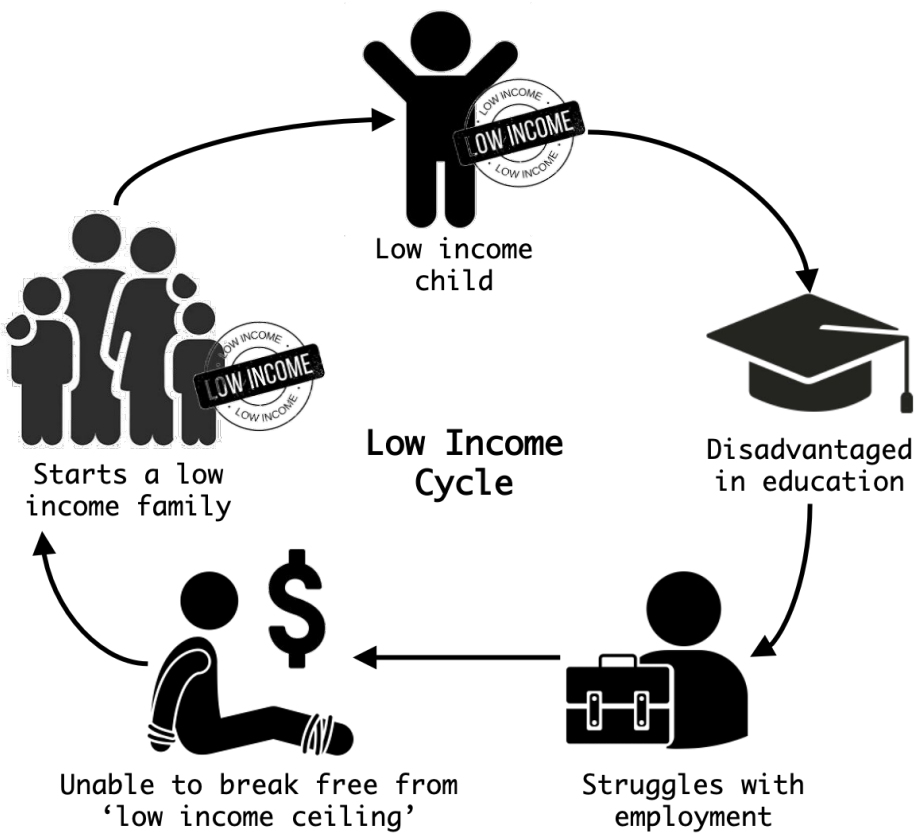
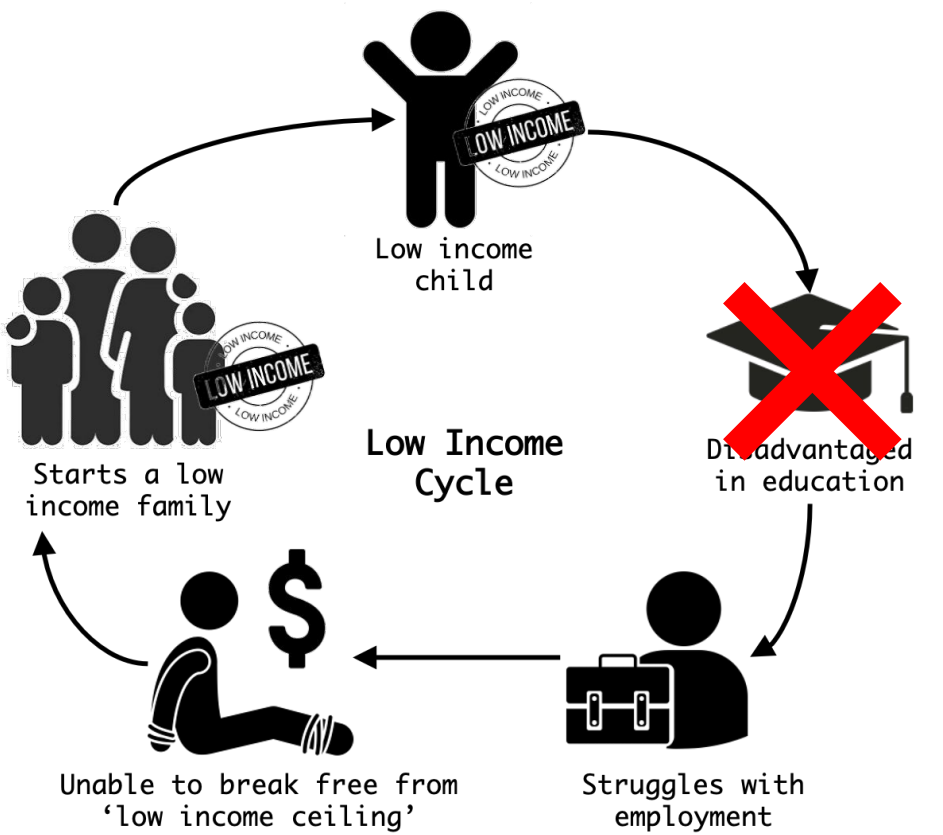
{‘DSIF3’ : ‘Group5’: [‘Project_1’]}


