

MONASH UNIVERSITY  
FACULTY OF INFORMATION TECHNOLOGY

Australian Overseas Traveller and International  
Aviation  
**FIT3179 Data Visualization 2 Report**

Minhua Zhou  
31389171

DATE: 17<sup>TH</sup> OCTOBER 2023

Visualization URL:

<https://tonyz1260.github.io/FIT3179/DV2/index.html>

GitHub URL: <https://github.com/tonyz1260/FIT3179/tree/main/DV2>

Word Count: 1000

TUTOR: CLAIR PAN

CE/LECTURER: ASSOCIATE PROF. BERNHARD JENNY

## Content

<b>Domain.....</b>	<b>3</b>
<b>What.....</b>	<b>4</b>
<b>Why and How.....</b>	<b>5</b>
<b>Design.....</b>	<b>12</b>
Layout.....	12
Colour.....	12
Figure-ground.....	12
Typography.....	12
Storytelling.....	13
<b>References.....</b>	<b>14</b>
<b>Appendices.....</b>	<b>17</b>

## Domain

The visualization focuses on Australian Aviation and Overseas Travellers current status and compared with the status pre-COVID. This intends to allow Australian aviation and tourism stakeholders to understand the affect of current recovering and what aspect they could possibly improve on based on the statistics. The overseas traveller visualization also allows the government to understand the residence country of tourists that Australia is attracting and how they can aim for more.

# What

The Australian international flight data set is from Kaggle (*Australian Flight Dataset [2003-2022]*, 2023), created by Gaurav Pandey, original data source is from Australian Government. The Overseas Traveller data is from Australian Bureau of Statistics (*Overseas Arrivals and Departures, Australia, August 2023*) which is gathered by the Australian Border Force. These 2 data helps showing the current status of Australian aviation and tourism.

# Why and How

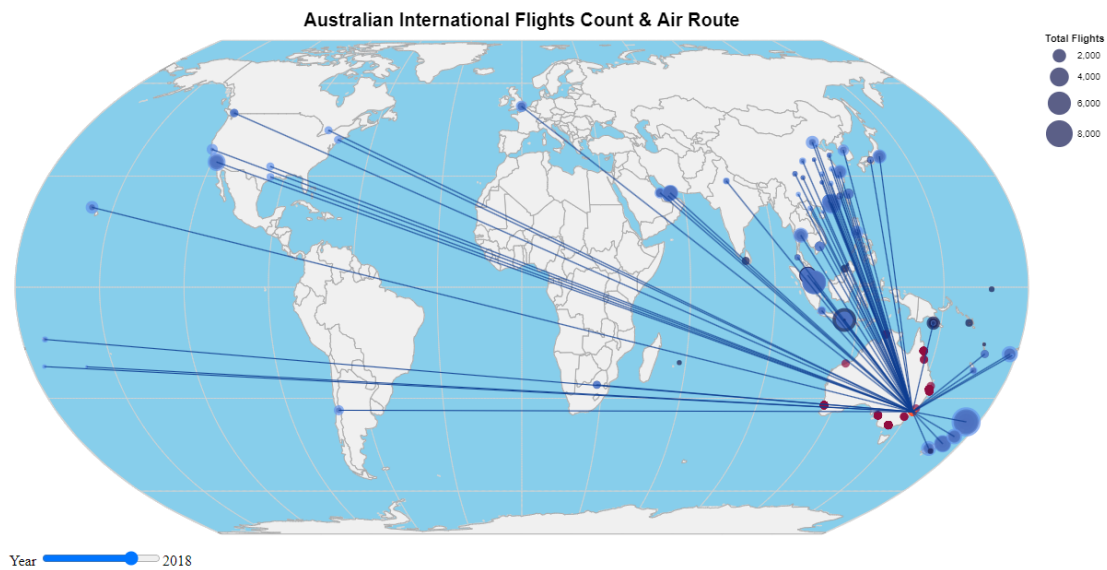


Figure 1. Proportional Symbol Map of Australian International Flights and Air Routes (by connections)

Figure 1 is intended to show the audience the overview of Australian International aviation. With the symbol showing the count of total flights to/from that city every year. The Year slider at the bottom allows the audience to see the status for each year. The marks used here are points and lines. Channels such as position, colour, length are used to convey information such as where the city is and how many flights goes to each city.

