



# Project 1 - ACT/ SAT analysis

# Agenda

- Problem Statement
- Executive Summary
- Pre-processing of Data
- EDA
- Conclusions & Recommendations



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## Problem Statement

Participation rates in SAT and ACT varies differently across states, through data science, we seek to explore patterns and understanding behind each state, quantitatively and qualitatively to provide College Board insights on driving SAT participation rates upwards.



# Executive Summary

Objective: Increase SAT participation rate in a particular state

Process:

- **Consolidating** data from SAT and ACT from 2017 and 2018
  - Import, Cleaning and Editing
- **Translating** data into visualizations charts to observe patterns
- **Understanding** patterns, anomalies on the charts
  - Qualitative research on observations to understand extremities, e.g. Why some states achieved 100% participation rate ?
  - Quantitative research through statistical inference

Outcome:

- Providing states with advisory on increasing participation rate, through evidence-based findings

# Pre-processing of Data

Data import

Data cleaning

Data merging

Import of csv files for the following:

- 2017 SAT Data
- 2017 ACT Data
- 2018 SAT Data
- 2018 ACT Data

	State	SAT_Participation	SAT_Evidence-Based Reading and Writing		SAT_Math	SAT_Total
0	Alabama	5		593	572	1165
1	Alaska	38		547	533	1080

	State	ACT_Participation	ACT_English	ACT_Math	ACT_Reading	ACT_Science	ACT_Composite
0	National	60	20.3	20.7	21.4	21.0	21.0
1	Alabama	100	18.9	18.4	19.7	19.4	19.2

# Pre-processing of Data

Data import

Data cleaning

Data merging

- Compare questionable values to data source and fix errors
- Converting data type
- Drop unnecessary rows
- Rename columns to be consistent



# Pre-processing of Data

Data import

Data cleaning

Data merging

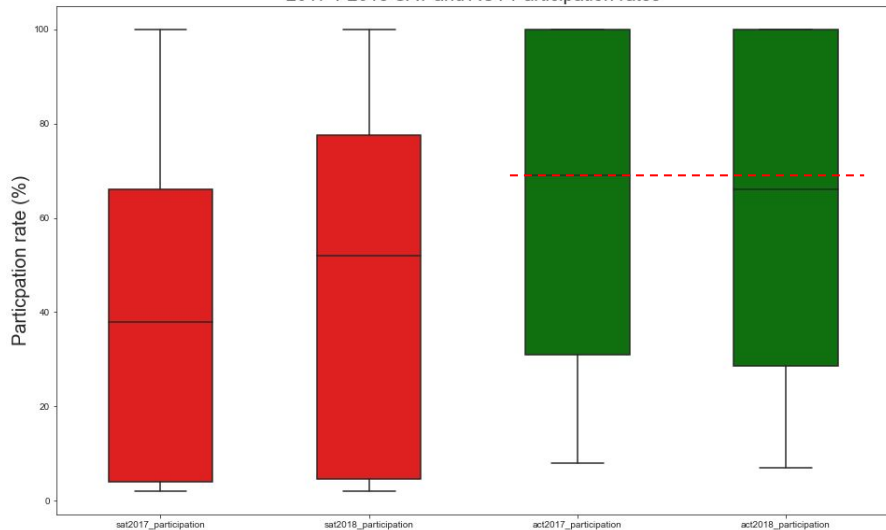
- Merge all SAT and ACT datasets for both years

State	2017_SAT_Participation	2017_SAT_Evidence-Based Reading and Writing	2017_SAT_Math	2017_SAT_Total	2017_ACT_Participation	2017_ACT_English	2017_ACT_Math
Alabama	5	593	572	1165	100	18.9	18.4
Alaska	38	547	533	1080	65	18.7	19.8
Arizona	30	563	553	1116	62	18.6	19.8

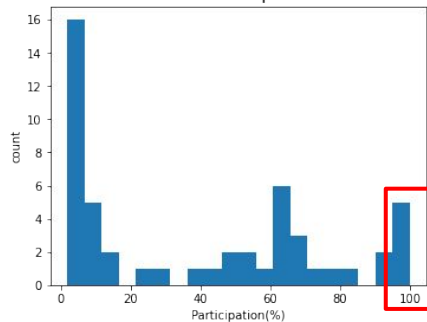
2018_SAT_Math	2018_SAT_Total	2018_ACT_Participation	2018_ACT_Composite	2018_ACT_English	2018_ACT_Math	2018_ACT_Reading	2018_ACT_Science
571	1166	100	19.1	18.9	18.3	19.6	19.0
544	1106	33	20.8	19.8	20.6	21.6	20.7
572	1149	66	19.2	18.2	19.4	19.5	19.2