LOW INCOME
Low income child
Disadvantaged in education
Struggles with employment
Unable to break free from ‘low income ceiling’
Starts a low income family
Low Income Cycle



Break the cycle here!

*"**Education**, then, beyond all other devices of human origin, is **the great equalizer** of the conditions of men, the balance wheel of the social machinery."*

— Horace Mann, 1848.

SAT

Choice Colleges

↓

Better Job Opportunities

↓

Narrow Income Gap

As a team of data scientists from the Board of Education of California, we want to...

Identify the relationship between **County Income** and **SAT Participation Rate**.

Should there be a **Positive Correlation**, we want to propose qualitative solutions to **improve SAT participation rates of students from lower-income counties**.

Executive Summary

1. Background Problem Statement
2. EDA (Procedures and methodologies)
3. Visualisation
4. Scholarly Findings
5. Conclusion and Recommendation

Procedures & Methodologies

Income?

Culture?

Location?

Why Low SAT participation?

Procedures & Methodologies (contd): Importing libraries

CSV files used:

- 2019 Participation rate and scores of counties for SATs in the various counties in California, US
- 2019 Household median income by county

Procedures & Methodologies (contd): Cleaning Data

Checklist for Cleaning Data

Data Quality (validity, accuracy, completeness, consistency, uniformity)

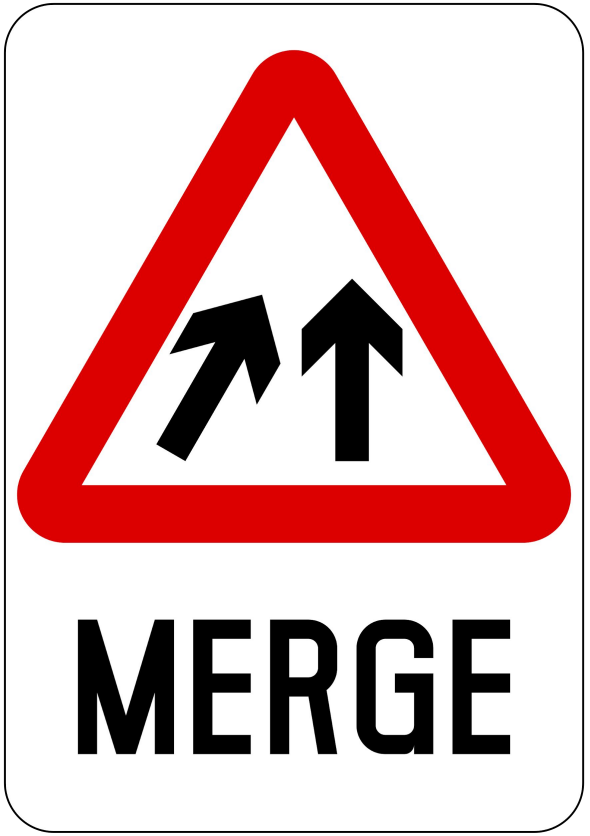
- ❏ Data drawn from U.S. Census and U.S. College Board
- ❏ Constraints considered (eg data type, mandatory, unique)
- ❏ Cross field validation (e.g. Total score of SAT cannot be less than Math score)

