

U.S. Senate Map Visualization

Software Tool Design

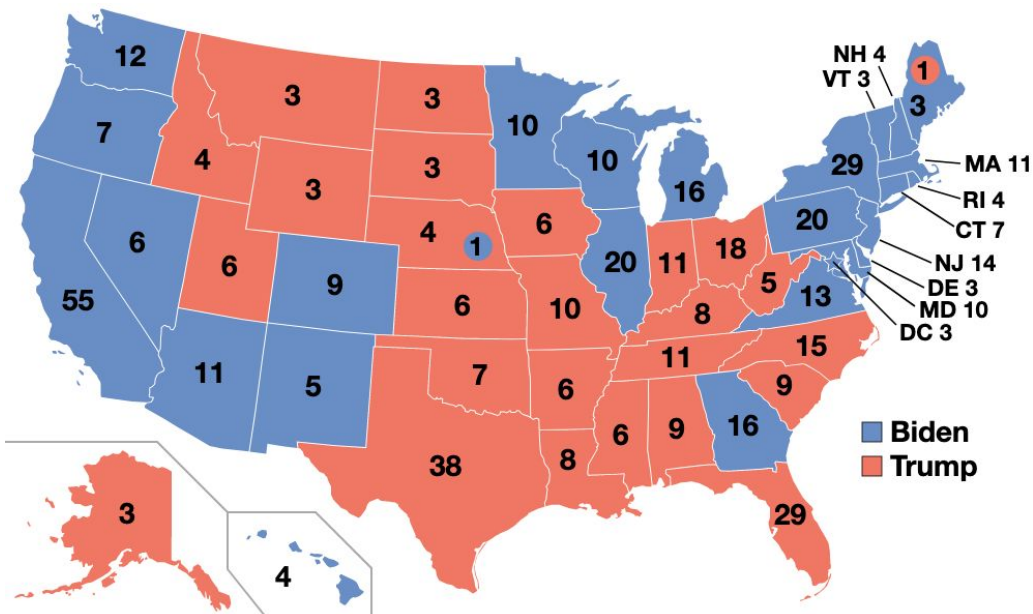
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EECE 5642, Spring 2021

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Motivation / Problem

This is the electoral college map of last November's presidential election.

Political maps are a type of data visualization that I decided to explore more.



I have chosen to make Senate election maps because I can use a simple U.S. map, I can compare them to presidential elections, and because of my personal interest in Senate elections, which have become more expensive and high-stakes in recent years.

Data source



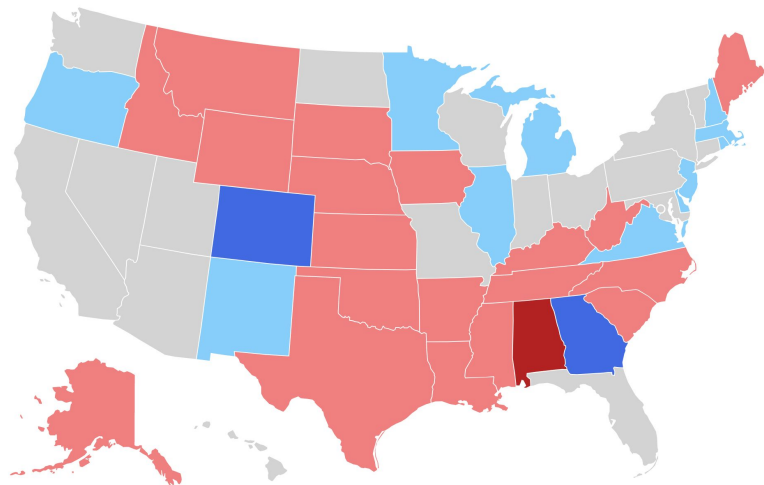
I have two data sources.

My first data source is a free, live API at <https://theunitedstates.io>, used to retrieve the list of current members of the Senate.

My second data source is Wikipedia. I took election results over the past 20 years for Presidential and Senate elections, and put them in my own .json format using a combination of manual editing and a spreadsheet.

Background

- In several visualizations, I am showing Senate election maps like this
- There are 100 Senate seats (2 per state) divided into three classes
- Each class is up for election every six years
- This is why each map will have ~17 states greyed out and around ~33 with a color




Tools Used

Language: JavaScript

The JavaScript logo, consisting of the letters "JS" in black on a yellow square background.

Packages:

- React 
- react-usa-map - provided the blank map
- Bootstrap - simple CSS tool

Also used a spreadsheet to preprocess data.



https://commons.wikimedia.org/wiki/File:Unofficial_JavaScript_logo_2.svg

[https://en.wikipedia.org/wiki/React_\(JavaScript_library\)#/media/File:React-icon.svg](https://en.wikipedia.org/wiki/React_(JavaScript_library)#/media/File:React-icon.svg)

https://en.wikipedia.org/wiki/Google_Sheets#/media/File:Google_Sheets_2020_Logo.svg

Visualization techniques: general

Map visualization:

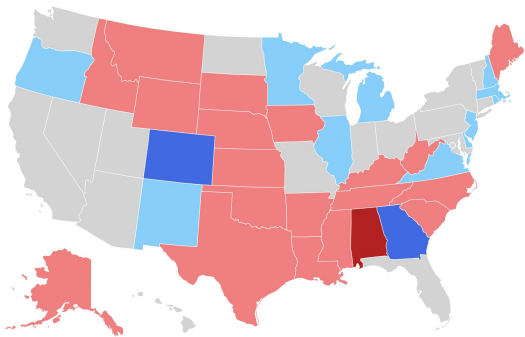


Table visualization:

Georgia

Party	Name	Percent
Democratic	Jon Ossoff	50.60
Republican	David Perdue	49.40
Margin	Democratic	+1.20

Colors:

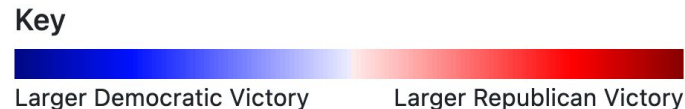
Key



Note on Colors: In the U.S., the two major parties are commonly associated with colors: red being Republican and blue being Democratic. In most Senate elections, there is one candidate affiliated with each party. I used these colors heavily in the map visualizations to encode data about the election results.

