

DAS732: Data Visualisation Assignment 3 Report

Aditya Saraf
IMT2022067
Aditya.Saraf@iiitb.ac.in

I. VISUAL ANALYTICS WORKFLOW

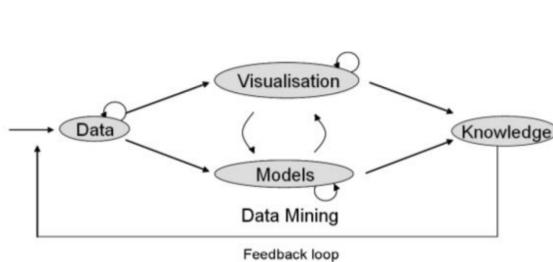


Fig. 1: Kiem et al. Visual Analytics Workflow, Image Courtesy: [8]

II. TASKS

Through visual exploratory analysis, we aim to gain the following insights and expect one to reproduce the following tasks:

- 1) T1: Different plots to get other inferences
- 2) T2: Other important inferences
- 3) T3: A Deeper dive into Geographical Analysis

III. DATA STORIES

A. T1: Visualizing Attrition Rates Across Attributes

1) *Donut like plot:* Various plots were created to explore additional inferences based on attributes not analyzed in Assignment 1. A donut chart was used to visualize the average attrition rate across different years, grouped by attributes. The Viridis colormap was applied to represent the attrition rates effectively, as its gradient intuitively highlights differences in values, making it easier to identify trends and outliers.

Donut Chart of Average Attrition Data by Group

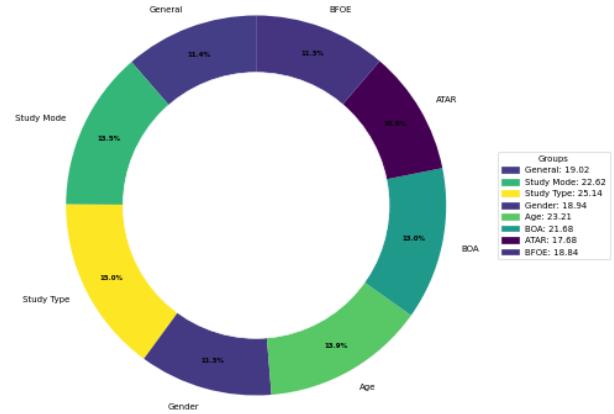


Fig. 2: Donut like plot for average attrition of different categories across different years.

From the Figure 2, we observe that the "Study Type" group exhibits the highest attrition rate at approximately 15%, highlighted in yellow. In contrast, attributes like "Study Mode," "Age," and "BOA" display intermediate attrition rates, while other groups show slightly lower rates overall. This visualization provides actionable insights into which attributes may require targeted interventions to improve student retention.

Sunburst Chart of Attributes Year-wise

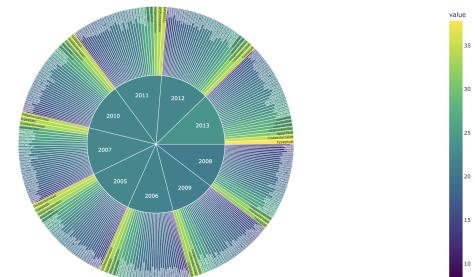


Fig. 3: Sunburst plot showing

2) *Sunburst plot:* To analyze the year-wise contribution of various attributes to attrition rates, a sunburst plot was created. Figure 3. This plot provides a hierarchical visualization where the inner circle represents years as parents, and the outer segments represent attributes as children. The size of each

segment corresponds to the respective attrition rate. The Viridis colormap was employed for this visualization, as its gradient effectively highlights differences in attrition rates, making it easier to discern patterns and trends.

The sunburst plot offers several key insights:

- The hierarchical relationship in the plot is depicted through the inner circle (representing years) and the outer regions (representing attributes). This structure allows us to observe trends for each year and compare the attrition rates of different attributes within a year.
- "Study Type" consistently ranks among the top 3 attributes with the highest attrition rates across all years, confirming its significance as a key factor. This aligns with the observation from the donut chart in Figure 2, which highlights "Study Type" as having a higher average attrition rate.
- The sunburst plot also provides an overall view of year-wise attrition rates. For example, 2013 stands out with the highest attrition rate, consistent with trends observed in Assignment 1.
- By visualizing the contribution of attributes year-wise, we can identify years or attributes that require targeted interventions. For instance, attributes with consistently high attrition rates may indicate systemic issues that need attention.

This visualization complements the donut chart by providing a more granular year-wise breakdown of attrition rates while preserving the ability to analyze overall trends.

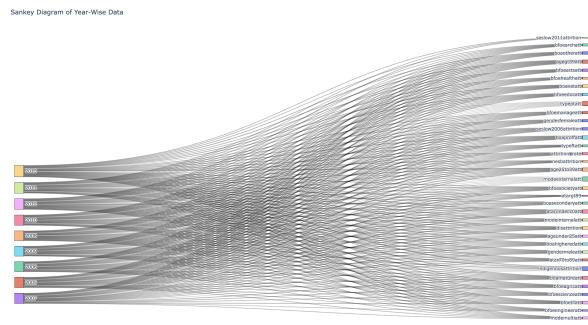


Fig. 4: Sankey flow chart for years to different attributes.

3) Sankey flow plot: A Sankey flow chart (Figure: 4) was created to visualize the year-wise relationships between different attributes and their contributions to the attrition rate. This diagram highlights the dependency of attributes on the attrition rate by representing them as proportional flows. The size of each attribute's block in the chart is proportional to its corresponding attrition rate, allowing for an intuitive understanding of the magnitude of contributions.

Unlike other visualizations, a colormap was deliberately not used in the Sankey diagram. This decision was based on the nature of the diagram, where the flow widths themselves effectively convey the relative values of attrition rates, making the addition of a colormap redundant.

Key insights from the Sankey diagram include:

- The year-wise side of the diagram is arranged in descending order of attrition rates, providing a clear visualization of which years had higher or lower attrition rates overall.
- The proportional representation of attributes reveals the dependencies of certain factors on the attrition rate. For instance, attributes with larger blocks consistently across years indicate their significant impact on overall attrition trends.
- The flow between years and attributes captures the dynamics of change over time, making it easier to observe if specific attributes contributed more heavily in particular years.
- This visualization is particularly useful for identifying systemic patterns. For example, if certain attributes have a consistently larger flow across all years, it signals a persistent issue that may require targeted intervention.
- The Sankey diagram complements other visualizations like the sunburst plot by focusing on the relationship and distribution of attributes over time, rather than individual yearly trends.

This diagram provides a holistic view of how different attributes contribute to attrition rates year by year, making it an effective tool for both identifying trends and understanding dependencies.

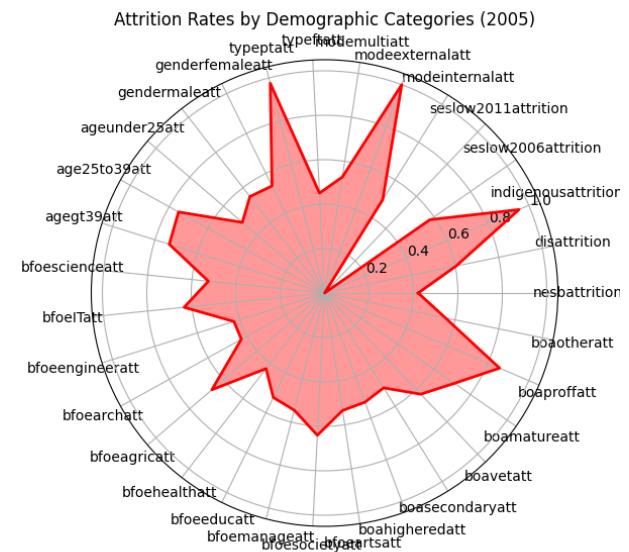


Fig. 5: Radar chart for attrition rates across different types for 2005.

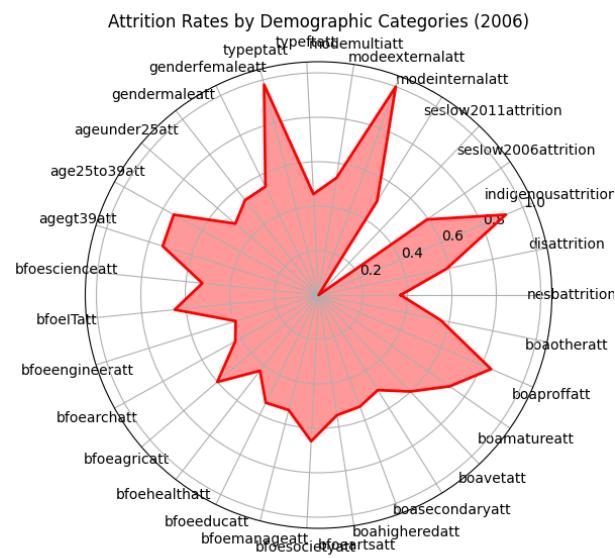


Fig. 6: Radar chart for attrition rates across different types for 2006.

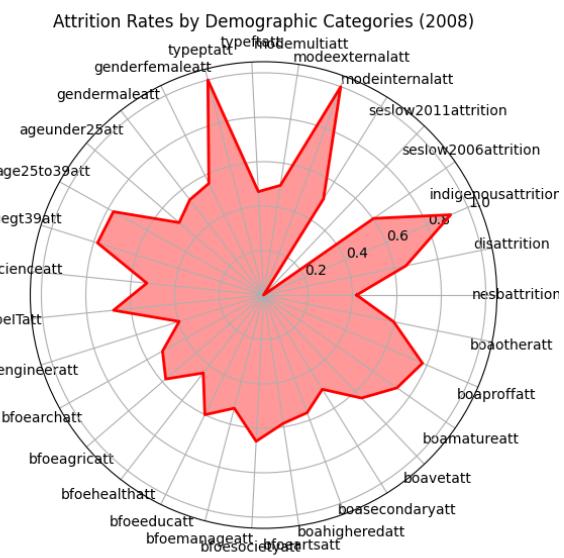


Fig. 8: Radar chart for attrition rates across different types for 2008.

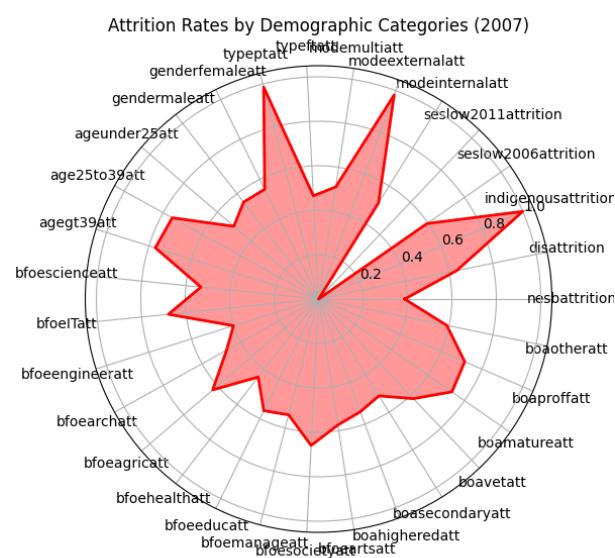


Fig. 7: Radar chart for attrition rates across different types for 2007.

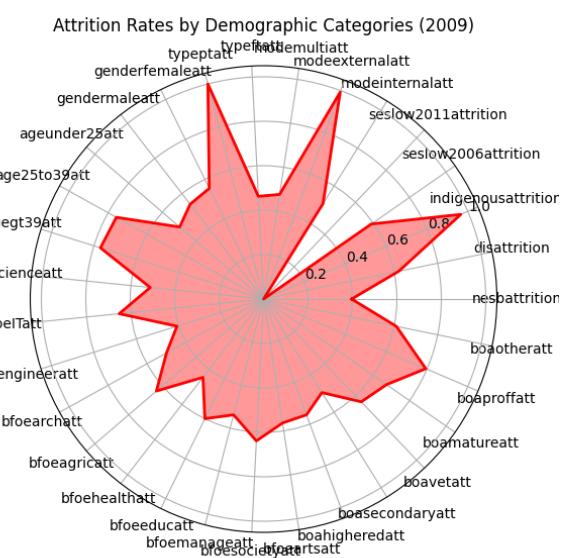


Fig. 9: Radar chart for attrition rates across different types for 2009.