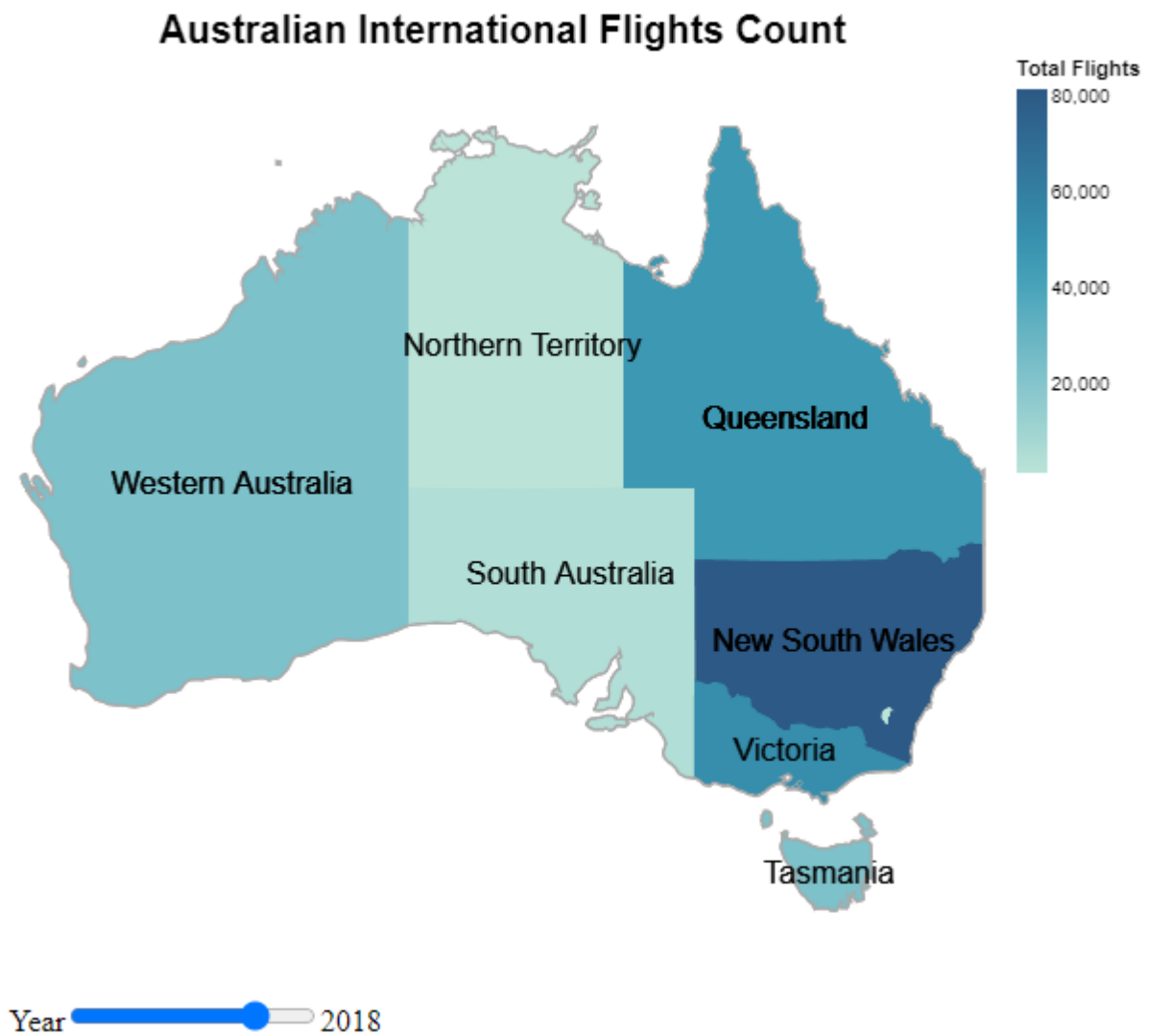
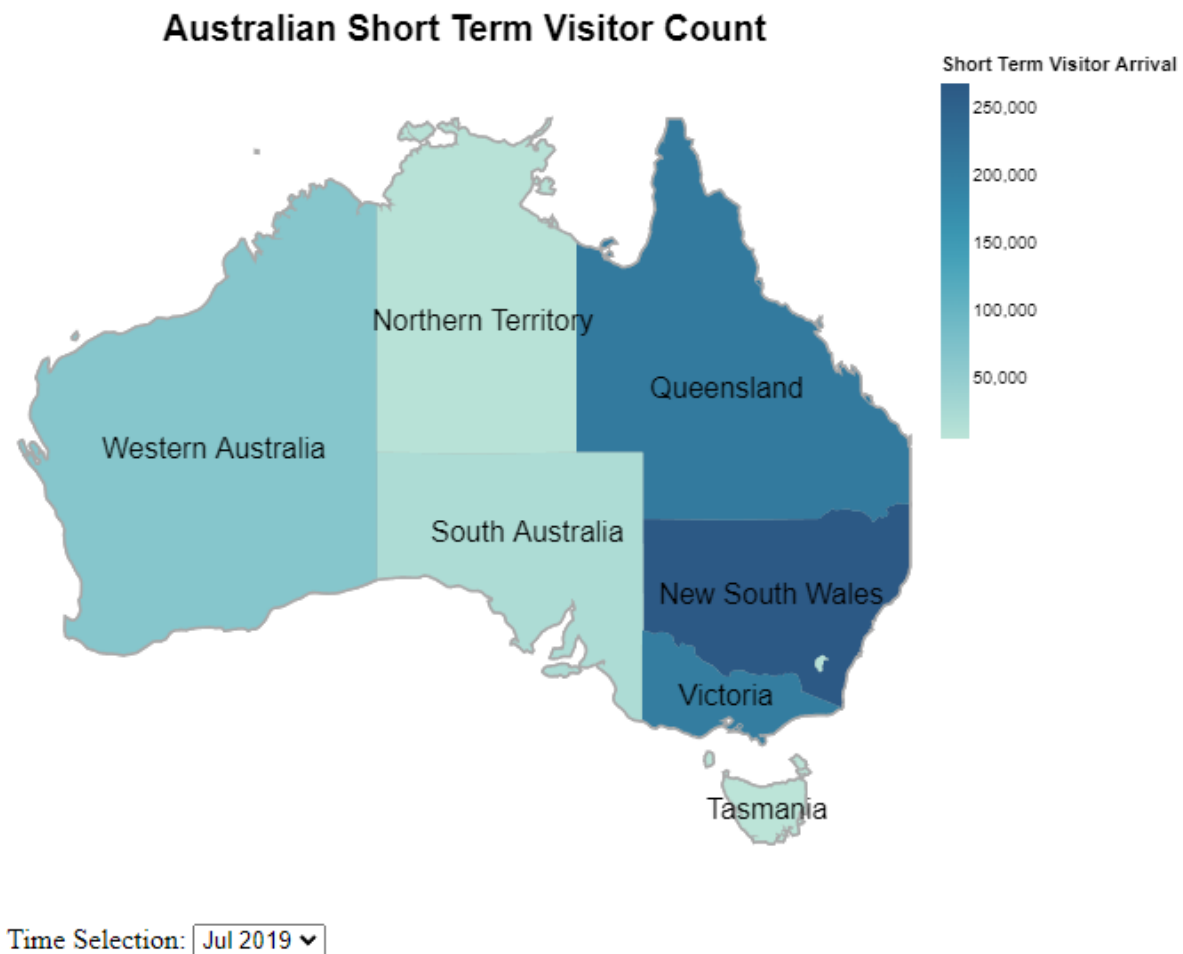


Figure 2. Choropleth map of flight count for each Australian state

Figure 2 shows the flight count for each Australian state. The marks used are area which covers the corresponding state. The channels used here are color saturations. The colours are used to demonstrate the flight count which allows the audience to see which state has the most flights based on the shade.