Visualization techniques: colors

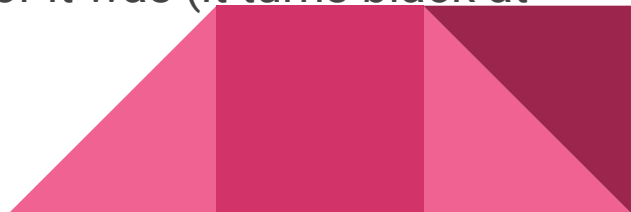
In some maps, I used a color range like this to encode information about the election results.



To accomplish this, I used the HSL color space by using a base color for the hue, 100% saturation, and varying changing the lightness level from 96% to 26%.

I used only two values as the base colors: 236 (blue) and 0 (red).

I chose the lightness range between 96 and 26 because any higher or lower lightness than the range made it difficult to tell which color it was (it turns black at 0% lightness and white at 100% lightness).



Contributions of the work

Here are the maps that I made for this project. I will show demos of them in the upcoming slides. Each allows clicking on states to see more information.

1. Current Senate Partisanship Map

- a. What party each state's senators belong to

2. Senate Election Results Map

- a. Whether a party gained or lost seats in an election

3. Margin of Victory Map

- a. Where larger victories (75-25) are shown as a darker color than a smaller victory (51-49)

4. Comparison to Baseline Map

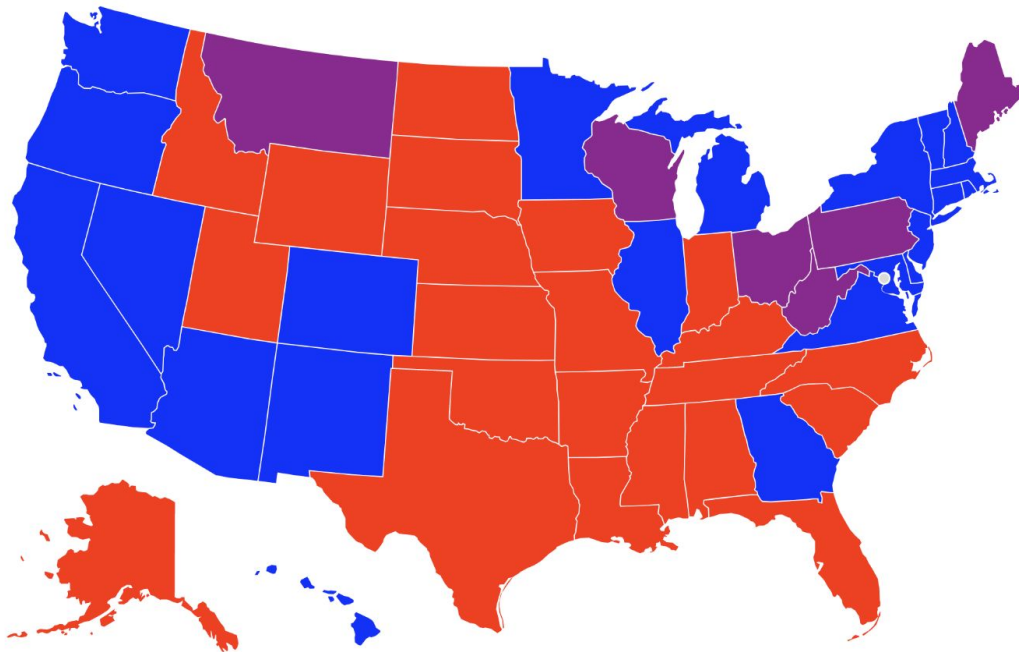
- a. Did a Senate candidate perform better or worse than Presidential candidate



Current Senate Partisanship Map

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Current Senators



Key

Two Republican Senators

Two Democratic Senators

One Republican Senator and one Democratic Senator

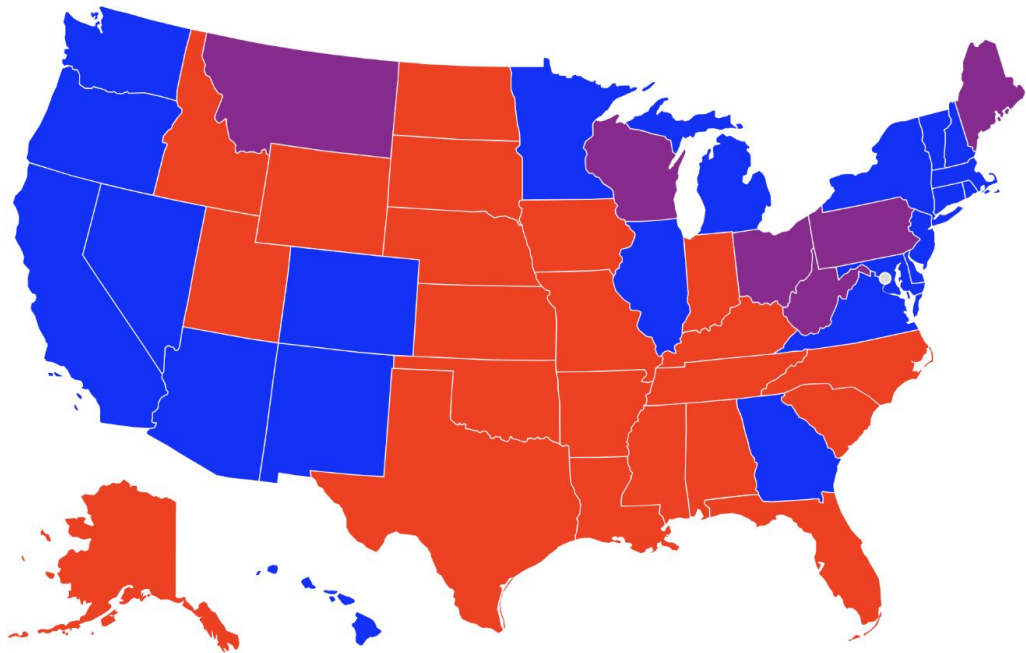
Note: Angus King (I-ME) and Bernie Sanders (I-VT) are independents caucusing with the Democrats.

Click on a state to see more information.

