

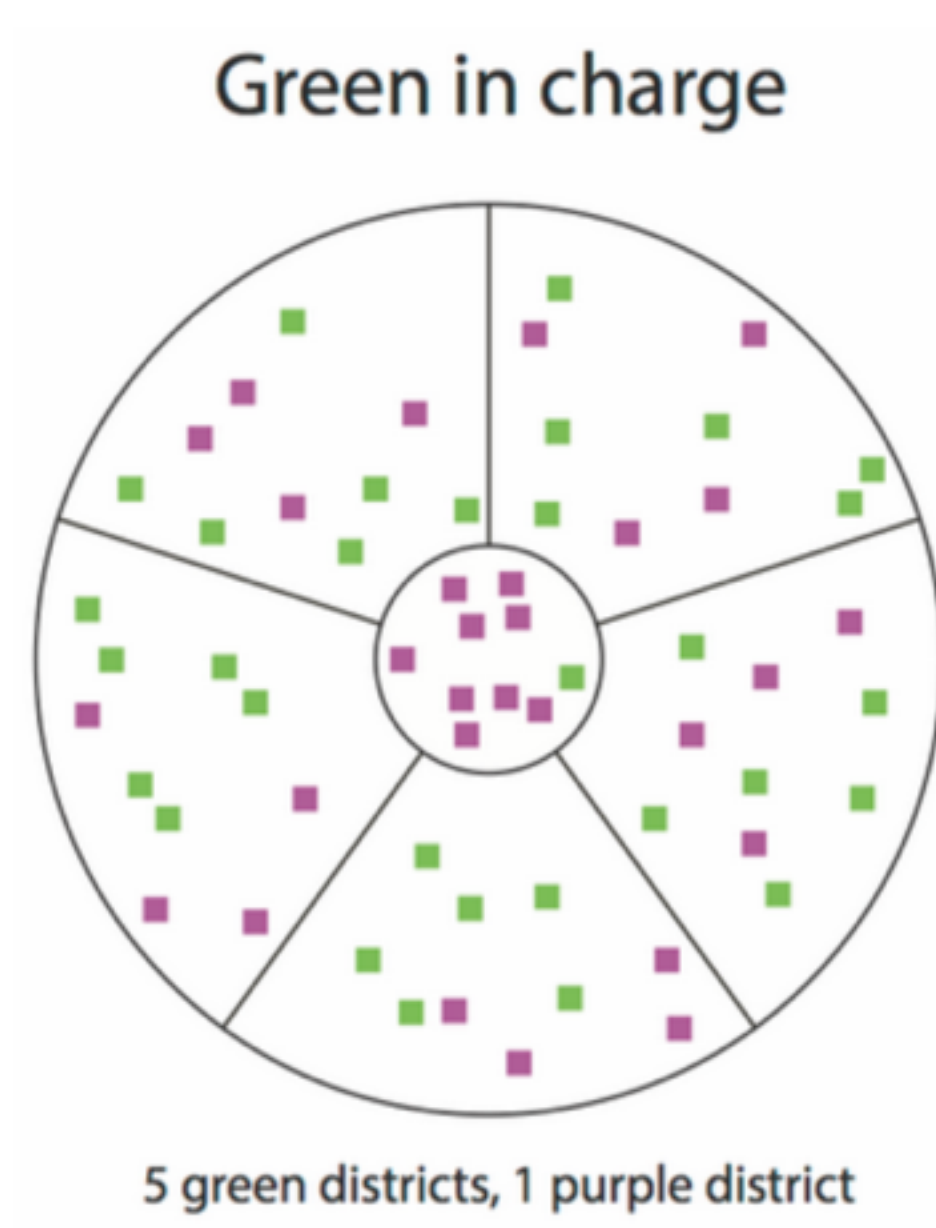
A photograph of a protest in front of the Supreme Court. Protesters are holding up various signs. One sign on the left says 'IRMAPS' and features a blue map of the United States. Another sign in the center says '#Fair Maps' and has the LWV (League of Women Voters) logo. A sign on the right says '#FAI'. A woman in a red shirt is holding a sign with a red map of the United States. The background shows the Supreme Court building under a clear blue sky.

VISUALIZING GERRYMANDERING

*Efficiency Gap Analysis of the
2016 House of Representatives
Election Results*

Protesters hold up signs in front of the Supreme Court on October 3, 2017. (AP Photo via CQ Roll Call / Tom Williams)