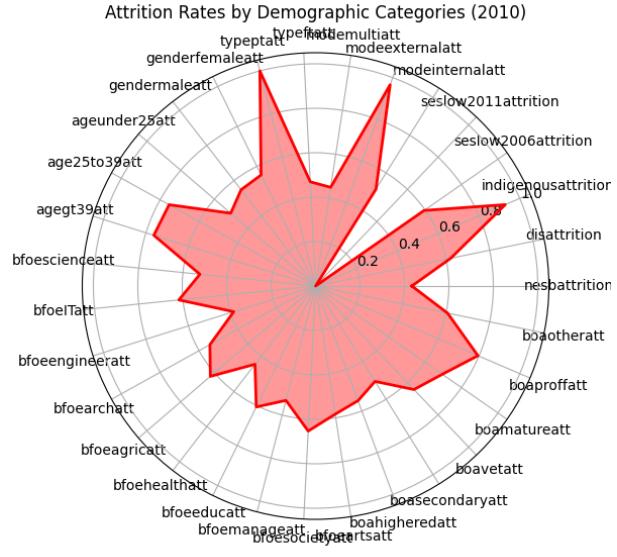


Fig. 10: Radar chart for attrition rates across different types for 2010.

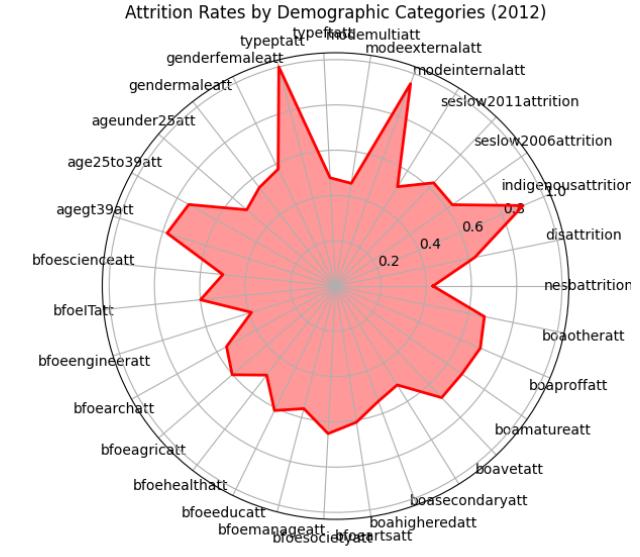


Fig. 12: Radar chart for attrition rates across different types for 2012.

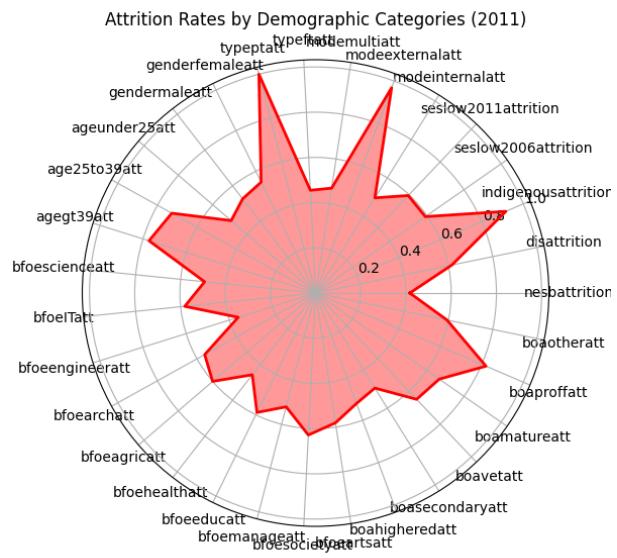


Fig. 11: Radar chart for attrition rates across different types for 2011.

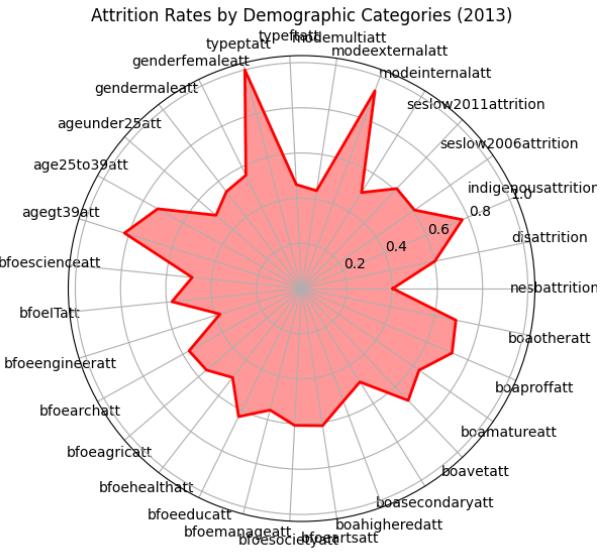


Fig. 13: Radar chart for attrition rates across different types for 2013.

4) Radar charts: Radar charts were plotted for different years, as shown in Figures 5 - 13, to analyze the relative contributions of various attributes to the attrition rate. The attribute values were normalized to a 0 to 1 scale to allow for a consistent comparison across attributes and years. Red color is used to signify the alerting attrition rates. This visualization highlights the dominant attributes contributing to the attrition rate for each year.

Key insights from the radar charts include:

- The radar charts for the years 2005 to 2010 exhibit a similar structure, while the charts for 2011 to 2013

share a different but consistent structure with minimal variations. This divergence is due to the attribute seslow2011 having a value of 0 or being null for the years 2005-2010, indicating no contribution to the attrition rate during those years.

- The distinct patterns in radar charts across the two time periods (2005-2010 and 2011-2013) suggest a shift in the influence of certain attributes over time, potentially due to policy changes, demographic shifts, or other external factors.
- The radar charts corroborate the findings from the Sankey and Sunburst plots. Attributes identified as significant contributors in those visualizations are similarly prominent in the radar charts, further validating their impact.
- By compressing values to a 0 to 1 scale, it becomes easier to directly compare the contribution of attributes year-over-year, making trends more apparent and actionable.
- This visualization also reveals the relative balance or imbalance of contributions from different attributes, helping to identify dominant factors as well as those with minimal influence.
- Radar charts offer a compact and intuitive way to analyze multivariate data, particularly when visualizing trends or patterns across multiple years.

Overall, the radar charts effectively complement other visualizations, providing an additional perspective on attribute contributions to attrition rates and reinforcing key trends observed in the data.

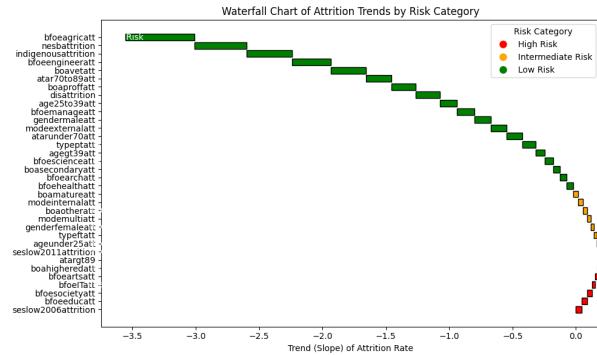


Fig. 14: Waterfall chart for average trend of attributes across years.

5) Horizontal waterfall plot: A horizontal waterfall chart was used to illustrate the average trends of various attributes over the years. This type of chart is particularly effective in highlighting changes in attrition rates. Three distinct colors were employed: green for attributes with a decreasing trend, yellow for attributes with an intermediate trend, and red for those with an increasing trend. This color-coding simplifies trend identification and helps in drawing meaningful insights.

Key insights and inferences from the chart:

- Attributes such as atar89, boahigheredatt, bfoeartsatt, bfoeITatt, bfoesocietyatt,

bfoeeducatt, and seslow2006attrition exhibit an increasing trend in attrition rates. This indicates growing challenges or issues in these areas that need attention to curb attrition.

- Attributes like nesattrition, indigenousattrition, gender, and others show a clear decreasing trend. These improvements could be attributed to the implementation of targeted government policies, programs, or institutional measures aimed at reducing attrition rates for specific demographics or groups.
- Intermediate trends represented in yellow highlight attributes that display minimal or fluctuating changes over the years. These attributes might indicate areas where the attrition rate has remained relatively stable but require monitoring to prevent future issues.
- The visualization also confirms some of the broader trends observed in other visualizations, such as the radar and sunburst charts, reinforcing the reliability of the insights.
- By combining visual representation with color-coded trends, the chart provides an intuitive understanding of which attributes need further attention and which areas show positive development over time.

B. T2: Other Important Inference

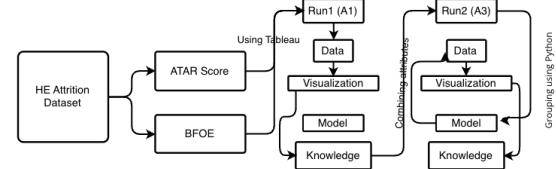


Fig. 15: Workflow for Task 2, using [6]

The following workflow ,Figure 15 is followed :

- Based on ATAR Score
- Prior Visualization and Inferences **Iteration 1: Initial Analysis**
 - In DAS-732-Assignment-1 Task-1, Part 10, we explored attrition rates across different years for ATAR scores. This task served as a foundation for deeper analysis, providing insights into how overall attrition rates correlate with ATAR scores.
 - Visualization Methodology - A1**
Figures 39 and 38 illustrate the relationship between ATAR scores and attrition rates from 2005 to 2013. A line chart depicts trends in attrition rates across years for various ATAR score ranges, while a pie chart shows the average attrition rates for each ATAR range over the entire period.
 - Inferences - A1**
 - Students with ATAR scores of 90+ consistently maintain the lowest attrition rates, reflecting strong academic preparedness.

- Attrition rates are highest for students with ATAR scores below 70, indicating academic challenges and higher dropout risks, highlighted in red on the pie chart.
- The pie chart effectively visualizes the average attrition distribution across ATAR ranges, while the line chart captures yearly trends.
- Consistent color usage (red for high attrition, orange for moderate, and green for low) across both figures enhances clarity and emphasizes the severity of attrition rates.

* Additional Insights

To deepen the analysis, we compared the attrition rates with the weighted mean of all ATAR scores across different years.

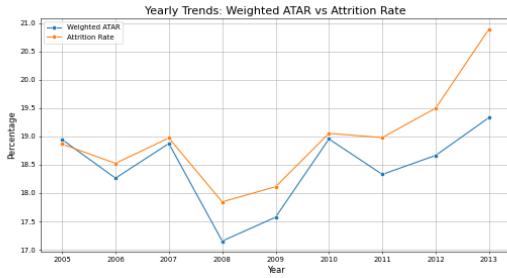


Fig. 16: Comparison of ATAR Score Mean with Attrition Rate Across Years.

- Iteration 2: Weighted Mean Analysis

- In this iteration, we computed the weighted mean for three ATAR score ranges by assigning weights as follows: intermediate-level scores (0.5), lower scores (0.3), and higher scores (0.2). A line chart was plotted to compare the weighted mean with attrition rates across different years.

* Inferences - A2

- The weighted mean of ATAR scores shows a trend similar to the overall attrition rates across different years. It intersects with the attrition rate trend at three key points: 2005, 2007, and 2010.

- Summary

The overall findings align with insights from the article [1], confirming the correlation between ATAR scores and attrition rates. Higher ATAR scores are associated with lower attrition rates, reflecting stronger academic preparedness, while lower ATAR scores correlate with higher dropout rates due to academic challenges.

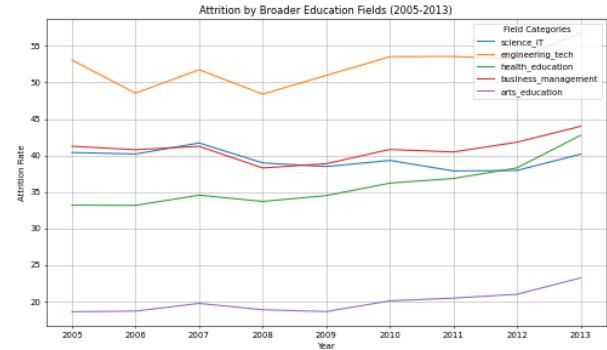


Fig. 17: Education-based attrition rate across different years.

