

Cars and pollution at Australia

DVP

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Applied session: Applied 02

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1.Introduction:

My aim for this project is to convey a clear and concise message about the relationship between automotive elements and CO2 emissions. Specifically, it aims to show how various elements or components of a car, such as Engine size, fuel efficiency and number of cylinders, affect CO2 emissions. The goal is to demonstrate the importance of these elements in contributing to or mitigating greenhouse gas emissions in the automotive industry. Helping Australian families make informed choices about environmentally friendly vehicles

My target audience includes environmental advocates, automotive industry professionals and the general public. I want to provide a comprehensive and easy-to-understand overview of the factors that influence CO2 emissions from vehicles. Environmental advocates can use it for awareness campaigns, industry professionals can identify areas of innovation, and the general public can make informed decisions about vehicle choices and their environmental impact

2.Design:

2.1 5 design sheet:

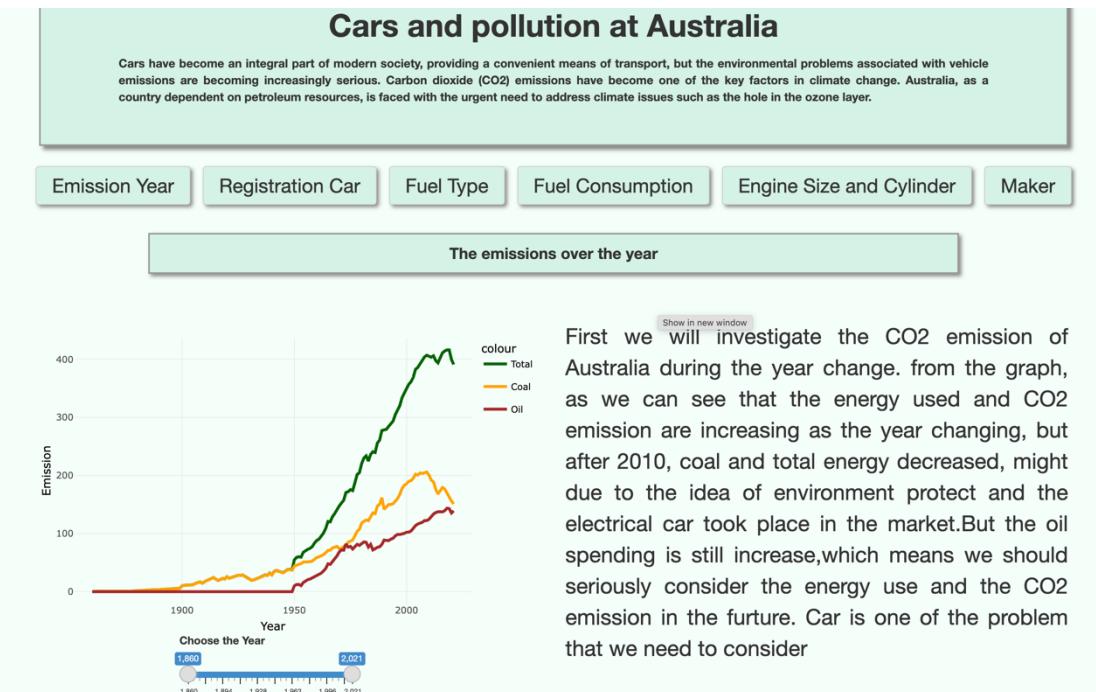
In my process of design, I followed a strict 5 design sheet design process, my first design sheet provided me with many possible diagrams, my second design sheet will be more on the car elements including their maker, engine size and cylinders, my third design sheet will focus on CO2 and other resources emissions but will display car elements at the back . My fourth design sheet will consider the combination of the two to strike a balance, and my fifth design sheet will improve on the fourth chapter by firstly increasing the number of graphs, secondly combining the various elements of the emission in a line graph, and then I will go into more detail about the car to fit the theme better.(see appendix 1).

2.2 R shiny implementation

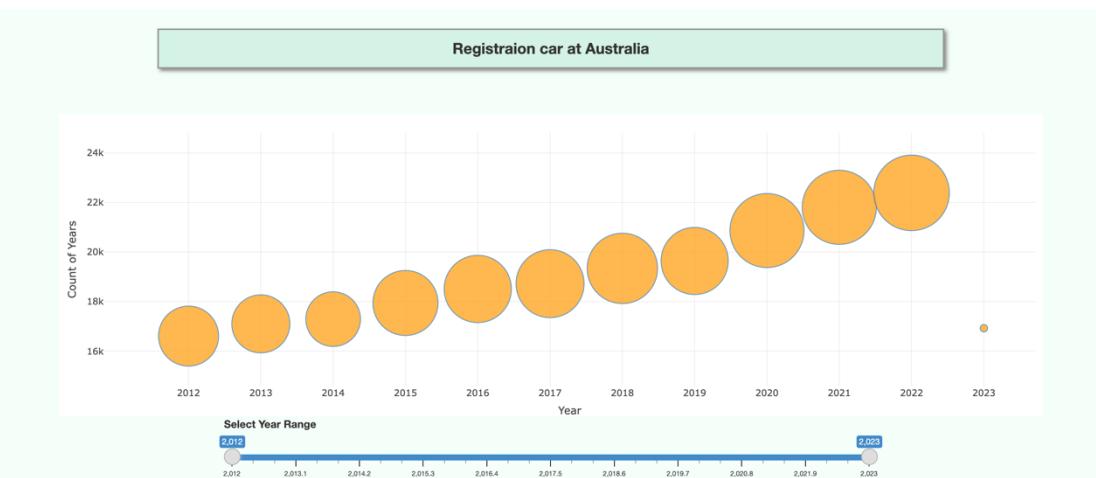
Overall:

The overall design I follow the design consistency, I choose to use the same color for the whole page, I choose light blue as background color because blue normally represent sky and environment. Also the font size, I keep the title , subtitle and paragraph equal across the whole page. Also I follow the same color pattern, avoid using red and green in case of color blind. Also for the design, I keep the margin same to keep the design consistency. For the genres of narration style, I choose to use Explanatory Style[1] to explain the detail of all the graph, This style focuses on detailed data explanations to ensure that the audience understands the meaning behind the data. It usually includes labelling and textual descriptions to clarify key points of the data. At the top I add navigation buttons, you can click and jump to different graph, this provide the convenient.

