Modeling the Impacts of Tropical Storms to the Power Grid using Comprehensive Information

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Hurricanes, Typhoons, and other tropical storms can cause widespread damage to infrastructure which is difficult to predict because of the complex interactions between the weather hazard, the infrastructure, and the surrounding environment. While previous research has demonstrated that machine learning methodologies can be applied to predict impacts like the number of power outages caused by tropical storms, they have also shown that the quality and availability of data can limit the accuracy and generalizability of these data-driven models. A more comprehensive approach to data-driven impact modeling is needed. We will present such an approach applied to a national-scale machine-learning model designed to predict the number of customers affected by power outages caused by tropical storms in the Continental United States. Using a record of more than 25 tropical storm events, we supply comprehensive information about the storms as well as the economy, demographics, and environment of each area to the model to ensure that the major aspects of the hazard, vulnerability, and exposure are included. Based on our results, we believe this or similar approaches could be applied to create a range of useful data-driven impact models that could be applied to different hazards and infrastructural systems.

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