Proposal for Funding ACEMS and AT&T Collaboration

Professor Dianne Cook, EBS, Monash University   23 August 2021

1 Topic

Multivariate spatio-temporal visualisation with application to Australian bushfire detection, causes and risk.

2 Personnel

- Dianne Cook, ACEMS
- Emily Dodwell, previously at AT&T
- Chris Volinsky, AT&T

3 Purpose

3.1 Background

The 2019-2020 Australia bushfire season was catastrophic in the scale of damage caused to agricultural resources, property, infrastructure, and ecological systems. By the end of 2020, the devastation attributable to these Black Summer fires included 33 lives lost, almost 19 million hectares of land burned, over 3,000 homes destroyed and AUD $1.7 billion in insurance losses, as well as an estimated 1 billion animals killed, including half of Kangaroo Island's population of koalas.

[handwritten annotation: fires; occur most frequently in summers]

The summer of 2021 has seen devastating wild fires in the northern hemisphere, including Canada, USA, Turkey, Greece, Italy, Russia. That July was the hottest ever recorded on record likely contributed.

[handwritten annotation: study; potentially help other countries in Northern hemis.]

This raises cause for concern, as Australia moves into summer. Increasing the availability of tools and models for understanding and mitigating the risk this year is imperative.

[handwritten annotation: help; by increasing availability of tools & models for understanding thus mitigating risks]

3.2 Results of current collaboration

The initial collaboration began when Emily Dodwell visited Monash University and Queensland University of Technology, in Feb 2020. The initial goal was to develop multivariate spatio-temporal visualisation for complex emergency call data. AT&T call data is privacy protected, so another data example was needed for testing and communicating findings. With the Australian bushfires freshly burned into our minds, and almost preventing Emily's travel, we used open data on the Victorian bushfires as the example data.

The collaboration has produced an R package, `spotoroo` available on CRAN and accompanying paper soon to be submitted, and a web app. The package and paper detail a spatio-temporal clustering algorithm applied to satellite hotspot data, to remotely detect fire ignition and track fire movements.

The project involved extensive data fusion, using historical fire cause data, weather, proximity to locations such as camp sites and roads, to develop a model for bushfire ignition causes, to predict the causes of fires detected by spatio-temporal clustering of 2019-2020 satellite hotspots. The data collection and predictions are available to a general user through the VICfire app.

3.3 Goal

The collaboration would develop risk models and visualisations, to monitor potential fire ignitions and track fires from satellite hotspots, in real-time, for the 2021-2022 Victorian bushfire season. These will be made these publicly available by extending the existing web app.

3.4 Broader applications

The environmental resiliency research group at AT&T who would be consulted on the work, and have the rights to use the models and visualisations developed.

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The researchers will engage with other ACEMS researchers on bush fire modelling and monitoring// A goal to provide expertise on visualisation and data fusion tools, and also receive expertise on fire models, and utilise private data such as lightning.

4 Funds

The funds would be entirely fund a research assistant to work under the supervision of the ACEMS and AT&T personnel, to develop the real-time risk visualisations and implement in the existing app// The app would be available for testing during the 2021-2022 bushfire season, for monitoring and predicting risk under different weather, time and space conditions.

4.1 Caveats

AT&T has rights of refusal to have their name associated with any particular publication, but reserves the right to use products privately in-house.