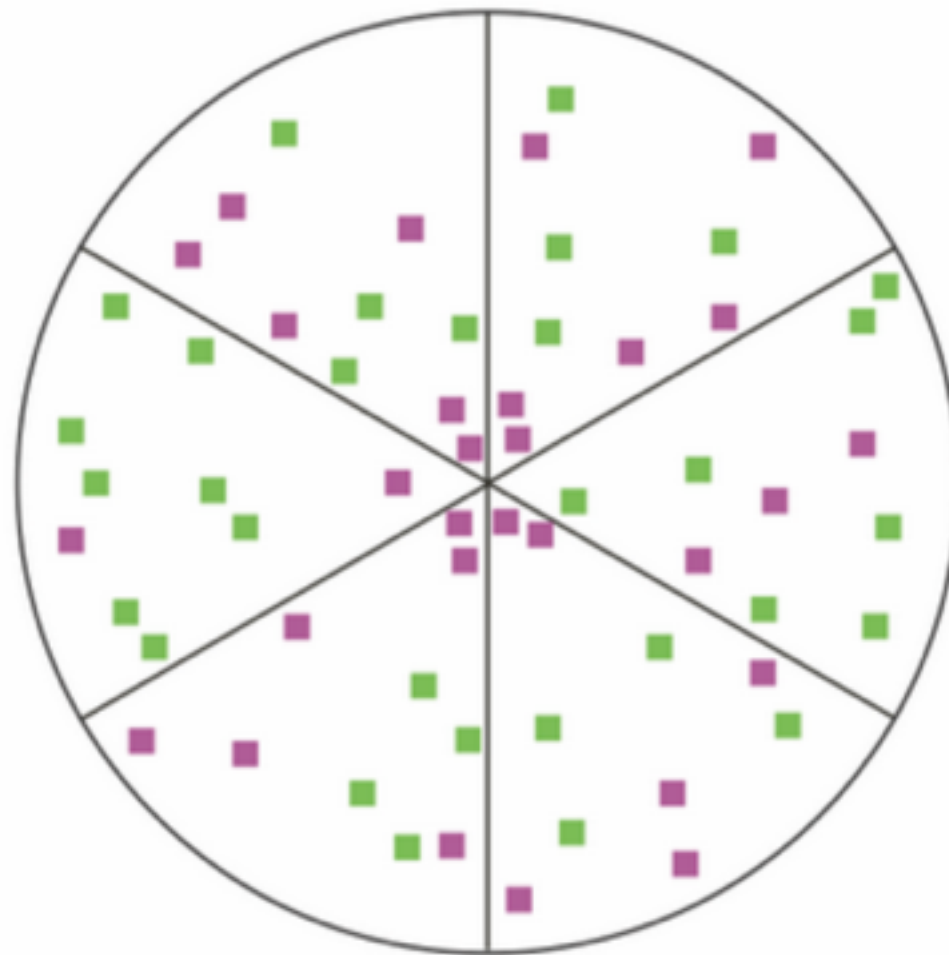
GERRYMANDERING



Source: <http://gerrymander.princeton.edu/info>

GERRYMANDERING

Purple in charge



2 green districts, 4 purple districts

Source: <http://gerrymander.princeton.edu/info>

HOUSTON, WE HAVE A REPRESENTATION PROBLEM!

.....

[← 2014](#)

November 8, 2016

2018 [→](#)

All 435 seats in the [United States House of Representatives](#)^[Note 1]

218 seats needed for a majority

Turnout

54.7% of total eligible

Leader

Paul Ryan

Nancy Pelosi

Party

Republican

Democratic

Leader since

October 29, 2015

January 3, 2003

Leader's seat

[Wisconsin-1st](#)

[California-12th](#)

Last election

247 seats, 51.2%

188 seats, 45.5%

Seats won

241

194

Seat change

▼ 6

▲ 6

Popular vote

63,173,815

61,776,554

Percentage

49.1%

48.0%

Swing

▼ 2.1%

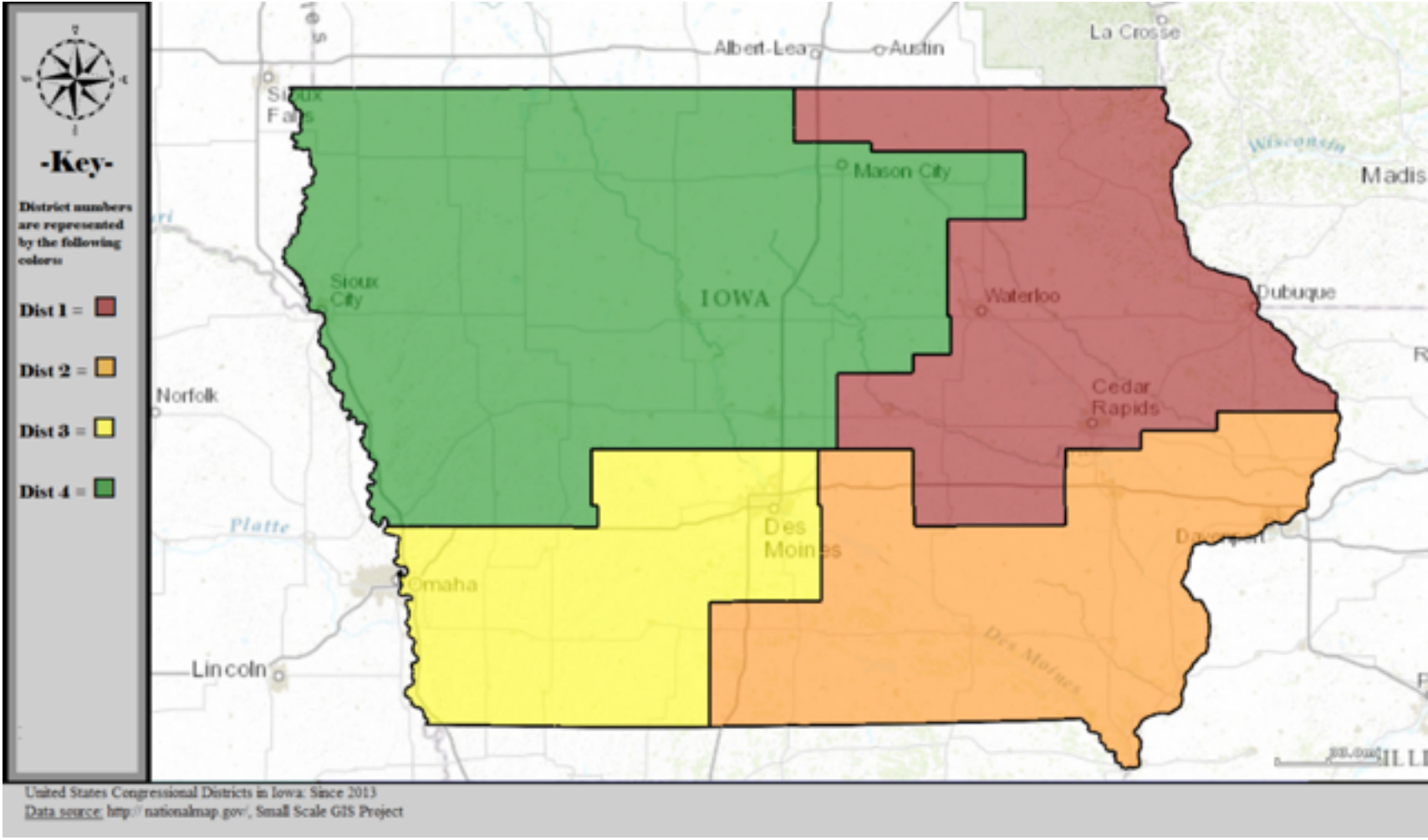
▲ 2.5%

Republican electors
were able to convert
1% more votes
into 24% more seats

RESEARCH QUESTION 1

- Is gerrymandering the cause of this disproportional representation?