*Figure 3. Choropleth map of visitor count for each Australian state*

Figure 3 has a similar design as Figure 2. The difference is with the time selection, the time is selected via drop down menu instead of the slider as we have limited data points that's not considered continuous.

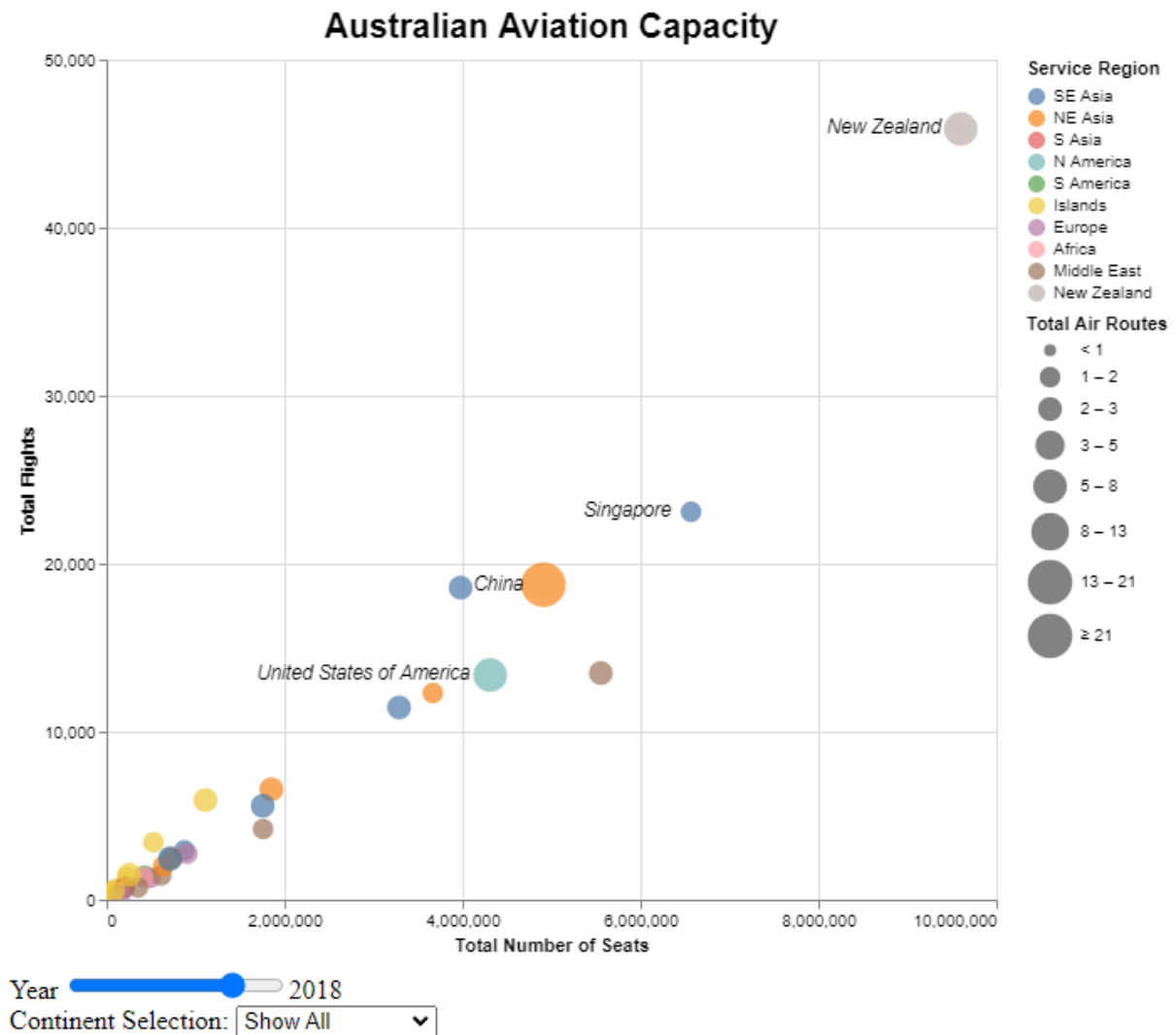


Figure 4. Scatter plot of Australian International Aviation Capacity

Figure 4 shows the Australian International Aviation Capacity. It encodes 4 attributes, the total number of flights, total number of seats, total number of air routes, service region. It uses the point mark and it uses color hue, position and length channels. These color hue allows the audience to see which service region it belongs to, the size allows the audience to understand the air routes availability. The position allows the audience to see the actual capacity of international flights to these countries. There's text annotation denoting some famous countries that Australia has direct flight with and we can clearly see the New Zealand being placed at the top right indicating the Australian-New Zealand travel relationship. You may also zoom in/out for this plot.



