ATS/CIRA Colloquium

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Visiting ATS from the National Center for Atmospheric Research

Deep Machine Learning for High-Impact Weather Forecasting

Hosted by Greg Herman and Russ Schumacher

Friday, Feb. 10, 2017

ATS room 101
Discussion will begin at 11:15 a.m.
Refreshments will be served at 10:45 a.m. in the weather lab

The weather forecasting process has grown more complex in recent years with the growing amount of observational data and model output available to weather forecasters and the trend toward providing more impact-based decision support services. In order to assist forecasters and end-users with the task of managing the firehose of data, I have developed and evaluated machine learning forecast guidance systems for different high-impact weather phenomena. Machine learning models have demonstrated the ability to synthesize large, multifaceted datasets into accurate predictions for many different problems. In this presentation, I will discuss my storm-based machine learning hail forecasting model. The machine learning hail model identifies potential storms in convection-allowing model output, associates each forecast storm with an observed hailstorm, and then feeds storm and environmental information into a machine learning model to predict whether hail will occur and what the size distribution of the hail will be. The machine learning hail model has run in real-time on the Center for Analysis and Prediction of Storms and NCAR Convection-Allowing ensembles and has shown increased skill over other hail forecasting methods for predicting severe and significant severe hail. I will also discuss ongoing work on incorporating deep learning models into different weather prediction tasks. Deep learning models can identify multiscale features in gridded spatio-temporal data and use that information to produce better predictions than traditional machine learning approaches. A form of deep learning called generative adversarial networks will be discussed and demonstrated. It has the ability to learn complex feature representations in spatial data without the need of labeled examples. These deep learning methods will be demonstrated against traditional machine learning models on the GEFS Reforecast dataset for the task of predicting 2 m temperature anomalies.

Link to colloquium videos and announcement page: http://www.atmos.colostate.edu/dept/colloquia.php