- Based on Broad field of Education

- Prior Visualization and Inferences: Iteration 1: Initial Analysis

- In DAS-732-Assignment-1 Task-2, Part 2, we explored attrition rates across different years for the broad fields of education. This analysis provided foundational insights into how different fields of education contribute to overall attrition trends.

* Visualization Methodology - A1

Figures 44 and 45 illustrate the relationship between broad fields of education and attrition rates from 2005 to 2013. The treemap shows average attrition rates across years for various fields, while the stacked bar chart highlights the overall attrition rates for each field over the entire period.

* Inferences - A1:

- Figure 44 highlights consistent overall attrition trends across years, with the lowest rates observed in 2008.
- Higher attrition rates are seen in fields like Bfoesocietyatt (grey), Bfoe — Tatt (dark blue), and Bfoeagriatt (orange), whereas Bfoeengineeringatt (yellow) consistently demonstrates the lowest attrition rate.
- Figure 45 validates these findings by ranking fields based on average attrition rates, with consistent use of colors for clarity.

* Summary and Basis for Second Iteration:

The first iteration highlights the need to simplify the complexity of analyzing individual fields. Grouping similar fields into broader categories is essential to streamline trends and draw actionable conclusions. This forms the basis for the second iteration, where fields are aggregated to improve interpretability.

- Iteration 2: Combined Broad Fields of Education

- In this iteration, fields with similar course content or structure were grouped based on the dataset description. The following groups were created:
 - Engineering: Bfoeengineeringatt, Bfoearchatt, and Bfoeagricatt.
 - Science & IT: Bfoescienceatt and BfoeITatt.

- Health & Education: Bfoehealthatt and Bfoeeducatt.
 - Business & Management: Bfoemanageatt and Bfoesocietyatt.
 - Arts & Creative Fields: Bfoeartsatt.

A line graph (Figure 17) was plotted to analyze trends across these broader categories.

* Inferences - A2

- The **Engineering & Tech** group exhibits the highest attrition rate, followed by **Science & IT** and **Business & Management**, while the **Arts & Creative Fields** group has the lowest attrition rate.
 - The higher attrition rates in engineering-related fields might stem from the academic rigor and program-specific challenges, as discussed in this article [5].
 - The grouping also highlights consistent trends across broader categories, offering better interpretability compared to the first iteration.

* Summary:

This combined analysis simplifies field-specific trends by grouping related fields, improving clarity and enabling actionable insights. The findings confirm that broader categorization effectively reduces complexity while retaining key observations from the initial analysis.

- This section explores the relationship between attrition rates and key factors like ATAR scores and broad fields of education through iterative analysis. For ATAR scores, students with higher scores (90+) show the lowest attrition rates, reflecting strong academic preparedness, while lower scores (below 70) correlate with higher dropout risks. For fields of education, initial analyses highlight high attrition rates in engineering and related fields, while creative fields have the lowest. Grouping similar fields improves interpretability, confirming consistent trends and simplifying complex insights. These findings emphasize the importance of academic readiness and program-specific challenges in attrition rates.

C. T3: A Deeper Dive into Geographical Analysis

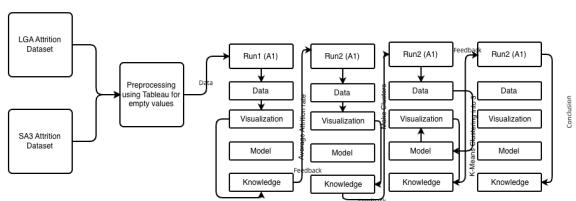


Fig. 18: Workflow for Task 3. Using [6]

The following workflow, Figure 15 is followed :

1) Prior Visualization and Inferences : Iteration1

In DAS-732-Assessment-1 Task-3, we explored attrition rates across different years based on LGA and SA3 codes for Australia. This task served as the basis for diving deeper into geographical analysis, providing insights into how regional factors influence attrition rates across different areas and over time.

Visualization Methodology - A1:

- We began by visualizing heatmaps for Australia, showing attrition rates across different years for both SA3 and LGA codes.
 - We also plotted scatter plots for the top 3 states based on LGA codes and the top 5 states based on SA3 codes, showing the lowest and highest attrition rates across years. In these scatter plots, the size of the bubble represents the attrition rate value.

Inference - A1:

- Regional Trends (SA3 and LGA):
 - SA3 Regions: Northern areas, particularly in Queensland, consistently show higher attrition rates, represented by darker teal shades in heatmaps. Southern and western regions display lighter shades, reflecting lower rates, with imputed minimum values for missing data ensuring stability.
 - LGA Regions: Similar trends are observed, with higher attrition concentrated in northern regions and a noticeable increase in Tasmania and parts of Western Australia from 2007-2013. Southern and eastern regions show consistently lower rates, with only minor yearly fluctuations.
 - Temporal Patterns: Attrition rates remain relatively stable over time, with only slight variations in specific areas, highlighting persistent geographical disparities in attrition across the years.
 - Visualization Insights:
 - Heatmaps effectively reveal spatial and temporal patterns, making it easier to interpret regional differences.
 - Scatter plots, with bubble size proportional to attrition rates, help identify regions with the highest (e.g., East Arnhem, Doomadgee) and lowest (e.g., Esperance, Carathool) attrition rates, making it clear where outliers exist.

Why it was done: This analysis aimed to establish the foundational geographical trends and patterns in attrition rates based on LGA and SA3 codes, allowing for a better understanding of the regional disparities across Australia.

Additional insights: We identified areas with significantly higher attrition rates, especially in northern Queensland and parts of Western Australia, which require targeted interventions. This also revealed that southern and eastern regions show more stability in terms of attrition rates.

Part 2 - A1: : Iteration 2:

- Visualized: Heatmaps were created to visualize the average rate of change of attrition rates per year across different states for both SA3 and LGA areas.

- Red represents increasing attrition rates, highlighting areas that are of concern.
- Green indicates decreasing attrition rates, reflecting positive trends.
- Inference:
 - LGA areas provide more granular insights compared to SA3 areas due to finer divisions, allowing for more precise identification of trends.
 - Northern and eastern regions predominantly show rising attrition rates.
 - Some eastern areas exhibit decreasing attrition rates, signaling positive trends in those regions.
 - Light green shades correspond to missing data or regions where no data is available.
 - Overall, these trends help pinpoint areas that require interventions (e.g., northern regions) and those benefiting from declining attrition rates (e.g., certain eastern areas).

Why it was done: This part of the analysis was conducted to assess the changes in attrition rates over time and identify areas that either improved or worsened during the years under review.

Additional insights: The heatmaps revealed that while some regions showed improvement (decreasing attrition), others, especially in the northern and eastern areas, faced increasing attrition rates. This highlights the need for more focused interventions and policy changes in those specific areas.

2) *New Ideas and Improvement: : Iteration 3:* To form clusters based on similar trends in attrition rates across different states, we transformed the LGA and SA3 attrition rate datasets to include a new column labeled “cluster,” based on states with similar trends.

Data Processing: We used K-Means clustering to form three clusters representing increasing, decreasing, and slightly constant trends in attrition rates. A report was generated to analyze the clusters and review their formation.

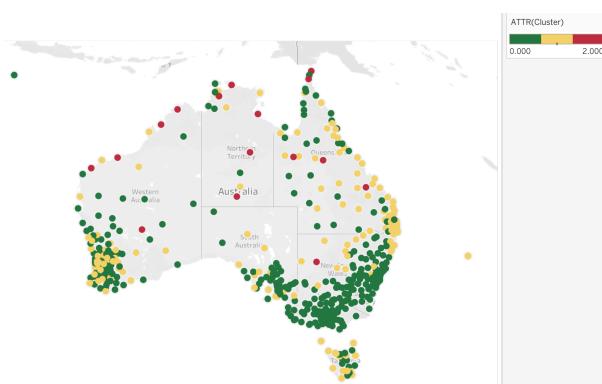


Fig. 19: Scatter plot based on LGA code and trend of attrition rate across years(clustering).

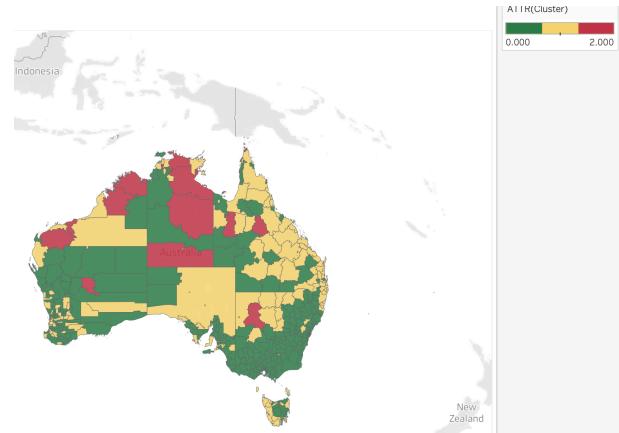


Fig. 20: Heatmap based on LGA code and trend of attrition rate across years(clustering).

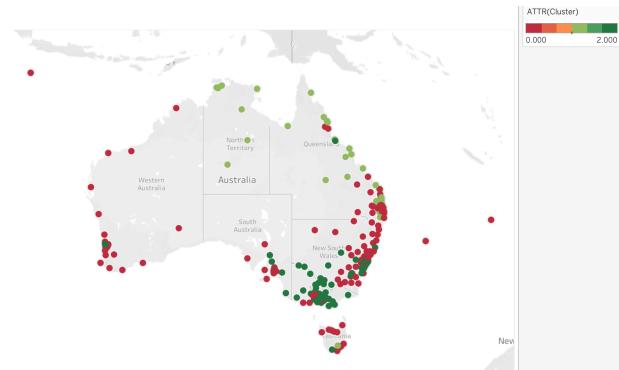


Fig. 21: Scatter plot based on SA3 code and trend of attrition rate across years(clustering).

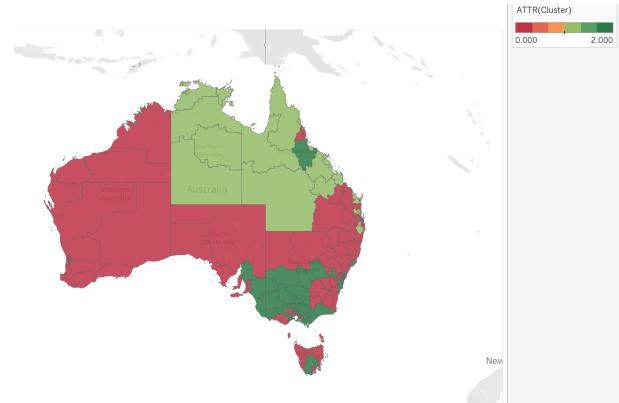


Fig. 22: Heatmap plot based on LGA code and trend of attrition rate across years(clustering).

Visualization:

- Both scatter and heatmap visualizations were plotted for the clusters of LGA and SA3 states to provide a clear view of the trends as in Figures: 19 - 22.
- In the LGA cluster, Cluster 0 represents states with an increasing trend (green), Cluster 1 represents slightly

increasing trends, and Cluster 2 represents decreasing trends (red).

- In the SA3 cluster, Cluster 0 represents states with increasing trends (green), Cluster 2 represents slightly increasing trends (red), and Cluster 1 represents decreasing trends.

Inference - Clusters : Iteration 4:

- Both visualizations reveal a similar structure, with the SA3 code map providing a more detailed representation of the differences.
- Both figures show that the western and southern regions (Cluster 0) exhibit states with an increasing trend (green), while the northern regions (Cluster 1) show a decreasing trend in attrition rates over the years.
- Certain parts of the southeastern regions show states with more constant-like trends across the years (Cluster 2), highlighting areas with minimal change.

Why it was done: The clustering analysis was carried out to better understand the grouping of states based on similar attrition trends and how these regions might require different types of interventions or policy considerations.

Additional insights: The clustering revealed that certain regions like the west and south tend to have increasing attrition trends, while the northern regions show more decreasing trends. This suggests regional policies may need to be tailored to specific clusters of trends for more effective interventions.

3) Connecting Geographical Patterns to Socio-economic and Indigenous Data: We can now examine these geographical patterns in relation to socio-economic and indigenous data.

Socio-economic Data: The socio-economic map (Fig. 23) is based on 2021 data, which is outside the range of the attrition rate data (2005-2013). This limitation arose because socio-economic data for the earlier period could not be obtained.