# Exploratory Data Analysis

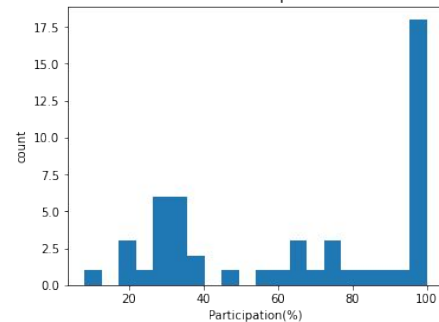
2017 v 2018 SAT and ACT Participation rates



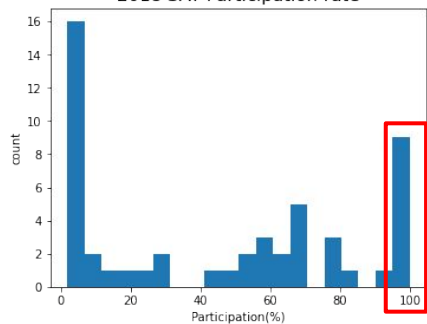
2017 SAT Participation rate



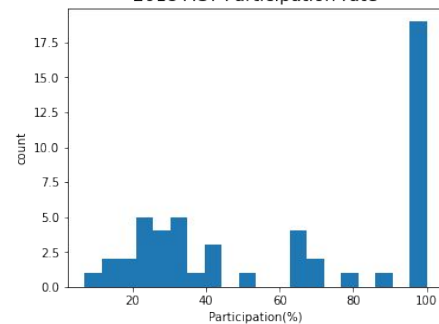
2017 ACT Participation rate



2018 SAT Participation rate



2018 ACT Participation rate

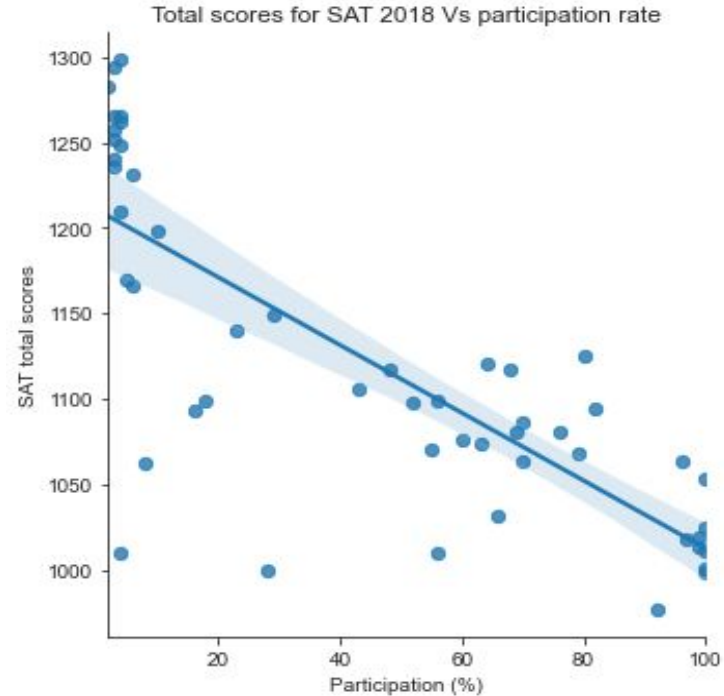
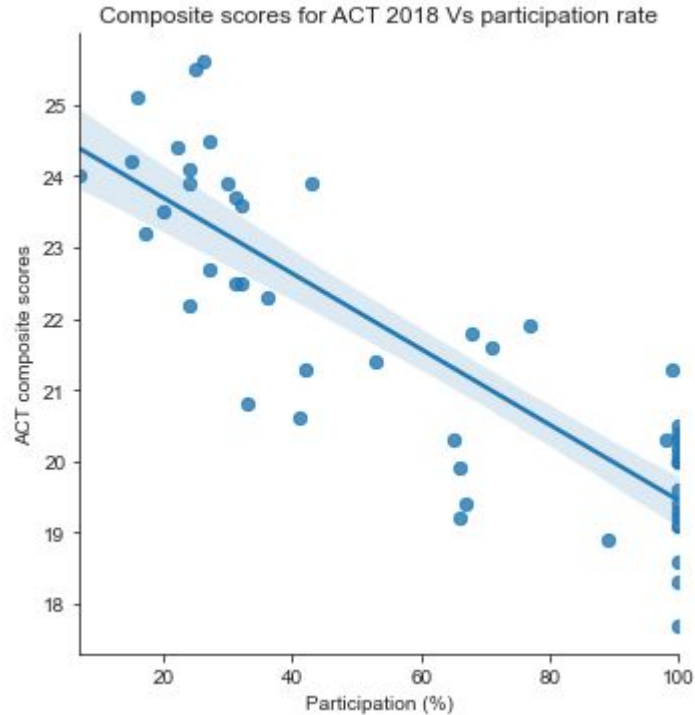


