IT8701 – Introduction to Programming for Data Science

CA2 Submission

SINGAPORE TELECOM INDUSTRY ANALYSIS

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INTRODUCTION

Singapore has a reputation of being technology-driven. From initiatives like **data.gov.sg** and **Smart Nation**, to institutions like the **IMDA**, it's not hard to see why.

In the Jupyter Notebook that accompanies this slide deck, we try to quantify this reputation and take a look at the relevant datasets

- **Theme 1:** Telecommunications service standards
- **Theme 2:** Singapore mobile broadband trends
- **Theme 3:** Singapore fixed broadband trends

INTRODUCTION

Singapore telecom service standards

We take a look at how **well covered** Singapore is by its main telecommunications providers, and how reliable their service is. Timeseries data representing **service coverage** and **call drop rates** for 3G services from Data.gov.sg is used.

Singapore mobile broadband trends

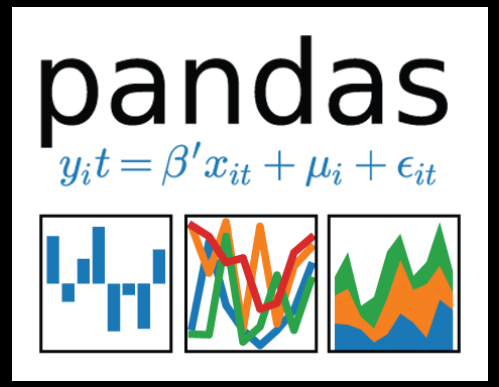
How much of the population has **access** to mobile data, and how does this compare to the rest of the world?
Also, just *how much* mobile data is
Singapore **consuming**?

Singapore fixed broadband trends

Is ADSL, Broadband or Fibre king in the Lion City? Are dial up connections dead? Also, we take a look at trends in fixed broadband subscription, with respect to service type, prices and speed, and see which service provider gives you more bang for your buck.

