introduction to Climate and Earth System Science   September 2021 - December 2021
Boston University, College of Arts and Sciences
Teaching Assistant, Intro to GIS   August 2018 - December 2018
University of Vermont, Rubenstein School of Environment and Natural Resources

SKILLS AND CERTIFICATIONS:

ESRI (ArcGIS Pro, ArcGIS Online, ArcGIS Server, ArcSDE, ArcPy), Python (PyTorch, TensorFlow, OpenCV, NumPy), Microsoft Power BI, SQL Server, R, Pix4D, EQuIS
FAA Part 107 Licensed Remote Pilot, 100+ flight hours