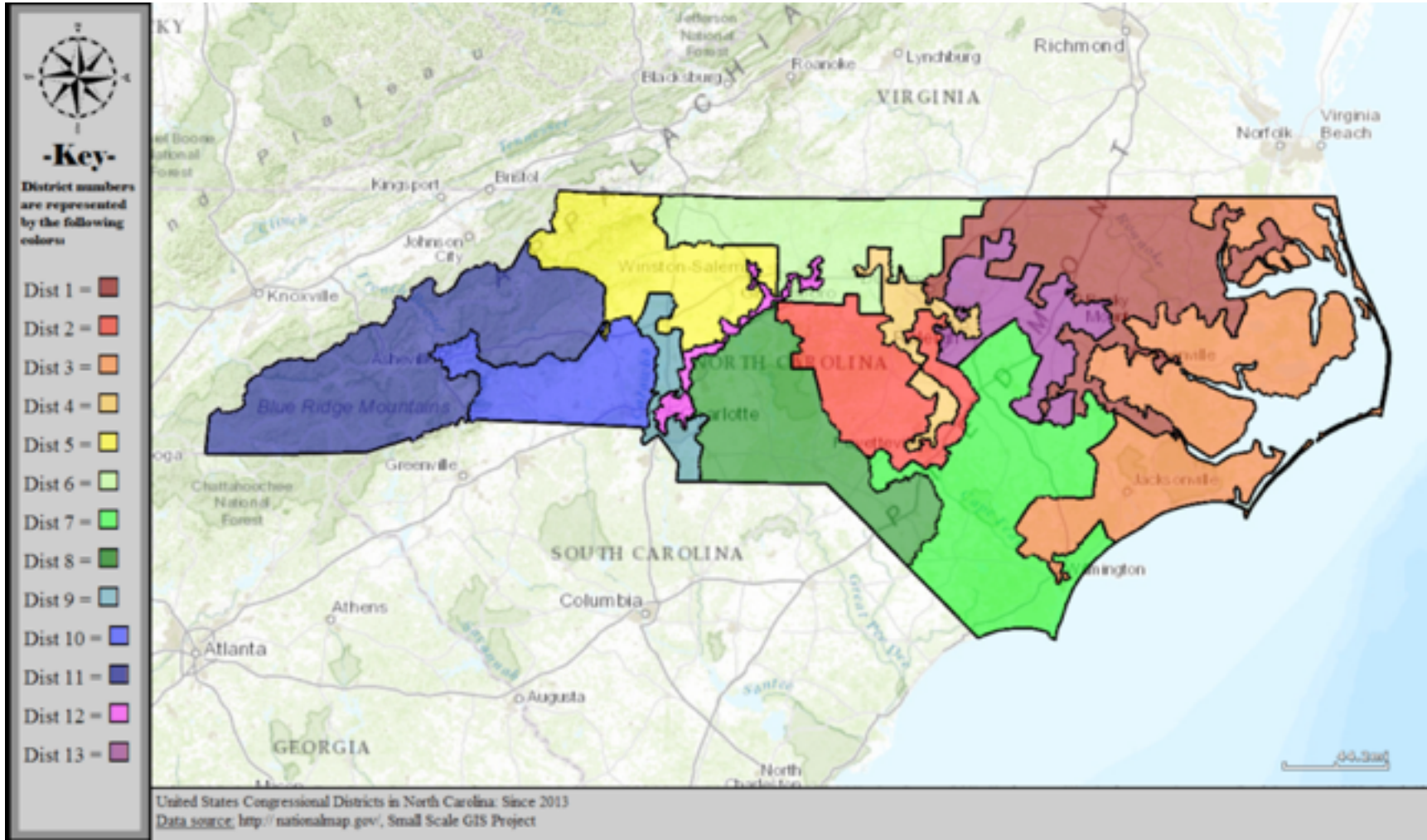




Iowa

Not too squiggly

North Carolina
Very squiggly

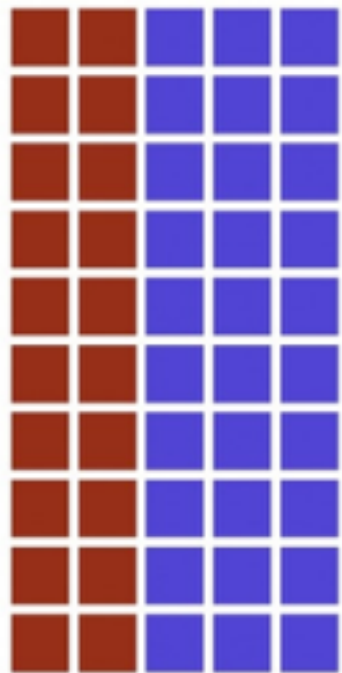


Sources: Wikipedia
https://en.wikipedia.org/wiki/Iowa's_congressional_districts
https://en.wikipedia.org/wiki/North_Carolina%27s_congressional_districts

CAN WE MEASURE GERRYMANDERING?

- Shape of district boundaries
- Wasted votes
 - All votes for losing candidate are wasted
 - All votes for winning candidate beyond simple majority are wasted
- Efficiency Gap
 - $\text{Net Wasted Votes} / \text{Total Votes}$

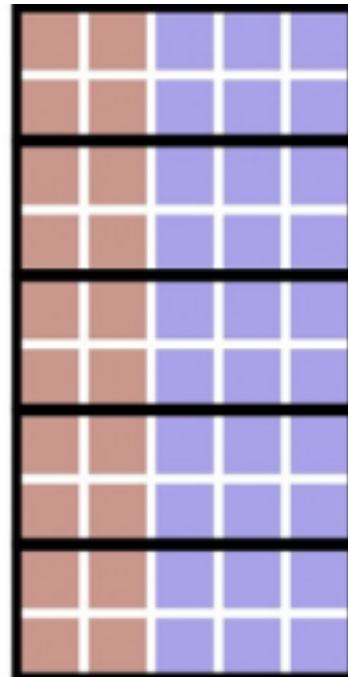
EFFICIENCY GAP EXAMPLE



**60% blue,
40% red**



**3 blue districts,
2 red districts**



**5 blue districts,
0 red districts**

Red votes wasted:

4 per district = total 20 votes

Blue votes wasted:

