INITIATIVE ON
Extreme Weather and Climate
COLUMBIA UNIVERSITY

Predicting Severe Wildfire Occurrence in Canada

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About 8000 wildfires occur in the protected area of Canada each year. Approximately 2% of these fires exceed 100+ ha in size, but account for most of the suppression costs and are the greatest threat to our communities. Although statistical approaches to fire occurrence Prediction (FOP) have evolved over the past 40 years, FOP has not yet been implemented at a national scale in Canada. We develop a big data based statistical modeling approach, applying Lasso logistic regression and supervised machine learning methods to a set of spatially gridded meteorological, topographic and demographic covariates to predict person, lightning and large wildfire occurrences in Canada one an two weeks ahead. Case control sampling was used to tackle the zero-inflation problem inherent to rare events problems. Both LASSO logistic and random forest methods allowed for the inclusion and selection of a large number of covariates, and the selection and fitting of models with useful skill. We anticipate that the implemented models will better facilitate agency preparedness as well as tactical decisions regarding resource allocation and sharing between fire management agencies in Canada. However, predicting surges in ignitions following large lightning storms remains challenging, and an area for future focus.