## Key observations:

- SAT YOY increased more than 20%
- More states with 100% SAT participation YOY
- Even though more states with 100% ACT participation, YOY the ACT median has dropped indicating states might be keen to take up SAT

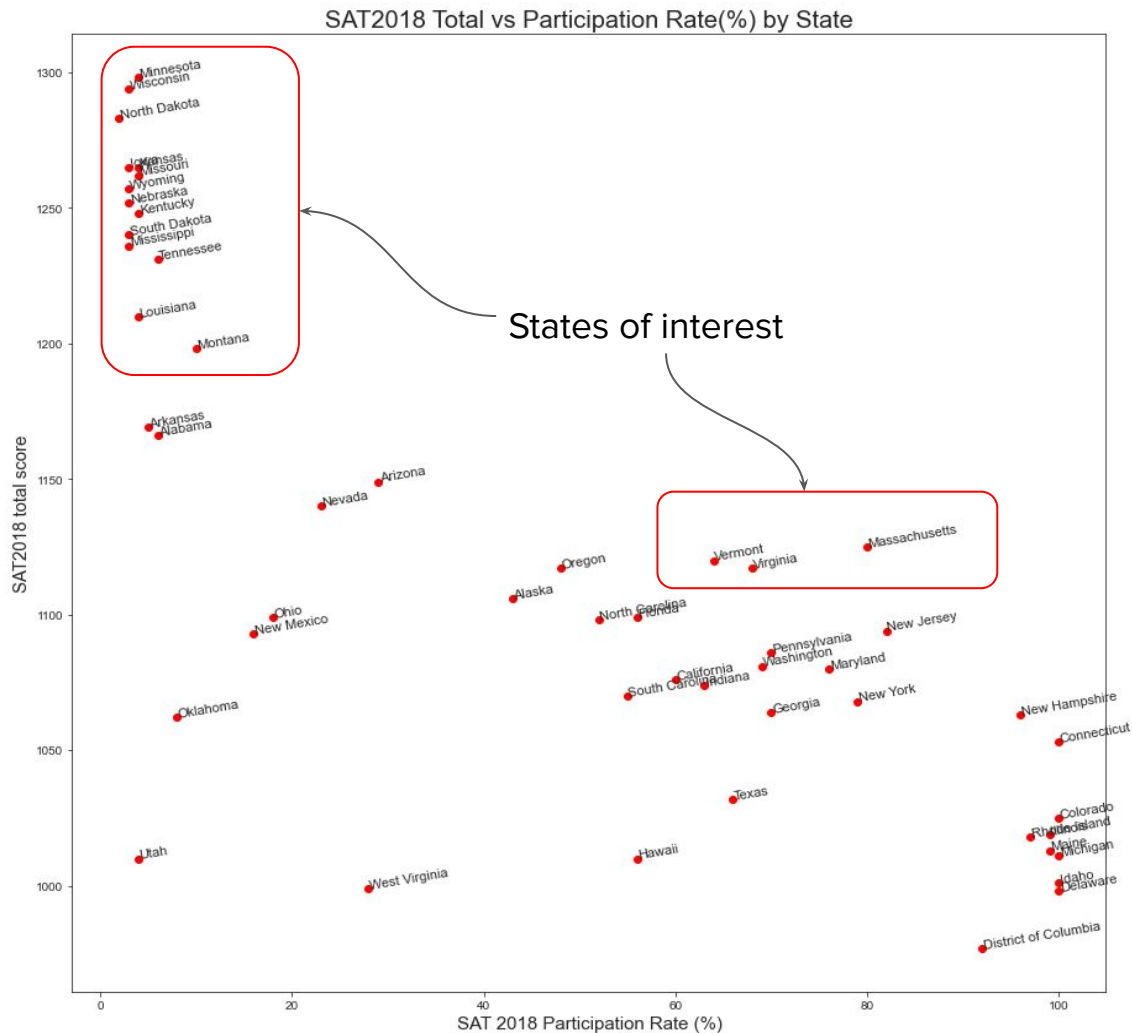


# Exploratory Data Analysis



Strong negative correlation observed

# Exploratory Data Analysis



# Exploratory Data Analysis

What's worked?

- Significant increase in participation rates in Illinois & Colorado

Filtering out states with low SAT participation in 2017 (i.e. <25%) and increased to high SAT participation in 2018 (i.e. >75%)

```
In [164]: final_df.loc[(final_df.sat18_participation >= 75) &
                      (final_df.sat17_participation < 25),
                      ['state', 'sat17_participation', 'sat18_participation']
                      ].sort_values('sat18_participation', ascending=False)
```

Out[164]:

	state	sat17_participation	sat18_participation
5	Colorado	11.0	100.0
13	Illinois	9.0	99.0

# Outside Research

What's worked :

- Outside research confirmed State Contracts are instrumental to SAT growth.

Q

Sections

The Washington Post  
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By Nick Anderson

Oct. 24, 2018 at 8:00 a.m. GMT+8

The SAT has vaulted past the rival ACT to reclaim its long-held position as the nation's most widely used college admission test, according to data provided Tuesday to The Washington Post.

Nearly 2 million U.S. students in the class of 2018 took the SAT during high school, compared with 1.91 million who took the ACT. A surge in delivery of the SAT on school days helped fuel the switch.

Counting international students, 2.1 million who graduated from high school this year took the SAT. That was up more than 20 percent from the previous year's global total of 1.7 million.

The ACT had been the overall leader [since 2012](#). But the College Board, which owns the SAT, pushed to expand its market share in recent years by revising the test and entering into deals with numerous states and school systems to give students the exam. [New contracts with Colorado and Illinois, College Board data show, were instrumental in the SAT's growth.](#)

# Approach to identify opportunity states:

- Focus on states with lowest SAT participation rates
  - Use 2018 as the most recent data to identify opportunities to improve going forward.
- Filter out states with Mandated ACT tests as these are harder to target & convert.