My first graph is the line chart about the energy emission:

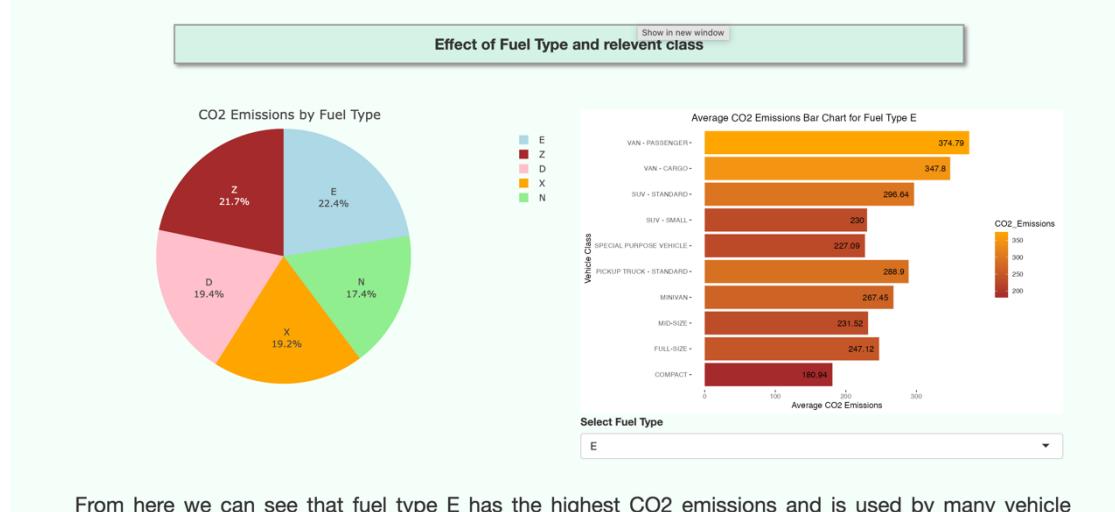


For this graph, on the top I have introduced on the overall reason of why I choose this topic, then I use graph to display the overall energy use and emission through the year. This can display the importance of energy use, so that we can continue to introduce the following part. For the color choose on the line chart, I avoid red and green to the visual issue. You can use the slider input to check the year range you like to see. Also you can click the legend to choose which line can be displayed. This can help the audience easier to locate the year they want.



For the graph 2, I add a bubble chart to display the Registration car through the year at Australia and their total transaction as the size of the circle. Also I add a slider to help the user

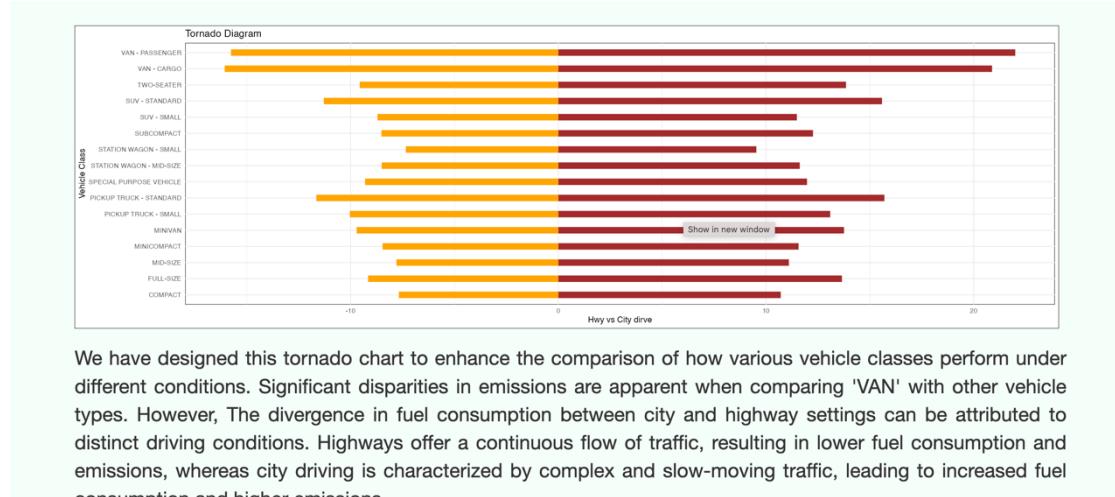
to choose the range, I choose bubble chart it because it can demonstrate three dimension information. I can use bubble chart to tell the audience that the change through the year and see if the difference obvious or not. In design I follow the color consistency.



From here we can see that fuel type E has the highest CO₂ emissions and is used by many vehicle

Graph 3: pie chart and bar chart

In the next I display two chart, one is pie chart and the other one is bar chart. From here I am going to introduce the car element. It focus on the Fuel type' s emission and which vehicle use the fuel type. Also for the bar chart, I add color pattern to visualize the average CO₂ emission. In this way it can be more simple to display more information within one graph. It can help the audience easy to understand which fuel is better and which vehicle they can purchase. In here I choose to use brown to orange, because this color always illustrate to temperature, which reminds the audience the CO₂ will bring the earth higher temperature. In order to avoid the clutter [2], I choose to use a selection for filter out all the fuel type, and the user can choose their ideal fuel and display the fuel corresponds 's vehicle class.