Current Senate Partisanship Map

Back

Current Senators



Key

- Two Republican Senators
- Two Democratic Senators
- One Republican Senator and one Democratic Senator

Note: Angus King (I-ME) and Bernie Sanders (I-VT) are independents caucusing with the Democrats.

Florida

Senior Senator

Marco Rubio (R)

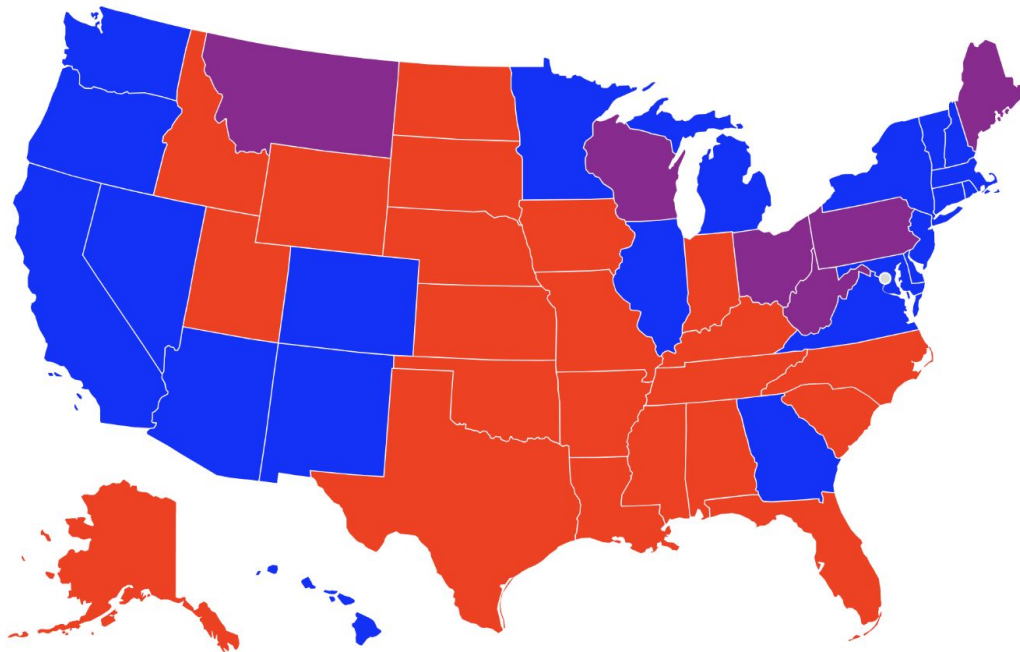
Junior Senator

Rick Scott (R)

Current Senate Partisanship Map

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Current Senators



Key

Two Republican Senators

Two Democratic Senators

One Republican Senator and one Democratic Senator

Note: Angus King (I-ME) and Bernie Sanders (I-VT) are independents caucusing with the Democrats.

Montana

Senior Senator

Jon Tester (D)

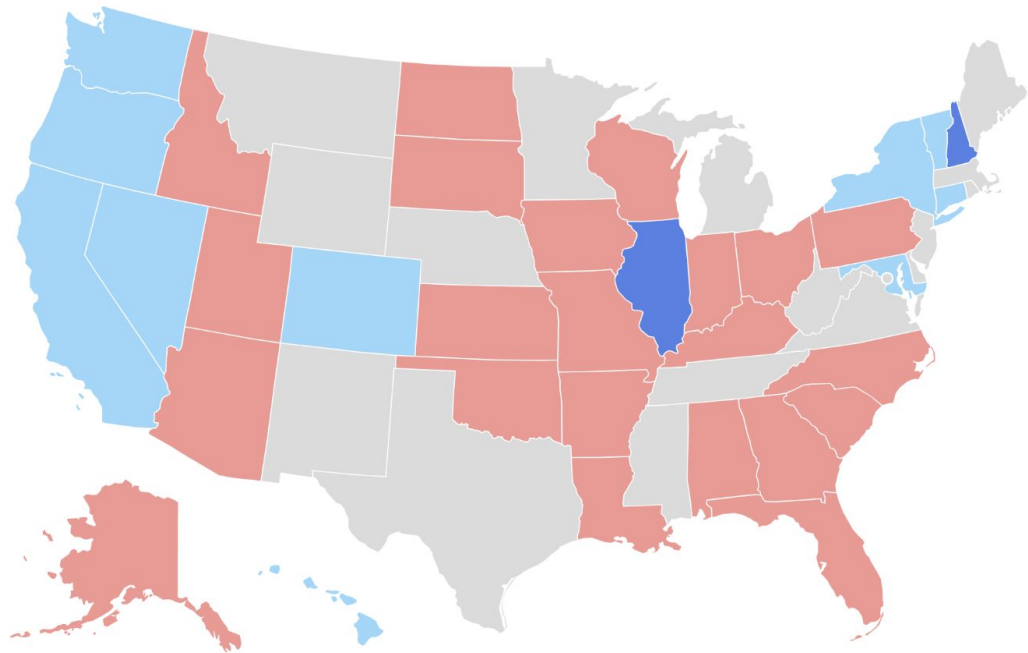
Junior Senator

Steve Daines (R)

Senate Elections Results Map

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2016 Senate Elections



Select Senate elections

2016 (Class 3)

