

An AI hybrid predictive tool for extreme hurricane forecasting



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OBJECTIVES

- Design of a novel AI-prediction strategy for extreme hurricanes.
- Identify key (structural) predictors
- associated to storm intensification from GOES images.
- Anticipate response to rapid intensification cases.
- Provide forecasts performance metrics.



FORECASTING HURRICANES

Our CNN-RF model shows an overall precision (in forecasting major hurricanes) of 83% with an effective CNN architecture in the studied cases. Predictions are also given for different forecast (or lead-times), from 6 to 54 hours before the maximum development (see Table 1).

The model was also successfully tested for recent rapid intensification cases over the North Atlantic and East Pacific oceans. In all cases we always observed a hit ratio of at least 60% for all lead-times (or higher than 80% for 36h to 54 hours in advance).

Time (h)	6	12	18	24	30	36	42	48	54
P _{MH}	82.32	84.56	85.00	85.57	84.72	84.26	80.37	85.20	77.0

Table 1. Precision of our CNN-RF model for each lead-time.

AI METHODS

- A Convolutional Neural Network (CNN) model as a high-level spatial feature extractor.
- A Random Forest (RF) framework (a more sophisticated classification strategy) to categorize tropical cyclone patterns, and provide predictions.



CONCLUSIONS: Advanced parameter extraction and classification of storms improves performance in predicting major hurricanes up to 54h in anticipation. The model also enables us to make more accurate and consistent predictions of rapid intensification cases.