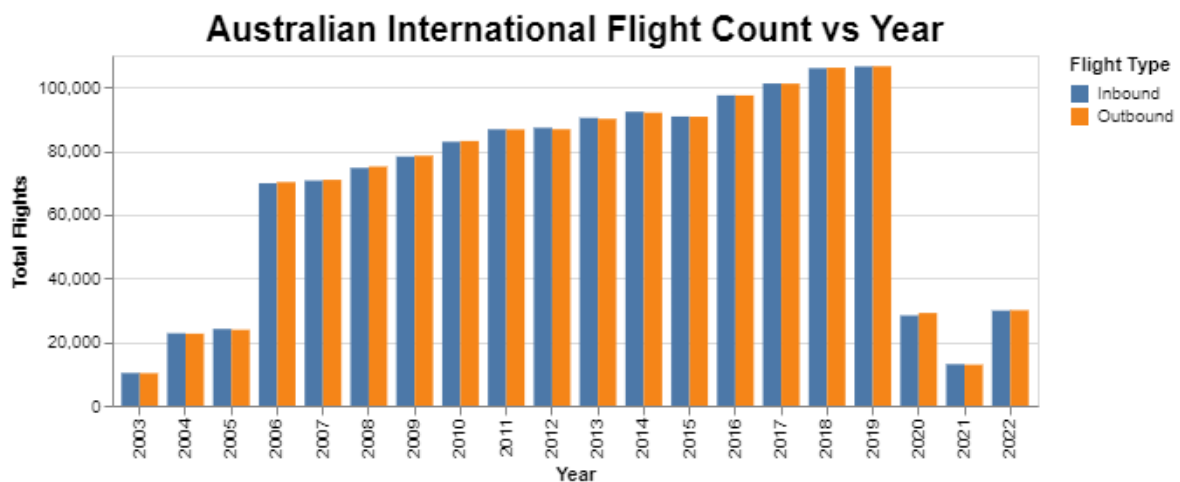


Figure 5. Grouped bar chart of Australian International Flight Count vs Year

Figure 5 intends to show the Inbound and Outbound international flights over different years. The mark used is point and the channels used are position and colour. The position intends to demonstrate the comparison between different years, especially the drop in 2020 and 2021 and then how it recovers in 2022. The colours used are intended to show either inbound or outbound.

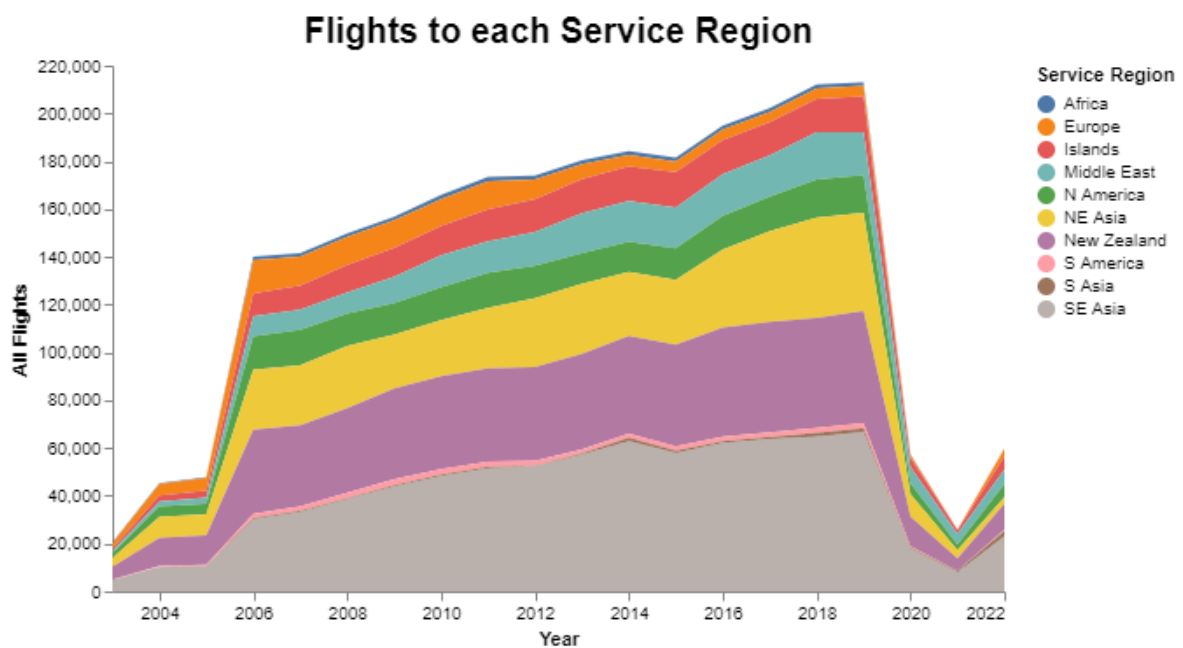


Figure 6. Stacked Area Chart of Australian International Flight to each region

Flight 6 shows a general comparison between flights to different destinations/regions. The mark used is area and the channels used are position and colours. The position is used to show the comparison and tell the

audience which region takes more Australian international flights. Colours are used to encode service regions.

