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Purely Data-Driven Approaches to Weather Prediction: Promise and Perils

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The use of machine learning (ML) models for weather prediction has emerged as a popular area of research. The promise of these models —whether in conjunction with more traditional Numerical Weather Prediction (NWP), or on its own —is that they allow for more accurate predictions of the weather at significantly reduced computational cost. In this talk, I will discuss both the promise and perils of using a data-driven (and more specifically deep learning) only approach. I will focus on a recent project with the Met Office on precipitation nowcasting as a case study. While we found that we could create a deep learning model that was significantly preferred by Met Office meteorologists and performed well on objective measures of performance, we also discovered many ways in which deep learning systems can perform well on objective measures of performance without improving decision-making value. I will discuss some reasons why this failure mode occurs, while also advocating for better verification of purely data-driven models. Although the discussion focuses on very-short-term prediction, we believe that many of these lessons are also applicable to longer-term forecasts.

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