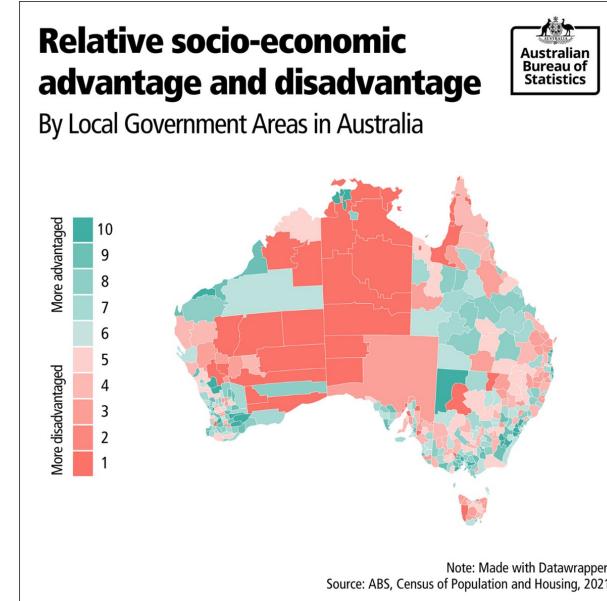


Fig. 23: Relative socio - economic advantage and disadvantages. Image courtesy: Australian Bureau of Statistics [2]

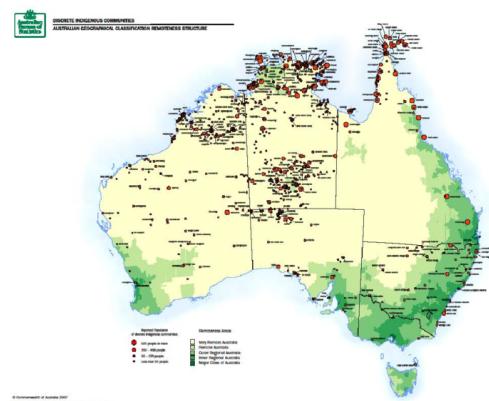


Fig. 24: Indigenous data for Australia, Image courtesy: James et al. [4]

Inferences based on Socio-economic Factors:

- In Figure 23, we observe that states with socio-economic disadvantages (highlighted in red) align with regions showing increasing attrition trends, particularly in the western areas. These regions also correspond with LGA and SA3 clusters showing a rising trend in attrition rates.
- Conversely, regions with socio-economic advantages show declining or constant attrition trends, particularly in the southern and eastern regions, which align with clusters showing stable or decreasing attrition rates.

Inferences based on Indigenous Data:

- In Figure 24, the indigenous regions, especially those located in the northernmost areas, show a higher attrition rate trend (represented in red). This suggests that the increasing attrition rates in these regions may be linked to underlying socio-economic factors and other challenges faced by indigenous communities.

Why it was done: This final connection was made to understand how socio-economic and indigenous factors correlate with geographical attrition trends, offering a more holistic perspective on the regional disparities in attrition rates.

Additional insights: By comparing socio-economic and indigenous data, we found clear connections between disadvantaged socio-economic regions and higher attrition rates. Indigenous areas in the north also showed increasing attrition, suggesting the need for targeted support for these communities to address underlying factors driving these trends.

In conclusion, this analysis provides valuable insights into the geographical and socio-economic patterns influencing student attrition rates across Australia from 2005 to 2013. By examining regional trends through heatmaps, scatter plots, and clustering techniques, we identified areas with significantly higher or lower attrition rates, particularly in northern and southern regions. The integration of socio-economic and indigenous data further highlighted the correlation between disadvantaged regions and rising attrition rates. These findings emphasize the need for targeted interventions in high-risk areas, especially those affected by socio-economic challenges and indigenous disparities, to reduce attrition and improve student retention.

IV. VISUALIZATIONS

Following are the visualizations that are used and described in detail in the section above.

- 1) HeatMap
- 2) Sunburst Plot
- 3) Sankey flow Chart
- 4) Horizontal Waterfall PLOT
- 5) Scatter Plot
- 6) Radar Chart
- 7) Donut like Chart

Also in each of the types wherever applicable, we have employed various marks and channels for making the visualizations more expressive for someone to get the maximum insights at the first glance.

V. MEMBER WISE CONTRIBUTIONS

As the sole team member, I independently handled all tasks for the project.

All tasks were completed individually to ensure comprehensive coverage and cohesive results for the final project and report.

REFERENCES

- [1] <https://www.cis.org.au/publication/atars-rising-relevance-admission-standards-and-completion-rates/>
- [2] <https://x.com/ABSSStats/status/1800709632198857003>
- [3] <https://data.gov.au/dataset/ds-dga-38e6bbd3-a071-482b-8742-7c64824308c1/details?q=Higher%20Education%20Attrition%20Rates>
- [4] https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FDiscrite-Aboriginal-and-Torres-Strait-Islander-Communities-in-Australia-Source_fig5_373297099&psig=AOvVaw1hlyU-wYlk4b59GKKeBDC&ust=1734015159923000&source=images&cd=vfe&opi=89978449&ved=0CBcQjhxFwoTCJjWv__7n4oDFQAAAAAdAAAABAE
- [5] <https://www.tandfonline.com/doi/full/10.111120/ened.2010.05020026#d1e203>

- [6] <https://online.visual-paradigm.com/>
- [7] <https://plotly.com/javascript/>
- [8] Daniel Keim, Gennady Andrienko, Jean-Daniel Fekete, Carsten Görg, Jörn Kohlhammer, et al. *Visual Analytics: Definition, Process and Challenges*, in Andreas Kerren, John T. Stasko, Jean-Daniel Fekete, and Chris North, eds., *Information Visualization - Human-Centered Issues and Perspectives*, LNCS 4950, Springer, pp. 154-175, 2008. <https://www.springer.com/gp/book/9783540786462>.

APPENDIX

This report examines the Higher Education Attrition Rate (Dropout Rate) dataset from 2005 to 2013 to explore trends in student retention across various demographics, regions, and socio-economic backgrounds at public universities in Australia.

The dataset comprises several files detailing attrition rates across various demographics and geographical areas. Key variables include:

- 1) Reference year: Year of the attrition rate.
- 2) attrition rate: Overall attrition rate.
- 3) nesbattrition: Attrition rate for non-English speaking background students.
- 4) disattrition: Attrition rate for students with disabilities (hearing, learning, mobility, vision, medical, etc.).
- 5) seslow2006attrition: Attrition rate for students from low socio-economic backgrounds (2006 SEIFA index).
- 6) seslow2011attrition: Attrition rate for students from low socio-economic backgrounds (2011 SEIFA index).
- 7) indigenousattrition: Attrition rate for Aboriginal and Torres Strait Islander students.
- 8) modeinternalatt: Attrition rate for internal (classroom) study.
- 9) modeexternalatt: Attrition rate for external (online) study.
- 10) modemultiatt: Attrition rate for mixed internal and external study.
- 11) typeftatt: Attrition rate for students studying full-time.
- 12) typeptatt: Attrition rate for students studying part-time.
- 13) genderfemaleatt: Attrition rate for female students.
- 14) gendermaleatt: Attrition rate for male students.
- 15) ageunder25att: Attrition rate for students aged under 25.
- 16) age25to39att: Attrition rate for students aged 25 to 39.
- 17) agegt39att: Attrition rate for students aged greater than 39.
- 18) boahigheredatt: Attrition rate for students admitted based on prior higher education.
- 19) boasecondaryatt: Attrition rate for students admitted based on secondary education.
- 20) boavetatt: Attrition rate for students admitted based on prior VET education.
- 21) boamatureatt: Attrition rate for students admitted based on mature age entry.
- 22) boaproffatt: Attrition rate for students admitted based on professional qualifications.
- 23) boatheratt: Attrition rate for students admitted based on other provisions (e.g., interviews, tests).
- 24) atarunder70att: Attrition rate for students with ATAR under 70.
- 25) atar70to89att: Attrition rate for students with ATAR between 70 and 89.
- 26) atargt89: Attrition rate for students with ATAR of 90 or above.
- 27) bfoescienceatt: Attrition rate for Natural and Physical Sciences students.
- 28) bfoeITatt: Attrition rate for Information Technology students.
- 29) bfoeengineeratt: Attrition rate for Engineering students.
- 30) bfoearchatt: Attrition rate for Architecture and Building students.
- 31) bfoeagricatt: Attrition rate for Agriculture and Environmental Studies students.
- 32) bfoehealthatt: Attrition rate for Health students.
- 33) bfoeeducatt: Attrition rate for Education students.
- 34) bfoemanageatt: Attrition rate for Management and Commerce students.
- 35) bfoesocietyatt: Attrition rate for Society and Culture students.
- 36) bfoeartsatt: Attrition rate for Creative Arts students.
- 37) SA3code: Unique Statistical Area Level 3 (SA3) code from the Australian Bureau of Statistics' ASGS 2011.
- 38) SA3name: Name corresponding to the SA3 code.
- 39) 2005 to 2013: Annual attrition rates for each year from 2005 to 2013.
- 40) LGACode: Local Government Area (LGA) code using 2015 boundaries from the Australian Bureau of Statistics.
- 41) LGAname: Name corresponding to the LGA code, based on 2015 boundaries.

Apart from this, we have made columns of our own based on the available data. These columns are:

- 1) avg[...]: Averages of different datasets from 2005 to 2013.
- 2) AvgRate: Average rate of attrition percentage change per year for SA3 and LGA states ,for 2005-2013.

Through visual exploratory analysis, we aim to gain the following insights and expect one to reproduce the following tasks:

- 1) T1: Trend Analysis Over Time and Demographics
- 2) T2: Field of Study Analysis
- 3) T3: Geographical Analysis

Given the small size of the dataset, we have opted not to apply any assumptions or filtration to the data.

A. T1: Trend Analysis Over Time and Demographics

What are the overall trends in attrition rates across the years 2005-2013?

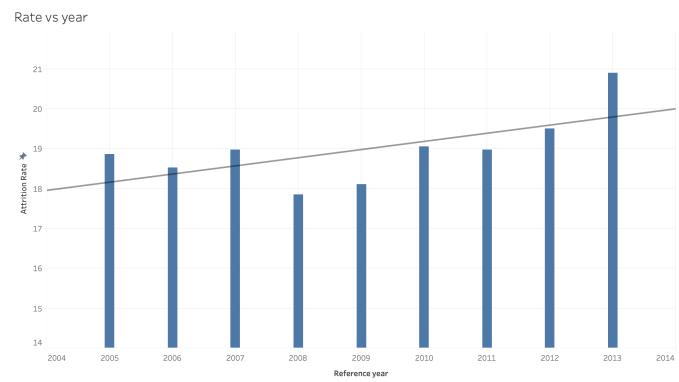


Fig. 25: Bar plot between Attrition Rate(%) and Year

1) Overall attrition rate across years: One can observe from Figure 25, a general increase in attrition rates each year, with an exception in 2008.

Several factors contributed to this anomaly, including the Global Financial Crisis, which led more students to stay in education due to a challenging job market. Additionally, government reforms increased funding and support for higher education, enhanced student support services improved retention. A focus on education quality also helped engage students and reduce dropouts.

2) *Age Group Analysis:* An area graph showing attrition rate versus year for different age groups is plotted in Figure 26. This graph reveals that the trends for individual age groups align closely with the overall attrition rate.

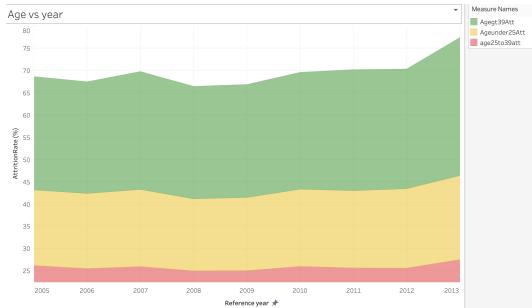


Fig. 26: Area plot showing attrition rate (%) by year for different age groups

Key observations from this plot include:

- The 25 to 39 years age group has the lowest attrition rate, likely due to greater stability in personal and professional lives.
- The age group above 39 years consistently shows the highest attrition rate, possibly due to increased job responsibilities, financial pressures, and personal commitments.
- The age group below 25 years shows moderate attrition rates, younger students might be more prone to dropping out due to the challenges of adjusting to higher education, exploring career paths, or switching courses.

