DS5110 Project Proposal

Title:
Gaining insights on Australian bushfires using high-frequency NASA satellite data

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Summary:
The Australian bushfires starting in late 2019 have been devastating and have caused a massive loss of wildlife, forest land, and has even led to human casualties. This project is based on Australian Bushfire satellite data provided by MODIS and VIIRS sensors on NASA satellites Terra and Aqua and compiled in [1].

Our aim is to explore the relationships between different attributes and use clear visualizations to answer some questions among others like the most impacted region with time, how the fire progressed geographically as well as temporally, which hot-spot type was the major cause for bush-fire and can we predict future bush-fire hotspots given past geographic conditions?

The dataset [1] contains 4 CSV files containing attributes like fire location (latitude-longitude), intensity of fire, brightness temperature of fire pixel, confidence of data points, fire in day/night and many more. The data is divided into 2 periods: archival (Sept 1st – Dec 31st, 2019), and real-time (Jan 1st – Jan 31st, 2020) data.

Proposed Plan of Research:
Data Gathering: The dataset has been gathered from the publically available data from NASA satellites VIIRS [2] and MODIS [3], under the Fire Information for Resource Management System (FIRMS). The data was downloaded in comma-separated text (.csv) files and in the UTF-8 format as given on their website.

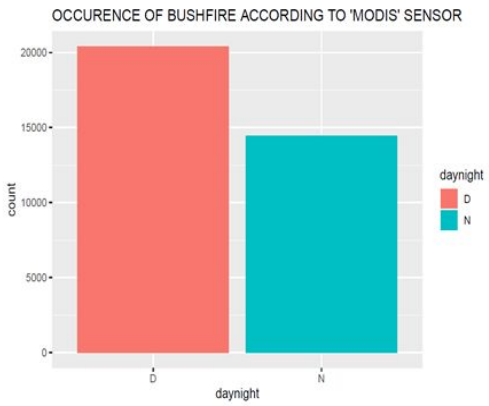
Data Consolidation: The dataset is clean, and the values are properly mapped to their respective rows and columns. All the files were merged using the {dplyr} package to perform necessary queries on them to answer the questions we aim to solve.

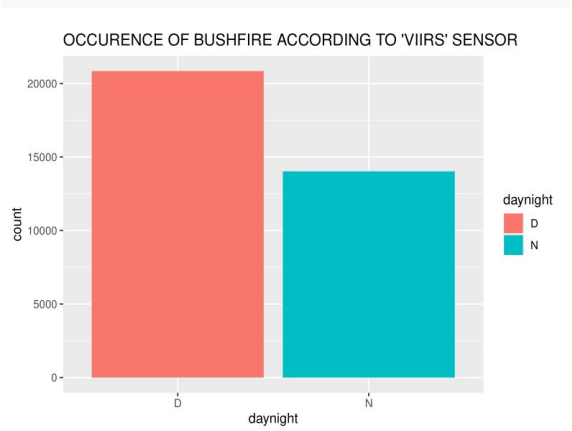
Exploratory data analysis: We will use the {ggplot2} package in R to design clear plots and visualizations so as to gain insights from them.

Data Modeling: We plan to use the {modelr} and {caret} packages to build predictive models on the data.

Preliminary Results:

This visualization depicts the occurrence (day/night) of bush-fire from different satellites according to the data collected by the MODIS and VIIRS sensor.
This strengthens the belief that while many of the fires occur in the day when there are higher chances of people interacting with the forests in any way, there are many other reasons that fires may occur, hence balancing the number of fires in the night with those in the day.





References & Citations:

1. Australian Bushfire satellite data by NASA (consolidated as a Kaggle dataset): https://www.kaggle.com/nagarajbhat/australian-bush-fire-satellite-data-nasa
2. NRT VIIRS 375m Active Fire product VNP14IMGT. Available online [https://earthdata.nasa.gov/firms]. DOI: 10.5067/FIRMS/VIIRS/VNP14IMGT.NRT.001.
3. MODIS Collection 6 NRT Hotspot / Active Fire Detections MCD14DL. Available online [https://earthdata.nasa.gov/firms]. DOI: 10.5067/FIRMS/MODIS/MCD14DL.NRT.006.