0 per district = total 0 votes

Total votes in state = 100

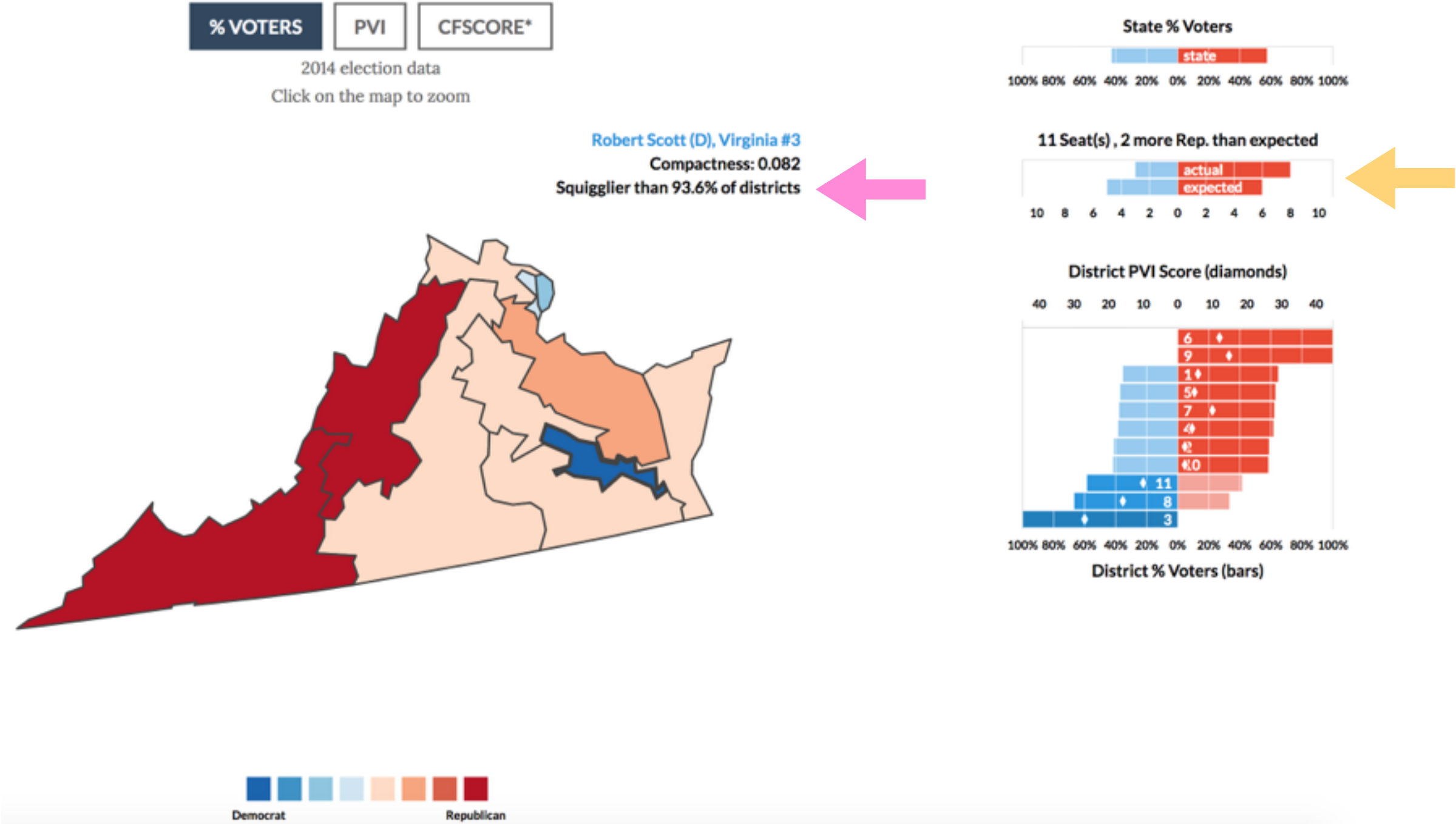
Efficiency gap = 20% favoring blue party

RESEARCH QUESTION 2

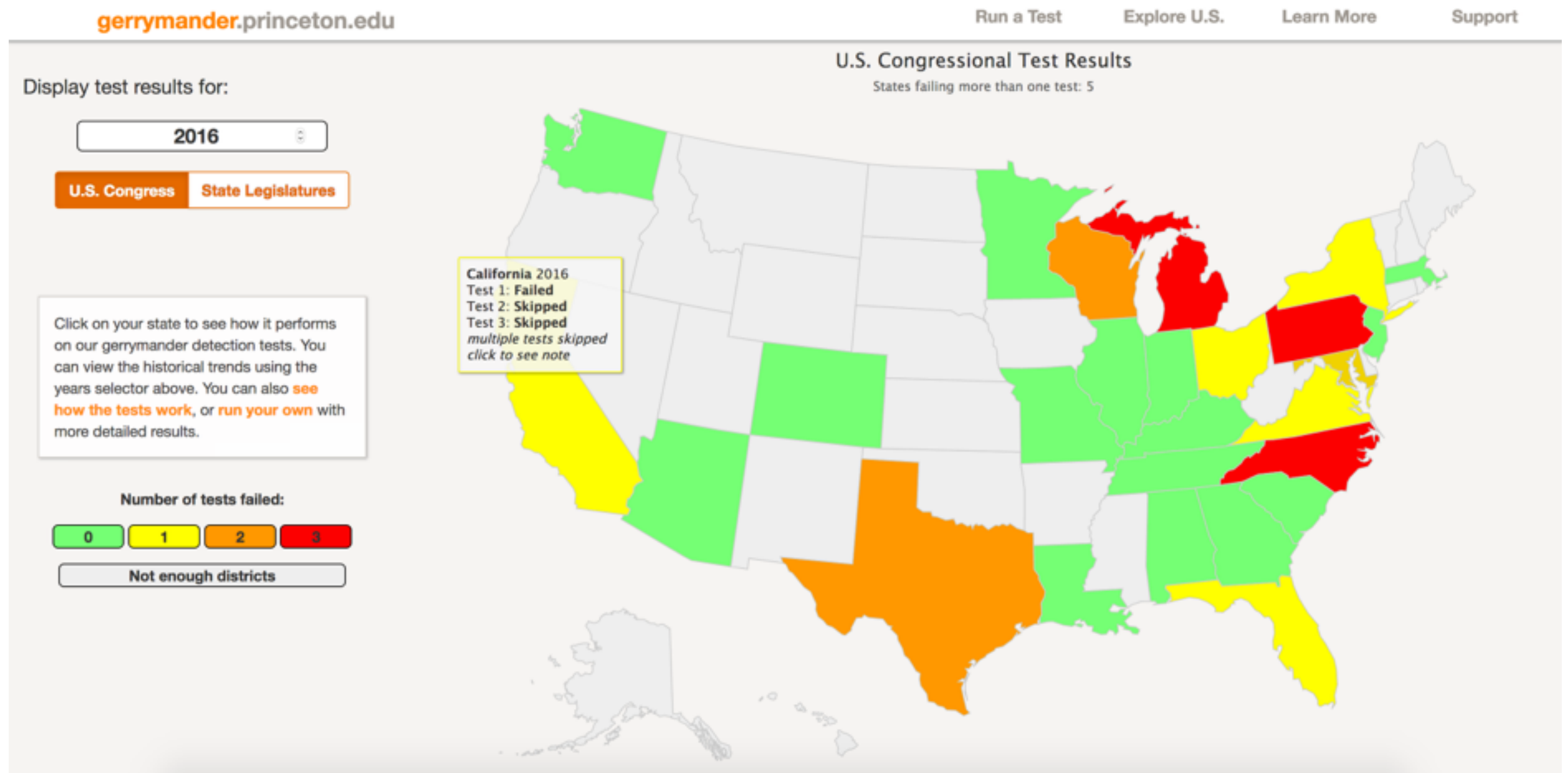
- How well can the efficiency gap help identify gerrymandering?



