

CMPE 280 TERM PROJECT

# ELECTION DATA VISUALIZATION



## TEAM – MEAN CODERS

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## INTRODUCTION AND PURPOSE

Elections are the backbone of the democracy and it gives citizens an opportunity to have their voices heard. It is important that all the people eligible to vote actually vote because if that does not happen, the elections end up under-representing certain group of people who did not vote. But election process can be challenging to manage because of the many factors at play like, voting time, registration problems, ballot cast rejections, issues faced by disabled people and much more. These factors if not managed properly will affect the voter turnout which is a direct threat to democracy. In order to avoid these problems, Federal election committee can use the data collected over the last few years to gain insights about the issues faced by each state of the US and take decisions to resolve these issues. Our tool provides a very unique view of the data collected by using 9 different Key Performance Indicators (KPI) for each state. Using these KPIs, each state can be ranked and analyzed individually or with all the other states.

## TARGET USERS

### 1. Federal election committee (FEC)

It is an independent regulatory agency whose purpose is to enforce campaign finance law in United States federal elections. FEC government officials can make use of our application to gain insights about the election process and make key decisions. Decisions may include,

- Proper arrangements for voters with disability.
- Steps taken to make the election process smoother like decreasing the wait time for voters.
- Help improve the ways/methods we can collect the election data.
- Steps taken to encourage people to exercise their voting right especially, young people.
- Compare states, make decisions like, if a state is performing good, follow the strategies or methods adopted by the good performing state to improve the performance in the under-performing states.

### 2. Geo-Political/history students/professor

Our application can also be used by political science students and professors as a visualization tool to gain insight and more information about the elections.

## DECISIONS MAKING AID

The election dashboard prompts following decision making:

- States where proper arrangements should be made for voters with disability conditions.

- Make the election process smoother like decreasing the wait time for voters.
- Data completeness- Helps to improve the ways/methods we can collect the data.
- Voter Turnout - Steps to be taken to encourage people to exercise voting especially young people.
- State comparison- compare states, make decisions such as if a state is performing good, follow the strategies or methods adopted by the good performing state to improve the performance in the underperforming states.

## TECHNOLOGIES USED



Mongo DB, Express, React, Node JS, React-google charts, Fusion charts

## DATASET

The data for this visualization project is taken from MIT Election Data and Science lab. It is a dedicated organization to the nonpartisan application of scientific principles to election research and administration. This lab is responsible for datasets that fuel studies on elections and how they are conducted. All the information can be found on <https://elections.mit.edu/>.

It two csv files. For our analysis we have taken data from 2008 to 2016. 2018 data is not yet made public. All the data sets can be downloaded from <https://github.com/MEDSL/elections-performance-index>.

The dataset contains 17 different Key Performance Indicators (KPI). Out of which we have used 6 KPI's for our project.

## KPI EXPLANATIONS

1. **Data Completeness** – The data completeness KPI measures the degree to which states provide information to the EAC about core election administration activities, through the Election Administration and Voting Survey (EAVS) [1].
2. **Voter turnout** - Turnout is the total number of people who cast a ballot, as reported to each state's leading election authority, divided by the eligible voting population [2].

3. **Disability or illness related voting problems** - This KPI measures the degree to which voters are deterred from voting because of disability or illness [3].
4. **Voter Wait time** - This KPI tracks the average amount of time voters spend in line in order to vote, or to deposit a ballot that had been mailed to them in a drop box [4].
5. **Registration rejection** - This KPI measures the degree to which voter registrations are rejected, as a percentage of new registrations received by a state [5].
6. **States with online registration** – This KPI tracks whether states offer online voter registration to its citizens [6].

