Student ID:5588984

WORD COUNT:1071

(Excluding bibliography)

GRAPHICAL REPORT

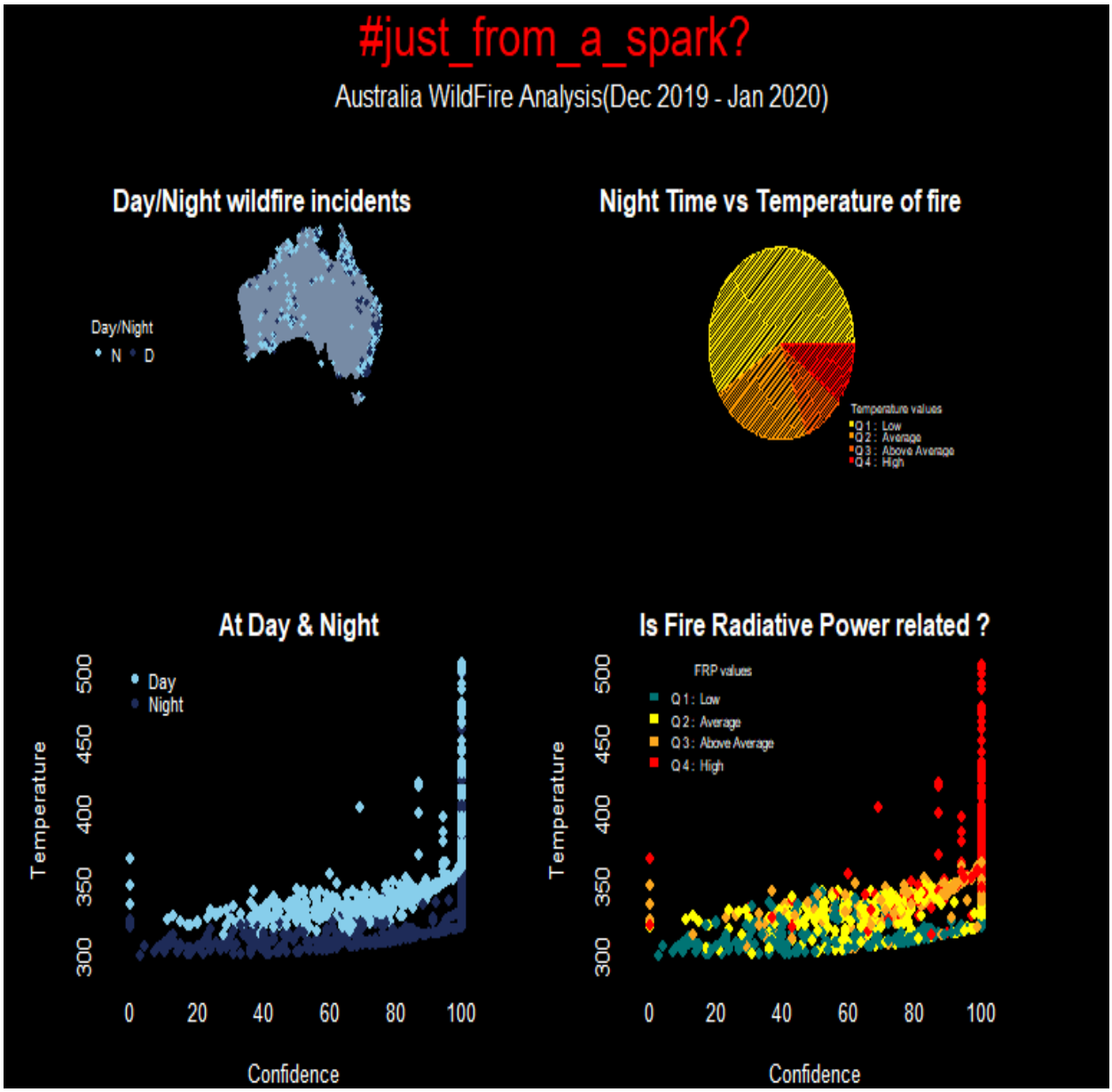

Figure 1: Visualisation of Australia Wildfire Analysis from December 2019 to January 2020

INTRODUCTION:

Wildfires in Australia that happened for a specific time period are analytically depicted as visualisation in Figure 1. The use of various graphs in a visualisation can help the audience have different demands on their minds **[1]**. Likewise, Figure 1 showcases four graphically represented pieces of information in three different graph forms. The visualisation concentrates on four main attributes of the data, namely: brightness: temperature of the fire; confidence: low confidence, medium confidence, high confidence; frp: fire radiative power and daynight: occurrence of fire with respect to day or night.