Key



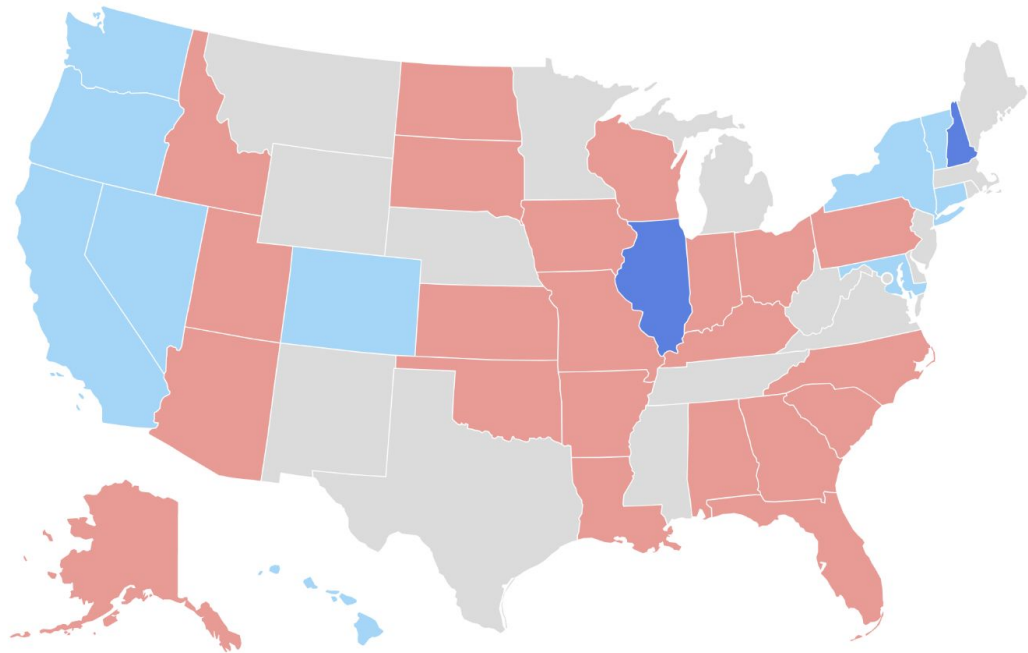
Ohio

Party	Name	Percent
Republican	Rob Portman	58.00
Democratic	Ted Strickland	37.10
Margin	Republican	+20.90

Senate Elections Results Map

Back

2016 Senate Elections



Select Senate elections

2016 (Class 3)

Key



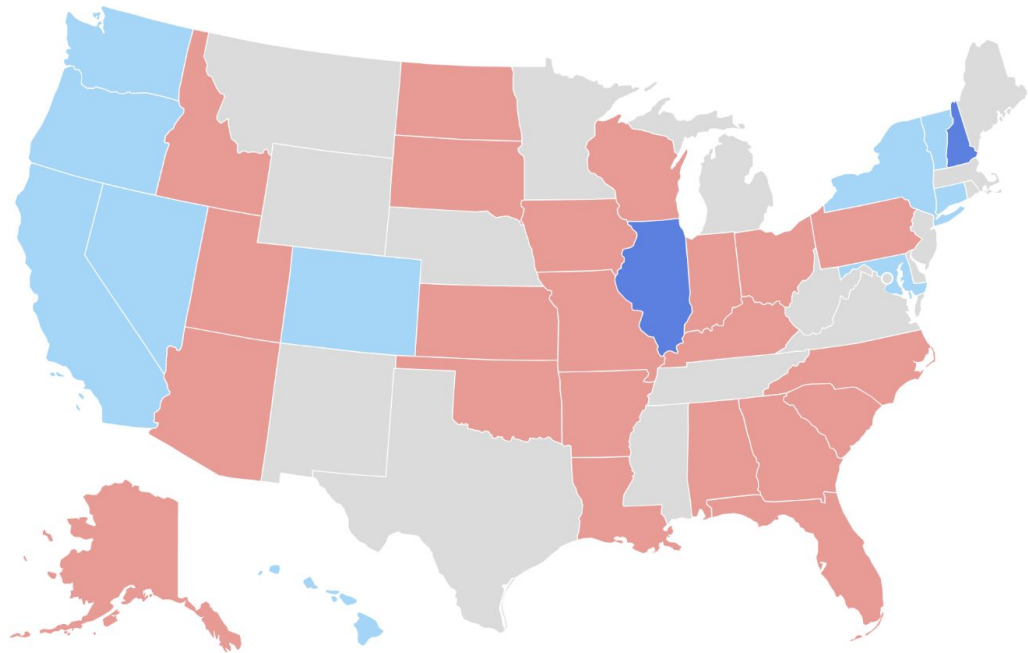
California

Party	Name	Percent
Democratic	Kamala Harris	61.80
Democratic	Loretta Sanchez	38.20
Margin	Democratic	+23.60

Senate Elections Results Map

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2016 Senate Elections



Select Senate elections

2016 (Class 3)

Key

Republican gain

Democratic gain

Republican hold

Democratic hold

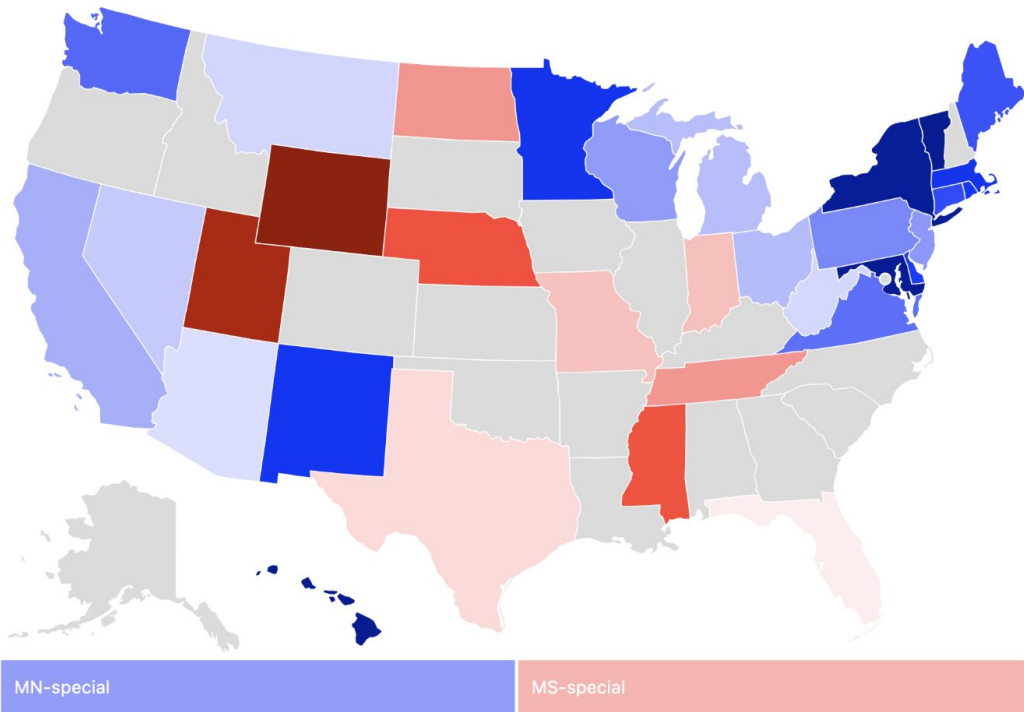
New Hampshire

Party	Name	Percent
Democratic	Maggie Hassan	47.97
Republican	Kelly Ayotte	47.87
Margin	Democratic	+0.10