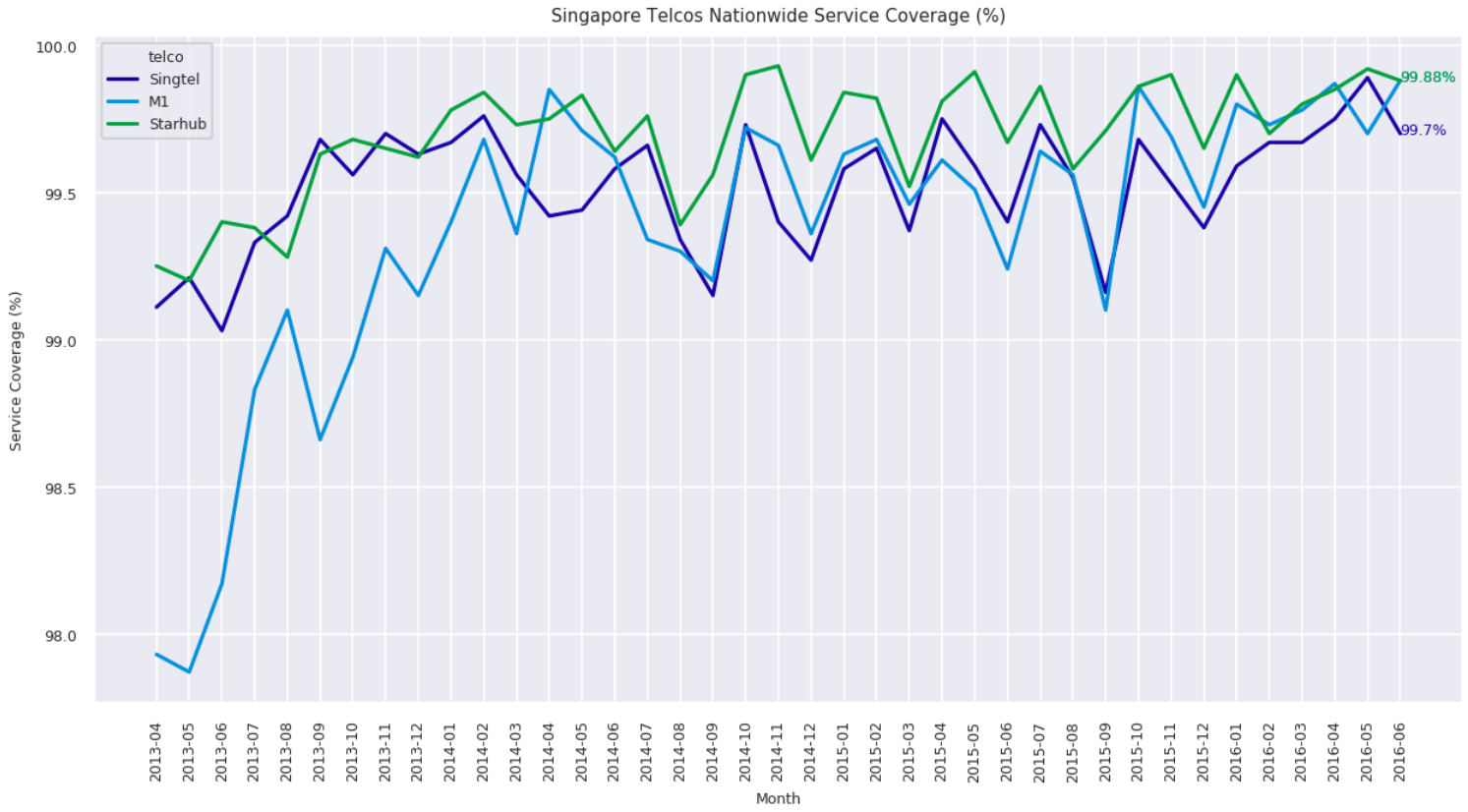
LIBRARIES USED

- Numpy for vectorized numerical operations
- Pandas for easy data loading and manipulation
- Matplotlib and seaborn for basic data visualization
- Plotly Express for interactive data visualization
- SQLAlchemy and mysql.connector for relational database operations



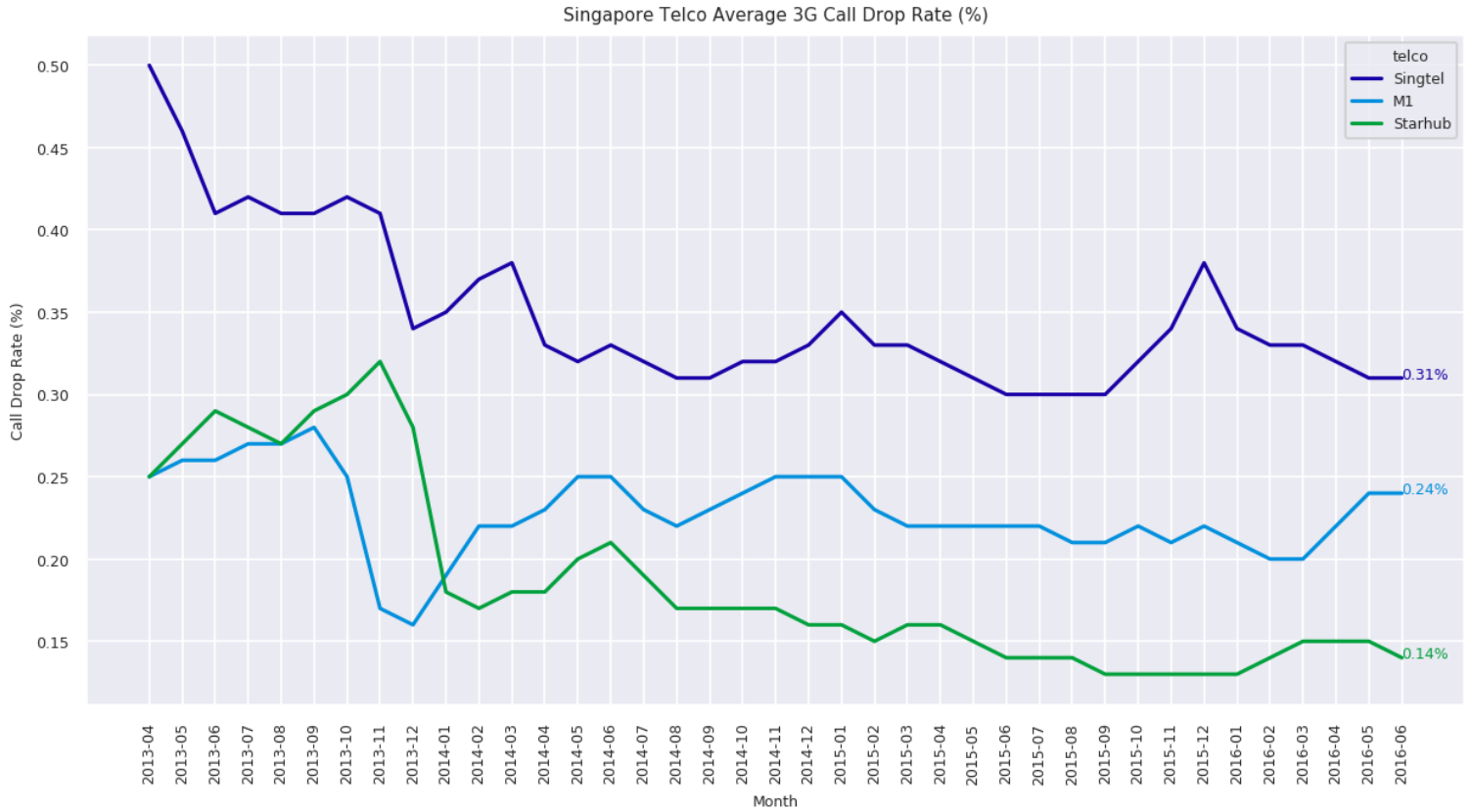
THEME 1 – TELECOMMUNICATION SERVICE STANDARDS

- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks.
- I used a lineplot to show a simple one variable comparison
- Regardless of who lead in terms of coverage initially, Singapore telcos are doing a remarkable job
- Service coverage close to 100% in recent years



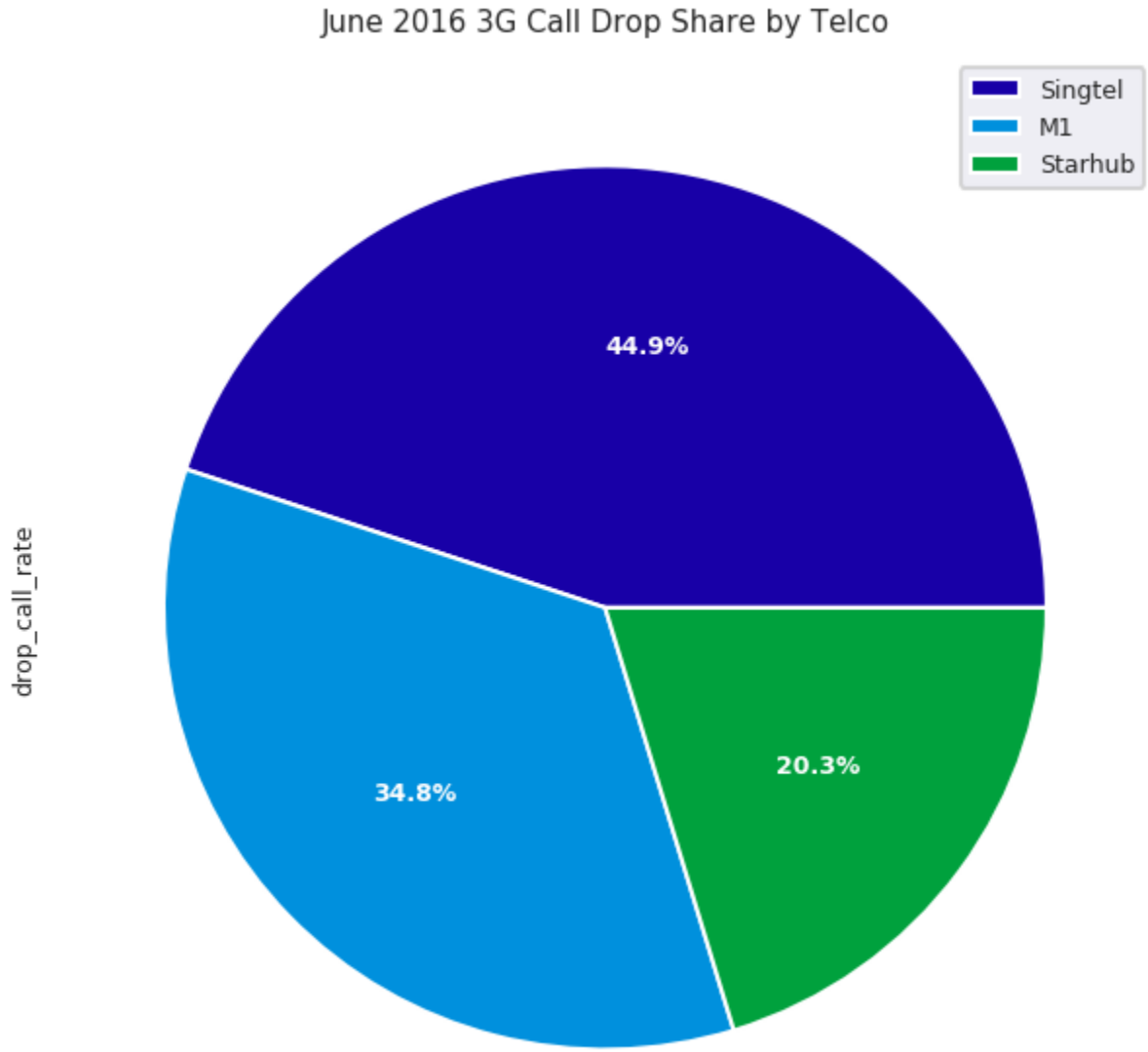
THEME 1 – TELECOMMUNICATION SERVICE STANDARDS

- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks.
- I used a lineplot to show a simple one variable comparison
- Singtel is the least reliable in terms of 3G call stability
- Again, it doesn't matter as all three major telcos offer close to 100% connection in 3G calls



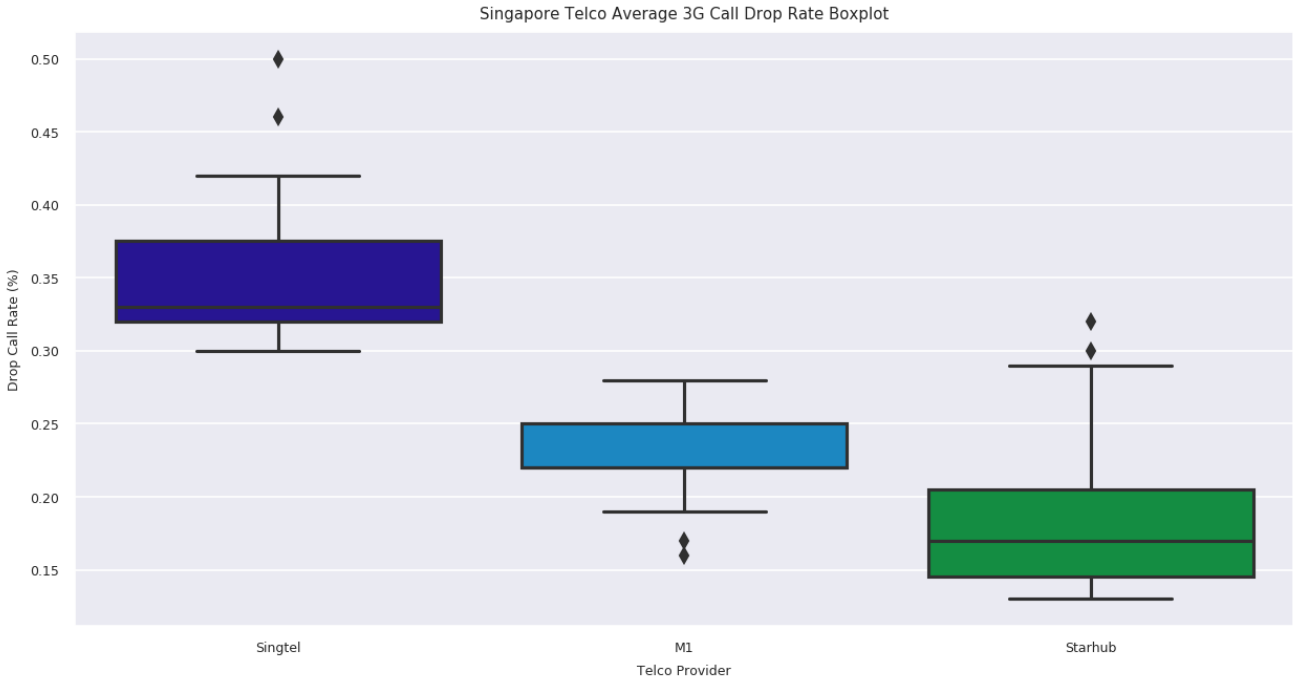
THEME 1 – TELECOMMUNICATION SERVICE STANDARDS

