Yes, 2019-2020 Victorian bushfires were most likely caused by lightning but there's more to be learned from open data

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1 Introduction

In a Jan 11, 2020 ABC article "The truth about Australia's fires — arsonists aren't responsible for many this season" reports about Victoria:

> "The Country Fire Authority (CFA) said the majority of fires were not arson-related. 'Most of the fires have been caused by lightning', said Brett Mitchell, the CFA incident controller in Bairnsdale, in East Gippsland. 'Our intelligence suggests there are no deliberate lightings that we are aware of.' Victoria Police had no arson figures available for this bushfire season, but said in the 12 months to September 2019, a dozen people had been arrested for causing bushfires."

These words were spoken in response to a fierce war of hashtags on twitter "#ClimateEmergency" vs "#ArsonEmergency". In the ABC article most other states quoted numbers for arson and lightning, but Victoria's response was more vague. This prompted us to dig into open data resources to learn as much as we could about the cause of the bush fires in Victoria.

2 Data sources and collation

To track bushfires in Australia remotely with high temporal and spatial resolution, we used hotspot data taken from the Himawari-8 satellite. This data was filtered using the firepower information to keep only hotspots that were most likely fires. We clustered the hotspots in time and geographically, to estimate the ignition point and time of fires, and label fires. This data was supplemented with data from other sources: weather, fuel load distance to camp sites, roads and CFA stations. Weather information included temperature, rainfall, wind, and solar exposure from various sources. Rainfall was aggregated at different time intervals to provide cumulative moisture for locations.

A model was trained to predict one of four causes (lightning, accident, arson, burning off) on the fire origins data from the Victorian Department of Environment, Land, Water and Planning (DELWP), which we supplemented with the same weather, fuel layer, distances data as the hot spot data. The performance of the model was very good: 75% overall accuracy, 90% accurate on lightning, 78% for accidents, 54% for arson which was mostly confused with accident, as would make sense. The most important contributors to distinguishing between lightning and

arson (or accident) ignition were distance to CFA stations, roads and camp sites, and average wind speed over the past 12-24 months. Smaller distances were most likely arson or accident, as might be expected.

3 Model predictions

bar chart or table of causes

Maps of predicted causes by month showing arson and accident

Validation of predictions

Historical data cases histograms

Show somewhere that it looks right?

Our predictions might disagree with this:

French Island likely due to dry lightning http://www.mpnews.com.au/2020/01/21/all-clear-after-island-fire-fright/

"Dry lightning is being blamed for the blaze which was thought to have started on the previous Wednesday and smouldered for three days before an east-wind change brought it surging to life."

zoom into map from app

Link to the app

4 Acknowledgements

This analysis is based on a research paper co-authored by Di Cook and Weihao Li, a Monash University Honours student, from the Department of Econometrics and Business Statistics at the Monash Business School, and Emily Dodwell, previously a member of AT&T Research in New York City. The full analysis is available at https://github.com/TengMCing/bushfire-conversation.

The code used for the analysis can be found in the github repository github.com/TengMCing/thesis.

You can explore the historical fire data, predictions for 2019-2020 fires and a fire risk map for Victoria using the shiny app at ebsmonash.shinyapps.io/VICfire/