"MAKE A LASTING FIRST IMPRESSION": TITLE

A question as an impressive title, creates curiosity instantly and also aligns with the current trend of hashtags is used, followed by a comprehensive subheading giving clear context about the visualisation. Many researchers conclude that wildfires are caused "#just_from_a_spark" in major cases.

MAPPING THE FLAMES: LAYOUT

Figure 1 visualises the wildfire incidents in a two-row by two-column layout with graphs representing different comparisons and yet trying to connect the dots(relationships) between each graph. This type of layout format is chosen because the result of the graphs in each cell sequentially stimulates a question, which can possibly be the title of the next corresponding graph.

The representation follows the below sequential order:

a) Comparison of the wildfire incidents that occurred with respect to day or night.
b) Depicting the temperature values of fire categorized as low, average, above average, and high that occurred specifically at night. [The two graphs can be related in a way that the lower frequency of fire at night may be due to fires tending to possess low temperature values at night.
c) To compare how the fires at day or night correspond to having the confidence levels at each temperature value.
d) Comparing if the values of energy released from the fire is proportional to having same level of confidence and temperature values.

Colour Scheme:

The background colour is set to black as it uplifts the overall look of the visualisation as shown in Figure 2. Considering the popular usage of" dark mode" in all applications by a general audience as it improves visual acuity and reduces visual fatigue **[5]**, Figure 1 can easily draw attention. Figure 1 can be visualized in any environment [bright or dark surrounding resulting in the same visual impact.

Another perspective is that the entire visualisation is colour coded in equal halves. The left column is entirely set with blue shades, and the right column is set with shades of yellow and red, majorly [relatively bright colours]. The black background is set to balance this colour difference aesthetically and, at the same time, allow the users to find this perspective instantly.

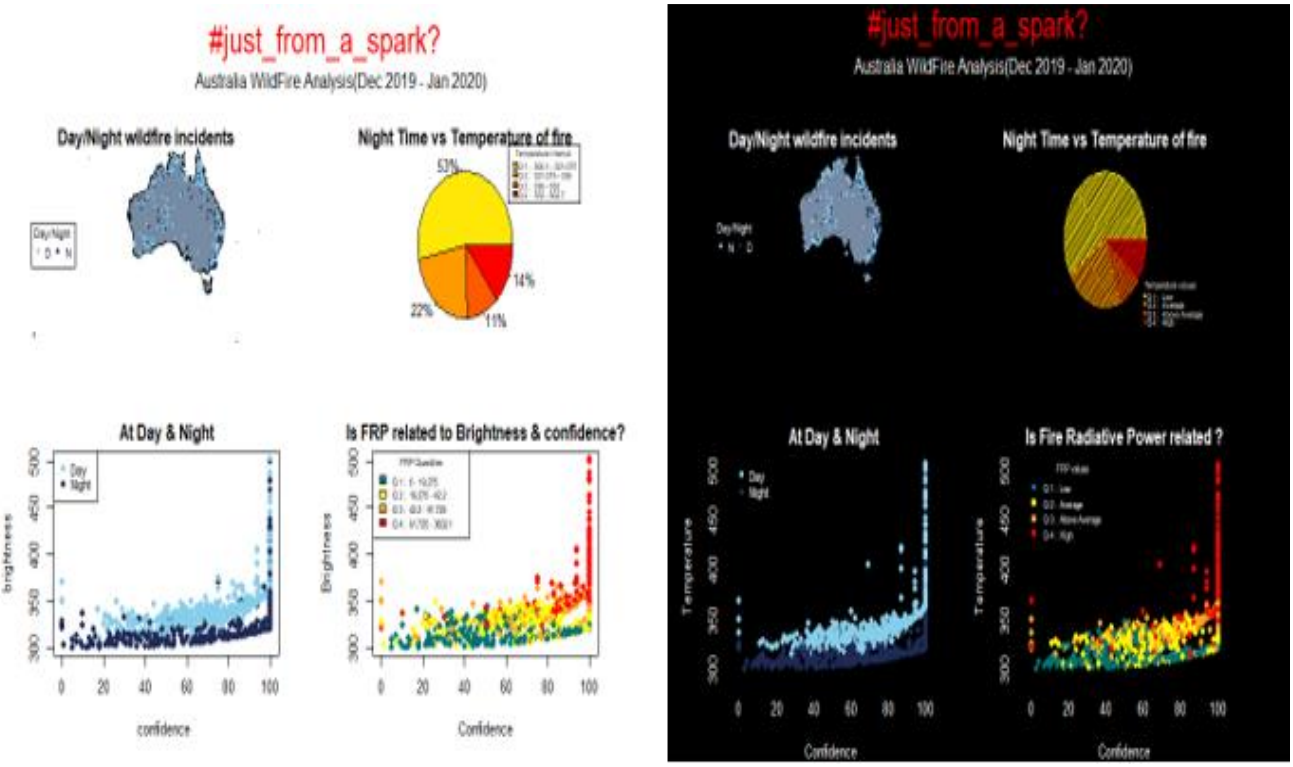

Figure 2: Representation of black background outperforming white background

CHOICE OF GRAPH:

MAP:

The first representation of wildfire places between day and night is plotted in map format. Many other graphs can showcase this relationship more effectively than using a map. Considering from viewer's point, the use of the Australia map at the top creates curiosity to take a glance at what figure 1 insists on, as the map directly links to the subject of this visualisation.