Margin of Victory Map

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2018 Senate Elections Margin of Victory



Select Senate elections

2018 (Class 1)

Key



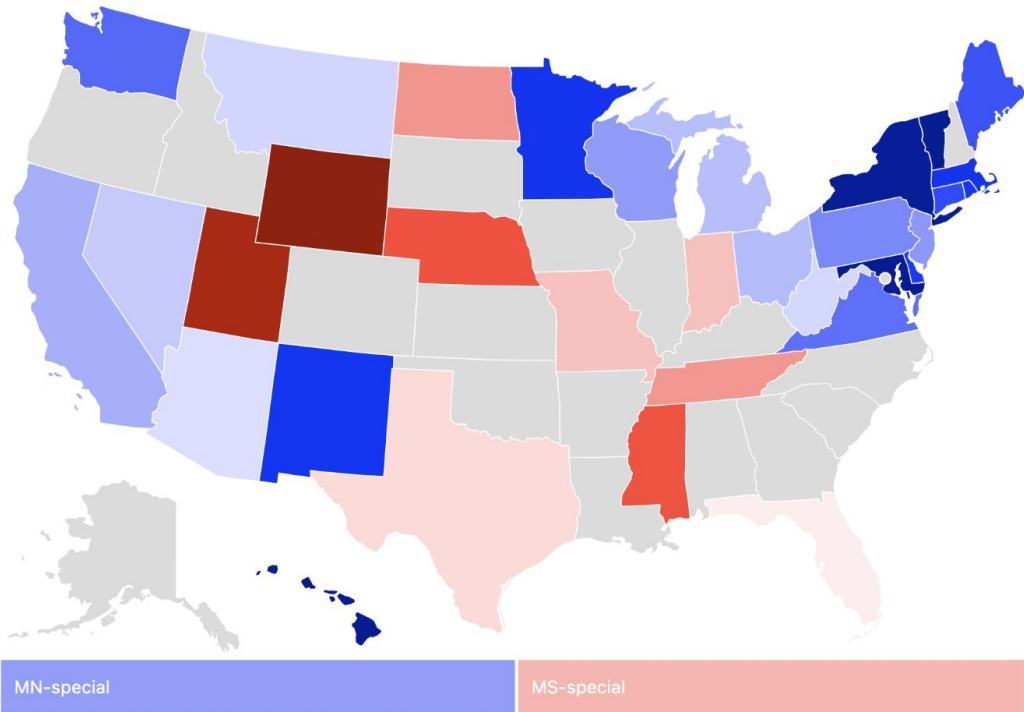
New York

Party	Name	Percent
Democratic	Kirsten Gillibrand	67.00
Republican	Chele Chiavacci Farley	33.00
Margin	Democratic	+34.00

Margin of Victory Map

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2018 Senate Elections Margin of Victory



Select Senate elections

2018 (Class 1)

Key



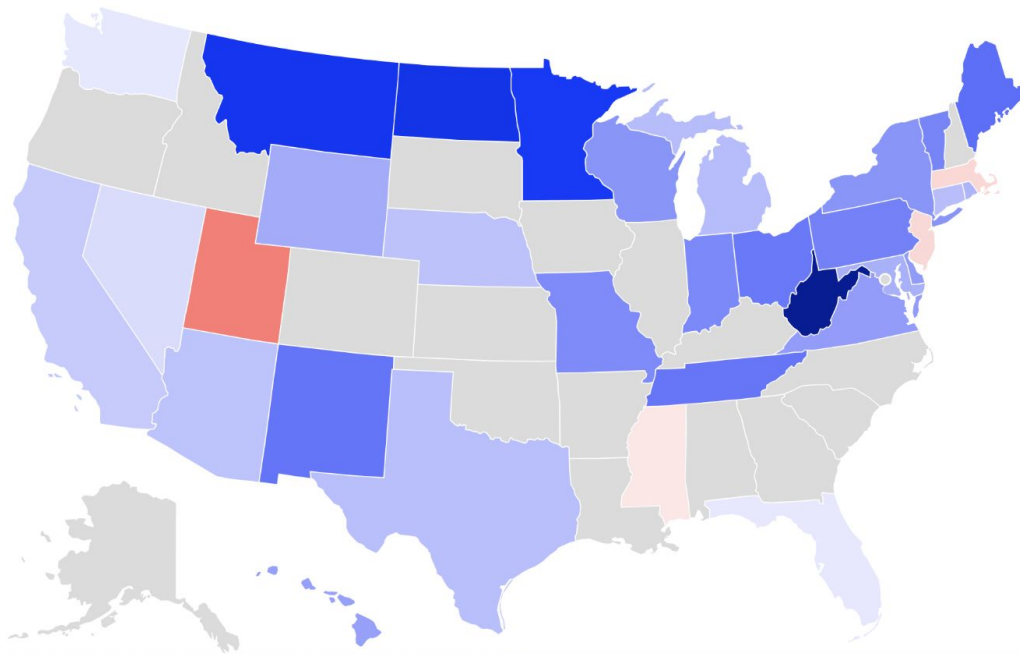
Utah

Party	Name	Percent
Republican	Mitt Romney	62.60
Democratic	Jenny Wilson	30.90
Margin	Republican	+31.70

Comparison to Baseline Map (Democratic wave)

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2018 Senate Elections vs. 2016 Presidential



MN-special

MS-special

Select Senate elections

2018 (Class 1)

Select Presidential Year to compare

2016 (Clinton vs. Trump)

Key

More Democratic than Presidential More Republican than Presidential

New York

Senate Race

Party	Name	Percent
Democratic	Kirsten Gillibrand	67.00
Republican	Chele Chiavacci Farley	33.00
Margin	Democratic	+34.00