3) *Gender-Based Analysis:* Figures 27 and 28 present the gender-based analysis. Figure 27 displays a bar graph for males and a line graph for females, while Figure 28 shows a pie chart of the average attrition rate by gender.

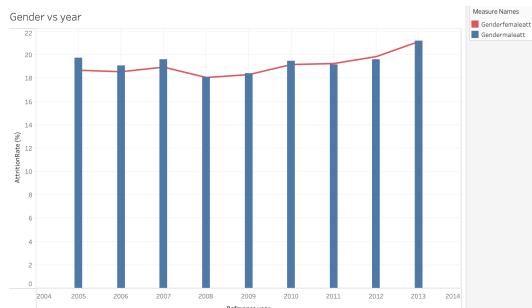


Fig. 27: Bar and line plot of attrition rate by gender (male: bar, female: line) over time

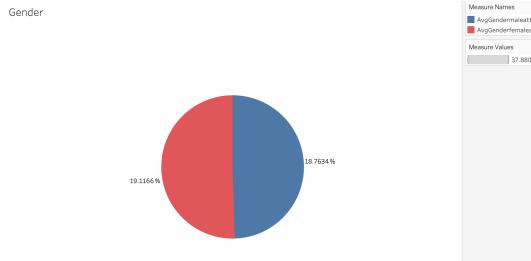


Fig. 28: Pie chart of average attrition rate by gender

From these plots, the following key observations are made:

- The combination of the line and bar plot in Figure 27 is used to compare attrition rates between genders.
- The pie chart in Figure 28 illustrates the overall attrition rate for males and females.
- The colors in Figures 27 and 28 are consistent, dark pink is used for female to highlight femininity and contrast with blue, while blue represents male for its common association with masculinity and clear differentiation..
- Figure 28 indicates that females have a higher overall attrition rate compared to males.
- Figure 27 shows that between 2005 and 2007, males had a higher attrition rate than females. However, from 2008 to 2013, the attrition rates for both genders were similar.

Summary: The analysis shows that females have a higher overall attrition rate compared to males, as seen in Figure 28. From 2005 to 2007, female attrition was lower than male, but by 2008-2013, the rates were similar, suggesting that institutional changes may have addressed earlier challenges. The visualizations effectively highlight these trends and gender differences.

4) *Mode of Study Analysis:* A line graph depicting the average attrition rate across years for different modes of study is shown in Figure 29. Additionally, Figure 30 presents a horizontal bar graph of average attrition rates from 2005-2013 for these modes.

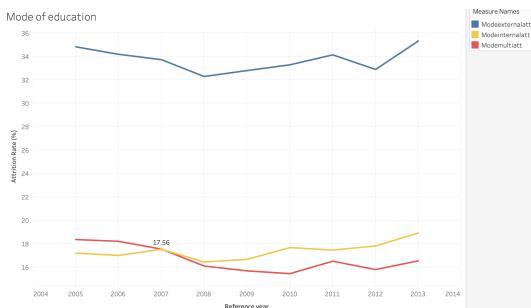


Fig. 29: Line graph of average attrition rate across years for different modes of study

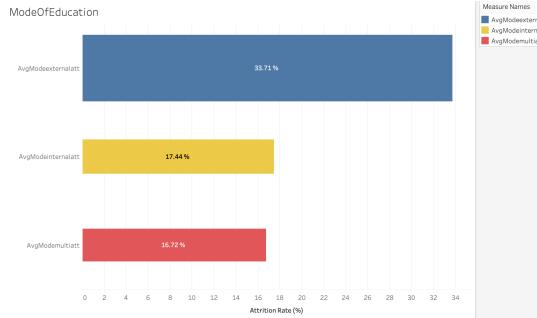


Fig. 30: Horizontal bar graph of average attrition rate (2005-2013) for different modes of study

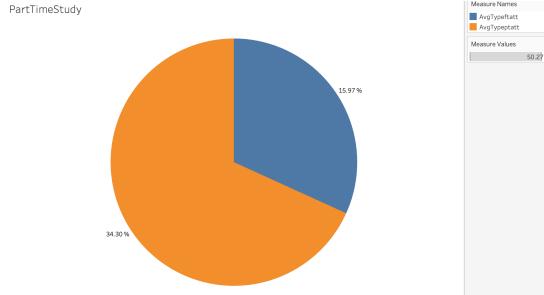


Fig. 32: Pie chart of average attrition rate (2005-2013) for full-time and part-time students

From these plots, the following key observations are made:

- Figure 30 shows that external mode(blue) has the highest average attrition rate, followed by internal(yellow) and multi-mode(red) studies.
- The external mode's higher attrition rate is due to reduced support, interaction, and difficulties managing distractions and technology issues.
- Figure 29 shows that before 2007, multi-mode study had higher attrition compared to internal mode, likely due to the complexities of hybrid formats and technology-related challenges.
- After 2007, Figure 29 indicates that internal mode had higher attrition, possibly due to increased pressures or changes in delivery and support systems.

Summary: External modes lead to higher attrition rates due to distractions and technology issues. In contrast, multi-mode studies show lower attrition rates due to better engagement with technology and resources.

5) Studying Full-Time and Part-Time Analysis: Figures 31 and 32 illustrate the attrition rates for full-time and part-time students. Figure 31 presents a line graph showing attrition trends over the years, while Figure 32 provides a pie chart of average attrition rates from 2005-2013.

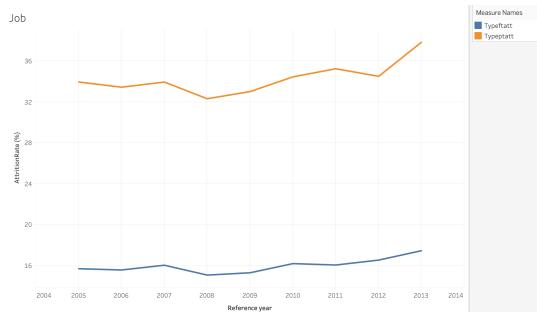


Fig. 31: Line graph of attrition rate across years for full-time and part-time students

From these plots, the following key observations are made:

- Figures 31 and 32 show that part-time students have a higher attrition rate compared to full-time students.
- Figure 32 highlights the proportion of attrition rates attributed to part-time versus full-time study.
- The higher attrition for part-time students may result from balancing work and study, reduced access to resources, and less academic engagement.

Summary: Part-time students have higher attrition rates compared to full-time students due to challenges in managing studies with other commitments. The visualizations effectively highlight these differences and the impact of study mode on attrition.

6) Socio-Economic Status Analysis: Figures 33 and 34 depict attrition rates for students from low socio-economic backgrounds across 2005-2013. The data is based on the 2006 and 2011 Australian Bureau of Statistics' Socio-Economic Indexes for Areas (SEIFA).

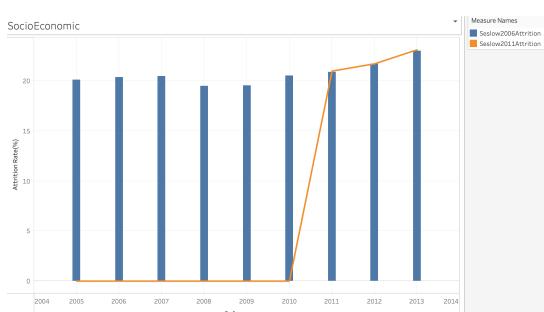


Fig. 33: Attrition rate across years for low socio-economic background (2006 and 2011)

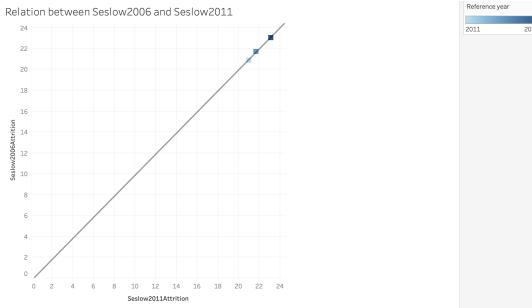


Fig. 34: Comparison of low socio-economic background (2006 vs. 2011)

Note: Low socio-economic status is based on students' postcode of permanent home residence mapped against the 2006 / 2011 Australian Bureau of Statistics' Socio-Economic Indexes for Areas (SEIFA) Index of Education and Occupation by postal area, with the postal areas containing the bottom 25% of the population aged 15-64 on the SEIFA file being classified as low socio-economic

From these plots, the following key observations are made:

- Figure 33 shows similar attrition trends for low socio-economic backgrounds in 2006 and 2011, consistent with Figure 34.
- Figure 33 reveals zero attrition for SESlow2011 between 2005-2010, since it's from 2011, while Figure 34 excludes these early data points in its analysis.
- The consistency between SESlow2006 and SESlow2011 suggests stable attrition patterns over the years for low socio-economic backgrounds.
- For the line chart representing 2011, orange is chosen to provide a vibrant and clear contrast to the blue, making it easy to distinguish between the two years

Summary: Attrition rates for students from low socio-economic backgrounds remain consistent between 2006 and 2011. The data indicates a stable relationship between these socio-economic indices over time.

7) *Non-English Speaking Students Analysis:* Figure 35 presents the attrition rates for non-English speaking students between 2005-2013.

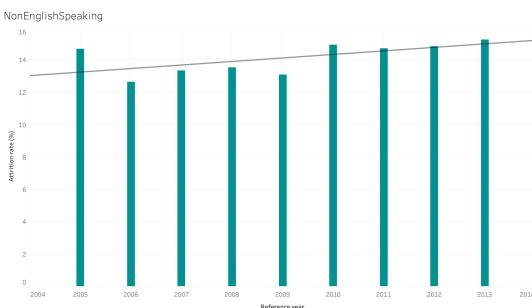


Fig. 35: Bar plot for attrition rate across years for non-English speaking students

From the plot, the following key observations are made:

- Figure 35 shows a slight but consistent increase in attrition rates for non-English speaking students over the years.
- The trend line in Figure 35 confirms this gradual rise.
- Teal is selected as the color for this Figure 35 because it is often associated with inclusivity and communication, aligning with the theme of addressing challenges faced by non-English speaking students. This choice ensures the data is clearly conveyed and thoughtfully represented..

Summary: Attrition rates for non-English speaking students have steadily increased over time, possibly due to language barriers, cultural adjustments, or difficulties accessing support services in a primarily English-speaking environment.

8) *Disability of Students Analysis:* Figure 36 presents attrition rates for students with disabilities from 2005-2013.

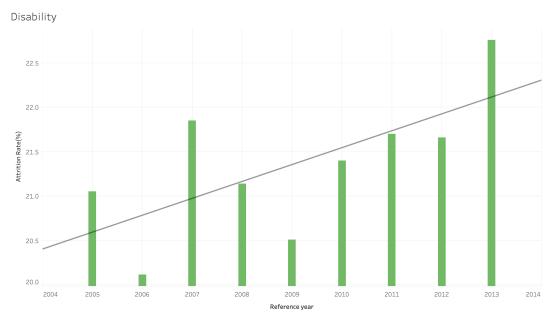


Fig. 36: Bar plot for attrition rate across years for students with disabilities

From the plot, the following key observations are made:

- Attrition rates for students with disabilities gradually increased over the years, as shown in Figure 36.
- 2006 shows the lowest attrition rate, likely due to the 2005 Disability Standards for Education, which improved support and accessibility.
- Green color is used in Figure 36 to represent the data for students with disabilities, symbolizing support and well-being.

Summary: Despite early improvements, attrition rates for students with disabilities have risen, possibly due to evolving challenges or insufficient ongoing support.

9) *Indigenous Students Analysis:* Figure 37 shows attrition rates for Indigenous students (Aboriginal and Torres Strait Islander) from 2005-2013.

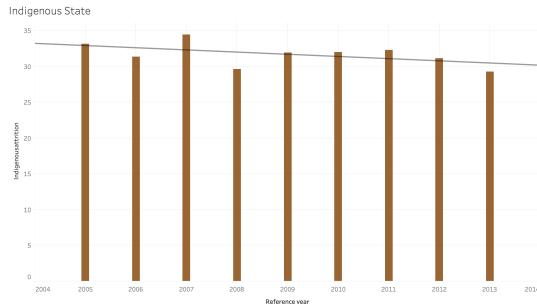


Fig. 37: Bar plot for attrition rate across years for Indigenous students

From the plot, the following key observations are made:

- Attrition rates for Indigenous students steadily decreased over the years, as seen in Figure 37.
- The most significant drop occurred between 2009 and 2013.
- 2013 recorded the lowest attrition rate, suggesting improvements in retention.
- Increased access to scholarships, community support programs, and cultural inclusion initiatives likely contributed to this decline.
- Earthly brown color used in Figure 37, chosen for representing attrition rates for Indigenous students due to its symbolic connection to land and cultural heritage. This color reflects respect for the traditional and cultural significance of Indigenous communities.