The workflow

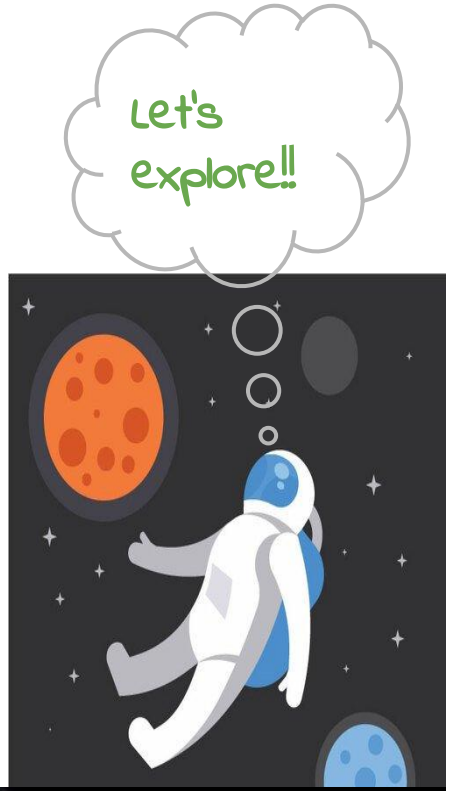
- ❏ Inspection (data profiling, visualizations. etc)
  - ❏ Detect unexpected, incorrect, and inconsistent data.
  - ❏ Check for missing values (NaN values) and management of it.
- ❏ Cleaning
  - ❏ Drop unwanted/irrelevant/duplicate columns
  - ❏ Type conversion, Fix syntax errors (e.g. white spaces), typos
  - ❏ Column names changed to lowercase
  - ❏ Replace weird/undesirable values
  - ❏ Ensure column names are unique and informative
  - ❏ Made values more readable by removing unnecessary words
  - ❏ Standardized!

Procedures & Methodologies (contd): Merging Data

- Merged 2 files:
  - 2019 Participation rate and scores of counties for SATs in the various counties in California, US
  - 2019 Household median income by county
- New merged dataframe (e.g. sat2019calinew) saved as CSV in code folder
- Dataframes merged so statistical analysis can be done



Procedures & Methodologies (contd): Data exploration using the new dataframes



- Inspection part 2 (data profiling, visualizations, etc)
- Data profiling again:
  - Measures of central tendency: e.g. mean, median mode.
  - Measures of variability: e.g. Standard deviation, minimum and maximum values.
    - E.g. df.describe() to find mean value of participation rates across counties in grade 11 and 12 respectively
  - Shape of a dataset's distribution
  - Sorted values functions often used E.g. to find the top 10 counties with highest SAT participation rates in grade 11 and 12, and bottom 10 counties with lowest SAT participation rates in grade 11 and 12
- Visualization
  - Generated Plot box, heatmap and Bar charts to discover data trends

Visualization (Overview)