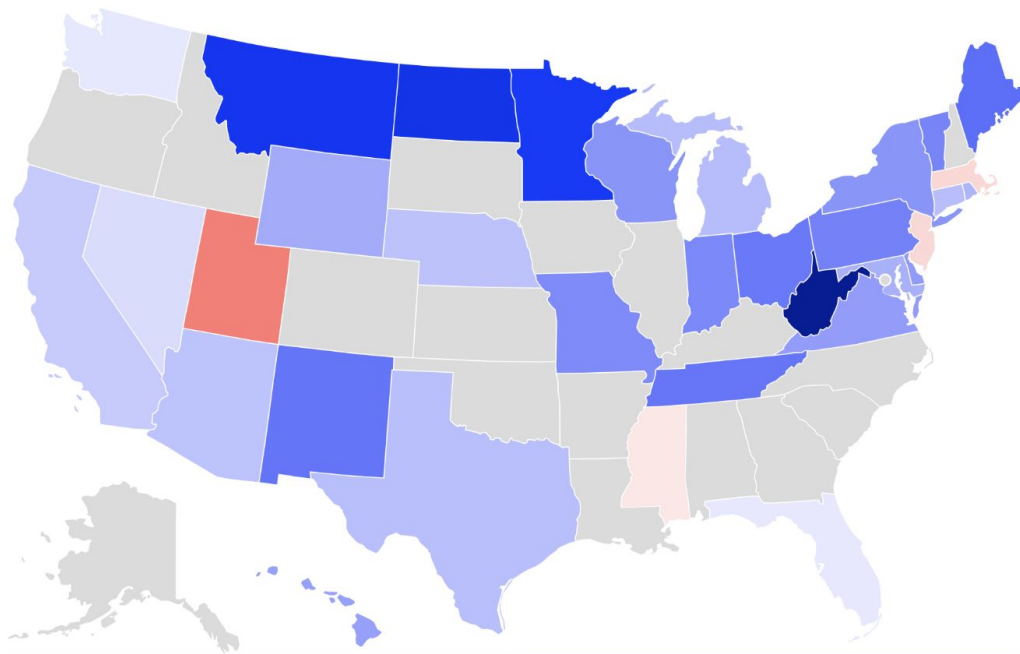
Presidential Race

Party	Name	Percent
Democratic	Hillary Clinton	59.01
Republican	Donald Trump	36.52
Margin	Democratic	+22.49

Comparison to Baseline Map (Democratic wave)

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2018 Senate Elections vs. 2016 Presidential



MN-special

MS-special

Select Senate elections

2018 (Class 1)

Select Presidential Year to compare

2016 (Clinton vs. Trump)

Key

More Democratic than Presidential More Republican than Presidential

West Virginia

Senate Race

Party	Name	Percent
Democratic	Joe Manchin	49.60
Republican	Patrick Morrisey	46.30
Margin	Democratic	+3.30

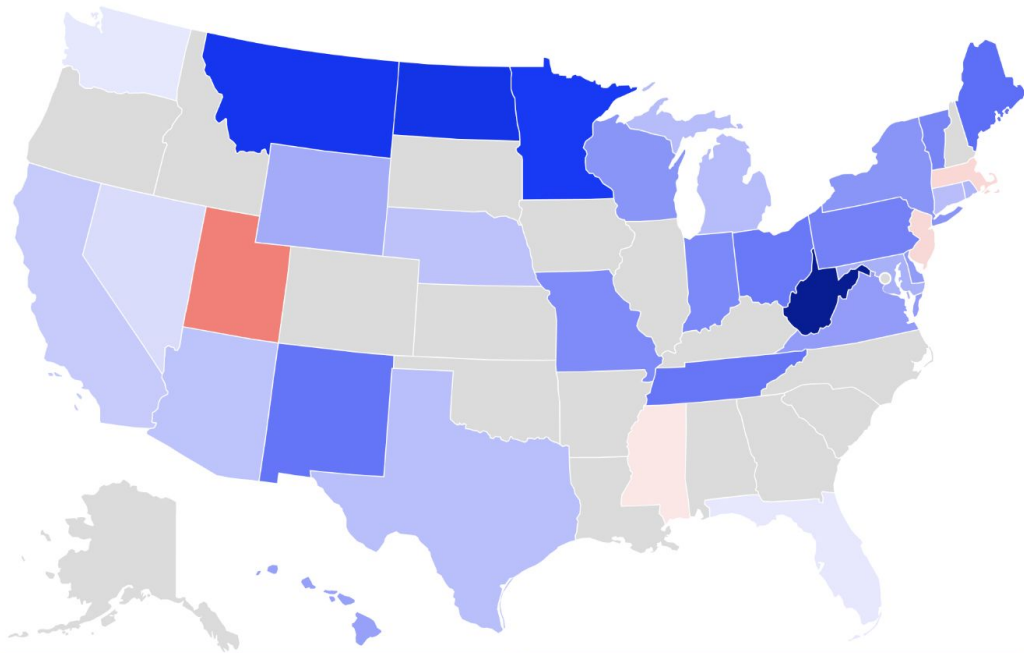
Presidential Race

Party	Name	Percent
Republican	Donald Trump	68.50
Democratic	Hillary Clinton	26.43
Margin	Republican	+42.07

Comparison to Baseline Map (Democratic wave)

Back

2018 Senate Elections vs. 2016 Presidential



MN-special

MS-special

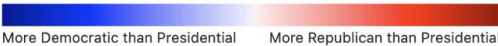
Select Senate elections

2018 (Class 1)

Select Presidential Year to compare

2016 (Clinton vs. Trump)

Key



Utah

Senate Race

Party	Name	Percent
Republican	Mitt Romney	62.60
Democratic	Jenny Wilson	30.90
Margin	Republican	+31.70