## CHART DESIGN PRINCIPLES

1. **Use of familiar chart types** - We have used common charts such as bar, sparkline, horizontal charts and map.
2. **Bar charts should start at zero.** - The bar chart we have used starts from 0.
3. **Don't include a legend when it's not needed** -We have not used legends when the graph is self-explanatory.
4. **Avoid 3D charts**
5. **Do not use randomly generated colors.** - None of our charts have randomly used colors.
6. **Avoid mixing chart types** - We have avoided mixing chart types and all the charts in the dashboard have single chart type.
7. **Order the data series** - We have ordered data series in horizontal bar chart to improve the readability of the chart.
8. **Data-ink ratio**

## DASHBOARD PRINCIPLES

1. **Not more than a single screen:**
  - a. The dashboard consists of only a single screen which shows a proper layout for all the components.
  - b. It shows everything needed (in our case, all the charts related to the elections data) all at once.
  - c. As a result, the user need not scroll to see all the content.
2. **Relevant context of the data:**
  - a. The data shown on the dashboard is acquired from the USA election

dataset.

- b. It shows four charts each depicting a proper context.
  - i. Chart 1 is a Map which shows the availability of online registration in year 2016.
  - ii. Chart 2 is a Column chart which shows the percentage of voter turnout over the years 2008-2016
  - iii. Chart 3 is a Line Chart which shows the percentage of voters with disability in the state of Vermont in the year 2008 to 2016.
  - iv. Chart 4 is a Horizontal Bar Chart depicting the state-wise average voting wait time (in minutes) in the year 2016.

### **3. Avoidance of excessive detail or precision:**

- a. The dashboard handles only the high-level data.
- b. As a result, it becomes easier for the user to scan through the data in a short period of time and also helps user to get the relevant data only.
- c. In our case, the dashboard consists of one of the charts which shows the percentage of the voters with disability.
- d. In this, the chart maps the percentage of voters with the year of voting (2008-2016) for the state of Vermont.
- e. The precise data increases the clarity with which the data is conveyed to the user.

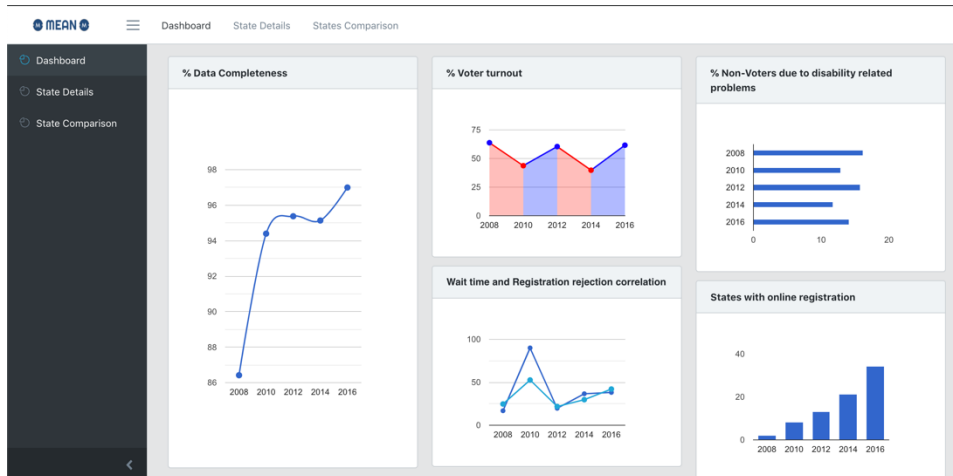
### **4. Proper arrangement of data:**

- a. The four charts are arranged in a manner such that all the needed information stands out. The page is divided into 4 parts wherein each chart is allotted a particular section of the page.
- b. The information shown in the charts stands out, providing the users with the data required

## **DESIGN PATTERNS**

### **A. Organization Pattern – Dashboard**

Dashboard pattern helps users monitor the information. It is used to see the important information at a glance. An incoming flow of information is depicted strategically on the page. It is a single information-dense page wherein the information widgets are frequently updated.



National average dashboard 1

## B. Action Pattern – Button Group

Button Group pattern has been used in two of the pages in the application viz. “State Details” and “State Comparison” to group similar actions. It helped making the interface self-describing as the buttons for year selection show the related actions that are available. Likewise, the button group of indicators gives viewer indication that these actions are related.