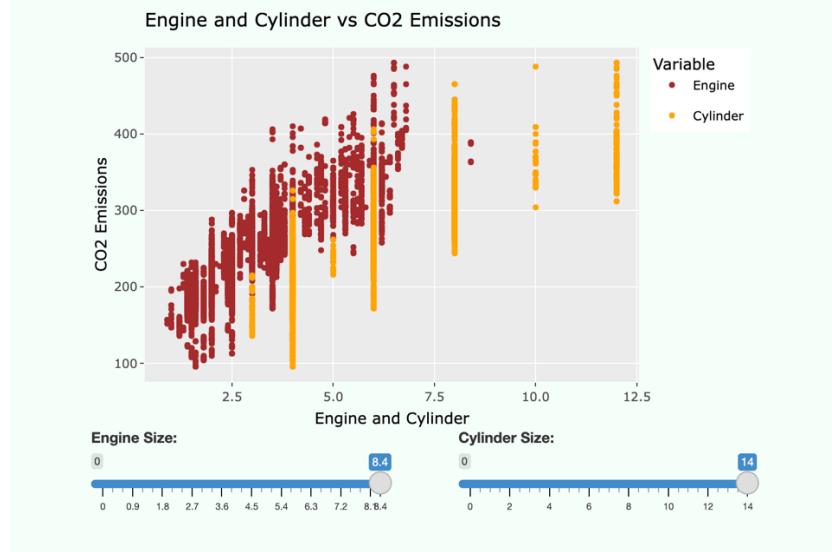


We have designed this tornado chart to enhance the comparison of how various vehicle classes perform under different conditions. Significant disparities in emissions are apparent when comparing 'VAN' with other vehicle types. However, The divergence in fuel consumption between city and highway settings can be attributed to distinct driving conditions. Highways offer a continuous flow of traffic, resulting in lower fuel consumption and emissions, whereas city driving is characterized by complex and slow-moving traffic, leading to increased fuel consumption and higher emissions.

Graph 4: tornado chart

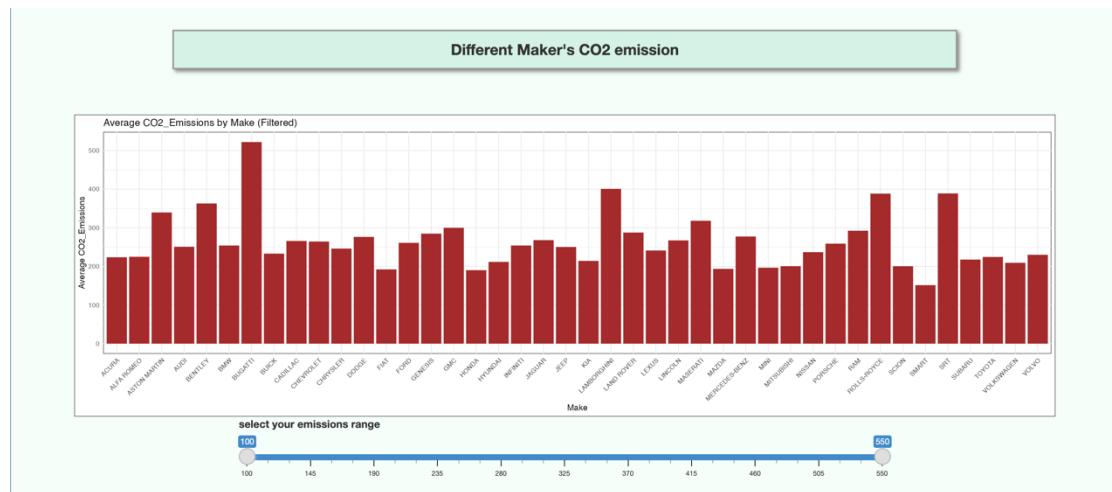
On the next part I will investigate the fuel consumption between city and highway between different vehicle class. It follows the information above about the fuel, most of the family are interesting in how the fuel consumption of each vehicle class. So that they can make decision on which car they like to purchase. This is a tornado chart, the left hand side is the

highway consumption, the right hand side is the city. To make a tornado chart is more easier to compare the difference. I choose orange and brown to follow the color design above in order to follow the design consistency.



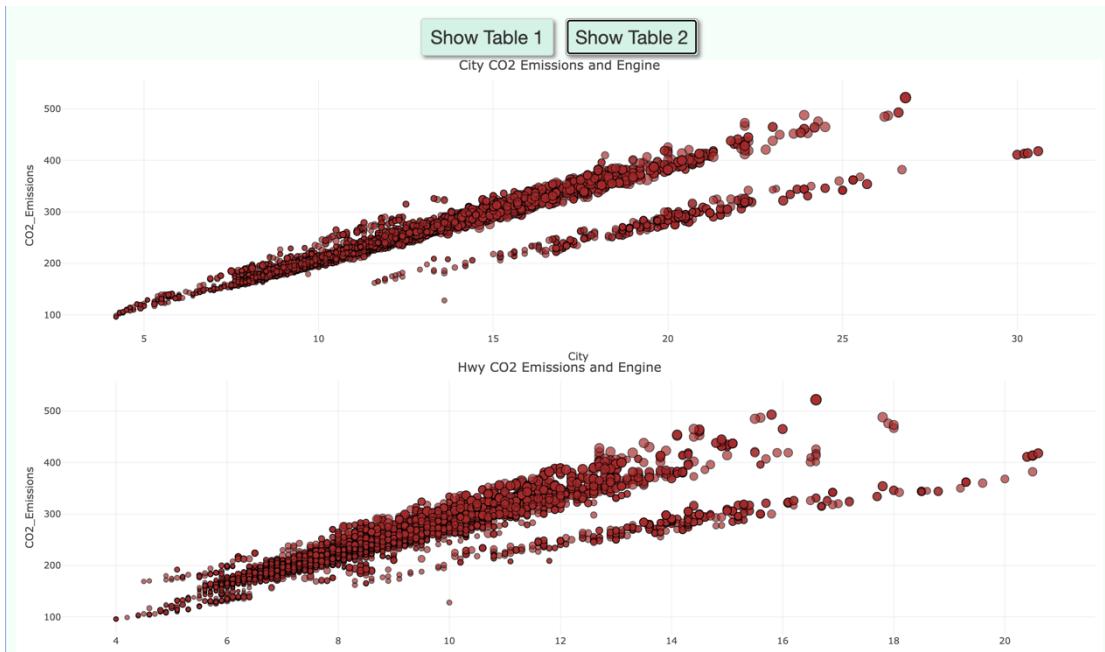
Graph 5: Scatter plot

For this part, I will investigate the cylinders and engine size's effect on CO2. I choose to use scatter plot to show how the engine size and cylinders' effect. This will be more easier to compare the trends. Also by clicking the legend, it can show each of the plot.