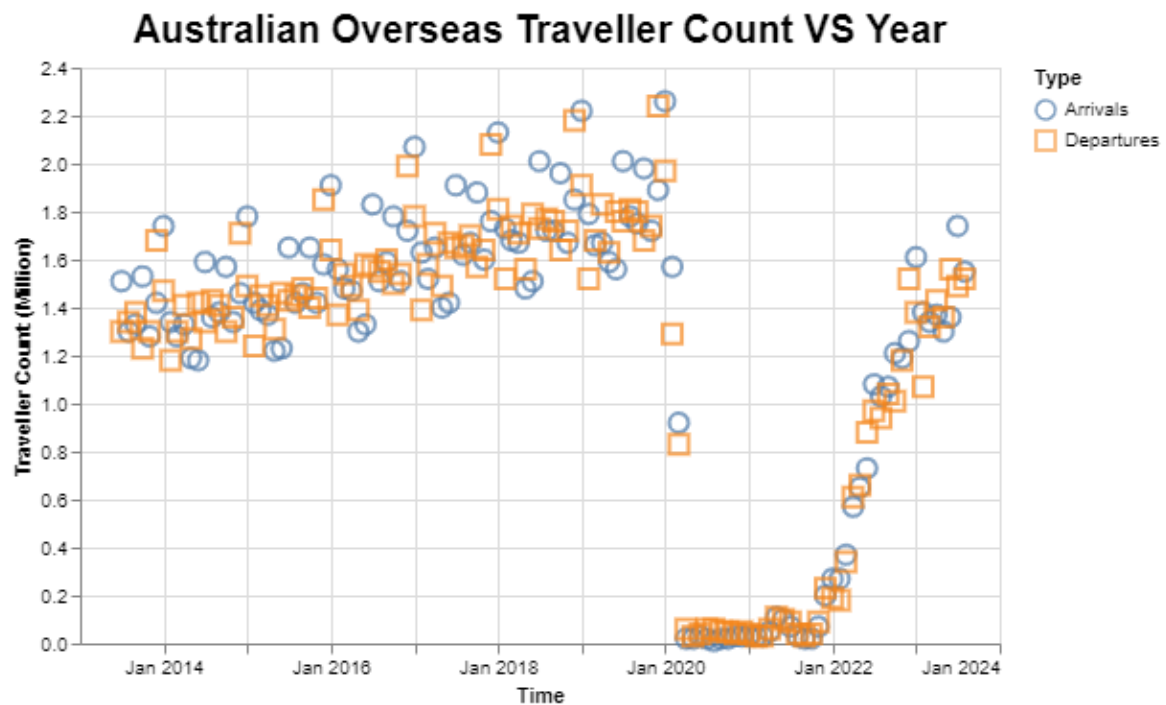


Figure 7. Dot Plot of Australian Overseas Traveller Count vs Year

Figure 7 shows the overall trend of Australian traveller count vs year. The mark used is point and the channels used are position and shape. The position is to show the trend of traveller count at certain time points. The shape is used to encode the travellers type.

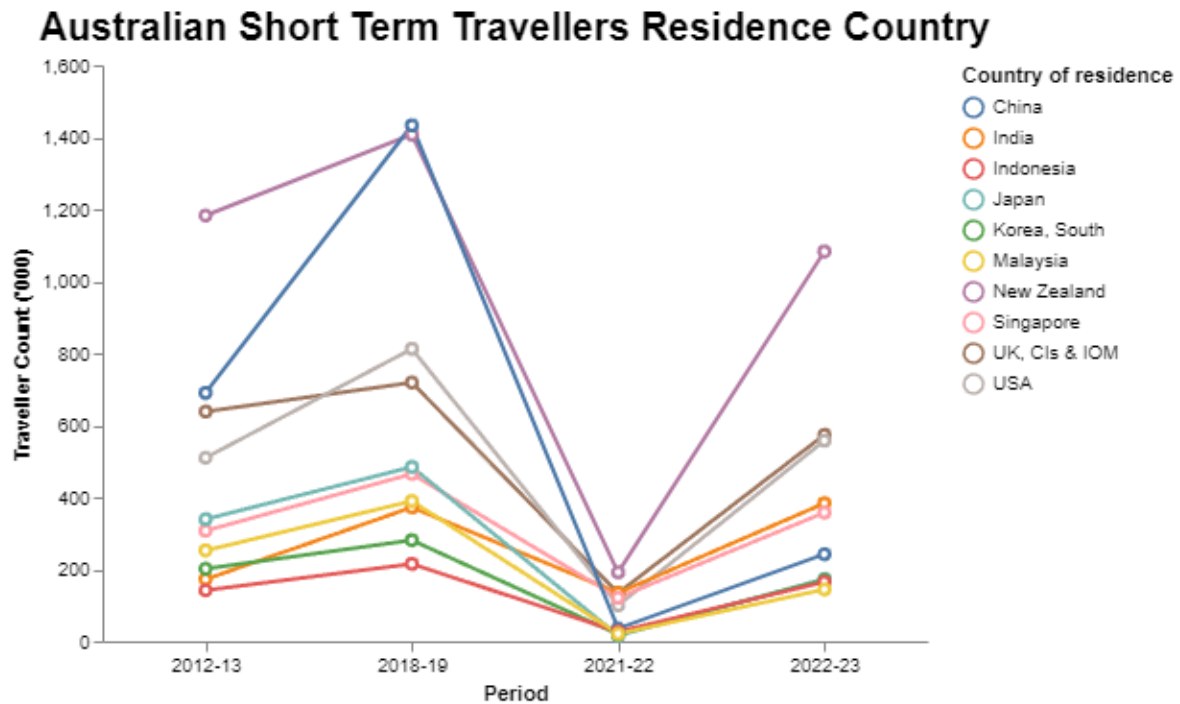


Figure 8. Line chart of Australian Short Term Travellers Residence Country

Figure 8 shows the traveller count vs year based on the residence of country. This only picks up the top 10. The mark used is point and line. The channels used color and angle. The color is used to encode country of residence which helps the audience to see which country has most visitors visiting Australia. The angle is used to show the trend of visitor counts from these 10 countries, intended to allow the audience to see whether visitors from these companies are coming and going as usual.

# Design

## Layout

The overall layout is structured in multiple rows within different containers. On the 2 sides of the overall webpage, I have left the same amount of margin area. The main sections will take 60% of the area. Based on it, each container will have 2 columns and a similar size to ensure symmetry and visual balance. The webpage is also created from top to bottom. Each section size depends on the actual information contained but generally won't contain more than 3 containers.

## Colour

The colours used in this visualisation are employed based on the color blind scheme. Colour combinations such as red and green are not used closely. Colours for the map are used for consistency. Colour schemes are intentionally selected, such as categorical scheme for categorical attributes, quantitative scheme for quantitative attributes. So for instance the choropleth map colours are quantitative.

## Figure-ground

In order to demonstrate the key sections more transparently, I have decided to use a skyblue background image and the white background for all sections. The section is also using a 3D border to make the screen more depth. The proportional symbol map also contains connections between different cities. The colours for the points will change over mousehover which makes the emphasizes the points for the audience. Also, there are texts shown above coloured background such as "Australia and New Zealand are like siblings across different nations", this is particularly important to enable a more cohesive storytelling.

## Typography

There are 2 non-default typefaces used. First is used by the dashboard title and section titles. These are used to inform the audience about a new section of information. The other one is used across text which used to display information solely. For important information, text are encoded with bold text. For information that is closely associated with the chart, information is encoded with either underlined or italics text.

