

Westin Boyd

Undergraduate Student,
Department of Meteorology & Atmospheric Science,
Pennsylvania State University

Non-Competitive Division

Developing An Artificial Intelligence–Based Forecast Model for Hurricane-Induced Power Outages

Power outages caused by tropical cyclones can disrupt critical infrastructure, posing serious risks to public safety and emergency response. As hurricanes approach landfall, a primary goal of the National Hurricane Center is to provide Impact-Based Decision Support Services (IDSS) to clearly describe the locally relevant risks posed to communities. This project develops an AI-based model that forecasts county-level power outage severity based on official forecast products from NOAA/NWS National Centers.

Archived probabilistic meteorological data from forecasts from 35 landfalling Atlantic hurricanes between 2020 and 2024 were collected and geoprocesed by county in ArcGIS Pro as a training dataset for the model. Additional variables – such as social vulnerability, vegetation coverage, and power infrastructure characteristics – were incorporated to represent non-meteorological drivers of outage risk.

An artificial intelligence model using neural networks was trained to decipher the complex patterns between predictor variables and outage severity, and it was found to have great accuracy. Meteorological hazard variables proved to be the most indicative of the location and severity of outages, but the model performed significantly worse when exposure and vulnerability metrics were removed. Ultimately, this capability will increase the NHC's situational awareness of hurricane-induced impacts when communicating with partners and the public.

Presentation Theme:

Climate/Weather

Preparedness

AI/Machine Learning

Collaborators, Advisor(s) and Department(s) that assisted with this research.

Joshua Alland

Associate Scientist at the National Hurricane Center

Jamie Rhome

Deputy Director of the National Hurricane Center

Wallace Hogsett

Science & Operations Officer at the National Hurricane Center