Graph 5: maker bar chart

At the next part, I will introduce the maker and their average CO2 emission. I choose to use bar chart, it can clearly and visually compare differences between different maker. By arranging the bars horizontally or vertically, viewers can easily see which maker is more environmental friendly. There is a slider input to help the user filter out the emission range. It can locate the ideal emission and exclude the high emission car.



At the end, I add two bubble chart, to display the different CO2 Emissions between highway and city and the engine size, I add a button to display two different graph, because this two graph is too large, it will have the Impact on fluency.

3.Implementation :

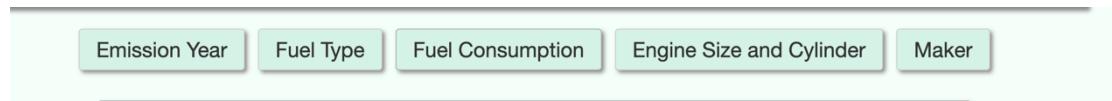
- For the package, I use plotly, ggplot2, shiny, dplyr and shinyjs
- The data I used is from Kaggle, they are all tabular data.
- For most of the chart include: line chart, scatter plot, bar chart about maker, I implement the slider input to create a range for user to select. This part will choose the minimum value and maximum value as it's boundary, allow the user to filter data, and the filtered data will pass to the server and show the different corresponded graph.
- For the Fuel type and vehicle class part, I add a selection input, allow user to select which vehicle they want, for this part, I used to choose a heat map, but heat map doesn't fit and easy to read, I choose to change it into bar chart.
- For the last two graph, I add a listener to invoke the graph, at the beginning I want to display it directly, but these two graph are two large and effect the fluent of the website, then I add a button to display it by placing it into conditional panel for the professional person who want to further investigate it.
- At the top I add a navigation to help guide the person, I use shinyjs to add a observer for each bottoms, it can jump to the graph by using their id.
- Most of the data with legend is clickable, the user can click it and show different filtered data
- Tooltip is also added to most of the graphs
- There are some different from my 5 design sheet, I change the heat map, and rearrange the format of maker (graph 5)and tornado graph(graph 3). Because I want to implement the graph storyline more reasonable. Also I add more detail on the

navigation and more text for each graph. Compare to my final design, there is one more change is I add two more graph to the buttons, this is because my final design can't display enough information, so I add two more graph to make my visualization more detailed.

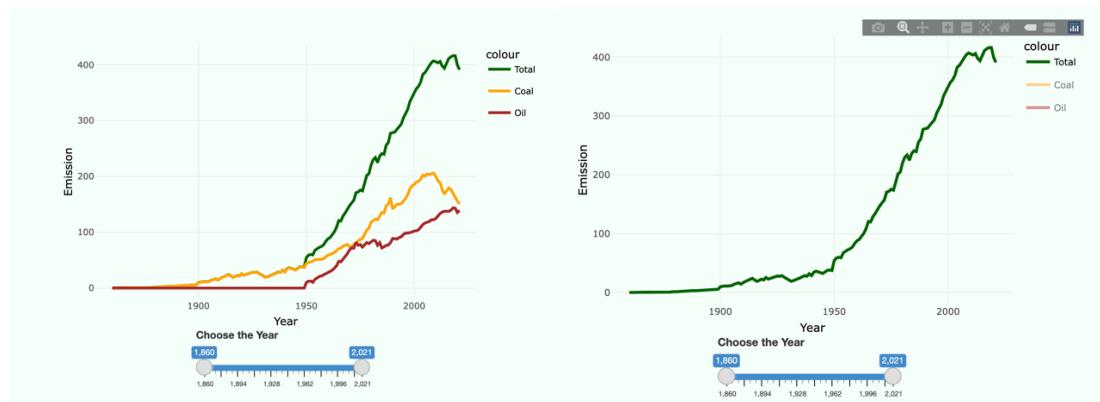
- During the implementation of the R shiny, I faced some issue, for the pie chart, It only requires limited data, doesn't need to load the whole dataset which will decrease the speed, I use summarize()function to extract the data first then put it into ggplot. Also for the emission.csv, It contains too much country, I extract the value that related to Australia first.

4.User Guide :

1:The user can click the navigation to jump to different chart

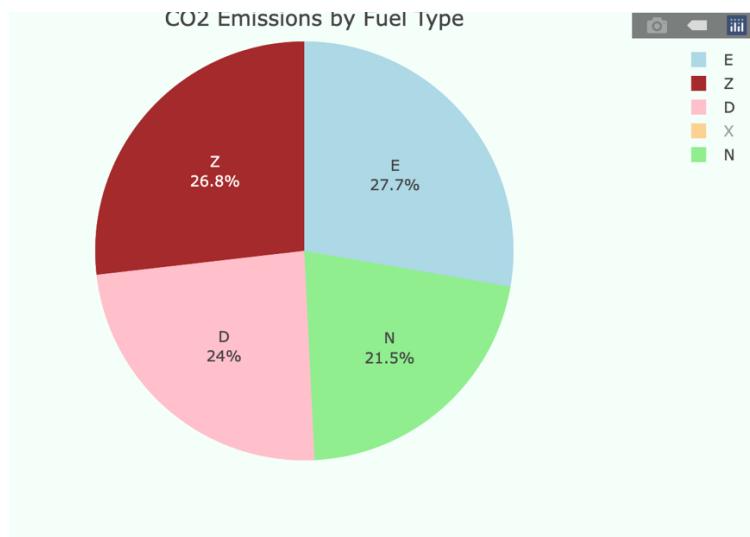


2: The line chart: you can select the slider below the line chart to filter the range, also by clicking the legend, it can display different line



