



RAL/MMM SEMINAR SERIES

Applying Machine Learning to Advance the Prediction of Hazardous Convective Weather

RUSS S. SCHUMACHER

Director, Colorado Climate Center, and
Colorado State Climatologist
Department of Atmospheric Science,
Colorado State University



Wednesday, August 7, 2024 1-2 PM (MT)

HYBRID MEETING FL2-1022 | [Watch Live](#)

Convective weather hazards, including tornadoes, large hail, damaging winds, and excessive rainfall, can have major societal impacts, yet they remain challenging to predict. One reason for this difficulty is that the hazards themselves generally occur on smaller spatial and temporal scales than can be resolved or directly predicted by numerical weather prediction models. Since 2017, our research group has been working to address this challenge by combining retrospective ensemble forecasts (i.e., “reforecasts”), observations, and machine learning to generate tools that provide skillful probabilistic guidance regarding these hazards. The tools have been transitioned into operational use at national forecasting centers and are widely used in the weather enterprise.

This presentation will provide an overview of these prediction systems, referred to as the “Colorado State University-Machine Learning Probabilities” (CSU-MLP) systems. This will include the data and techniques used to generate the forecasts, some success stories (and failures) from this research, and discussion of the importance of working closely with the users of the forecast tools. Furthermore, results from applying explainable AI techniques show that probabilistic random-forest predictions are physically interpretable and are consistent with ingredients-based conceptual models used in hazardous weather forecasting.

The presentation will conclude with a detour to a different topic: an introduction and update from the Colorado Climate Center. As the state climate office for Colorado, our mission is to provide climate monitoring, climate research, and climate services for the people of the state. I will give a brief overview of our ongoing and upcoming projects and initiatives.