Summary: The gradual decrease in attrition rates for Indigenous students is likely due to enhanced educational support, government policies, and community-driven programs aimed at reducing barriers for Indigenous students.

10) ATAR Score Analysis: Figure 38 shows attrition rates from 2005-2013 based on different ATAR scores, and Figure 39 shows the average attrition rate across these years for each ATAR range.

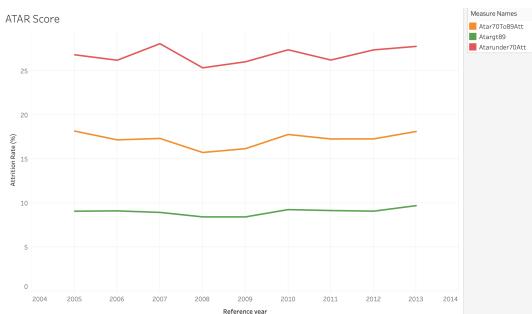


Fig. 38: Line chart for attrition rate across years based on different ATAR scores

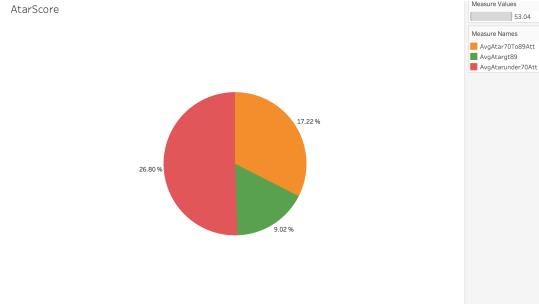


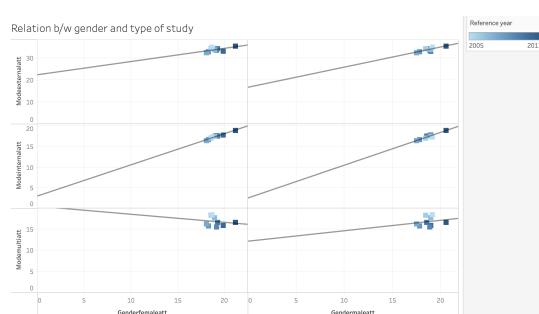
Fig. 39: Pie chart for average attrition rate across years based on different ATAR scores

From the plot, the following key observations are made:

- Figures 38 and 39 show that students with ATAR scores of 90+ consistently have the lowest attrition rates, remaining constant over time.
- Students with ATAR scores below 70 exhibit the highest attrition rates, indicating academic challenges, as seen in the red section of Figure 39.
- The pie chart in Figure 39, effectively visualizes the distribution of average attrition rates across different ATAR ranges using color differentiation.
- The line chart in Figure 38, highlights the trend of attrition rates for various ATAR scores over the years.
- Colors are consistent across both charts: red for high attrition (urgent concern), orange for moderate attrition (caution), and green for low attrition (stability) rates.

Summary: Higher ATAR scores correlate with lower attrition rates, likely reflecting stronger academic preparedness, while students with lower ATAR scores struggle more, leading to higher dropout rates.

11) Other Correlation Between Attributes: Square graphs were plotted to analyze the relationship between gender and mode of study (Figure 40) and studying time and mode of study (Figure 41), because they effectively represent relationships between multiple categorical variables, allowing us to observe trends in attrition rates over time.



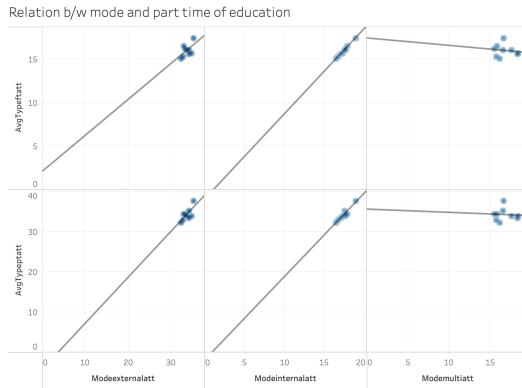


Fig. 41: Square graph showing correlation between studying time and mode of study for attrition rates.

From the plot, the following key observations are made:

- Figure 40 shows fewer female students in multi-mode programs are dropping out, likely due to improvements in blended learning, flexible schedules, and better resource access.
- The same figure reveals higher dropout rates for male and female students in internal and external programs, with males in multi-mode programs also showing higher attrition.
- Figure 41 indicates lower dropout rates for both full-time and part-time students in multi-mode programs, suggesting greater flexibility and integration.
- However, full-time and part-time students in internal and external programs display higher dropout rates, evidenced by the upward trend in the figure.
- The square graph effectively visualizes these trends by clearly showing the relationship between the variables.

Summary: Attrition rates for female students, as well as full-time and part-time students in multi-mode programs, show a declining trend. This is likely due to enhanced learning support systems, increased flexibility, and better resource access. The correlation suggests that multi-mode programs are becoming more inclusive and supportive, especially for diverse student groups.

B. T2: Field of Study Analysis

How do attrition rates vary across different fields of study?

1) Student Admission Criteria Analysis: Figures 42 and 43 present the student admission criteria analysis. Figure 42 displays a stacked bar graph for attrition rates for different student admission criteria across several years, while Figure 43 shows a horizontal bar chart of the average attrition rate for each criterion over the same period.

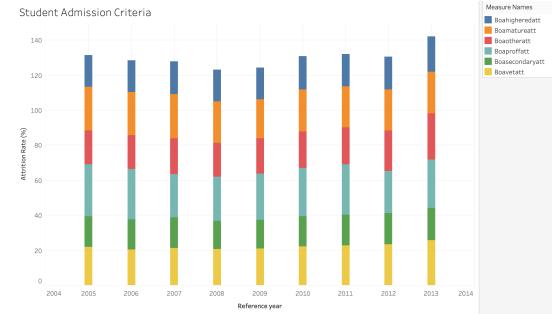


Fig. 42: Stacked bar graph for attrition rates for different student admission criteria across different years

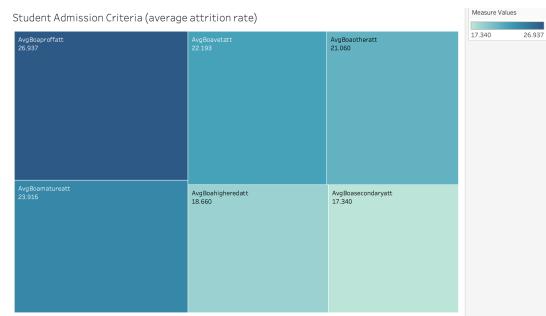


Fig. 43: Tree Map showing the average attrition rate for different student admission criteria over the years.

From these plots, the following key observations are made:

- Figure 42 shows similar overall attrition trends across different years, with the lowest rate in 2008.
- Figure 42 illustrates how each student admission pathway contributes to the overall attrition, using distinct colors for clarity.
- Figure 43 confirms that Boaproffatt has the highest average attrition rate, while Boasecondaryatt (admission via secondary education) contributes the least.
- The stacked bar chart in Figure 42 demonstrates the impact of each student admission criteria on attrition rate across years, using distinct colors.
- The tree map in Figure 43 ranks average attrition rates for student admission criteria from highest to lowest.
- Colors are consistent across both charts, ensuring clarity and ease of comparison.

The color scheme used across both figures is designed to provide clear and consistent information. In Figure 42, Boaproffatt is shown in light blue to highlight its consistently high attrition rate, indicating significant challenges for students with professional qualifications. Boamatureatt is represented in orange, reflecting its moderately high attrition rate, which may be due to the difficulties mature students face in balancing work and study. Boavetatt is depicted in yellow, showing a stable but noticeable attrition rate, suggesting that students from vocational backgrounds might need extra support. Boatheratt is shown in red to emphasize its variable attrition rates, which could be due to the unpredictability of non-standard admission pathways. In Figure 43, these

color choices are maintained to allow easy comparison and interpretation of the average attrition rates.

Summary: The analysis of attrition rates based on student admission criteria reveals that students admitted via professional qualifications (Boaprofatt) consistently exhibit the highest attrition rates, suggesting a need for tailored support. In contrast, those admitted through secondary education (Boasecondaryatt) have the lowest rates, indicating stronger academic preparation. Mature age (Boamatureatt) and VET course entrants (Boavetatt) also show moderate attrition, reflecting potential challenges specific to these groups. Boatheratt's variable rates across years emphasize the need for personalized academic support. These insights highlight the importance of targeted interventions to reduce attrition across diverse admission pathways.

2) Background Education of Student Analysis: Figures 44 and 45 present the background education of student analysis. Figure 44 displays a stacked bar graph for attrition rate for different education backgrounds across several years, while Figure 45 shows a tree map of the average attrition rate for different education backgrounds over the same period.

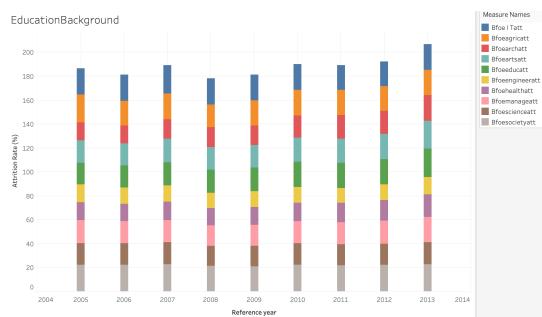


Fig. 44: Stacked bar graph for attrition rate for different education backgrounds across different years

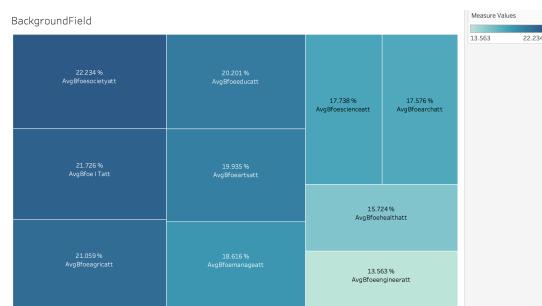


Fig. 45: Tree Map showing the average attrition rate for different education backgrounds over the years.

From these plots, the following key observations are made:

- Figure 44 shows similar overall attrition trends across different years, with the lowest rate in 2008.
 - Figure 44 highlights higher attrition rates for Bfoesocietyatt (grey), Bfoe — Tatt (dark blue), and Bfoeagriatt (orange).
 - Figure 45 confirms these findings, showing consistent color for higher attrition rates at left side, while

Bfoeengineeringatt (yellow) has the lowest rate(at bottom right in Figure 45).

- The stacked bar chart in Figure 44 demonstrates the impact of each field of education on overall attrition, using distinct colors.
 - The tree map in Figure 45 ranks average attrition rates from highest to lowest.
 - Colors are consistent across both charts, ensuring clarity and ease of comparison.

Agriculture and Creative Arts show the highest attrition rates due to limited career opportunities and financial instability. Conversely, Engineering and Health have the lowest attrition rates, reflecting strong job prospects. Natural and Physical Sciences, Information Technology, and Education exhibit moderate attrition rates influenced by steady demand and varying job market conditions. Management and Commerce also show moderate rates due to a dynamic job market. Society and Culture, and Architecture have higher attrition rates due to less direct career pathways and industry competitiveness.

Summary: The analysis indicates that fields with high attrition rates, such as Agriculture and Creative Arts, are often linked to limited career opportunities and financial instability. Conversely, fields like Engineering and Health, with low attrition rates, benefit from strong job prospects and high demand. Other fields exhibit moderate attrition rates, reflecting a balance between market demand and career stability.

C. T3: Geographical Analysis

Are there any regional differences in attrition rates across Australia? **Note:** Some SA3 / LGA regions were missing in the dataset. To avoid null values, we assigned the minimum attrition rate observed across all years. As a result, the left part of the map consistently shows a lighter shade of teal blue, indicating the missing SA3 / LGA regions.

1) Based on SA3 area analysis:: Figure 46 and 47 shows different heat map for attrition rate across different years from 2005-2013 according to SA3 regions of Australia.