## C. Page Layout Pattern - Visual Framework, Tiled Sections

**Visual Framework:** The application provides a common framework for all the application pages and also allows flexibility to handle page content. This design pattern is used to design an application with multiple pages. On using this design pattern in the application, there is a consistency which makes the user experience better. Moreover, the pattern helps page content stand out.

**Tiled Sections:** This pattern is used in “State Detail” page of application where the state content, ranking and performance are grouped as separate sections which eases in scanning the required information.

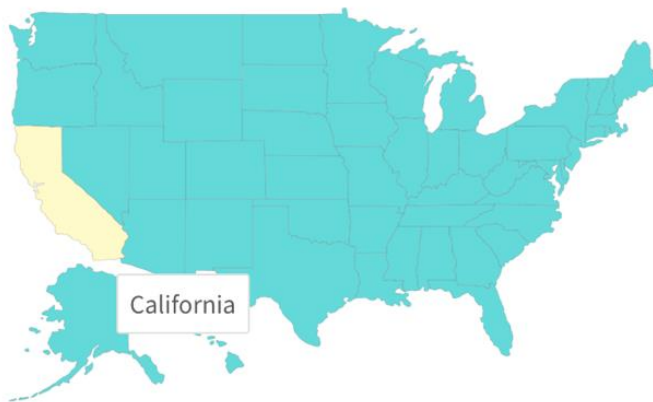
## D. Navigation Pattern – Fully Connected

The application has a global navigation feature implemented using top menu and side menu, which allows user to navigate to any page from any other page.

## JUSTIFICATION FOR VISULIZATION

## 1. Maps

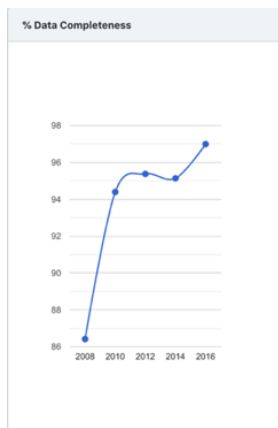
- Map chart is used to display the map of USA in the “State Details” page.
- It allows users to pick a state for which data needs to be visualized.
- We have used Fusion charts to display the map.
- The state selected by the user gets highlighted.
- Upon state selection, the data is populated on the “State Details” page according to the year selected.



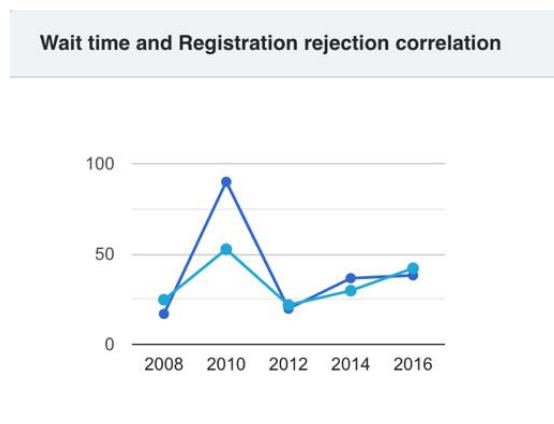
Map of the USA 1

## 2. Line chart

- Line chart is used in couple of instances like data completeness and comparison of voting time and registration related problems.
- Line charts are very useful in representing the trend of an indicator.
- Line charts are very effective in comparing the trends of two entities.