- I used the plot method in pandas to access matplotlib functionality, and matplotlib to label the pie chart.
- Singtel contributed 44.9% of all dropped calls in June 2016
- Starhub leads the pack in reliability

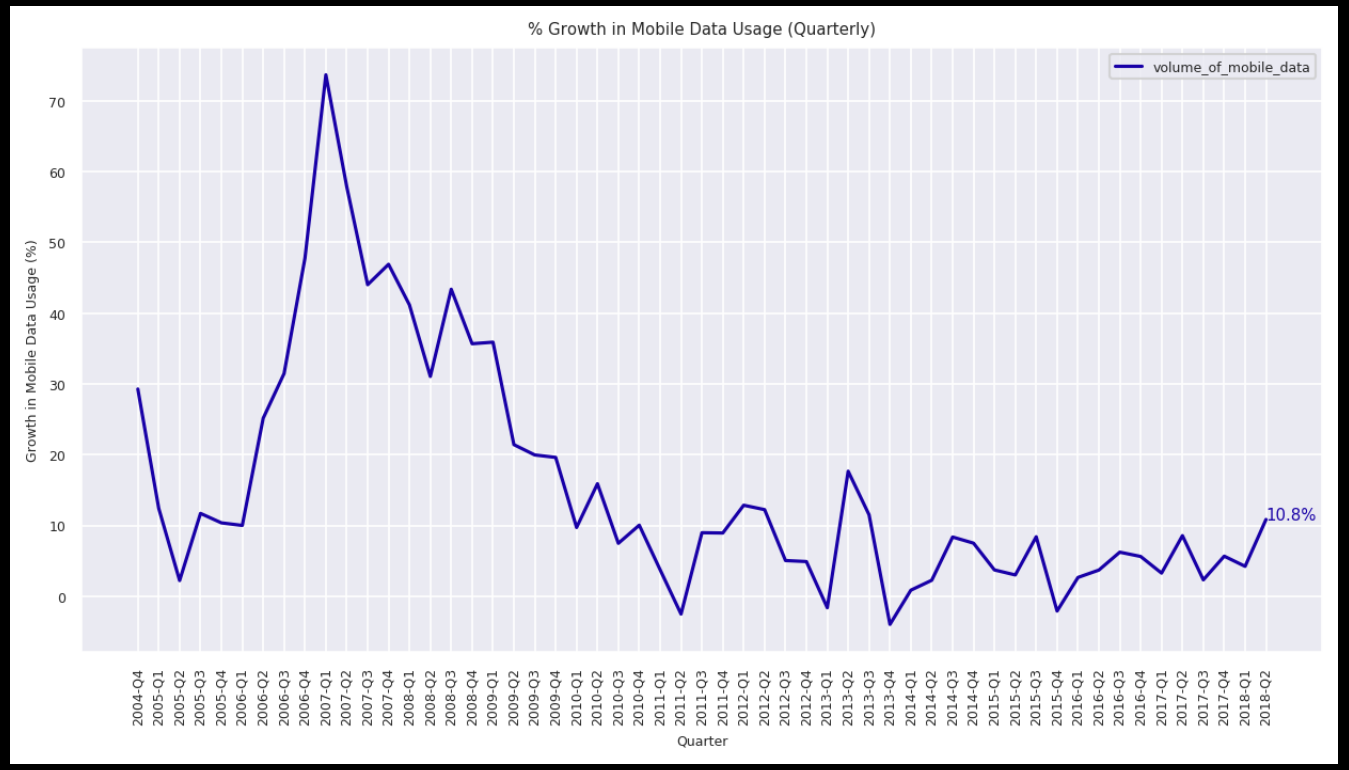


THEME 1 – TELECOMMUNICATION SERVICE STANDARDS

- I used pandas to load the dataset and seaborn to draw the boxplot. Matplotlib was used to tweak minor elements like drawing labels and axis ticks.
- I used a boxplot to summarize the distribution of one variable data by category.
- In any given month, Singtel will have the highest call drop rate, with the lower quartile of its box plot higher than the higher quartile of the other two call providers

