Christina (Bonfanti) Kumler
Associate Scientist III
Cooperative Institute for Research in Environmental Sciences (CIRES) and National Oceanic and Atmospheric Administration Global Systems Laboratory (NOAA GSL)
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Professional Preparation

University of Miami, Miami, FL	Meteorology and Physical Oceanography, M. P. S., 2015
University of Colorado, Boulder, CO	Applied Mathematics, B.Sc., 2013
University of Colorado, Boulder, CO	Atmospheric and Oceanic Science, minor, 2013

Appointments

May 2023 – present	Associate Scientist III at CIRES and NOAA GSL (Boulder, CO)
May 2016 – present	Associate Scientist II at CIRES and NOAA GSL (Boulder, CO)
Aug 2014 – Apr 2016	Associate Scientist I at CIRES and GSL (Boulder, CO)
June 2014 – Aug 2014	NASA AMES intern. Selected to attend the Intensive Summer School for Computing in Environmental Sciences (ISSCENS) and then further selected from those pool of candidates to participate at NASA Ames Internship. (Mountain View, CA)
May 2011 – July 2013	Student data assistant at NCAR-EARTH OBSERVING LABORATORY (NCAR)- COMPUTER DATA MANAGEMENT (CDM) under Don Stott. (Boulder, CO)
Jan 2011 – May 2011	Weather Intern at Channel Seven, The Denver Channel, under chief meteorologist Mike Nelson. (Denver, CO)
Aug 2010 – Aug 2012	Mentor with the Broadening Opportunity through Leadership and Diversity (BOLD) Center (Boulder, CO)

Professional Service and Leadership

2023 – present	Editor of Artificial Intelligence (AI) for the Earth Systems.
2022 – 2023	Associate editor of Artificial Intelligence (AI) for the Earth Systems (ES) - AIES
2022 – present	Lead of NOAA Artificial Intelligence working group
2022 – present	Member of the Global Systems Laboratory (GSL) Diversity, Equity, and Inclusion Council
2022 – present	Program planning chair for American Meteorological Society (AMS) Annual Conference on AI
2023 – 2026	President AMS Artificial Intelligence committee
2021	Subject matter expert for AI in environmental science during NOAA GSL lab review
2021 – 2023	Vice Chair for the AMS AI committee
2021 – 2022	Planning committee for the NOAA AI workshops
2019 – present	Member of AMS AI committee
2020 – present	Member of NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES)
2020 – present	Co-lead for AI2ES diversity, equity and inclusion division
2020 – present	GSL's Evergreen Leadership Team

2020	Co-lead of the transition of leadership from a single member to a group-based monthly rotating lead and oversaw new recruitment for GSL's Evergreen Leadership Team

Awards

2023	Five NOAA Gold Star Awards: (List upon request)
2022	Two NOAA Gold Star Awards: "for presenting to a national audience of kids for the Picture Climate Change Photo Contest live event" and "and for presenting to a high school class, speaking about weather, technology, and working as a scientist"
2019	One NOAA Gold Star Award: "Worked up and presented a new session for Women in STEM at the University"
2019	NOAA GSL's Employee of the Month
2017	CIRES Award in Recognition of Extraordinary Service to Research

International Collaboration

2018-2021	European Centre for Medium-Range Weather Forecasts (ECMWF) sharing of the cyclone detection U-Net code/model and worked with them to improve it and implement it into their operations
2019-2020	Collaboration with the International Telecommunication Union (ITU/WMO/UNEP) Focus Group on AI for Natural Disaster Management on expertise of cyclone detection and tracking with AI tools

1st Author Presentations

2024	**(invited)** The Context of Machine Learning in Prediction Models. American Meteorological Society Annual Meeting. Baltimore.
2024	Modeling Wildfire Behavior with Forest Machine Learning Models Using the RAVE Dataset. American Meteorological Society Annual Meeting. Baltimore.
2023	Using Random Forests for Hourly Prediction of Wildfire Intensity with Inputs from Weather Forecast and Combined Satellites Fire Radiative Power Observations. American Geophysical Union. San Francisco.
2023	**(invited)** AI/ML in the Service of Forecasting Fire Radiative Power. CIRA Probabilistic Fire Weather Guidance Project at the Meteorological Development Laboratory (MDL). Fort Collins.
2023	**(invited)** Panel. AI2ES Career panel. Boulder.
2023	How Using Machine Learning Improves Hourly Fire Radiative Power for Smoke Modeling. AMS. Denver.
2023	**(invited)** Machine Learning and Wildfire Radiative Power Modeling. USFS NOAA Fire Weather Research Meeting. Denver.
2022	Discussion on Machine Learning Methods for Wildfire Hourly Radiative Power. American Geophysical Union (AGU). Chicago.
2022	How satellite Data and Numerical Weather Model Data Make Up Big Data for Training Machine Learning. AGU. Chicago.
2022	**(invited)** Two-day lecture on AI and Explainable AI. CU Boulder.