## Storytelling

For the storytelling, this is done with all design elements aforementioned. A key factor of the storytelling is the cohesion of the 2 topics. This is done via the section which shows the comparison between pre-COVID and current status of Australian international aviation. Then the overseas traveller comparison is shown by using dot plot and line charts thus the final map is used to wrap up and throw the THINK. Also the very first chart is the proportional symbol map with the connections between cities at the very top which enables the audience to start thinking about the flights and aviation directly.

# References

1. *Australian Flight Dataset [2003-2022]*. (2023, May 17). Kaggle.  
<https://www.kaggle.com/datasets/pandeyg0811/australian-flight-dataset-2003-2022>
2. Australian Bureau of Statistics. (2023, August). *Overseas Arrivals and Departures, Australia*. ABS.  
<https://www.abs.gov.au/statistics/industry/tourism-and-transport/overseas-arrivals-and-departures-australia/latest-release>.
3. *AU-NZ Travel Bubble*. (n.d.). CNBC.  
<https://image.cnbcfm.com/api/v1/image/106903818-1624935703365-gettyimages-1313187078-dbg-jam-7.jpeg?v=1624935725&w=929&h=523&vrcrop=y>
4. *AU-NZ National Flag*. (n.d.). Australian Immigration Network.  
<https://www.australianmigrationnetwork.com.au/wp-content/uploads/2016/02/australia-newzealand-map-flag.png>
5. *Australia Flight*. (n.d.). Travel Daily Media.  
<https://www.traveldailymedia.com/assets/2021/09/australia.jpg>

## AUSTRALIA OVERSEAS TRAVELLER & INTERNATIONAL AVIATION

### International Flights

*Are the planes taking off and landing as usual?*



*Have you ever thought of where flights departed from Australia can take you to and how many are there?*



Australia has more than **200,000** flights operating per year before COVID.

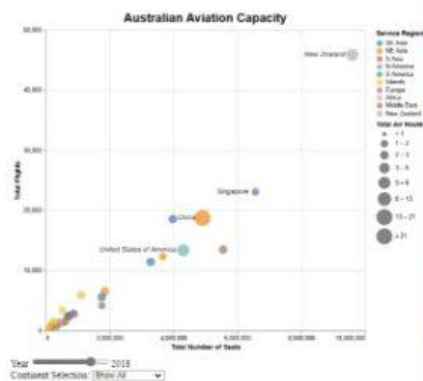
Direct Flights from Australia can take you to **47** countries, **105** cities worldwide.

In 2018, there were **234,855** flights departed/arrived from/in Australia. Sydney processed **87,619** of them within that year.

**Australia and New Zealand are like siblings across the Tasman Sea~**



*Before the pandemic, Australia and New Zealand boasted one of the most well-connected air routes in the Asia-Pacific region.*



### Aviation after Pandemic

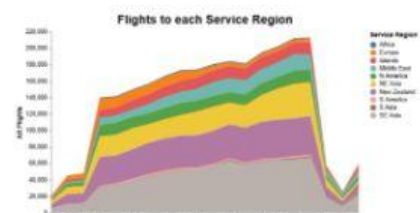
*Is Aviation recovering from the pandemic?*



The Australian aviation sector has been gradually recovering from the COVID-19 pandemic, though it remains far from pre-pandemic levels.

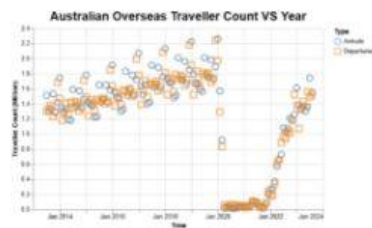
In 2020, there was a **substantial decrease** in air travel, which worsened in 2021 due to ongoing travel restrictions and uncertainty. Most international flights from Australia still predominantly operate in the **Asia Pacific** region, as well as to neighboring **New Zealand**, due to their relative proximity and the **Trans-Tasman** travel bubble.

However, the industry faces a challenging path ahead as international travel restrictions persist, hindering a full return to pre-pandemic levels.



## Overseas Travellers

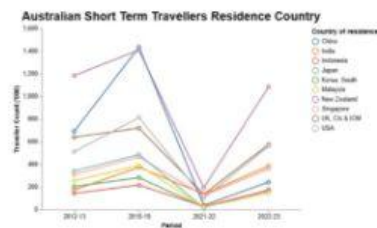
Are the travellers coming and going as usual compared with pre-COVID?



The Australian overseas traveler count **plummeted from 2.25 million to a mere 0.01 million** when the COVID-19 pandemic struck.

Now, as global conditions improve, it's on the rebound, with numbers steadily increasing to 1.5 million, signifying a **cautious return** to international travel and a hopeful revival of the tourism industry.

However, fully recovering will still take a long time ...



Before COVID, the top three countries for short-term Australian travelers' residency were **New Zealand, China, and the USA**.

Since the pandemic, the landscape has shifted to **New Zealand, the USA, and the UK**.

A significant change includes the **loss of 1,191,000 Chinese tourists**, impacting Australia's tourism industry and international visitor profile.

### Australian Short Term Visitor Count



Time Selection: [Jul 2019 w]

**Each Australian state offers unique landscapes, wildlife, and vibrant cultural experiences.**

**New South Wales (NSW)** attracts the most tourists, after the lockdown, fortunately, by 2023, NSW has managed to recover impressively, hosting **253,530** tourists compared with **268,050** tourists in 2019.

**Victoria** and **Queensland** also experienced substantial declines but are bouncing back, with both states welcoming approximately **153,000** visitors each, showcasing the resilience of the Australian tourism industry.

