MOTIVATION

Commercial software business intelligence (BI) tools such as Tableau and PowerBI allow users to visualise their data. However, these softwares limit the types of customisations that the users can make. On the other hand, open-source packages like ggplot2 and plotly on R offers more flexibility in plotting graphs but requires the user to learn how to code. Hence our motivation is to provide users access to the flexibility of these package without having to code. Moreover, Commercial BI tools always come with a subscription fee which small companies may not be able to afford. Hence this effort will seek to democratise data visualisation by making it available to those without the means to purchase them.

To put this in practice, we will work on Challenge 3 of VAST Challenge 2022 by designing a web-based application using Shiny app for the user to visualise the economic patterns of the City of Engagement, Ohio USA. The app will allow the user to modify the visualisations to their preferences and needs.

PROBLEMS

As part of Challenge 3 of VAST Challenge 2022, we are to use visual analytic techniques to address the following questions in relation to the economic health of the city:

- Over the period covered by the dataset, which businesses appear to be more prosperous? Which appear to be struggling?
- How does the financial health of the residents change over the period covered by the dataset? How do wages compare to the overall cost of living in Engagement? Are there groups that appear to exhibit similar patterns?
- Describe the health of the various employers within the city limits. What employment patterns do you observe? Do you notice any areas of particularly high or low turnover?

SOLUTION

1. BUSINESS
How businesses perform is a straightforward gauge of a city's economic development. **Monthly number of customers** and **revenue per customer** for pubs will be displayed with a scatter plot. A slider to select the month will allow the user to observe the performance of the pubs over time.
A good measure of the current business performance for pubs is to display the **occupancy rate** throughout the day. The average occupancy rate for Fridays and Saturdays for the first and last month of the available data will be compared.

2. FINANCIALS
Good indicators of resident financial health are their wage and cost of living. We will sum the expenditures on food, education, and shelter as cost of living, then plot both wage and cost of living over time. In terms of wage and expenditure, outliers may have

significant effect on statistics, hence the median will be used to display the results. In addition, we will calculate the cost of living as a percentage of wage, to better reflect the standard of living in the city. A selection panel is also provided for the user to select the education group which they are interested studying.

3. EMPLOYMENT

To measure the health of employers, we can look at the distribution of the average hourly salary provided by various employers in the city. This can be visualised using a tree map with different colouration.

For employment patterns, we can count the number of employers providing various number jobs to find the most common employer to employee ratio. This can be visualised using an ordered bar chart with a reactive table to display the information presented.

To study the rate of turnover in the city, we will compute the numbers of turnovers over the provided time period by each employer. This can be visualised using a geographical map showing areas with high/medium/low turnovers based on employer locations.

SHINY APP DESIGN

The main page of the Shiny App contains a navigation bar for the user to access the various tabs. The "Business", "Financial" and "Employment" tabs will contain the visual analysis of the various economic aspects of the City of Engagement, Ohio USA. Each visual analysis will come with a panel for the user to modify the graph displayed. The "About" tab will contain the user guide, project proposal and information about the site creators.