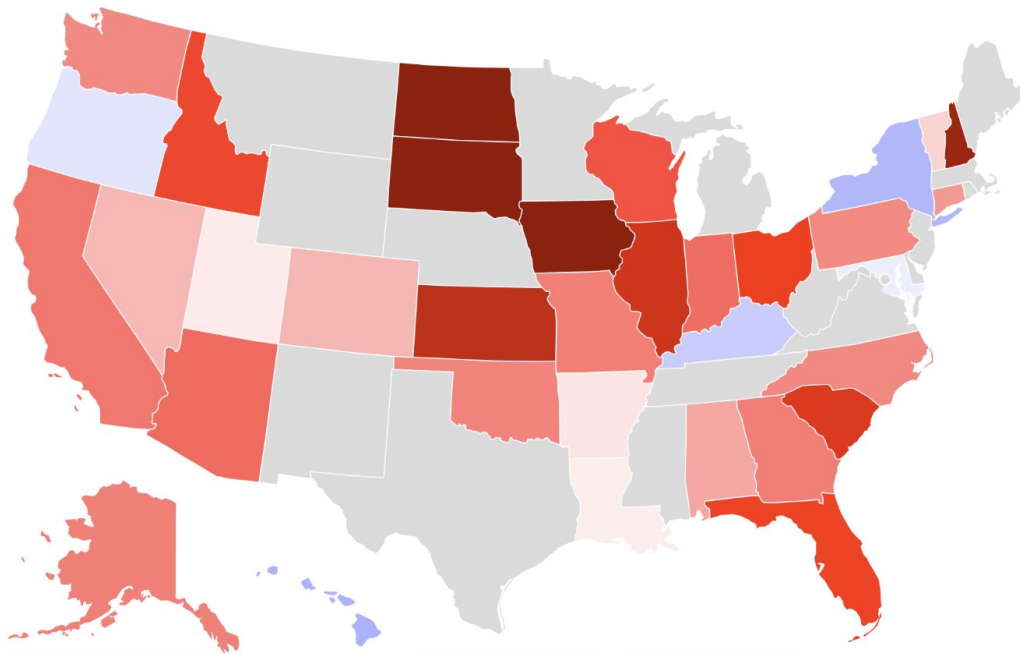
Presidential Race

Party	Name	Percent
Republican	Donald Trump	45.54
Democratic	Hillary Clinton	27.46
Margin	Republican	+18.08

Comparison to Baseline Map (Republican wave)

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2010 Senate Elections vs. 2008 Presidential



MA-special

DE-special

IL-special

NY-special

WV-special

Select Senate elections

2010 (Class 3)

Select Presidential Year to compare

2008 (Obama vs. McCain)

Key

More Democratic than Presidential More Republican than Presidential

Wisconsin

Senate Race

Party	Name	Percent
Republican	Ron Johnson	51.90
Democratic	Russ Feingold	47.00
Margin	Republican	+4.90

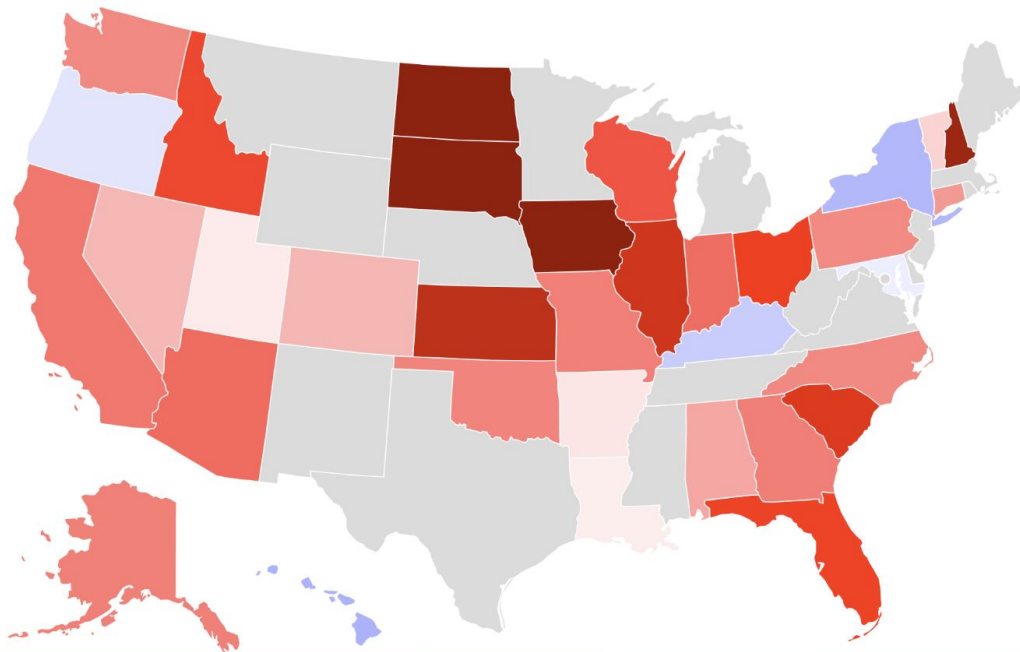
Presidential Race

Party	Name	Percent
Democratic	Barack Obama	56.22
Republican	John McCain	42.31
Margin	Democratic	+13.91

Comparison to Baseline Map (Republican wave)

[Back](#)

2010 Senate Elections vs. 2008 Presidential



Select Senate elections

2010 (Class 3)

Select Presidential Year to compare

2008 (Obama vs. McCain)

Key

More Democratic than Presidential More Republican than Presidential

Kentucky

Senate Race

Party	Name	Percent
Republican	Rand Paul	55.80
Democratic	Jack Conway	44.20
Margin	Republican	+11.60