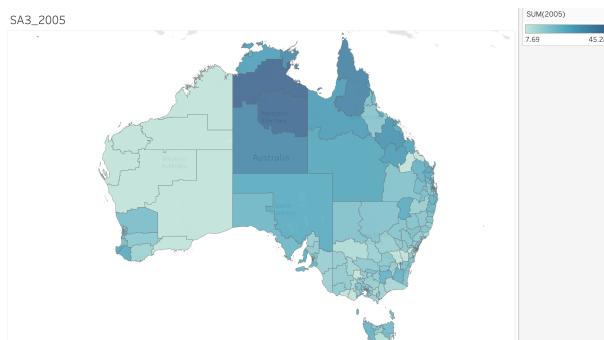
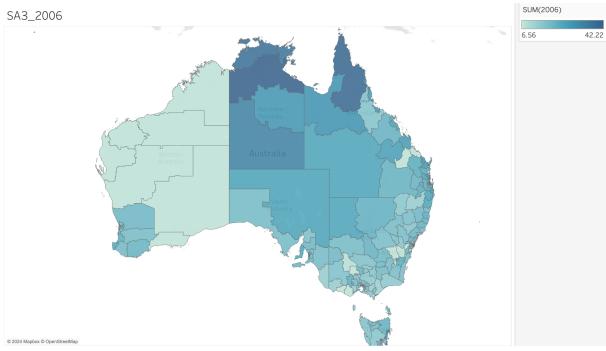
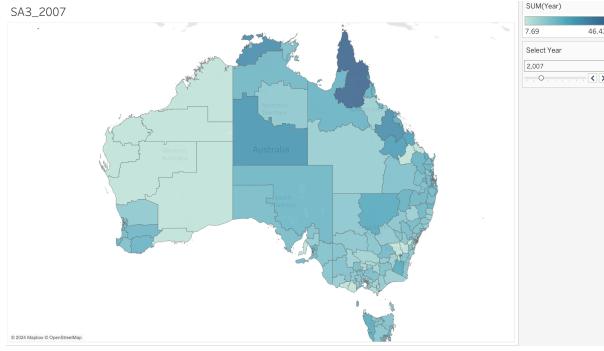


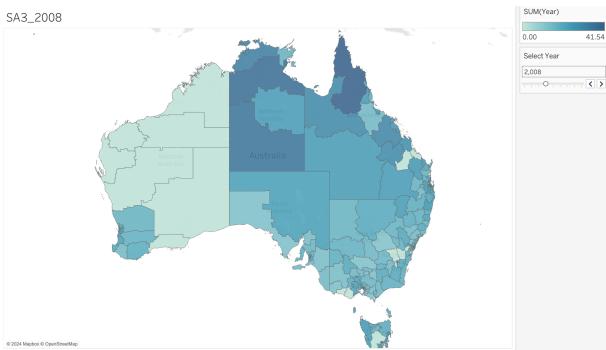
Fig. 46: Heat maps for SA3 areas 2005 to 2013 (Part 1)



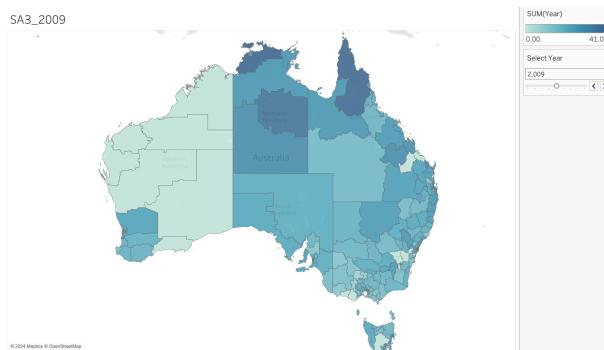
(a) Heat map for 2006



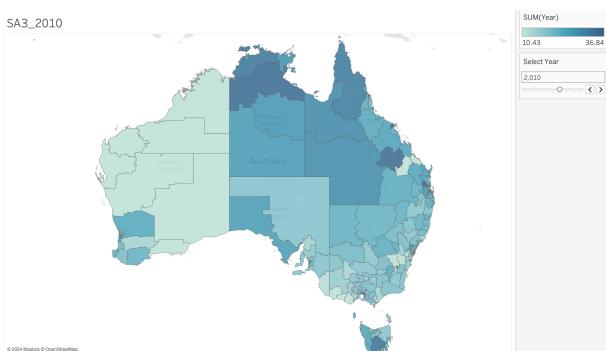
(b) Heat map for 2007



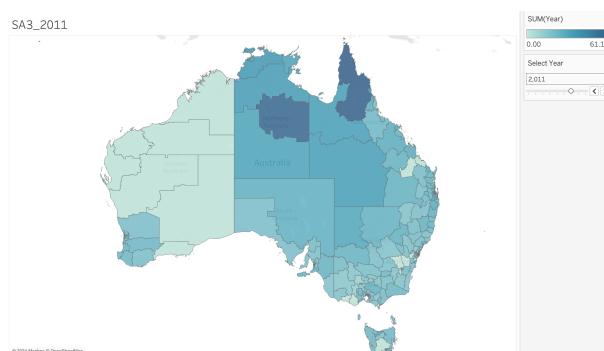
(c) Heat map for 2008



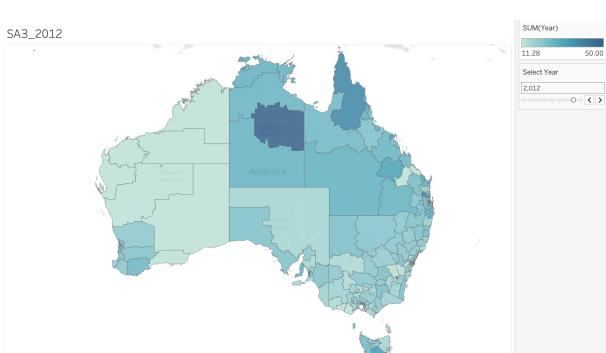
(d) Heat map for 2009



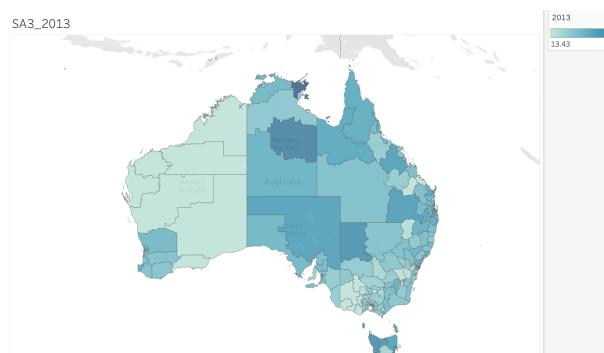
(e) Heat map for 2010



(f) Heat map for 2011



(g) Heat map for 2012



(h) Heat map for 2013

Fig. 47: Heat maps for SA3 areas 2005 to 2013 (Part 2).

Key Observations and Insights:

- Color Scheme: Darker teal shades represent higher attrition rates, and lighter shades indicate lower rates across the years (Figures 46 and 47).
- Regional Trends: Northern regions, particularly in Queensland, consistently show darker shades, reflecting higher attrition rates.
- Southern and Western Regions: Southern regions exhibit lighter shades, indicating lower attrition. Western areas also appear lighter, likely due to imputed minimum attrition rates where data was missing.
- Attrition Stability: Minor variations in attrition rates are observed, but the overall distribution of high and low attrition regions remains stable across the years.
- Heatmap Utility: The heatmaps effectively visualize the intensity of student attrition across regions, highlighting geographical and temporal patterns.
- Color Choice: Teal is selected for its neutral and professional appearance, offering clear contrast between high and low attrition areas.

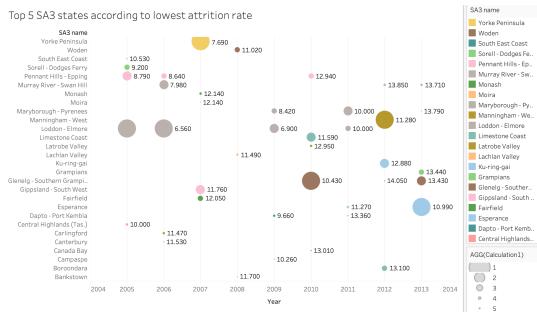


Fig. 48: Scatter plot for top 5 states(based on SA3) with lowest attrition rate across years.

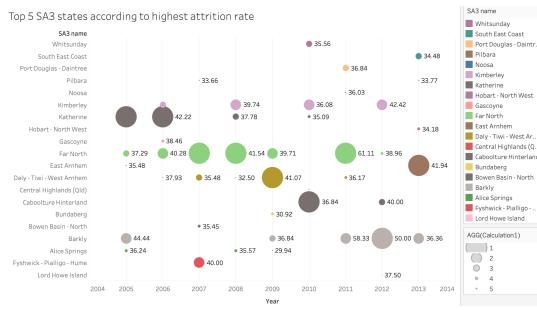


Fig. 49: Scatter plot for top 5 states(based on SA3) with highest attrition rate across years.

We have plotted bubble charts (Figures 48 and 49) to visualize the top 5 states with the highest and lowest attrition rates across different years for SA3 regions. Key observations and insights are:

- Figures 48 and 49 use circle size to represent attrition rates. Larger circles indicate regions with the highest or lowest attrition rates, while smaller circles represent regions with intermediate rates.

- Figure 48 displays the top 5 states with the lowest attrition rates across years. Regions like Loddon-Elmore (grey), Glenelg-Southern (brown), and Murray River (pink) consistently appear on the map, indicating their lower attrition rates over time. In 2013, the states with the lowest rates are Esperance (10.99%), Glenelg-Southern (13.43%), Grampians (13.44%), Murray River-Swan Hill (13.71%), and Marlborough-Pyrenees (13.79%).
- Figure 49 shows the top 5 states with the highest attrition rates across years. Regions such as Far North (light green), Barkly (grey), and Kimberley (light purple) frequently appear, indicating consistently high attrition rates. In 2013, the states with the highest rates are East Arnhem (41.94%), Barkly (36.36%), Port Douglas (34.38%), Hobart-North West (34.18%), and Pilbara (33.77%).
- The bubble charts ensure that the size of the circles is proportional to the attrition rates, making it easy to identify regions with the highest and lowest rates. Larger circles stand out clearly.

2) *Based on LGA area analysis::* Figure 50 and 51 shows different heat map for attrition rate across different years from 2005-2013 according to LGA regions of Australia.

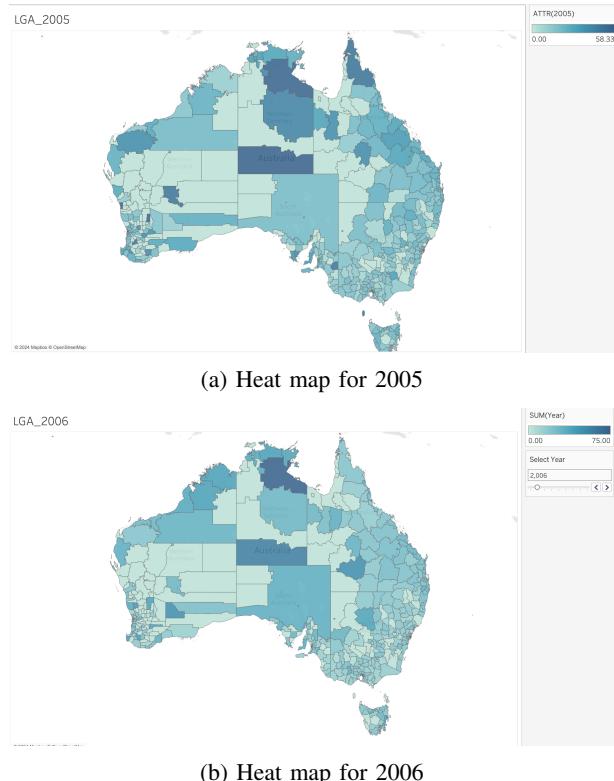
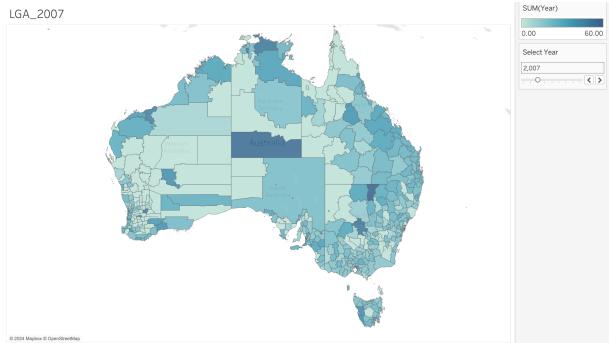
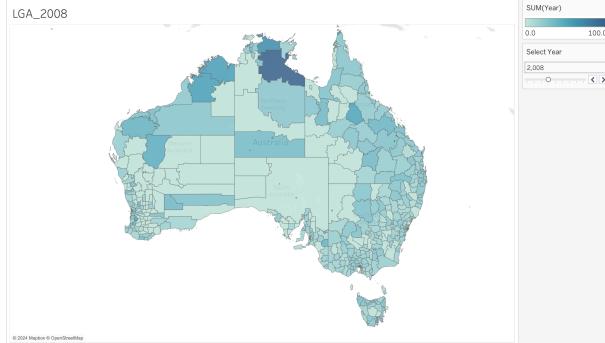


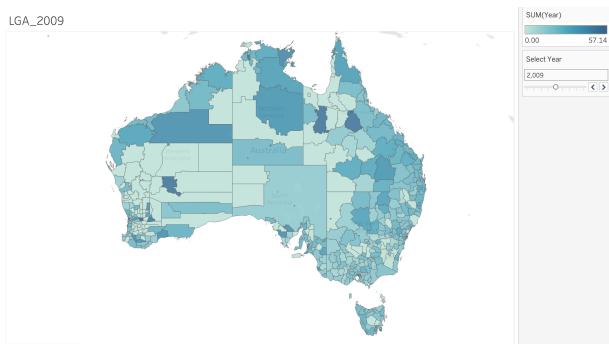
Fig. 50: Heat maps for LGA areas 2005 to 2013 (Part 1).