2022	**(invited)** Class lecture on Deep Learning. CU Boulder.
2022	**(invited)** Using Machine Learning as a Tool for Improving Wildfire Intensity Forecasting. 4th NOAA Workshop on Leveraging Artificial Intelligence in Environmental Sciences. Virtual.
2022	Using a Random Forest Model to Model Fire Radiative Power (FRP) for Wildfires. AMS. Virtual.
2022	**(invited)** Panel. CU Society of Applied Mathematics Western Student Conference Women's Career Panel. Virtual.
2021	**(invited)** Identifying Cyclone Regions Using Deep Learning from Satellite and Weather Data. NVIDIA GTC Conference. Virtual.
2021	**(invited)** Deep Learning Short course seminar. CU Denver.
2021	**(invited)** Using Deep Learning to Identify Cyclones in Satellite and Weather Model Data. Third ITU/WMO/UNEP Workshop on Artificial Intelligence for Natural Disaster Management. International Virtual.
2021	Combining Satellite Data with Numerical Weather Model Output in Random Forest Models to Derive Weather-Aware Fire Radiative Power (FRP) Forecasted Values. AMS Annual Conference. Virtual.
2021	Deriving Fire Radiative Power from Numerical Weather Models and Satellites using Machine Learning Methods. NOAA National Environmental Satellite, Data, and Information Service Center for Satellite Applications and Research (NESDIS STAR) AI Conference. virtual.
2021	Taking Advantage of Machine Learning (ML) for Fire Radiative Power (FRP) Modeling. NCAR's SEA'S IMPROVING SCIENTIFIC SOFTWARE. Virtual.
2021	**(invited)** Panel. Women in Science University of Wyoming Women in Science (NASA). Virtual.
2021	**(invited)** Improving Wildfire Fire Radiative Power Estimates with Random Forests. Google informational/collaborative meeting. Virtual.
2020	Using Deep Learning to Extract Cyclone Regions of Interest (ROI). ECMWF-ESA Workshop on Machine Learning for Earth System Observation and Prediction. International virtual.
2020	Using Machine Learning to Find Weather Making Cyclones. AMS. Boston.
2020	Using Deep Learning to Extract Regions of Interest (ROI) in Real-Time from Geostationary Satellite Data. AMS. Boston.
2020	Representing Fire Radiative Power (FRP) from Machine Learning. AMS. Boston.
2020	Representing Fire Radiative Power (FRP) from Machine Learning. NOAA GSL Seminars.
2020	**(invited)** Tropical and Extratropical Cyclone Detection Using Deep Learning. CIRA. Virtual.
2019	The Success and Struggles of Using Deep Learning to Detect Extratropical and Tropical Cyclone Regions of Interest (ROI) in Seconds from Satellite Data. AGU. San Francisco.

2019	**(invited repeat)** Machine Learning Specific to Climate and Weather Applications. NOAA NESDIS STAR. Virtual.
2019	**(invited)** Machine Learning Specific to Climate and Weather Applications. NOAA NESDIS STAR. Virtual.
2019	Using Machine Learning to Find Weather Making Cyclones. AGU. San Francisco.
2019	Deep Learning Methods for Extratropical and Tropical Cyclone Regions of Interest (ROI) from Satellite Observations. AMS 2019. Phoenix.
2019	A New Deep Learning Software to Extract Tropical and Extratropical Cyclone Information. NCARs Science and Technology Conference. Boulder.
2019	Using Deep Learning to Extract Regions of Interest from Satellite Data. NOAAs 1st AI Conference. College Park.
2019	**(invited)** GSD's Machine Learning Initiatives. CIRA Fellows Meeting. Fort Collins.
2018	Machine Learning: Defining Worldwide Cyclone Labels for Training. IEEE Fusion 2018. International- Cambridge, UK.
2018	Improving Satellite Observation Utilization for Model Initialization with Machine Learning: An Introduction and Tackling the "Labeled Dataset" Challenge for Cyclones Around the World. AMS 2018. Austin.
2017	A Bin-Classifier Model to Diagnose Deep Convection. AMS. Seattle.
2017	Improving Satellite Observation Utilization for Model Initialization with Machine Learning: An Introduction and Tackling the "Labeled Dataset" Challenge for Cyclones Around the World. AGU. New Orleans.

External Proposals

2023	Weather Program Office Research Programs (WPO). Lead PI: Developing and Exploring Fire Weather Outlook Models Using Data-Driven Artificial Intelligence Model Inputs. *Decision Pending.*
2022	Weather Program Office Research Programs (WPO). Lead PI: Wildfire Risk: Using Uncertainty Quantification Techniques with Machine Learning to Design a Seasonal to Sub-seasonal Scale Fire Outlook Mode. *Unfunded.*
2021	WPO. Lead PI: Using Deep Learning to Improve Knowledge of Synoptic Conditions Leading to Extreme Fire Weather and Behavior. *Funded.*
2020	Joint Technology Transfer Initiative (JTTI). Lead PI: Development of Machine Learning Algorithms for Aerosol Scattering for Modeling and Data Assimilation. *Unfunded.*
2020	NASA NSPIRES. Co-PI: A Hybrid Workflow to Create High-Quality Training Dataset for Machine Learning Applications in Cyclone Identification. *Unfunded.*
2018	NOAA HPCC Technology Incubator Program. Co-PI: Use of Machine Learning Algorithms and Satellite Data for Improved Estimation of Surface Soil Moisture State for Improved RAP/HRRR QPF.