**THINK: How can we help other states to bounce back from the pandemic hit and boost tourism again?**

Created by Michela Zhou

Data source: [Keeply](#) and [Australian Bureau of Statistics \(ABS\)](#)

Figure 9. Overview of the visualization dashboard



# Appendices

A. See the next page for 5 design sheets.

**Title:** Design idea  
**Author:** MINHUA ZHOU  
**Date:** 17 Oct 2023  
**Sheet:** 1  
**Task:** Brainstorming

---

**1. Ideas**

flight count, choropleth map, flight dest.

proportional symbol map, network diagram, color region, stacked area chart, Overseas Travellers, Flight Count, Time, Inbound/Outbound, grouped bar chart, multiple line chart.

**2. Filter**

These are possibly hard to implement. Can be shown on the map directly.

used to show the percentage of travellers but due to data limitation, may not be able to see contrast directly.

Choropleth Map: not suitable if data not showing for all countries.

---

**3. Categorize**

Flight & Air route count

count by region, year & state

Aviation Recovering from COVID-19

Overseas travel recovering from COVID-19

Tourist Count by state, year & residence country

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**4. Combine and Refine**

Shows Air Routes & Flight Count [tooltip format] on the proportional symbol map.

bar chart to line chart, better?

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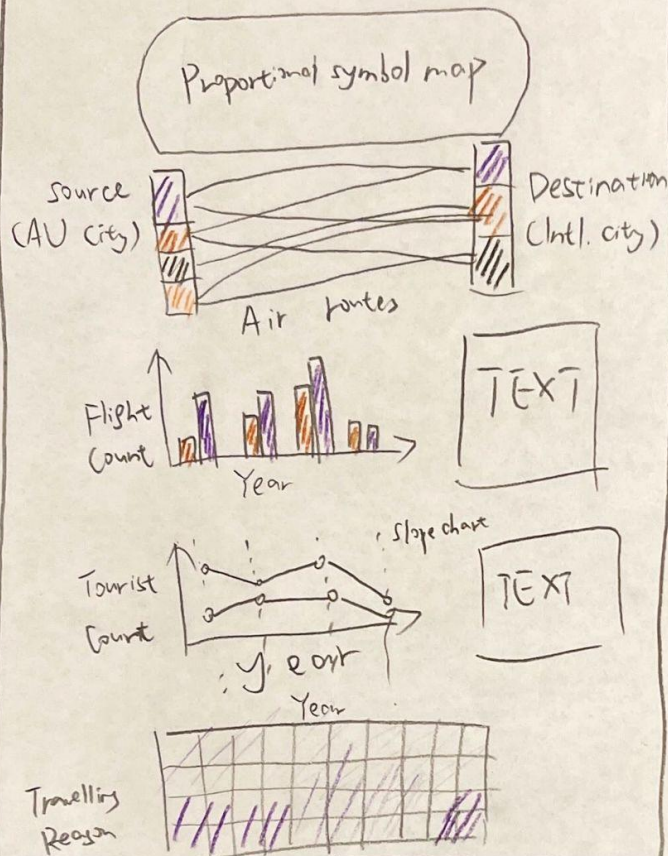
**5. Question**

- Is stacked area chart clear enough to show the comparisons?
- Should Map be the main ~~thing~~ focus?
- Any complex idiom?



## Layout

### Australian Intl. Flight & Overseas traveller



Title: First Draft

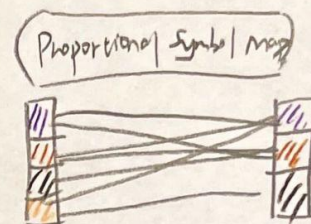
Author: MIN HUA ZHANG

Date: 17 Oct 2023

Sheet: 2

Task: Design idea combination

## Operations



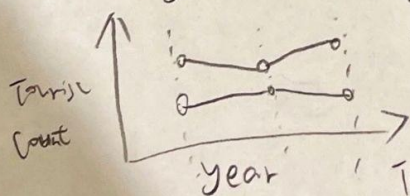
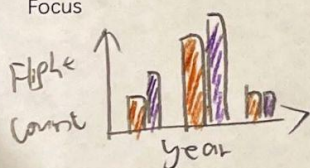
Year 2023 2023

The slider is for year selection

The charts should reflect the data based on selection

The steps for each slide should be 1.

## Focus



Focus on changes in values over years (especially with the pandemic) period

Tooltip should be added to show actual values and comparison in percentages with previous years

## Discussion

- Pros.
1. visual balance across different sections
  2. Sankey Diagram used to show the flow

Cons  
Sankey Diagram not useful to show specific air routes

Question

Should map be the main focus?

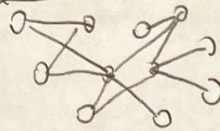


Layout

Australian Intl. Flight  
Overseas Traveller  
Intl. Flight

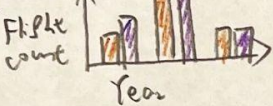
CHOROPLETH MAP

Showing  
Air routes  
to different  
international city



Showing  
percentage  
to each service  
region/country

Intend  
to show  
recovery

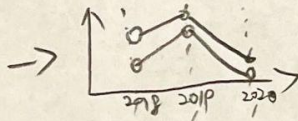


TEXT

Overseas Traveller  
Choropleth map

Visitor count  
by states

Intend  
to show  
recovery



Title: Second Draft

Author: MINHUA ZHOU

Date: 17 Oct 2023

Sheet: 3

Task: Design idea combination

Operations

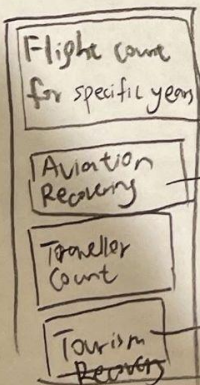


Continent

Selection

After selecting the continent  
from the drop-down menu,  
the heatmap should show the  
proportion of flight count  
to each country (color from  
color encoding for region to country).  
Smaller sections are cities.

Focus



Time series

Time series

Better storytelling.

Sections are  
categorized based  
on the subtopic.