SILICON VALLEY DATA SCIENCE VISUALIZATION



GERRYMANDER.PRINCETON.EDU: HOW GERRYMANDERED IS MY STATE?



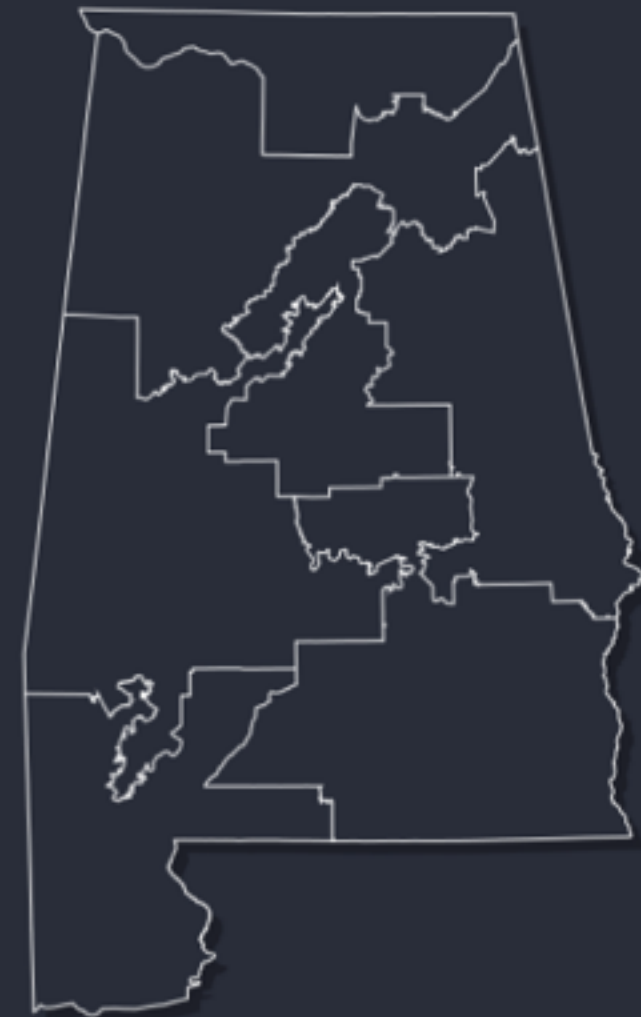
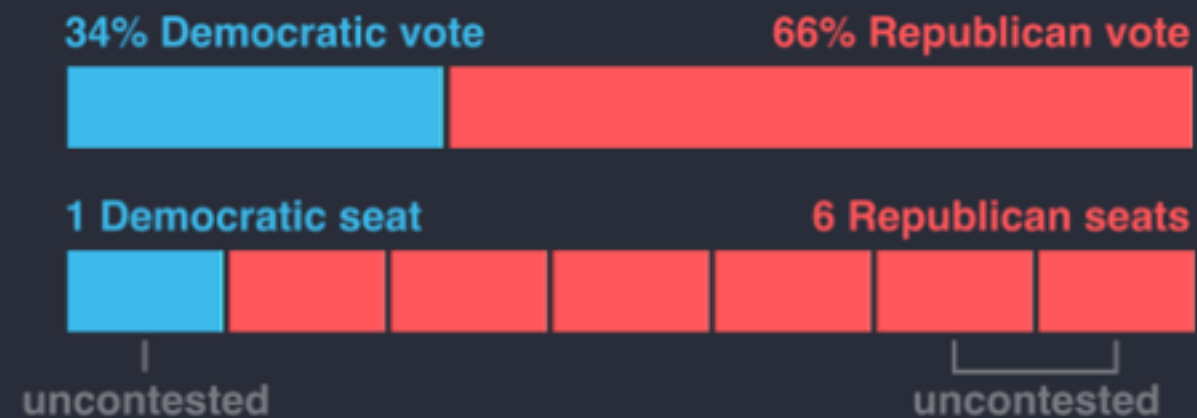
AZAVEA VISUALIZATION BY PATRICK HAN

.....