SAT Participation Rate vs **Low Median Household Income**

1) Bar Charts
2) Linear Regression Model
3) Heatmap

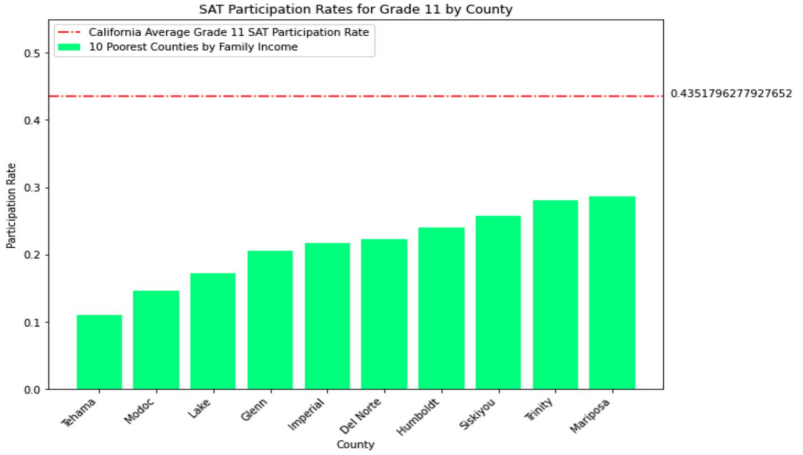
SAT Participation rate vs Low income

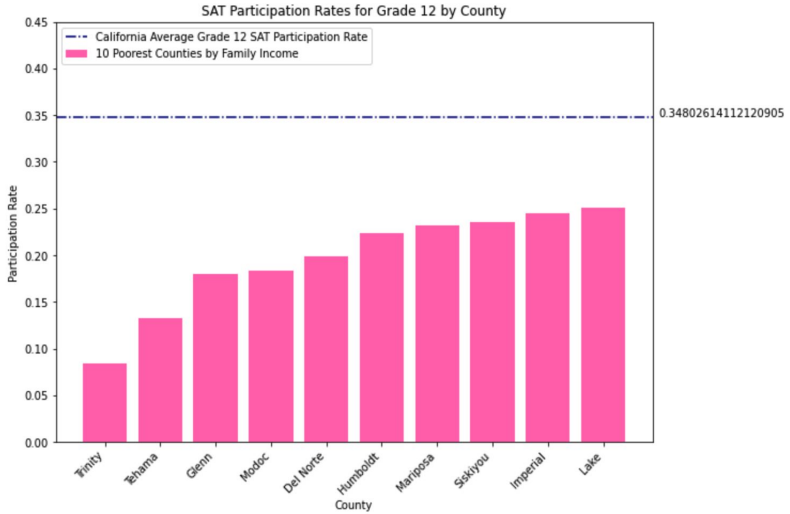
Bar charts shows Median Household income counties vs SAT Participation Rate at different Grades

10 low median household income counties as shown

Low Median Household Income = Low Participation Rate

SAT Participation Rate for Average Grade 12 & 11 in California





linear regression model

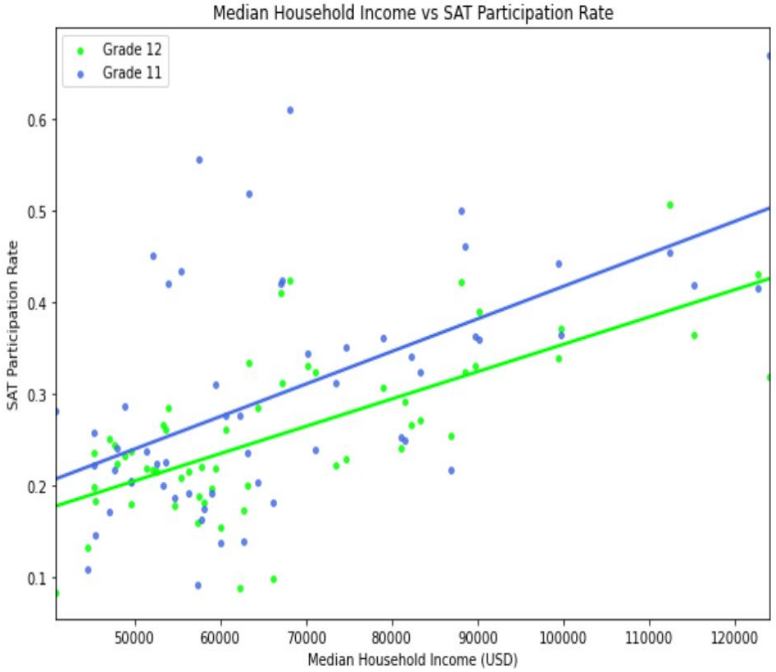
$$y = \beta_0 + \beta_1 x_1$$

Fig shows SAT participation rate being affected by low median household income(USD)

The lower Median Household income (USD), the lower participation rate for SAT

SAT Participation Rate slightly lower 0.2 , Median Household Income = 25,000

There is a strong positive correlation.



