

Hello, my name is Aaron Spaulding, I'm a second-year Ph.D. student at Princeton studying power outages caused by tropical cyclones.

AND

Tropical cyclones occur frequently in the Eastern and Gulf U.S. states, driving the majority of large-scale distribution system power outages in the region. These outages are incredibly costly—causing between \$20 and \$55 billion in annual economic losses.^{1,2} They endanger lives, disrupt critical infrastructure, and can take days to weeks to fully restore.

BUT

However, the dangers posed by changing tropical cyclone climatology in the Atlantic basin are highly uncertain in future climate change scenarios. In addition, current tools for predicting outages in the short term are limited in scope and accuracy. Existing models are often limited to individual utilities, generalize poorly to extreme events, or lack the resolution needed to inform local storm response and community-level planning.

Therefore

Therefore, my research seeks to develop high-resolution, probabilistic outage prediction models that capture the relationship between severe weather hazards and power system vulnerability. These models integrate hazards such as wind gust intensity with detailed utility infrastructure data and census-based demographic characteristics across the Eastern and Gulf U.S. states.

This approach allows us to not only predict where outages will occur and how many customers may be affected but also to evaluate how outage risk and restoration timelines might change under future climate scenarios. Ultimately, the goal is to support more effective storm preparedness, faster restoration, and more efficient investment in resilient infrastructure.

Please don't hesitate to contact me if you have any questions, or would like to discuss outage modeling in more detail! Thank you!

1. Sullivan, M. J., Schellenberg, J. & Blundell, M. Updated Value of Service Reliability Estimates for Electric Utility Customers in the United States.

2. Campbell, R. J. Weather-Related Power Outages and Electric System Resiliency. (2012).