User guide 1

3: The pie chart: you can click the legend, it can display the wanted part



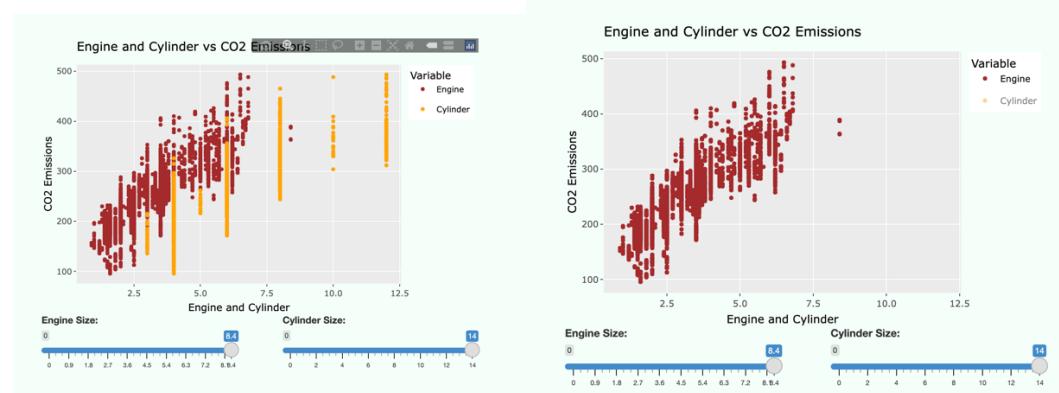
User guide 2

4: The user can select the fuel type to check different bar chart



User guide 3

5: The user can select slider to filter out the data by selecting the slider, also you can click the legend to display engine or cylinder



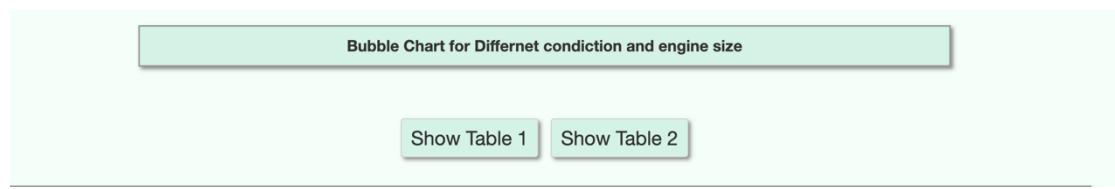
User guide 4

6: The user can select the different range of CO2 emission to filter out different maker

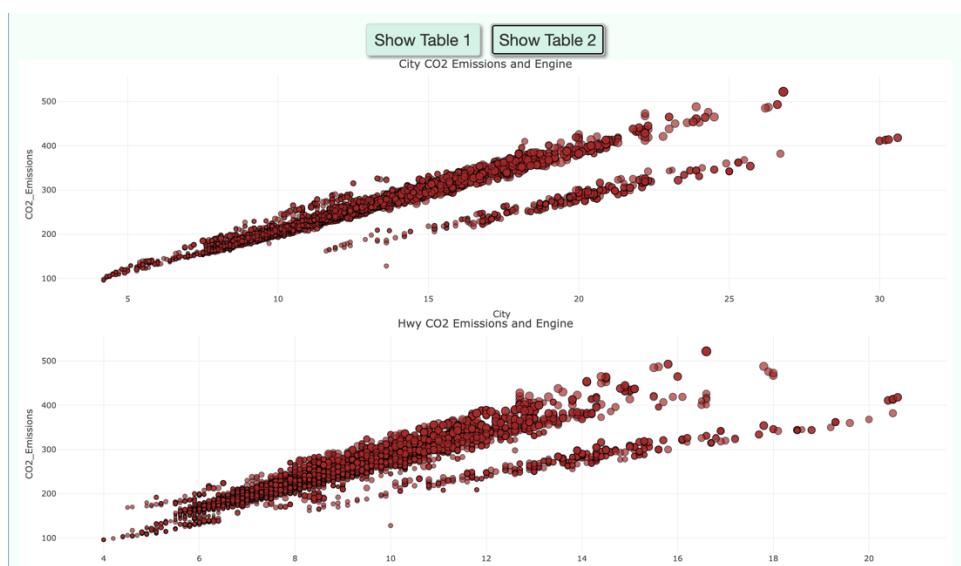


User guide 5

7:User can click these two buttons to display the graph



User guide 6



User guide 7

8: The user can use slider to select the wanted year range



User guide 8

5. Conclusion :

From this DVP project I can see that There are significant differences in CO2 emissions between car manufacturers. Engine size and number of cylinders are positively correlated with CO2 emissions Vehicle class has different emissions under different conditions, city and highway driving conditions are different. Fuel type has a significant impact on CO2 emissions, so choose an environmentally friendly fuel when purchasing a vehicle. The above situation should be considered carefully when purchasing a vehicle.

From this DVP project, I learned how to do a full data visualization with R shiny. I have learnt how to use shinyjs and create interactive chart. But the animation of the graph and linking action should be another goal that I should work on. And I'm not skilled enough in the use of shinyjs, and I don't know enough about the kinds of tables for data visualization, which leads to my DVP graph types being rather homogeneous and not detailed enough. At the same time, I don't have a good enough eye for data analysis, and I don't analyse enough of the information presented in the charts and graphs.

In the future, I will focus more on learning about animation and interaction, understanding how to create animated charts and how to implement features that interact with the user. Increasing my proficiency in shinyjs has helped me to gain an in-depth understanding of the shinyjs package in order to take full advantage of the interactivity and user-friendliness of Shiny applications. And experimenting with different kinds of charts to present data more fully. And also

Enhance my data analysis skills, including statistical analysis, trend analysis and pattern recognition. Delve deeper into the insights in the data. At the end of the day I will keep learning and practicing, data visualization is a constantly evolving field and continued learning and practice is vital to improve my skills.

6.Reference :

- [1] "Explanatory style," Wikipedia,
https://en.wikipedia.org/wiki/Explanatory_style#:~:text=Explanatory%20style%20is%20a%20psychological,event%2C%20either%20positive%20or%20negative. (accessed Oct. 23, 2023).
- [2] T. ThoughtSpot, "6 most useful data visualization principles for analysts," ThoughtSpot, <https://www.thoughtspot.com/data-trends/data-visualization/data-visualization-principles> (accessed Oct. 23, 2023).