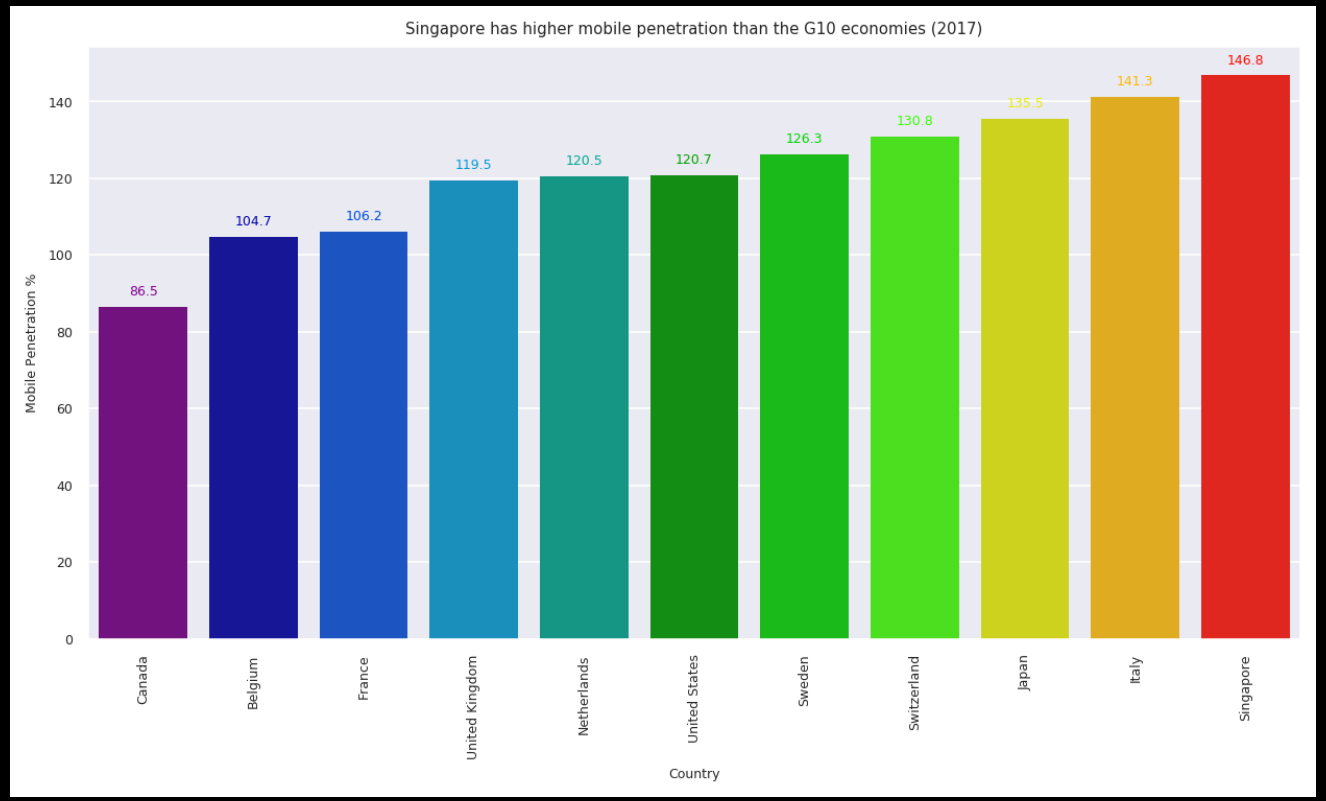


THEME 2 – MOBILE BROADBAND USAGE TRENDS



- I used np.diff to calculate percentage change in order to determine quarter on quarter growth of mobile penetration in Singapore
- I used a lineplot for a simple one variable data visualization
- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks

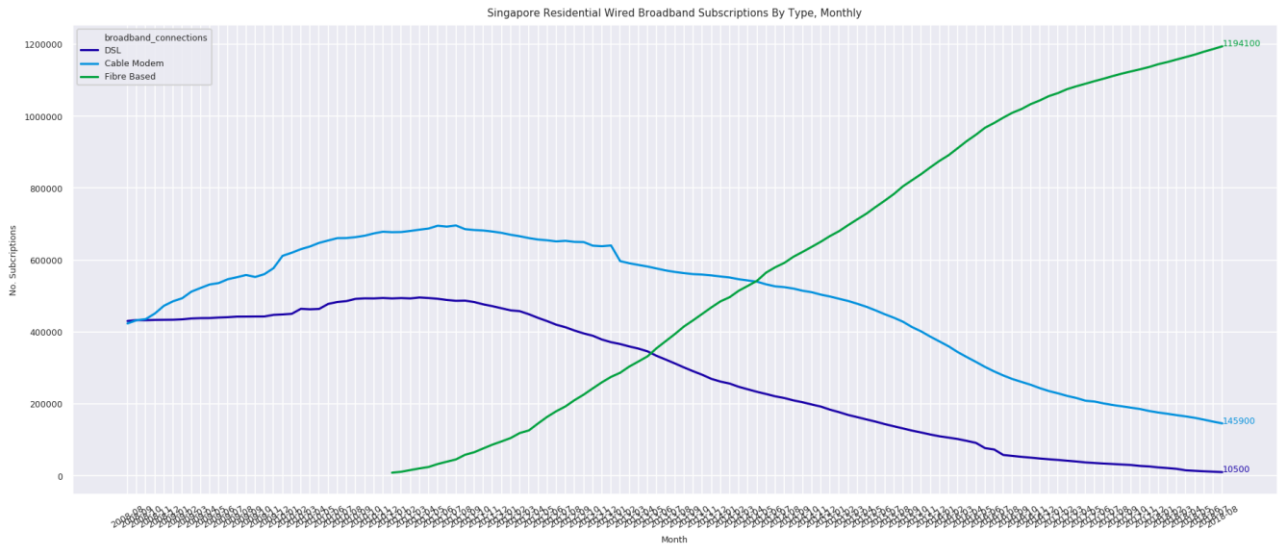
THEME 2 – MOBILE BROADBAND USAGE TRENDS



- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks.
- I used a lineplot to show a simple one variable comparison
- World Bank data was used to compare mobile penetration in Singapore with G10 countries
- Singapore leads the pack, probably due to the nature of its small land mass and high population density