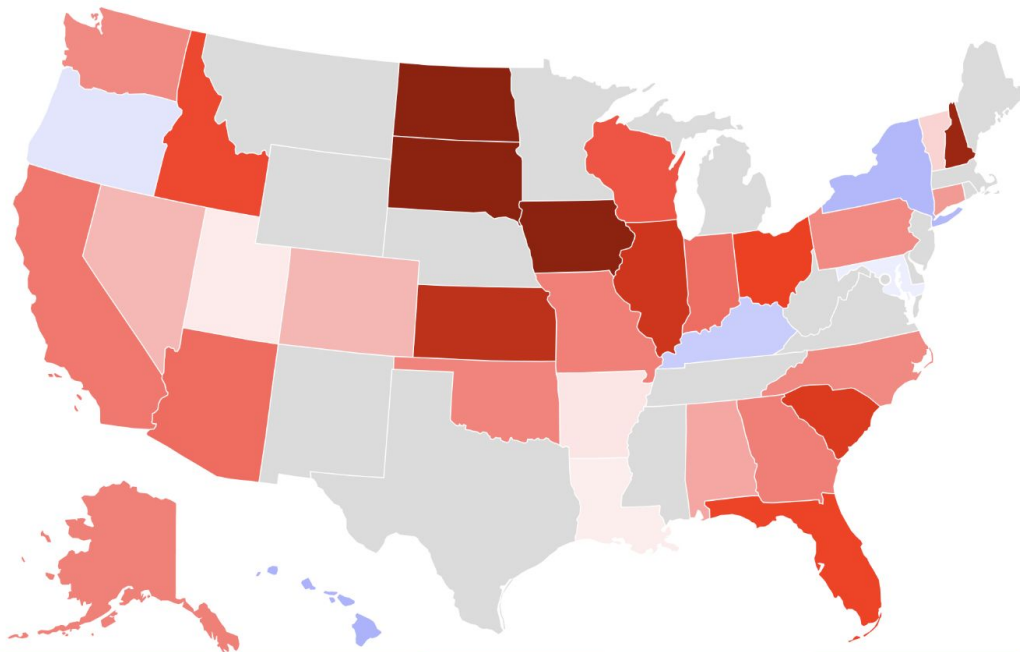
Presidential Race

Party	Name	Percent
Republican	John McCain	57.40
Democratic	Barack Obama	41.17
Margin	Republican	+16.23

Comparison to Baseline Map (Republican wave)

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2010 Senate Elections vs. 2008 Presidential



MA-special

DE-special

IL-special

NY-special

WV-special

Select Senate elections

2010 (Class 3)

Select Presidential Year to compare

2008 (Obama vs. McCain)

Key

More Democratic than Presidential More Republican than Presidential

California

Senate Race

Party	Name	Percent
Democratic	Barbara Boxer	52.10
Republican	Carly Fiorina	42.50
Margin	Democratic	+9.60

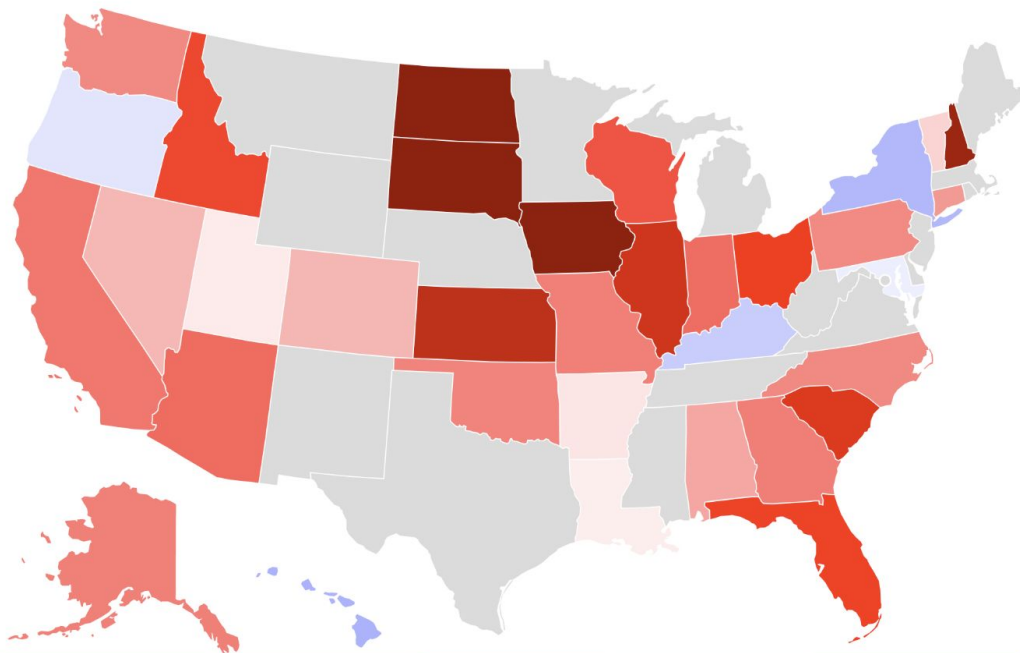
Presidential Race

Party	Name	Percent
Democratic	Barack Obama	61.01
Republican	John McCain	36.95
Margin	Democratic	+24.06

Senate special elections

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2010 Senate Elections vs. 2008 Presidential



MA-special

DE-special

IL-special

NY-special

WV-special

Select Senate elections

2010 (Class 3)

Select Presidential Year to compare

2008 (Obama vs. McCain)

Key

More Democratic than Presidential More Republican than Presidential

Massachusetts special

Senate Race

Party	Name	Percent
Republican	Scott Brown	51.90
Democratic	Martha Coakley	47.10
Margin	Republican	+4.80

Presidential Race

Party	Name	Percent
Democratic	Barack Obama	61.80
Republican	John McCain	35.99
Margin	Democratic	+25.81

Novelty of the work

Political maps are an extremely common map visualization, used on news broadcasts and articles. Showing a Senate election map like the one I showed second is very common.

The more unusual maps I created are the Margin of Victory and the Comparison to Baseline maps.



Future work

- Better exceptional case handling
 - Differing electoral systems can cause some unusual maps. Most states have a party primary then a general election. CA/WA/LA/ME/AK/GA have nonstandard rules
 - When two candidates of the same party are competing, it can skew the comparison to presidential results
 - Some candidates run unopposed, which also skews the comparison
- Being able to look at election maps in a more granular way
 - See how specific counties/precincts performed
 - See how a specific House district performed in a Senate election
- Other election visualizations (Presidential, House)



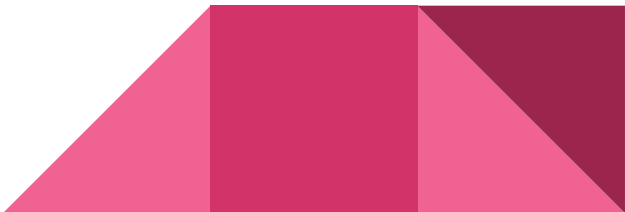
References

The source code is here:

<https://github.com/harrisonjwong/data-viz-senate-elections>

Data sources:

- <https://theunitedstates.io/>
- https://en.wikipedia.org/wiki/2020_United_States_Senate_elections
 - I used a similar link for 2018, 2016, 2014, 2012, 2010, 2008, 2006, 2004, 2002, 2000
- https://en.wikipedia.org/wiki/2020_United_States_presidential_election
 - I used a similar link for 2016, 2012, 2008, 2004, 2000



Questions