Data completeness trend using line chart 1

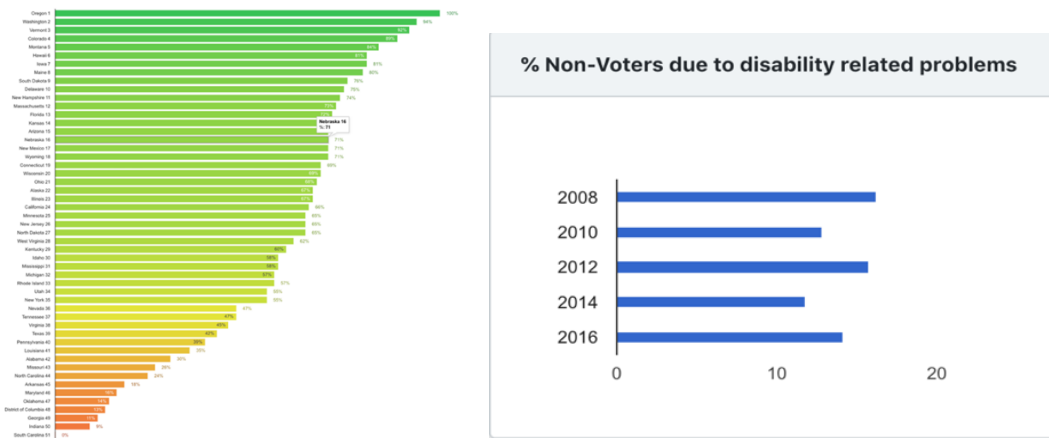


Comparison line chart 1



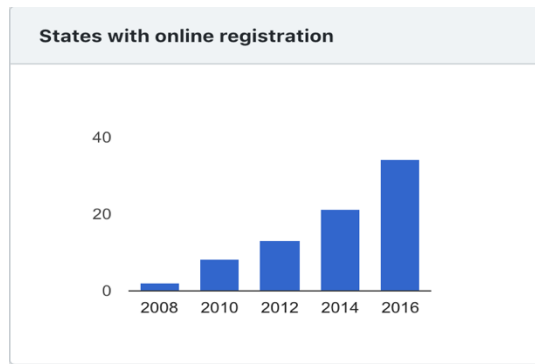
### 3. Bar Chart

- A bar chart is used in “State Comparison” page which helps in comparing states’ performance based on the indicators selected.
- It shows their relative ranking and performance percentage on a scale of 0-100.
- The rankings here are calculated using min-max scaling technique for each year across all states.
- Bar chart is also used in “Dashboard” page and “State Details” page to display the % of non-voters who could not come to cast their vote due to disability conditions.
- It provides a year-wise comparison across states.



### 4. Column Chart

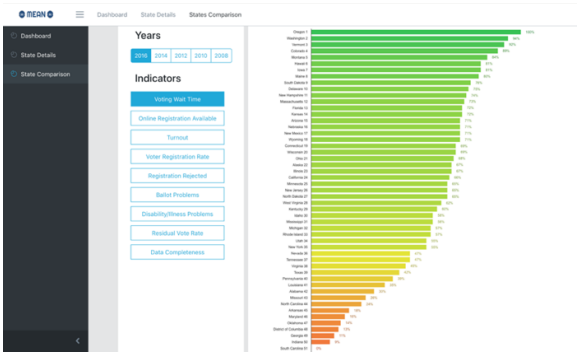
- Column chart is used in application to display and compare count of states with online registration facility available across years.



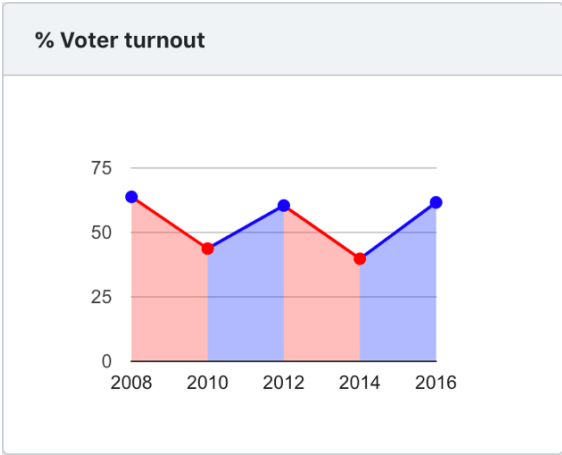
## PRE-ATTENTIVE ATTRIBUTES:

Pre-attentive attributes are used in application to direct viewer’s attention towards the most important action items on the webpage. The instances are:

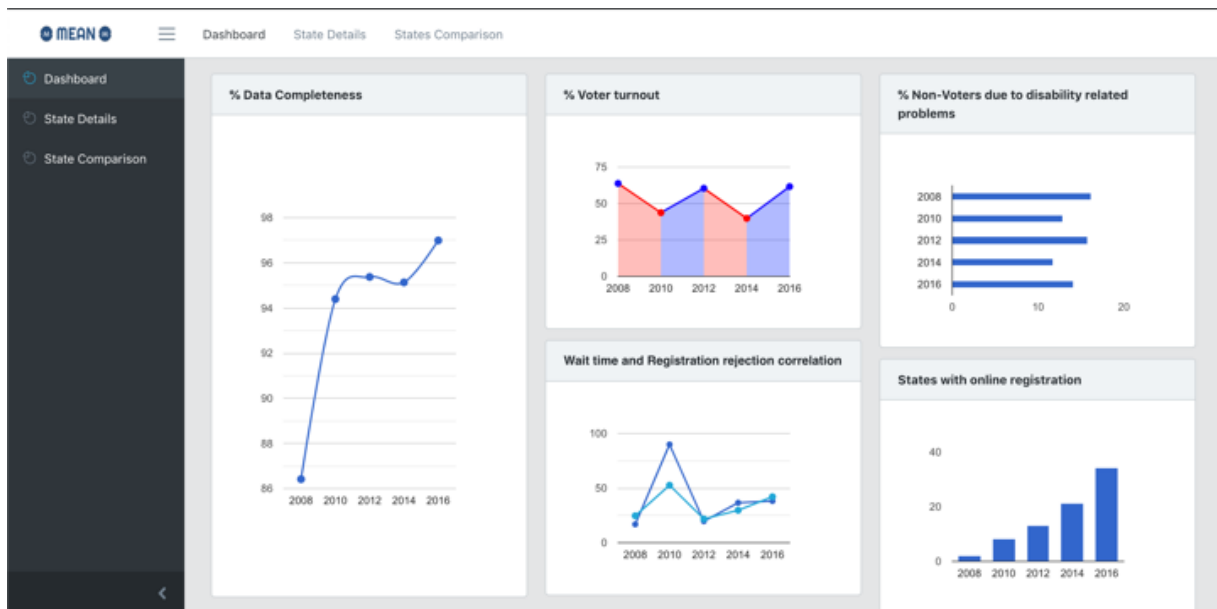
- Used diverging colors to create visual hierarchy for the state performance wherein bright orange shades show low-performing states and green shades depict states with comparatively good performance



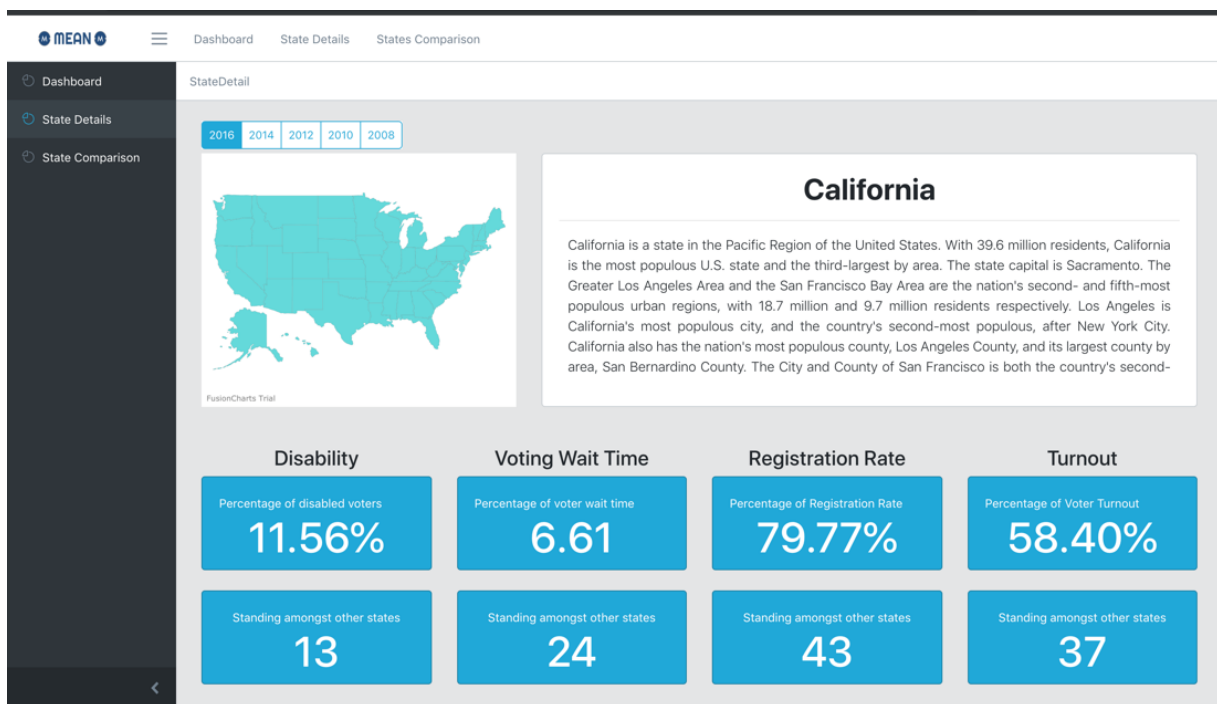
- Used red color to show the declining voter turnout for a period of five election y