Alabama Congressional Delegation

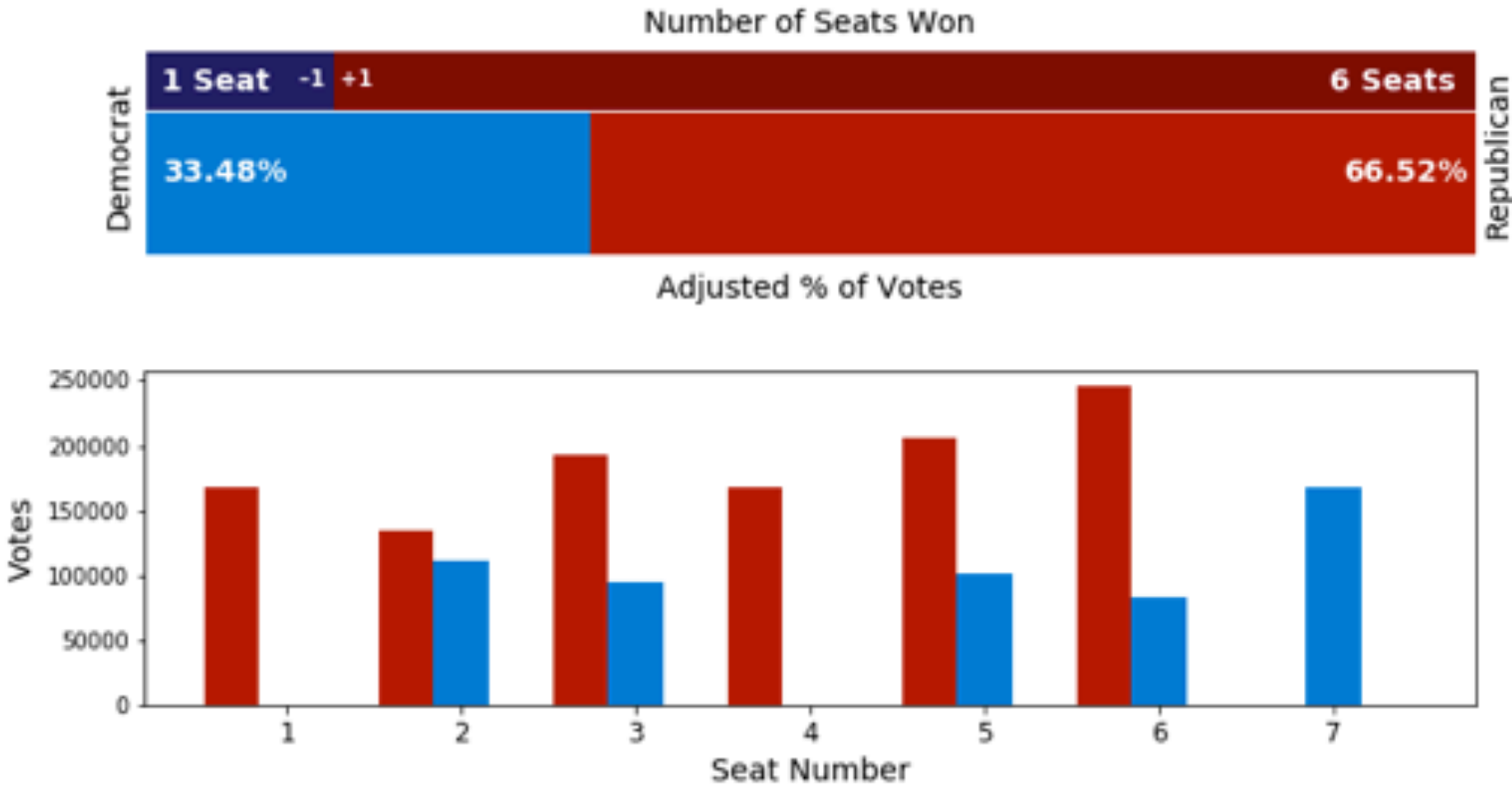
(elected 2016)

The **Republican Party** had a **10.2% efficiency gap advantage*** worth **1 extra seat**, but some seats were left uncontested.**