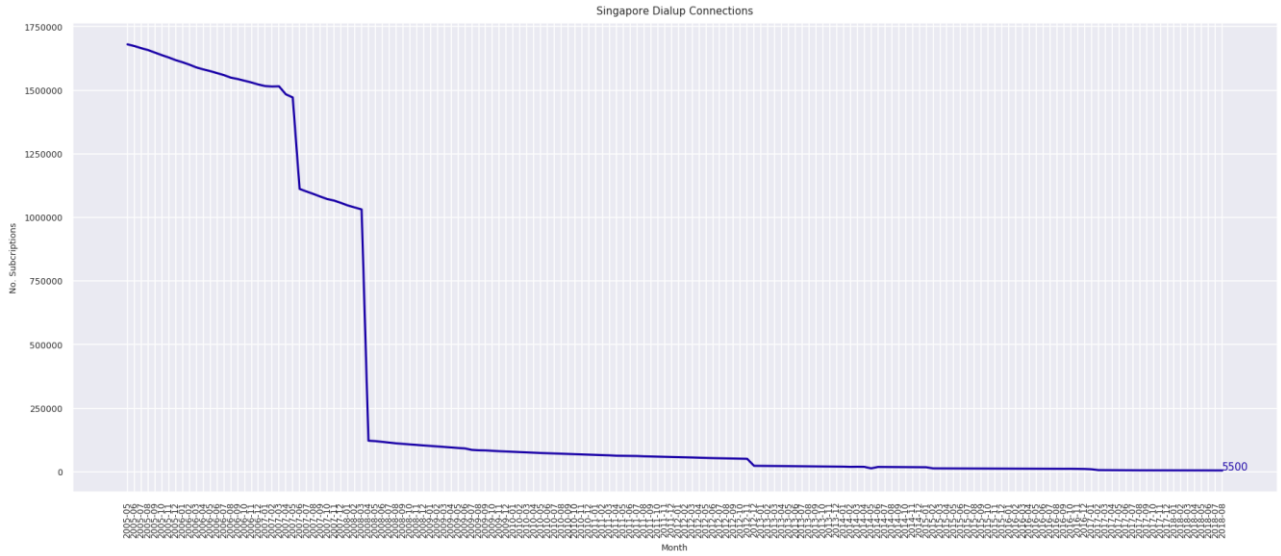
THEME 3 – FIXED BROADBAND TRENDS

- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks.
- I used a lineplot to show a simple one variable comparison
- Fibre broadband has been taking market share in Singapore, with its introduction and rise in adoption coinciding with the slow demise of DSL and Cable Modem



THEME 3 – FIXED BROADBAND TRENDS

- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks.
- I used a lineplot for a simple one variable data visualization
- Dial up connections saw a huge drop in adoption in 2007, due to market share being taken up by broadband internet.

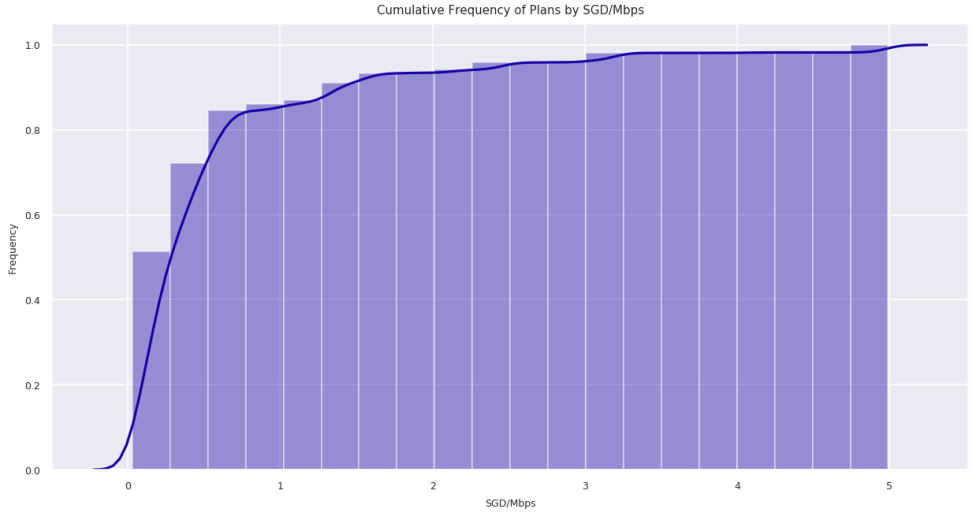


THEME 3 – FIXED BROADBAND TRENDS

- I used pandas to load the dataset, and plotly_express to generate an interactive plotly joint plot. The scatterplot is augmented with rug plots and histograms on the margins.
- The chart is interactive, meaning you can zoom in on areas to get a closer look.
- MyRepublic leads the pack in terms of SGD/mbps

THEME 3 – FIXED BROADBAND TRENDS

- I used pandas to load the dataset and seaborn to visualize the relationships. Matplotlib was used to tweak minor elements like drawing labels and axis ticks
- I used a cumulative histogram to find out under which bucket did most of the observation lie under
- Most of Singapore's fixed broadband plans (approx. 80%) are offered for below a dollar per mbps, one of the lowest in the world



THEME 3 – FIXED BROADBAND TRENDS

- I used pandas to load the dataset and seaborn to draw the boxplot. Matplotlib was used to tweak minor elements like drawing labels and axis ticks
- I used a boxplot to summarize the distribution of one variable data by category
- After controlling for the legacy ADSL plans offered by Singtel, it is clear Singtel offers pretty good value for money for fixed broadband plans