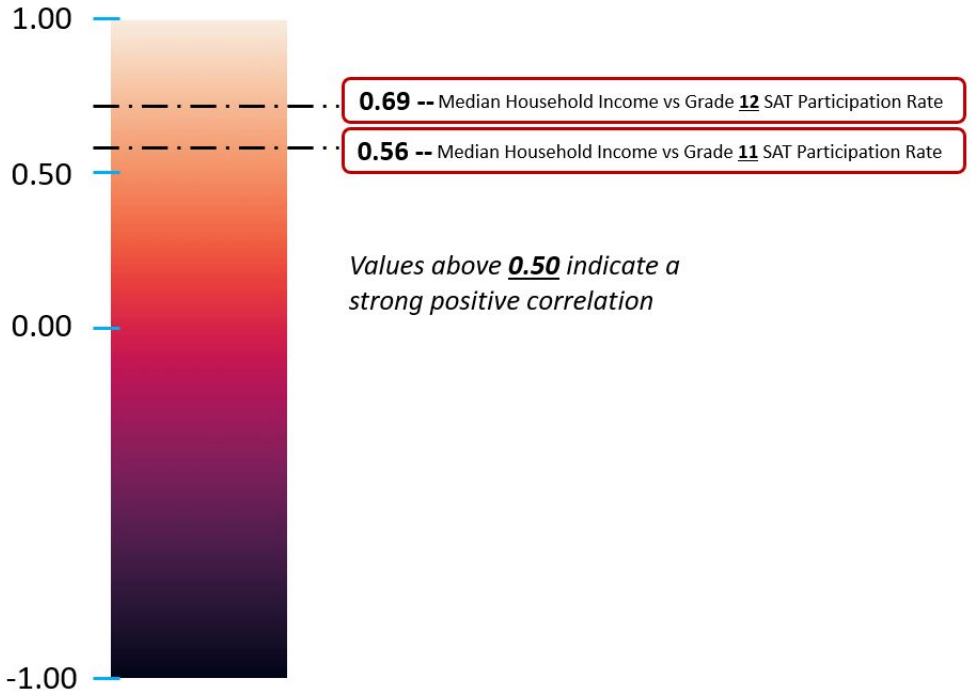
HEATMAP- Participation rate vs Low income

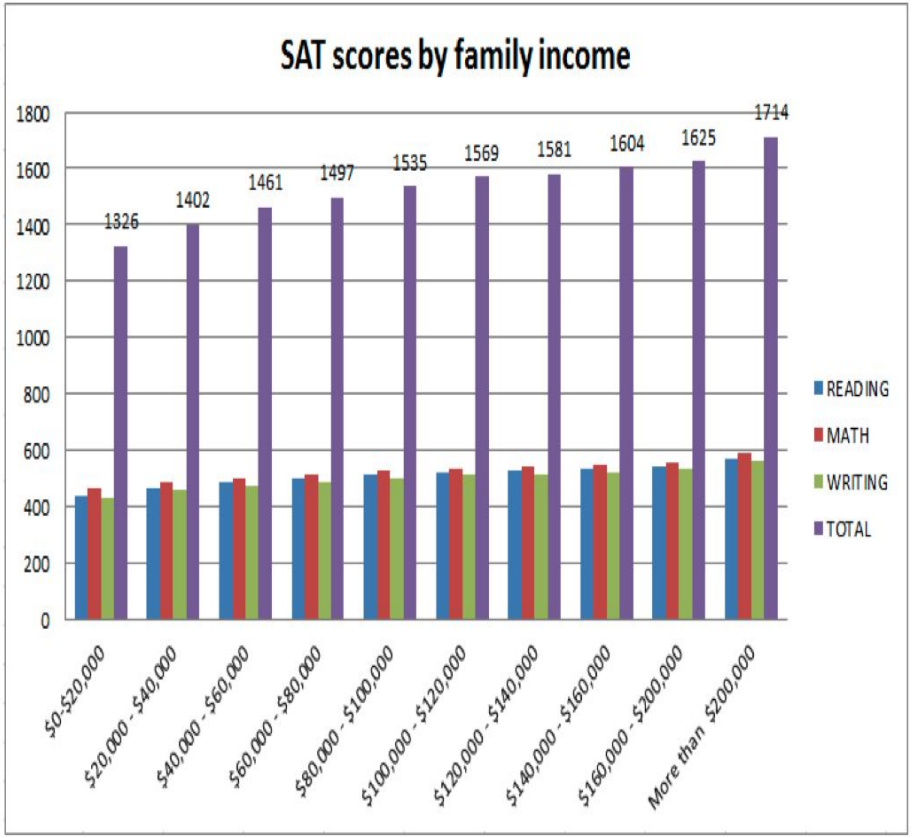
Figure shows, Heatmap of Median Household income (USD) vs Participation Rate