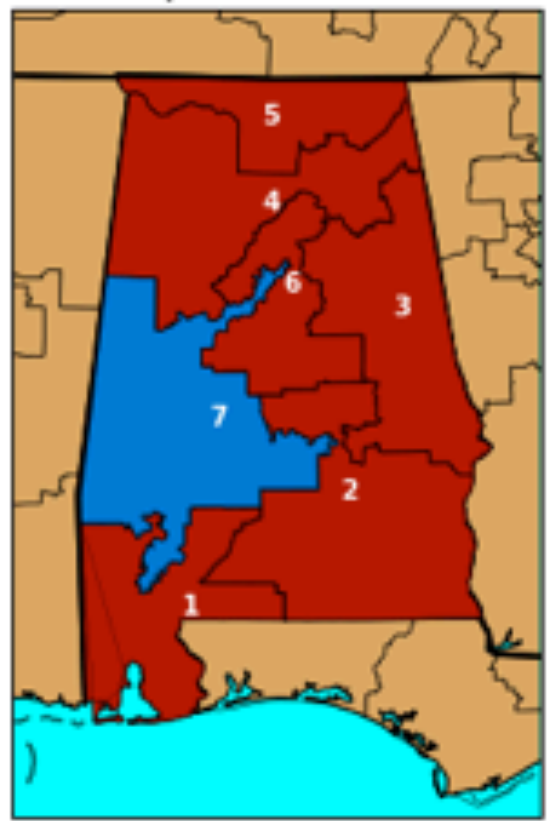


ALABAMA

Alabama Election Results

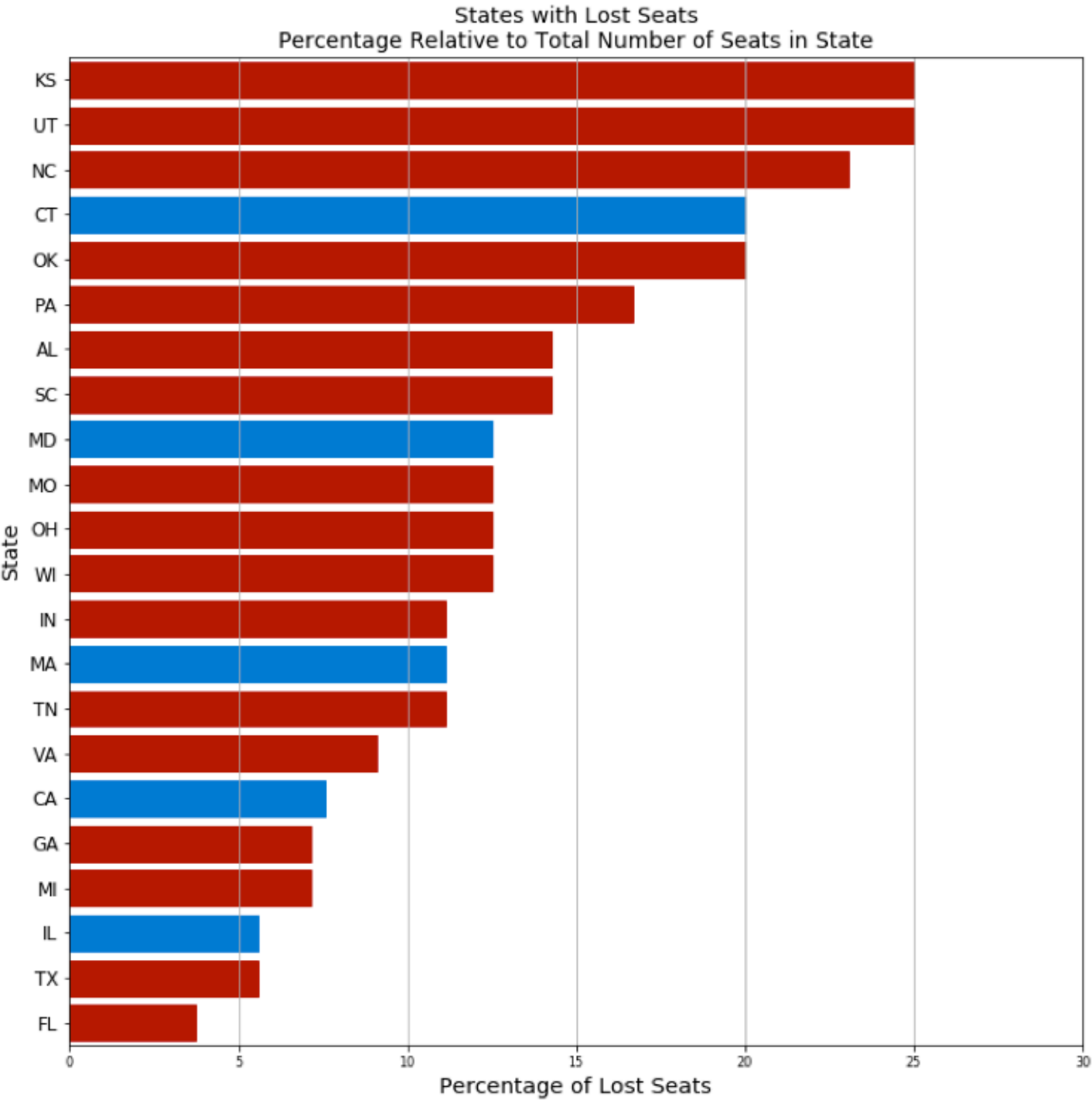


State Map with Seat Numbers



CAN THE EFFICIENCY GAP HELP IDENTIFY GERRYMANDERING?

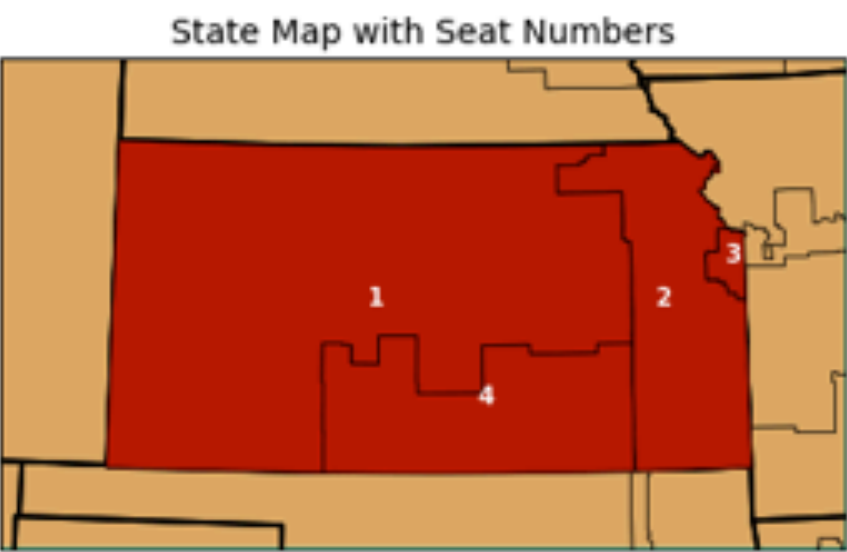
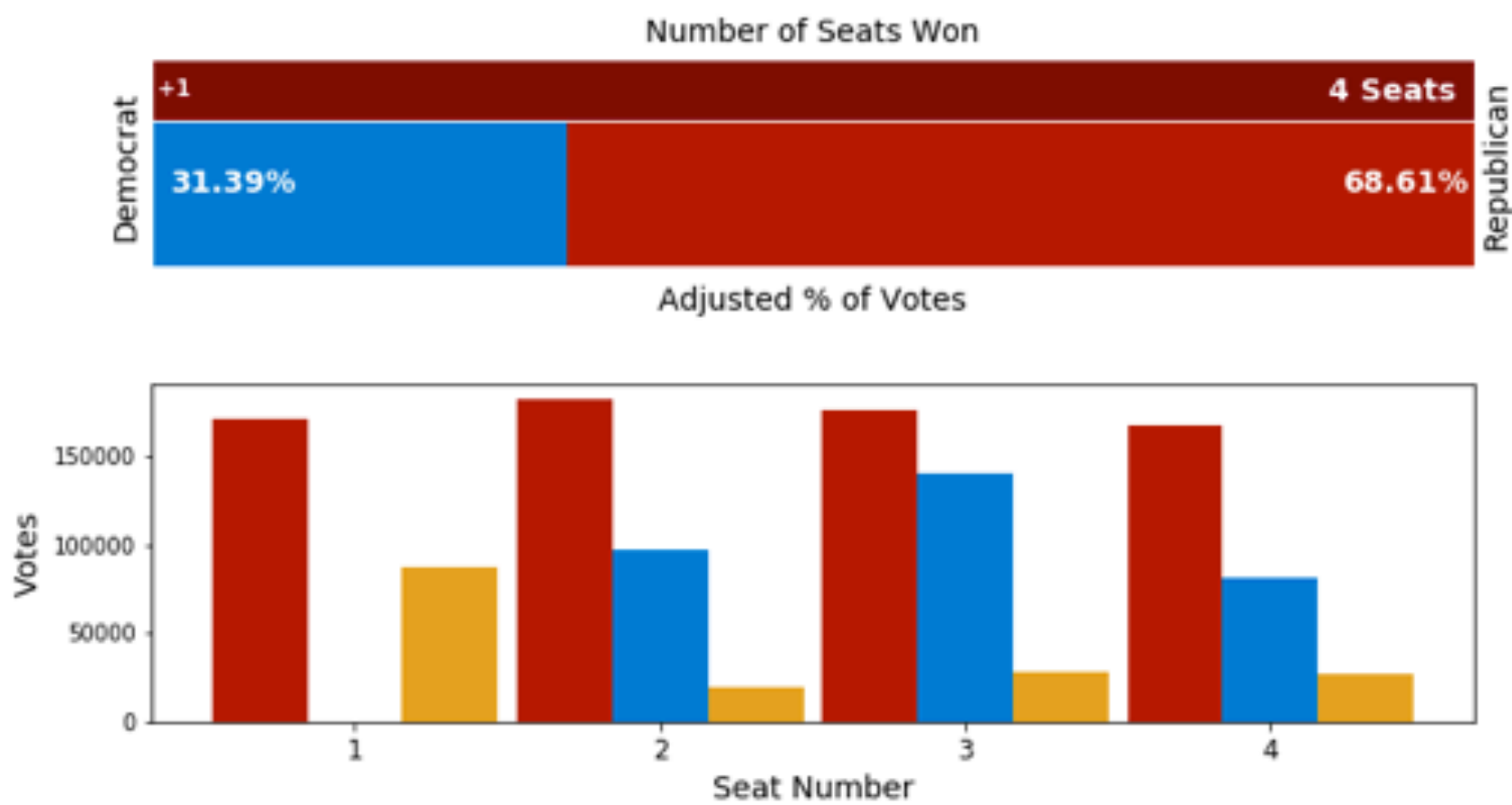
.....