# Approach to identify opportunity states:

Filtering states with that meet the criteria:

```
# List of ACT and SAT states taken from https://www.testive.com/state-sat-act/
act_states = ['Alabama', 'Hawaii', 'Idaho', 'Kentucky', 'Louisiana', \
              'Mississippi', 'Missouri', 'Montana', 'Nebraska', 'Nevada', \
              'North Carolina', 'North Dakota', 'Ohio', 'South Carolina', \
              'Tennessee', 'Utah', 'Wisconsin', 'Wyoming' ]

sat_states = ['Colorado', 'Connecticut', 'Delaware', 'District of Columbia', \
              'Idaho', 'Illinois', 'Maine', 'Michigan', \
              'New Hampshire', 'Ohio', 'Tennessee' ]

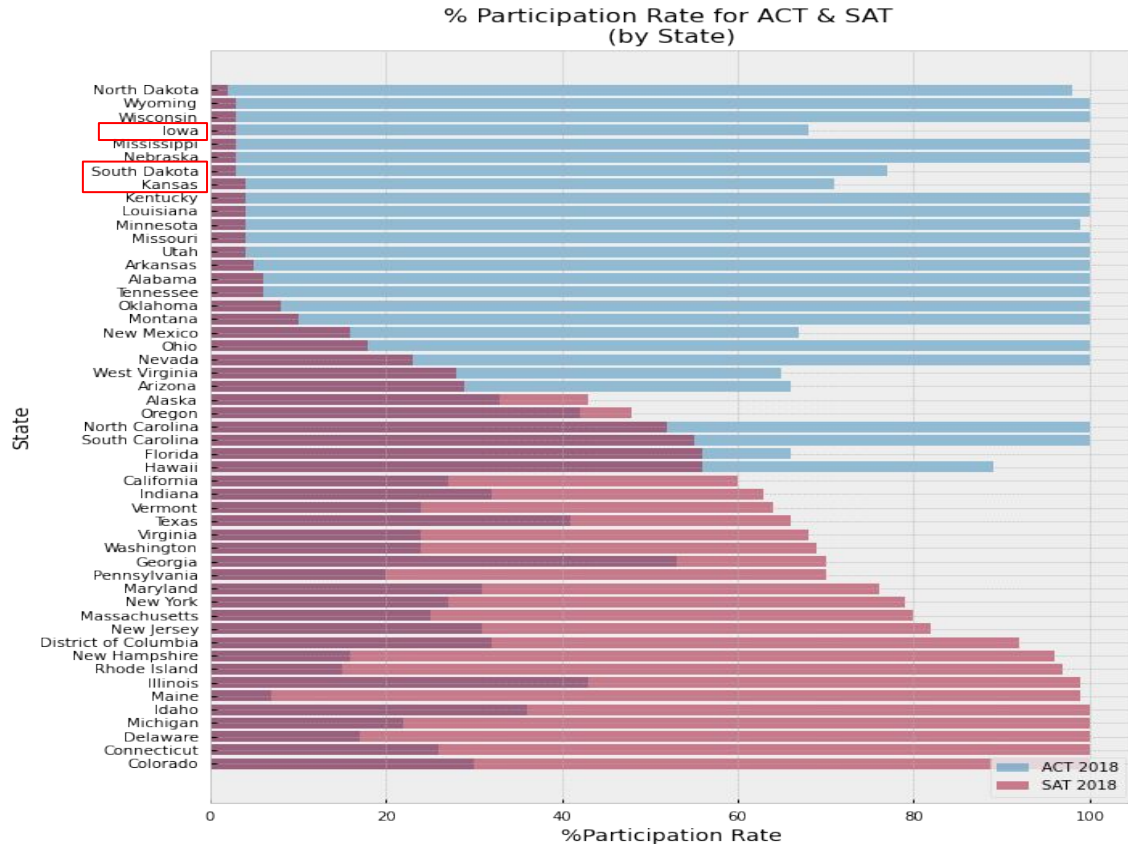
# filter out ACT and SAT mandated states
state_part = final_df[(~final_df['State'].isin(act_states)) & (~final_df['State'].isin(sat_states)) ].copy()
# filter other columns except participation rates
state_part = state_part[['State', '2017_SAT_Participation', '2018_SAT_Participation', \
                        '2017_ACT_Participation', '2018_ACT_Participation']]

# Look at states with SAT participation rate below 20% and
# ACT participation rate below 70%
state_part = state_part.set_index('State')
state_part[(state_part['2017_SAT_Participation'] < 20) & \
           (state_part['2018_ACT_Participation'] < 70)] \
           .sort_values('2017_SAT_Participation')
```

# Approach to identify opportunity states:

Identifying states with visualizations:

- Iowa
- South Dakota
- Kansas



# Key Takeaways

1. A higher participation rate can only be achieved by the state making either test mandatory and providing the necessary funding to make it affordable for students.
  - a. For example, Ohio state had made either ACT or SAT compulsory for high school students. This resulted both test participation rates to increase YOY.
2. Overall SAT scores improved in year 2018 despite the higher participation rate comparing to previous year, while ACT score remains relatively stable.
3. Factors such as choosing to go to a neighbouring state influenced the preference between SAT and ACT.
  - a. For example, in South and North Carolina, even though they had 100 % ACT participation due to state funding, their SAT participation was above 50%, indicating that students were preparing to enrol in colleges in the Upper East Coast



# Recommendations for the state, Iowa

1. Adopt same strategy as for Colorado & Illinois with State Contracts (SAT School Day Program).
2. Mandating the completion of SAT for all high school students.
3. Fee waivers to cover test registration costs
4. Create digital prep workshops or seminars to increase the student interest in the SAT and hear success stories
5. Encouraging state colleges to offer SAT sponsorships



# Thank You

Questions??