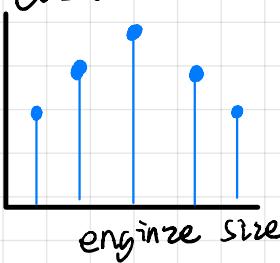
Appendix

Sheet 1

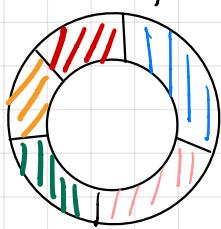
IDEAS:

Vehicle type

CO₂ emission

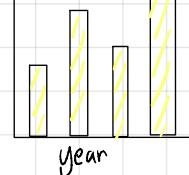


Fuel consumption

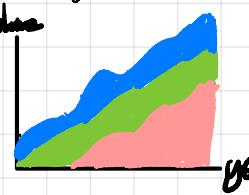


Fuel type and Avg CO₂ emission

CO₂ emission



year



CO₂ emission

year

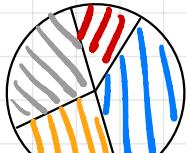


Engine size

Avg CO₂

motor

year



class

CO₂ emission

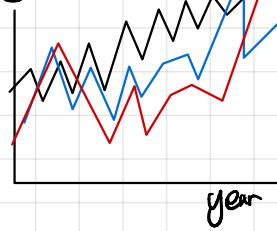
year

cylinder

motor

Combine and refine

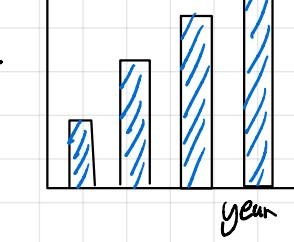
energy



year

registered car

+

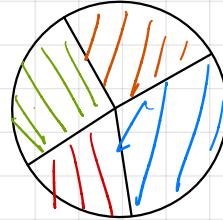


year



Filter

Amount



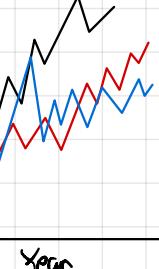
Fuel class

CO₂ emission



year

energy



year

Vehicle type



Fuel consumption

CATEGORIZE

1. bar chart

5: Tornado diagram

2. line chart

3. pie chart

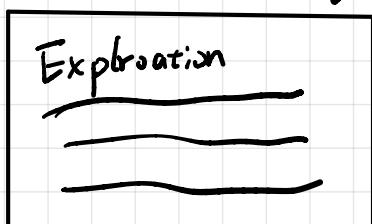
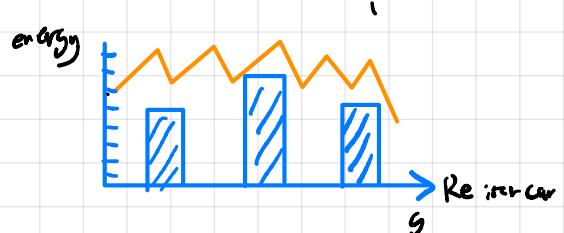
4. scatter chart

Question

1. Is there any chart can perform better solution?

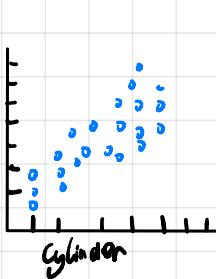
2. Does all the graph show enough information?

CO_2 and Car Element

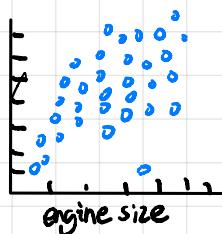


Sub title

Avg
 CO_2



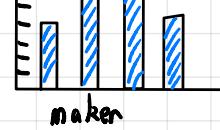
Avg
 CO_2



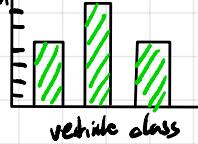
Text

Text

Avg
 CO_2



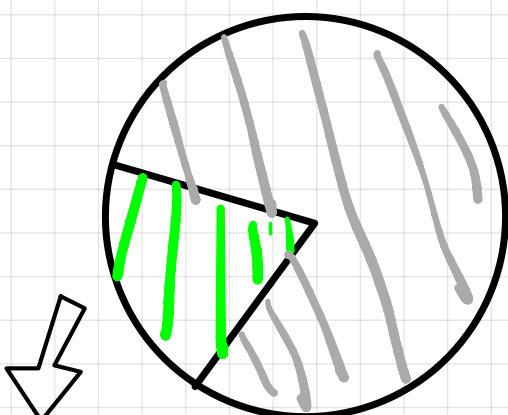
Fuel
consumption



Conclusion

Layout

focus



TYPE 5

van
SUV
sedan

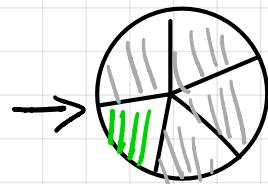
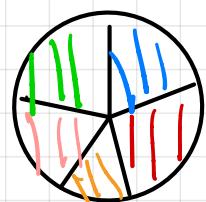


vehicle class

max min

Avg CO_2 emission (mL)

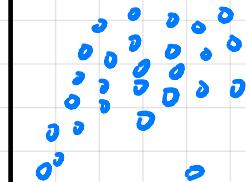
Title: The CO_2 emission and Car
Author: HuXunZHOU
Date: 09/10/2023
sheet FDS sheet2



Avg
 CO_2

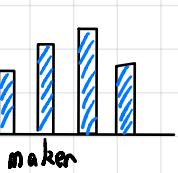


total



vehicle class

Avg
 CO_2



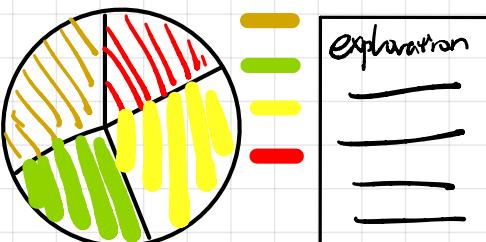
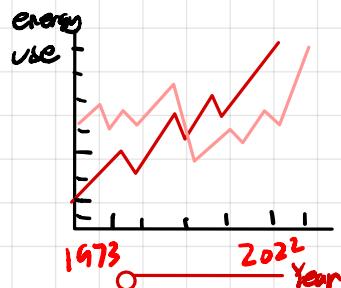
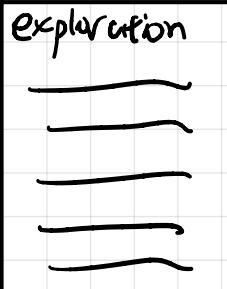
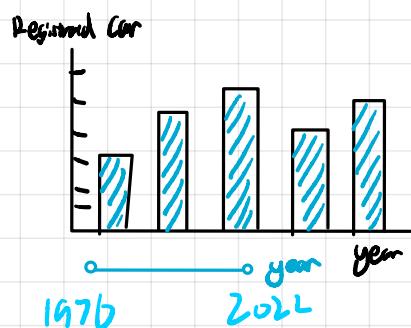
operation