SAT Grade 12 = 0.69

SAT Grade 11 = 0.56

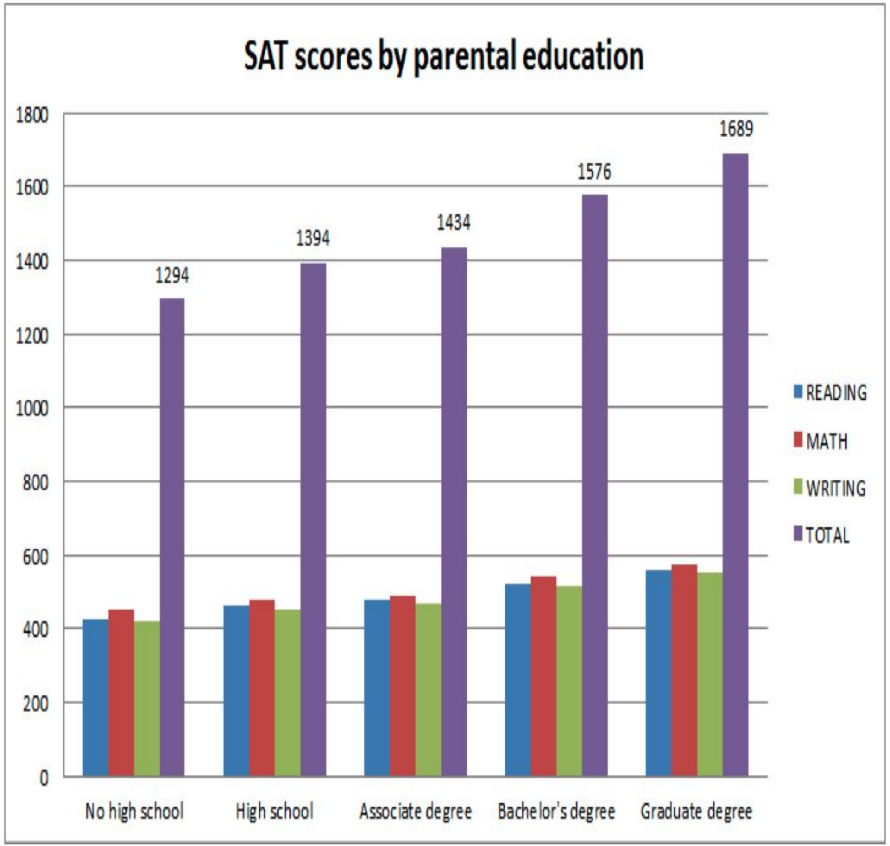
Both heatmap are >0.5





Parental income and socioeconomic status are correlated to academic achievement. (Dixon-Román, 2007; Rothstein, 2004)

Research shows that parental income has a substantial effect on academic achievement and accounts for a meaningful proportion of the score gap between high income families and the low income families.



Parental education is correlated to academic achievement. (Mattern, Shaw, & Williams, 2008; Zwick, Brown, & Sklar, 2004)

Research shows that parental education has a significant effect on academic achievement and accounts for a meaningful proportion of the score gap between high income families and the low income families.

Strategies that work to increase SAT participation

```
1 sat_2019[sat_2019['State'].isin(['Delaware', 'Idaho'])]
```

	State	Participation Rate	EBRW	Math	Total
7	Delaware	100%	499	486	985
12	Idaho	100%	505	488	993

1. Offering SAT at no cost
2. Free access to the College Board's official SAT online course
3. Conducting SAT exam during regular school hours with transportation provided.
4. Engagement with the school counselor

Conclusion

SAT increases students' chance of admission to good school and narrow income gap in the long run. Our goal is to improve SAT participation rate.

Household income is strongly correlated with SAT participation rate.

Recommendations to improve SAT participation rate:

1. Offering SAT at no cost
2. Conducting SAT exam during regular school hours with transportation provided.
3. Engagement with the school counselor
4. Free access to the College Board's official SAT online course

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