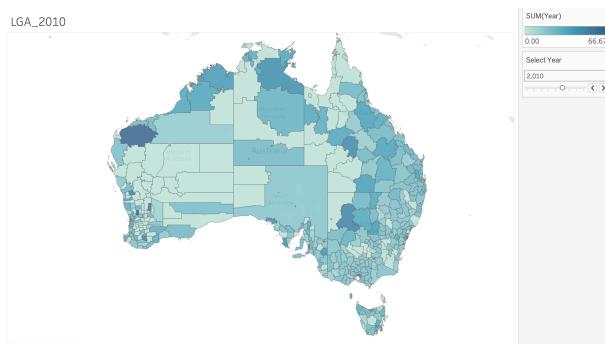
(a) Heat map for 2007



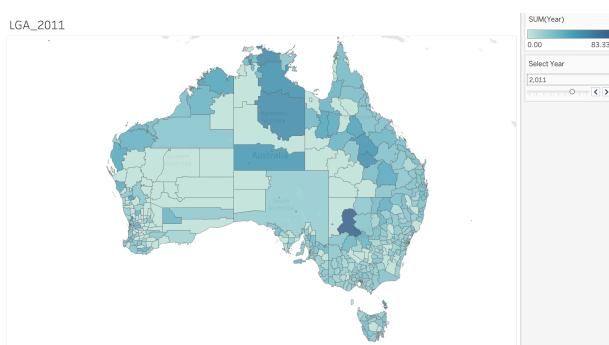
(b) Heat map for 2008



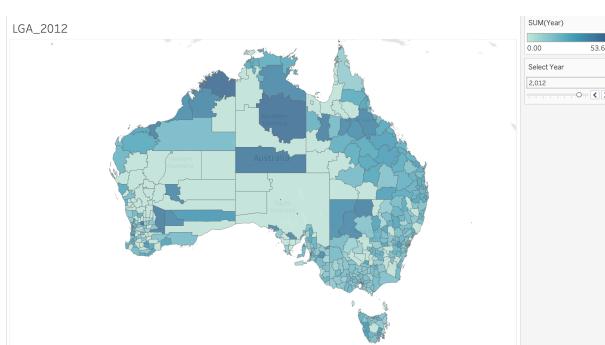
(c) Heat map for 2009



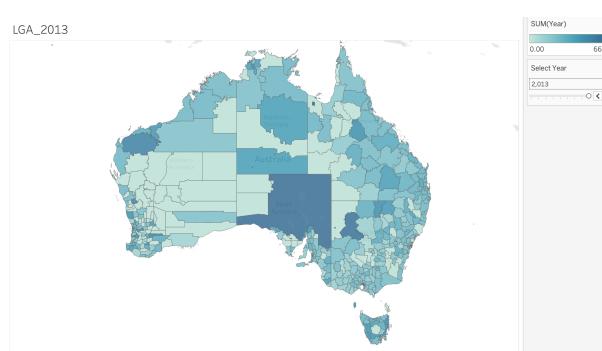
(d) Heat map for 2010



(e) Heat map for 2011



(f) Heat map for 2012



(g) Heat map for 2013

Fig. 51: Heat maps for LGA areas 2005 to 2013 (Part 2).

Key Observations and Insights:

- Color Scheme: Darker teal shades represent higher attrition rates, while lighter shades indicate lower rates for the years 2007 to 2013 (Figures 50 and 51).
- Regional Trends: Northern regions, particularly in Queensland, consistently show darker shades, reflecting higher attrition rates.
- Southern regions, including parts of New South Wales and Victoria, exhibit lighter shades, indicating lower attrition rates. Eastern coastal areas generally maintain moderate to low attrition rates, with some fluctuations across the years. Western areas also appear lighter, likely due to imputed minimum attrition rates where data was missing.
- Certain regions, such as Tasmania and parts of Western Australia, show increasing attrition rates over time, with noticeable darkening from 2007 to 2013. However, most central and southern areas exhibit stable trends with minor fluctuations.
- Heatmap Utility: The heatmaps effectively visualize the intensity of student attrition across regions, highlighting geographical and temporal patterns.
- Color Choice: Teal is chosen for its clarity and neutral tone, creating a strong visual contrast that emphasizes regional differences in attrition rates. The palette ensures that regions with minimal data or low attrition rates remain distinguishable from those with higher rates.

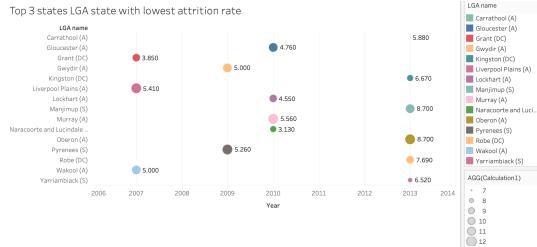


Fig. 52: Scatter plot for top 3 states(based on LGA) with lowest attrition rate across years.

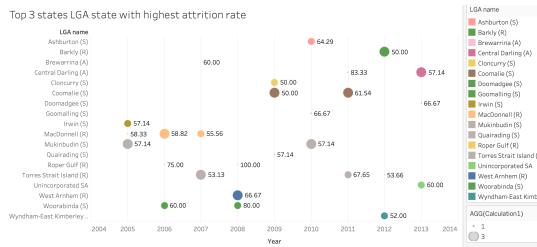


Fig. 53: Scatter plot for top 3 states(based on LGA) with highest attrition rate across years.

We have plotted bubble charts (Figures 52 and 53) to visualize the top 3 states with the highest and lowest attrition rates across different years for LGA regions. Key observations and insights are:

- Figures 52 and 53 use circle size to represent attrition rates. In Figure 52, smaller circles indicate regions with the lowest attrition rates, and in Figure 53 indicate regions with the highest attrition rates.
- Figure 52 shows the top 3 states with the lowest attrition rates across years. There is no consistent pattern across years. In 2013, the states with the lowest rates were Carathool (A) (5.88%), followed by Yarriambiack (S) (6.52%) and Kingston (DC) (6.67%).
- Figure 53 displays the top 3 states with the highest attrition rates across years. There is some consistency with states such as MacDonnell (R) (light orange), Torres Strait Island, and Mukinbudin (S) (grey). In 2013, the states with the highest rates were Doomadgee (S) (66.67%), followed by Unincorporated SA (60%) and Central Darling (A) (57.14%).
- The bubble charts use inverse proportionality for circle size relative to attrition rates. This approach was chosen because direct proportionality resulted in circles that were too small to visualize effectively.

3) Comparision between LGA and SA3 area Analysis::

It is observed that LGA area provide more detail compared to SA3 areas,since LGA is distributed into more areas as compared to SA3 areas. We have plotted heat map for average rate of change of attrition rate per year across different states according to SA3 (Figure: 54) and LGA (Figure: 55) areas.

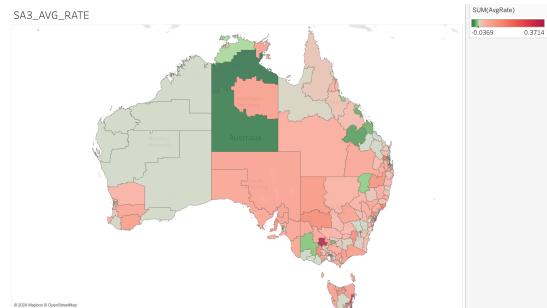


Fig. 54: Heat map for average rate of change of attrition rate per year across different states according to SA3.

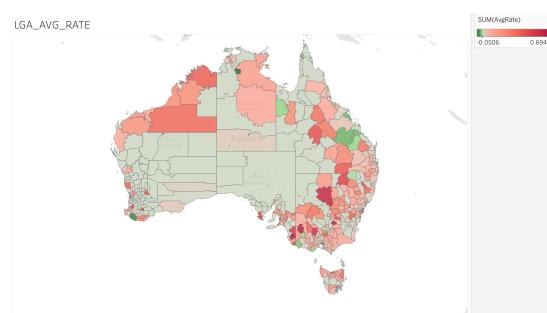


Fig. 55: Heat map for average rate of change of attrition rate per year across different states according to LGA.

Key observations and insights:

- In Figures 54 and 55, red represents a positive (increasing) average attrition rate, while green indicates a negative (decreasing) rate. Red highlights regions where the attrition rate is rising, signaling areas of concern, while green signifies declining rates, which is a positive trend for those regions.
- Regional Trends:
 - In Figure 54, many regions show a lighter red, indicating a slight increase in attrition, while northern, eastern, and southern areas show a green color, reflecting a slight decrease over time.
 - Figure 55 shows that northern, southern, and eastern areas display a lighter shade of red, indicating a marginal increase in attrition.
- Data Gaps: In both Figures 54 and 55, the lightest green shades likely correspond to missing data or regions not available in the dataset.
- Insight: The overall trends suggest a mix of rising and falling attrition rates, with some regions benefiting from declining rates. These regions may offer potential areas for further investigation to understand factors contributing to these positive trends.

Summary: Both heat maps show consistency with color variations. Red dominates in northern and eastern regions, indicating increasing attrition rates, while green areas in parts of the east reflect decreasing rates. The lightest green regions, especially in the west, likely represent missing data. These visualizations offer key insights into regions with both rising and falling attrition rates, which could guide targeted research and interventions.

D. Summary:

The analysis of attrition rates from 2005-2013 reveals several key trends. Overall attrition rates increased annually, with a notable exception in 2008, likely due to the Global Financial Crisis and improved student support systems. Age and gender differences were significant—students aged 25-39 had the lowest attrition, while those over 39 had the highest. Females had a higher overall attrition rate compared to males, with gender-based rates becoming more similar post-2008. Part-time students faced higher dropout rates than full-time students, and external study modes showed the highest attrition due to reduced engagement.

Attrition rates also varied across socio-economic backgrounds, with consistent rates for low-income students and a gradual increase for non-English-speaking and disabled students. Indigenous students showed improved retention, particularly after 2009. Additionally, students with higher ATAR scores consistently had lower attrition rates. The analysis highlights that factors like mode of study, socio-economic background, and academic preparedness strongly influence student attrition trends.

Following are the visualizations that are used and described in detail in the section above.

1) Bar plots

- 2) Scatter Plots
- 3) Pie Charts
- 4) Bubble Chart
- 5) Line Plots
- 6) Area Plots
- 7) Treemap
- 8) Heatmap

Also in each of the types wherever applicable, we have employed various marks and channels for making the visualizations more expressive for someone to get the maximum insights at the first glance.

As the sole team member, I independently handled all tasks for the project.

All tasks were completed individually to ensure comprehensive coverage and cohesive results for the final project and report.