Discussion

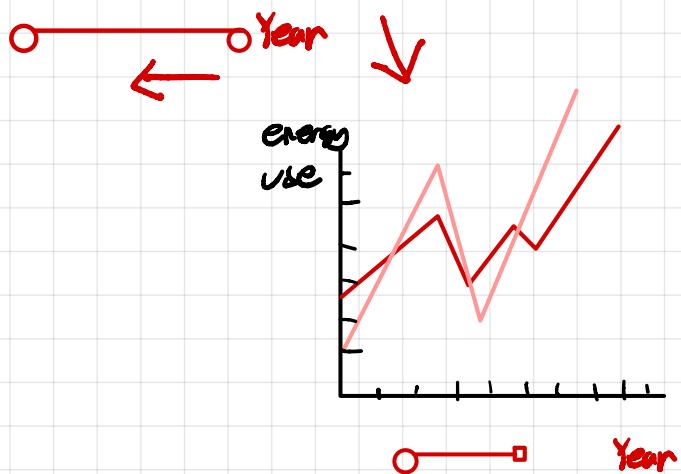
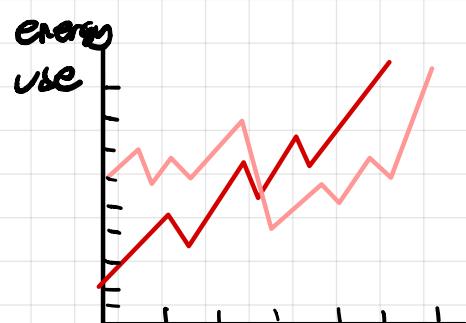
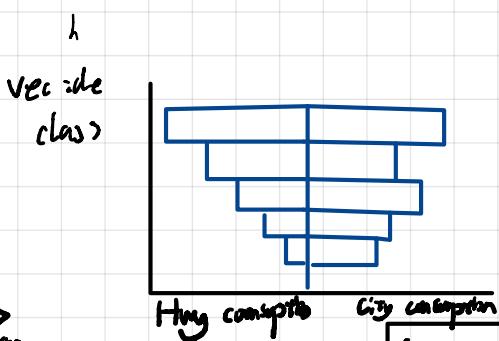
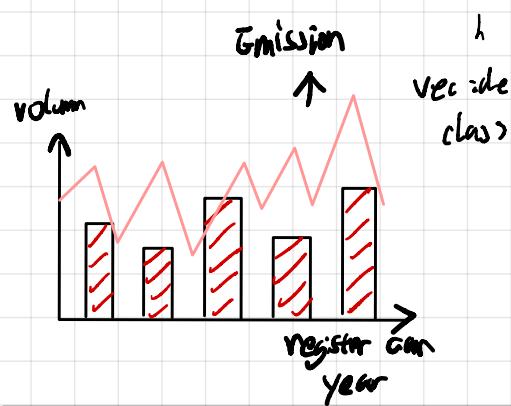
- Is there any possible way to demonstrate the comparison?

- Can cylinder and engine size be combined?

Title



Subtitle

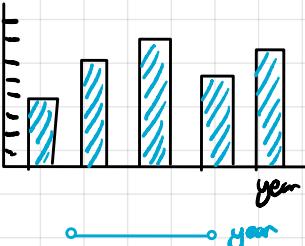


Author: HauXuan ZHOU

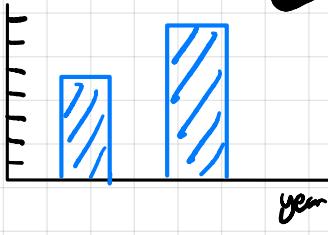
Date: 09/10/2023

Sheet: Sheet 3

Registered Car



Registered Car



Layout
focus

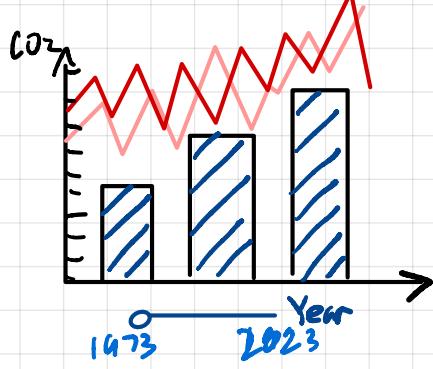
operator
Discussion

- Should we display more information while making the interaction

- How to add more chart type

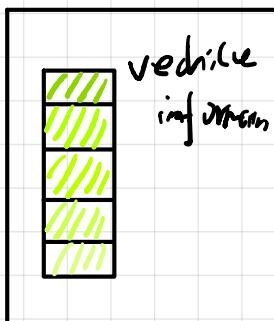
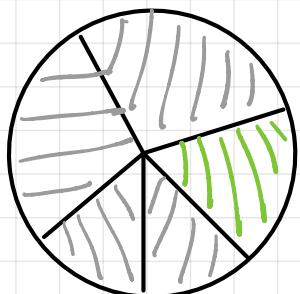
- Is it possible to add prediction?