Internal Proposals

2022	CIRES Innovative Research Program (IRP) Lead PI: Exploring Controlled and Wildfire Machine Learning Fire Radiative Power Modeling. *Funded.*
2022	GSL Director's Directed Research Fund (DDRF). Co-PI: Using Deep Learning to Improve Knowledge of Synoptic Conditions Leading to Extreme Fire Weather and Behavior. *Funded*.
2021	DDRF. Co-PI: Feature-Dependent Verification. *Funded.*
2019	DDRF. Co-PI: Deriving Relationships between Weather and Fire Intensity from Satellites and HRRR analysis with Machine Learning to improve smoke forecasting by HRRR-Smoke. *Funded*.

Software Packages

2024	(Draft one complete – under revision). Interactive google colab notebook on obtaining data, creating an machine learning ready dataset, and training a random forest model on weather and satellite data to model hourly fire radiave power.
2022	Random Forest (RF) Model and 2018 Fire Radiative Power (FRP) Dataset. Description: Four trained RF models based on satellite source and region can predict hourly FRP based on inputs from the RAP weather model and corresponding day-before mean satellite FRP values. Training dataset can also be available if requested.
2018	Tropical Cyclones and Extratropical Cyclones Regions of Interest (ROI) 2011-2015. Description: This is a dataset containing labeled center points, ROI, and monthly-unique IDs for tropical and extratropical cyclones from 2011 to 2015. This was created based off Bonfanti's heuristic model. Details can be provided upon request.

Highlighted Outreach/Diversity Equity and Inclusions Efforts (not previously listed)

2023	NCAR Science Days
2023	Letters to a Pre-Scientist National Pen-pal program
2022	Two high school lectures to at-risk students at Arapahoe Ridge High School
2022	Participated in a workshop on trust and trustworthiness in AI. This collected a diverse group of people to write thought/researched pieces on the topic of trust in AI and we are actively working on a large collaborative publication.
2022	Volunteered for the Picture Climate Change for kids' scientist expert providing expertise as well as announcing winners.
2017 – present	Serve as judge for both regional and state science fairs.
2019	Taught (three times) a basic AI interactive class for University of Wyoming Girl's in Science Day.
2019	Provided subject matter expertise to a local author writing a middle school textbook on weather by reviewing the entire textbook.
2017 and 2018	Girl's in Science Day volunteer and photographer. Denver.

Supervisees
- Three CIRES supervisees
- Additional supervisees that do not report to me through CIRES but through work

Publications

- Bostrom, A., Demuth, J. L., Wirz, C. D., Cains, M. G., Schumacher, A., Madlambayan, D., Bansal, A. S., Bearth, A., Chase, R., Crosman, K. M., Ebert-Uphoff, I., Gagne, D. J., Guikema, S., Hoffman, R., Johnson, B. B., **Kumler-Bonfanti, C.**, Lee, J. D., Lowe, A., McGovern, A., … Williams, J. K. (2023). Trust and trustworthy artificial intelligence: A research agenda for AI in the environmental sciences. Risk Analysis, 00, 1–16. https://doi.org/10.1111/risa.14245
- **(Accepted and pending second round of revisions) Kumler-Bonfanti, C.,** R. Ahmadov, E. James, & J. Q. Stewart (2022). Short-Range Prediction of Wildfire Intensity with Random Forest Model using Weather Forecast and Satellite Fire Radiative Power Observations.
- **Kumler-Bonfanti, C**., Stewart, J., Hall, D., & Govett, M. (2020). Tropical and extratropical cyclone detection using deep learning. Journal of Applied Meteorology and Climatology, 59(12), 1971-1985.
- **Bonfanti, C.,** L. Trailovic, J. Stewart, and M. Govett, 2018: Machine learning: Defining worldwide cyclone labels for training. 21st Int. Conf. on Information Fusion (FUSION), Cambridge, United Kingdom, IEEE, 753–760, https://doi.org/10.23919/ICIF.2018.8455276.
- Lagerquist, R., J. Stewart, I. Ebert-Uphoff, and **C. Kumler**, 2021: "Using deep learning to nowcast the spatial coverage of convection from Himawari-8 satellite data". *Monthly Weather Review,* early online release, https://doi.org/10.1175/MWR-D-21-0096.1.
- Giffard-Roisin, S., Yang, M., Charpiat, G., **Kumler Bonfanti, C.**, Kégl, B., & Monteleoni, C. (2020). Tropical cyclone track forecasting using fused deep learning from aligned reanalysis data. Frontiers in big Data, 3, 1.
- Ebert-Uphoff I. Ryan Lagerquist, Kyle Hilburn, Yoonjin Lee, Katherine Haynes, Jason Stock, **Christina Kumler**, Jebb Q Stewart. 2021. CIRA guide to custom loss functions for neural networks in environmental sciences–version 1. arXiv:2106.09757. Retrieved from https://arxiv.org/abs/2106.09757.