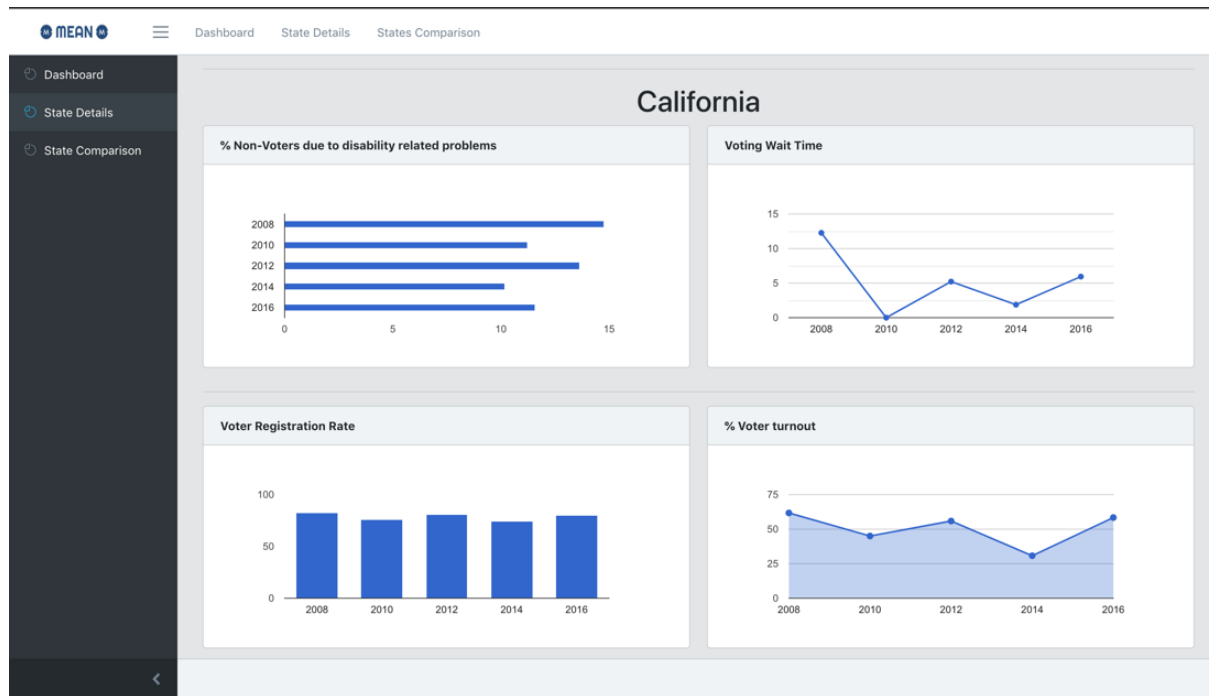
**SCREENSHOTS:**



National average dashboard 2



State details 1



State level dashboard 1



State comparison graph 1

## REFERENCES

[1] [2] [3] [4] [5] [6] <https://elections.mit.edu/#indicatorProfile>