THE PROBABILITY OF BUSHFIRE IGNITION IN VICTORIA

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ASSESSING BUSHFIRE RISK REQUIRES AN UNDERSTANDING OF BOTH FIRE SPREAD AND IGNITION. THIS PROJECT INVESTIGATES THE PROBABILITY OF BUSHFIRE IGNITION IN SPACE AND TIME TO ASSIST IN RISK FORECASTING AND OPERATIONAL DECISION MAKING. A LOGISTIC REGRESSION MODEL WILL MAKE USE OF WEATHER, TOPOGRAPHY AND VEGETATION TO PRODUCE PROBABILITY MAPS FOR IGNITION.

Model Implications

The model will utilise forecasts for weather conditions and other relevant covariates to produce a forecast map for the probability of ignition. These maps can be used to inform daily and long term risk assessments.

In Victoria, bushfire risk is assessed by looking at a collection of Phoenix spread runs each with a different ignition point chosen deterministically. The logistic regression model can be used in conjunction with Phoenix to take the probability of ignition into account to increase the accuracy of these risk assessments.

The output can also be used strategically to determine optimal scheduling of treatment units for fuel load reduction.

Logistic Regression Model

A logistic regression model is a type of generalised linear model which uses covariates to predict the outcome of presence/absence variables. In the case of bushfire ignition covariates often include precipitation, temperature, humidity, elevation, vegetation and fuel moisture layers. For predicting lightning-caused ignition a lightning frequency layer is often included and for human-caused ignition a population, road density and electricity infrastructure layer is often included.

Strengths:

- Relatively quick model to implement.
- Has a good physical interpretation.

Weaknesses:

- Poor ability to deal with spatial and temporal clustering, such as when several fires are caused by the same lightning storm.

The model is fitted by using daily historical rasters for both the covariates and presence/absence of ignition.

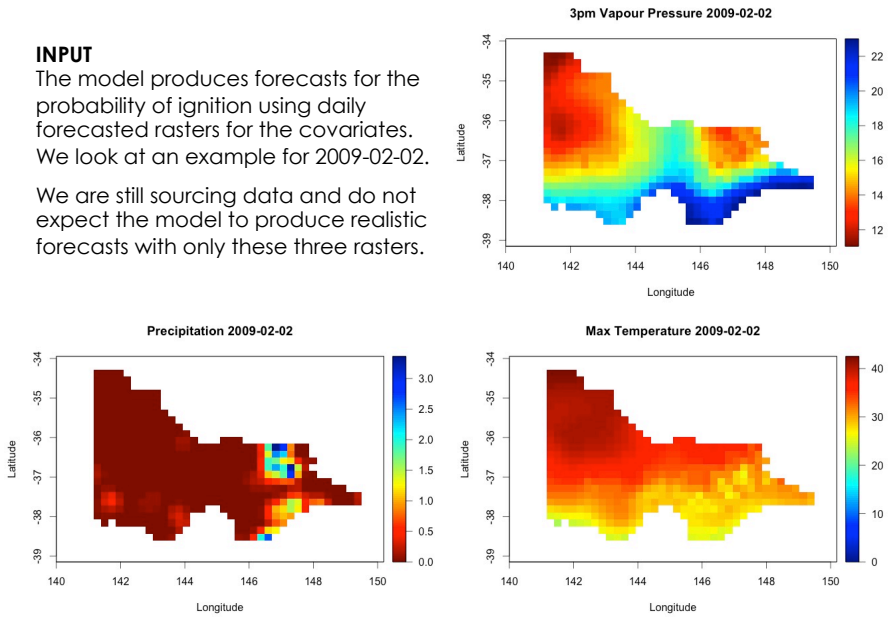
Future Work

We want to look at fitting a Cluster point process model to lightning-caused ignitions. This will allow for spatial and temporal dependence between ignitions, overcoming the main limitation of current modelling approaches.

INPUT

The model produces forecasts for the probability of ignition using daily forecasted rasters for the covariates. We look at an example for 2009-02-02.

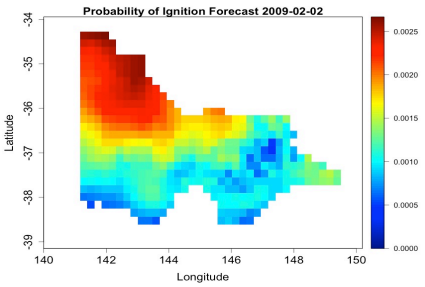
We are still sourcing data and do not expect the model to produce realistic forecasts with only these three rasters.



OUTPUT

The output from the logistic regression model is a raster grid of probabilities of ignition. For each grid cell we have the probability that there is one or more fires in that grid cell on that day. If the grid cells are chosen small enough then this can be interpreted simply as the probability of fire.

This test case was calculated using the rasters above. The coefficients were calculated using two months prior data.



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