Title



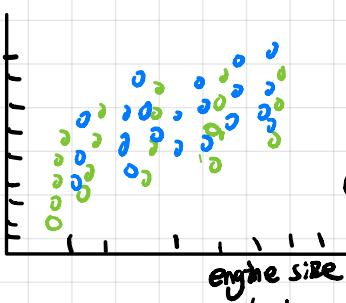
text

sub title



Sub title

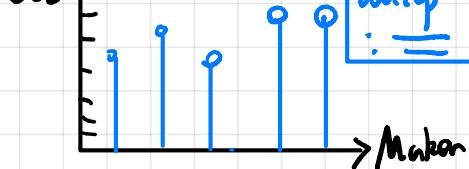
Fuel



engine
cylinder

discover

CO₂ emission



engine size
cylinder

tooltip

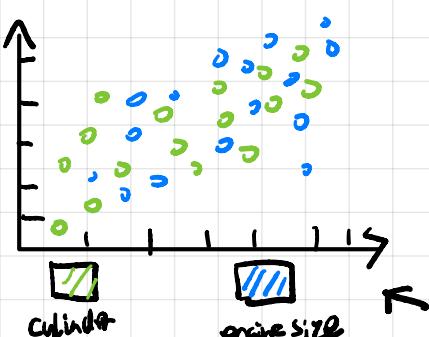
discover

Layout

operation

Focus

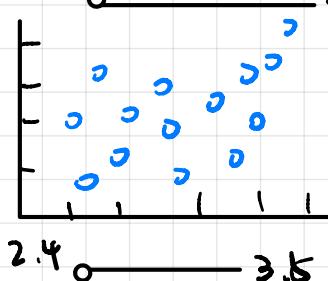
Discussion



cylinder

engine size

size selection



tooltip

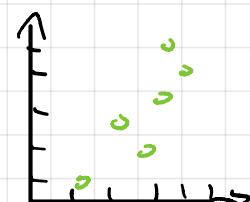
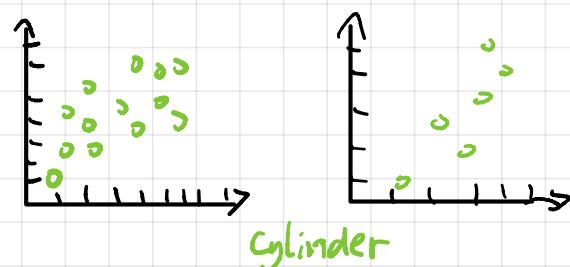
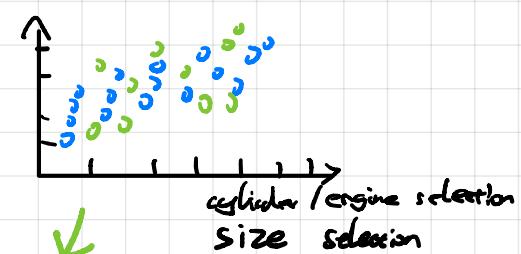
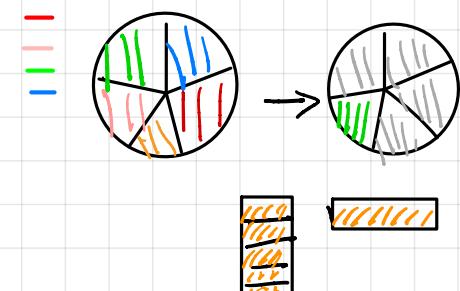
→ Is it possible to add more elements on the lolipop chart?

→ Only the click on the pie chart will display detail information, but what should be displayed on the original space?

Author: HauXuan 2023

Date: 09/10/2023

Sheet : Sheet 4

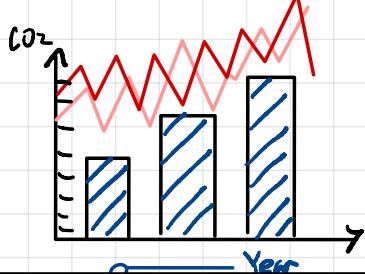


Title

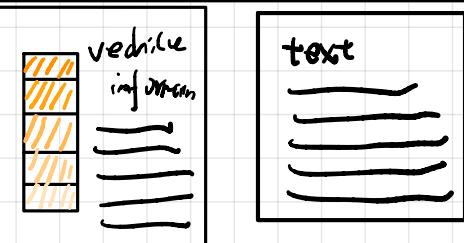
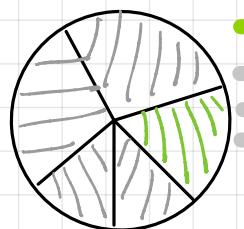
Author: Herkum Zher

Date 09/10/2023

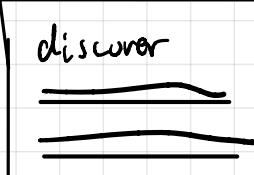
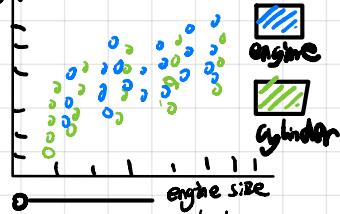
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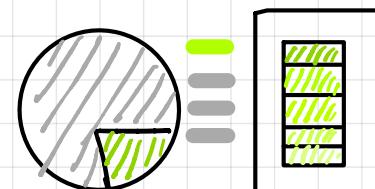
Sub title



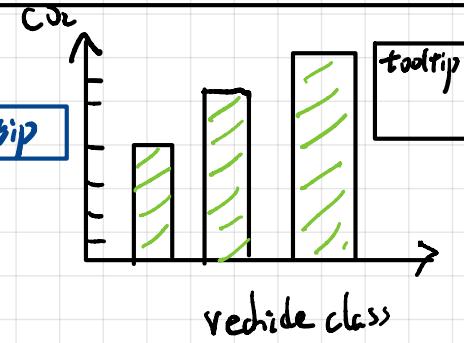
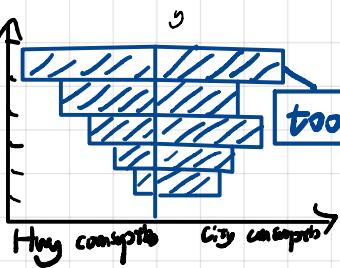
CO2 ↑



Sub
title



vehicle
class



discover —

Layout	operator
focus	detail

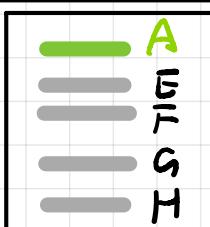
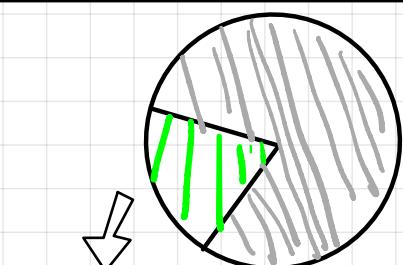
- Build with R

- time to build: 1 week

- color selection should be carefull

- multi-data set required

- Data analysis required before



vehicle class Any CO2 emission