Colour scheme: Direct colour grouping involves relating the data to its colour in the real world **[4]**. Sky colours like light blue and night sky colours like dark blue are used for point grouping as day or night in the first scatter plot.

PIE CHART:

Human eyes are skilled at distinguishing between pie slices that are larger than or smaller than the radius of the circle **[2]**. This type of chart is chosen specifically to indicate the proportion of temperature values at night due to the dominance of low temperatures at night, as pie charts allow users to visually grasp such outcomes in no time.

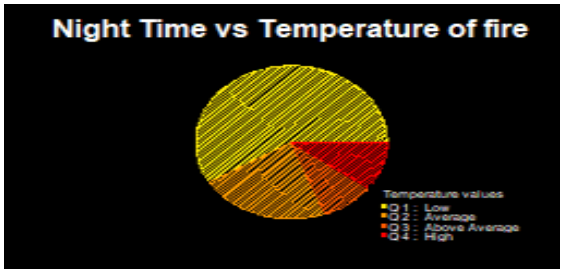

Figure 3: Chart consisting of pie slices larger and smaller than the radius of the circle

The column is broken down into four quantile values with distinct colours to represent the proportion of temperature values as low, average, above average, and high.

Colour Scheme: Sequential colour scheming is a way that is used to represent increasing values for increasing darkness **[4]**. They usually range from light to dark in one or two similar shades **[4]**. Here, the increasing values of temperature are represented by a range from yellow[light] to Red[dark].

SCATTER PLOT:

This type is chosen to represent two relationships between temperature and confidence with respect to day/night and FRP. A Scatter plot is the ideal option when dealing with multiple non-linear data variables. The problem arises when too many points are to be plotted over a small dimension especially when their layout includes more than one row and column. Grouping and positioning strategies can help visually overcome this problem **[3]**. Implicit grouping is a method that uses point- encoding to categorise similar points into a group **[3]**. Here, the quantile values of FRP are point encoded as low, average, above average, and high, with four different colours for easy interpretation of the data. The quantile values represent the intervals under which all FRP values fall.

Colour Scheme:

Direct colour grouping involves relating the data to its colour in the real world **[4]**. Sky colours like light blue and night sky colours like dark blue are used for point grouping as day or night in the first scatter plot.

As the FRP [amount of energy] values indicate a low to high range interval, which in some studies indicates a threat to the environment, the traffic signal colour scheme is used as a symbolic representation of FRP values indicating threat [green for low, Yellow for average, a shade of red with yellow for above average, and Red for high energy emission values respectively.

The sequential colour scheming **[4]** method is not used here to avoid the visual junk where different shades of similar colour can be quite confusing in recognising a pattern in a non-linear scatter plot graph. As a result, even if many points are plotted above each other, the colour scheme helps us distinguish the points. For example, most of the high FRP values with higher confidence is explicitly viewed at a glance.

CONCLUSION:

In conclusion, the visual representation, including an impressive title, a two-by-wo grid layout, the choice of graphs, and colour scheme contributes to a visually attractive and analytical depiction of Australian wildfire data.

REFERENCES:

[1] Tory, Melanie & Möller, Torsten. (2004). Human factors in visualization research. IEEE Trans Vis Comput Grap. IEEE transactions on visualization and computer graphics. 10. 72-84. 10.1109/TVCG.2004.1260759.

[2] Hopper, Joe. "Here's When Pie Charts Work." Versta Research, verstaresearch.com/blog/heres-when-pie-charts-work/. Accessed 5 Dec. 2023.

[3] A. Sarikaya and M. Gleicher, "Scatterplots: Tasks, Data, and Designs," in IEEE Transactions on Visualization and Computer Graphics, vol. 24, no. 1, pp. 402-412, Jan. 2018, doi: 10.1109/TVCG.2017.2744184.

[4] Midway, Stephen R. "Principles of Effective Data Visualization." Patterns, vol. 1, no. 9, 2020, p. 100141, https://doi.org/10.1016/j.patter.2020.100141.