Both recovery

parts will have  
x-axis as  
Time/Year

Discussion

Pros

1. Storytelling is more  
structured

Cons

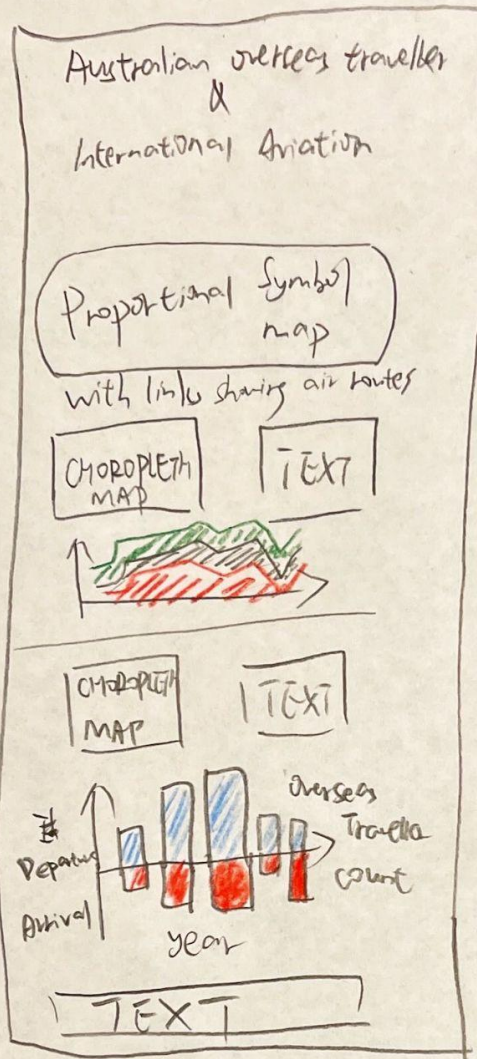
1. The choropleth Map  
for flight count will have  
high blank areas due to missing  
data

Question

1. Change in heatmap  
may cause blindness?

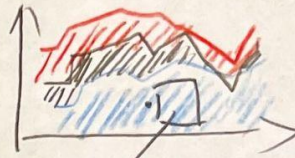


Layout



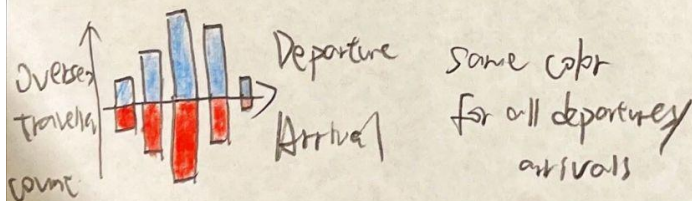
Title: Third Draft  
Author: MINHQUA 24100  
Date: 17 Oct 2023  
Sheet: 4  
Task: Design idea combination

Operations



Tooltip  
Whenever over certain places  
on the chart, there should  
be a tooltip shown with  
information corresponding  
to the chart.  
It should also contain  
comparison value if it's time  
series charts

Focus



This butterfly chart demonstrates the  
comparison between different years of  
overseas traveller count

Discussion

Pros  
1. The proportional symbol  
map with links is effective  
in terms of storytelling.

Cons  
1. The choropleth map, if placed  
too close without connection, may  
confuse audience

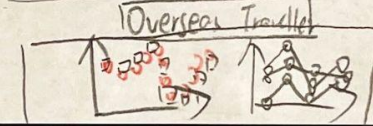
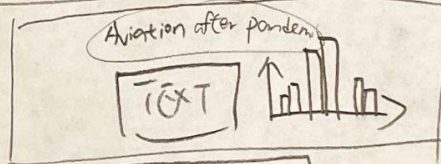
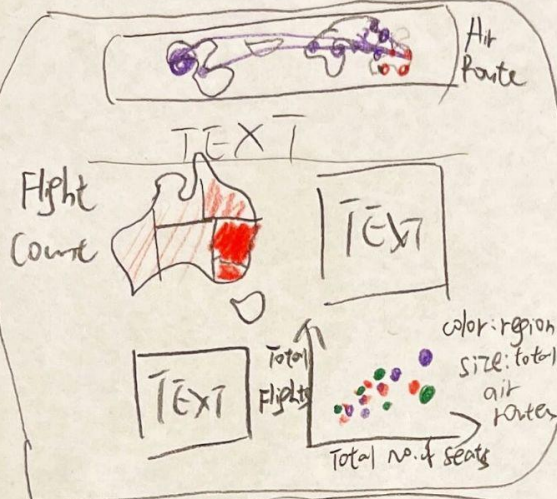
Q: 1. Should comparison  
charts be ~~not~~ placed together?



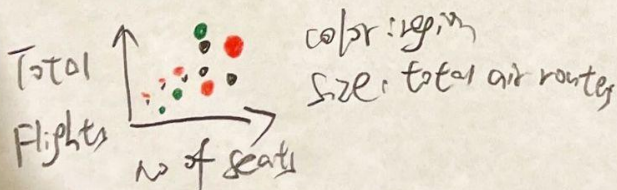
Layout

Australian Overseas Traveler  
&  
International Aviation

Section Title



Focus



The scatter plot has 4 attributes encoded.  
It's intended to show ~~the~~ the trends of  
international flights.  
New Zealand should show on top right  
and allows the storytelling to tell  
the flight to NZ

Title: Final

Author: MINHUA ZHOU

Date: 17 Oct 2023

Sheet: 5

Task: Design idea refinement

Operations

1. Year 1-11

The slider is used for year  
selection. The chart associated  
with such selection should  
reflect changes if the slider moves

2. Asia ▾

The continent selection  
is done via this drop down  
menu

3. when hovering over the  
point or map, the tooltip  
should show

Details

1. no special algorithm  
will be applied

2. Vega lite / Vega will be  
used for visualization  
manual modification for data  
cleaning

3. 1.5 hr for each chart  
3 hrs for layout

4. no specific req  
sheet size full screen