[5] Kangsoo Kim, Austin Erickson, Alexis Lambert, Gerd Bruder, and Greg Welch. 2019. Effects of Dark Mode on Visual Fatigue and Acuity in Optical See-Through Head-Mounted Displays. In Symposium on Spatial User Interaction (SUI '19). Association for Computing Machinery, New York, NY, USA, Article 9, 1–9. https://doi.org/10.1145/3357251.3357584

APPENDIX:

```
setwd("C:\\Users\\rmith\\OneDrive\\Desktop\\aus wild fire")

fia <- read.csv("fire_nrt_M6_96062.csv", sep=",")


# we are using dates so you will need to ensure that the formatting is 'correct'

fia$acq_date <- as.Date(fia$acq_date, format = "%d/%m/%Y")

# take a look at the data

summary(fia)

head(fia)


###___ there is A LOT of data in this file and your laptop might struggle ...

###___ a random sample of the data can be used during design and development...

###___ with the full dataset used in your final version by commenting out the sample code

NumberOfSamples <- 1000

fia <- fia[ sample(1:dim(fia)[1], NumberOfSamples, replace=F ),  ]

#

summary(fia$acq_date)

summary(fia$daynight)

summary(fia$brightness)

summary(fia$confidence)
```

```
summary(fia$frp)

par(bg="black")

par(mfrow = c(2, 2), mai = c(4, 1, 1, 1),mar=c(4,5,1,3))

#first plot-map

library( maps )

library( mapdata )


map(database = "worldHires", regions = "Australia",fill=T,col="#778ba5")


points(

  x = fia$longitude,

  y = fia$latitude,

  pch = 16,

  cex = 0.5,

  col = ifelse(fia$daynight == "D", "#87CEEB", "#1e2b58")

)

title(main = " Day/Night wildfire incidents ",col.main="White")

legend("left", legend = unique(fia$daynight), pch = 16, col = c("#87CEEB","#1e2b58"), title = "Day/Night",cex=0.7,horiz = T,text.col = "white")


#second plot-pie chart

fia$brightness <- as.numeric(fia$brightness)


quantiles <- quantile(fia$brightness, c(0, 0.25, 0.5, 0.75, 1))

colors <- c("#ffe808", "#ff9a00", "#ff5a00", "#ff0000")


night_data <- subset(fia, daynight == "N")


night_percentage <- prop.table(table(cut(night_data$brightness, quantiles)))

#above prob.table() reference source:https://stackoverflow.com/questions/56285928/can-i-use-prop-tabletabledatavariable-to-get-percentages-in-r
```

```
pie(night_percentage, col = colors,density = 80, main = "Night Time vs Temperature of fire", labels = paste0(round(night_percentage * 100), "%"),col.main="white")

#https://community.rstudio.com/t/how-do-i-outline-the-percentage-labels-for-greater-visibility-in-the-graph-help/166859

legend_labels <- paste("Q", 1:4, ": ",c("Low", "Average", "Above Average", "High"))

legend("bottomright", legend = legend_labels, fill = colors, title = "Temperature values", cex = 0.5,x.intersp = 0.1, y.intersp = 0.8,text.col = "white")

# third plot-Scatter plot at Day/night time

daynight_colors <- c("D" = "#87CEEB","N" = "#1e2b58")

par(mar=c(4,5,2,2))

plot(fia$confidence, fia$brightness,

    pch = 19,

    col = daynight_colors[fia$daynight],

    xlab = "Confidence ", ylab = "Temperature",

    main = " At Day & Night",col.lab="white",col.axis="white",col.main="white")

legend("topleft", legend = c("Day", "Night"), col = daynight_colors,pch = 16, cex = 0.8,trace = TRUE,x.intersp = 0.8, y.intersp = 0.8,text.col = "white")

#4th plot-Scatter plot

frp_quantiles <- quantile(fia$frp,c(0, 0.25, 0.5, 0.75, 1))


quantile_colors <- c("#007474", "yellow", "#FDA81F", "red")

fia$frp_color <- cut(fia$frp, frp_quantiles,label=quantile_colors)


par(mar=c(4,5,2,2))

plot(fia$confidence, fia$brightness,

    col = quantile_colors[fia$frp_color],

    col.lab="white",

    col.axis="white",

    pch = 19,

    xlab = "Confidence", ylab = "Temperature",

    main = "Is Fire Radiative Power related ?",col.main="white")
```

```
legend_labels <- paste("Q", 1:4, ": ",c("Low", "Average", "Above Average", "High"))


legend("topleft",legend = legend_labels, fill = quantile_colors, cex = 0.6, title = "FRP values",text.col =
"white")


par(mfrow = c(1, 1), mai = c(1, 1, 1, 1))


par(oma=c(0,0,3,0))

mtext("#just_from_a_spark?",outer=T,cex=1.8,line=1.4,col="red")

par(oma=c(0,0,3,3))

mtext("Australia WildFire Analysis(Dec 2019 - Jan 2020)",cex=1,line=5,col="white")
```