KANSAS

.....

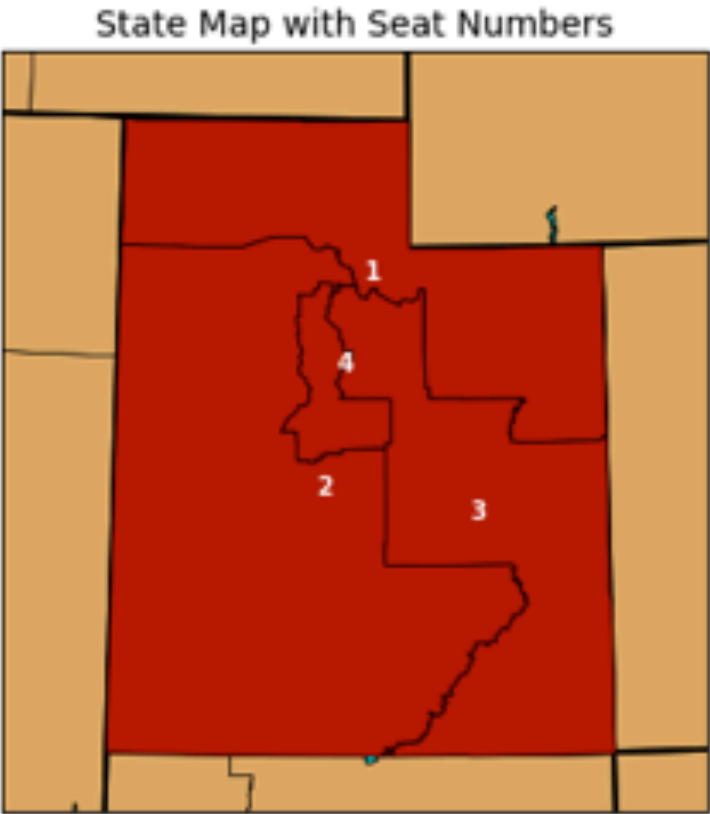
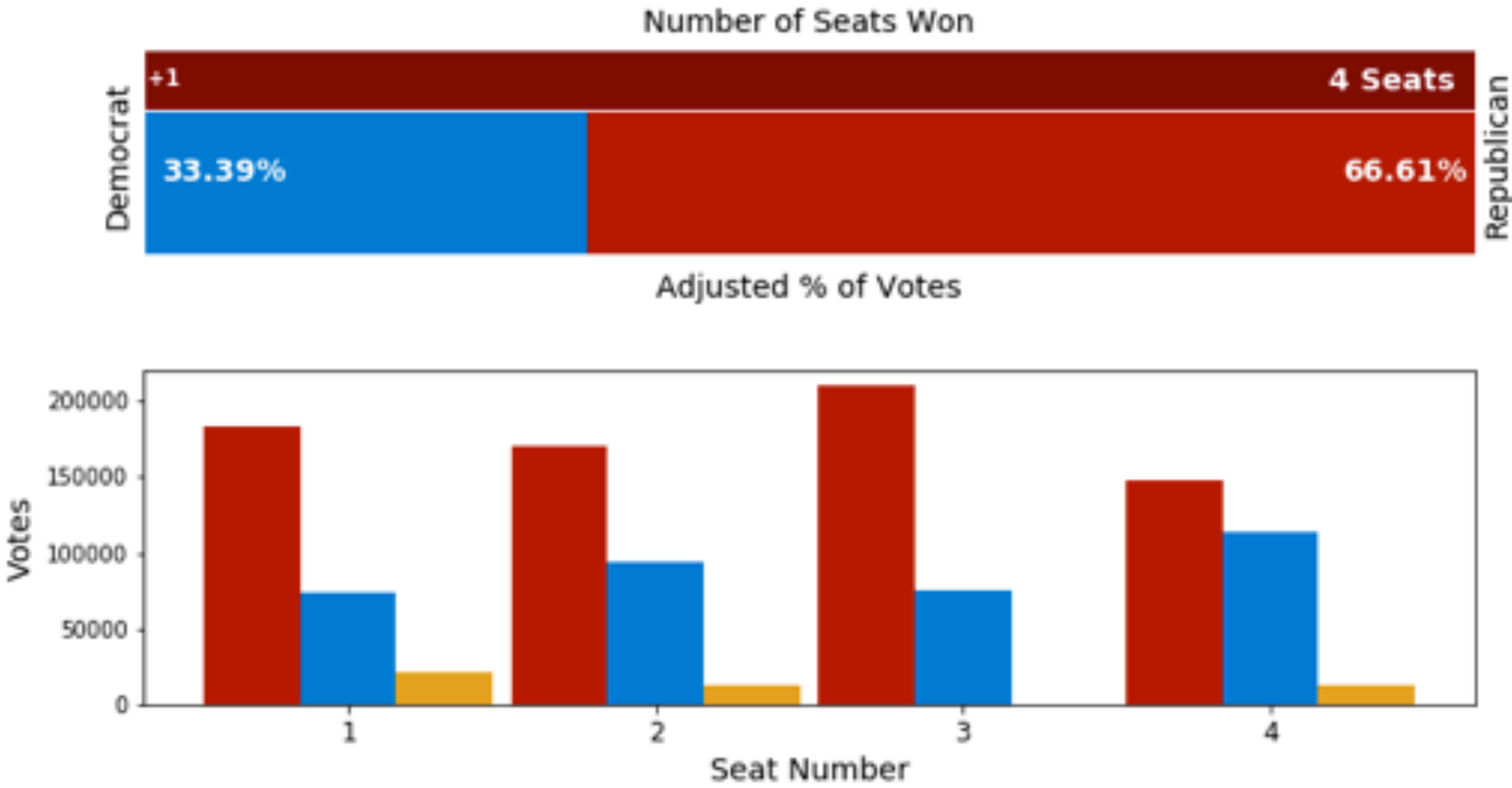
Kansas Election Results



UTAH

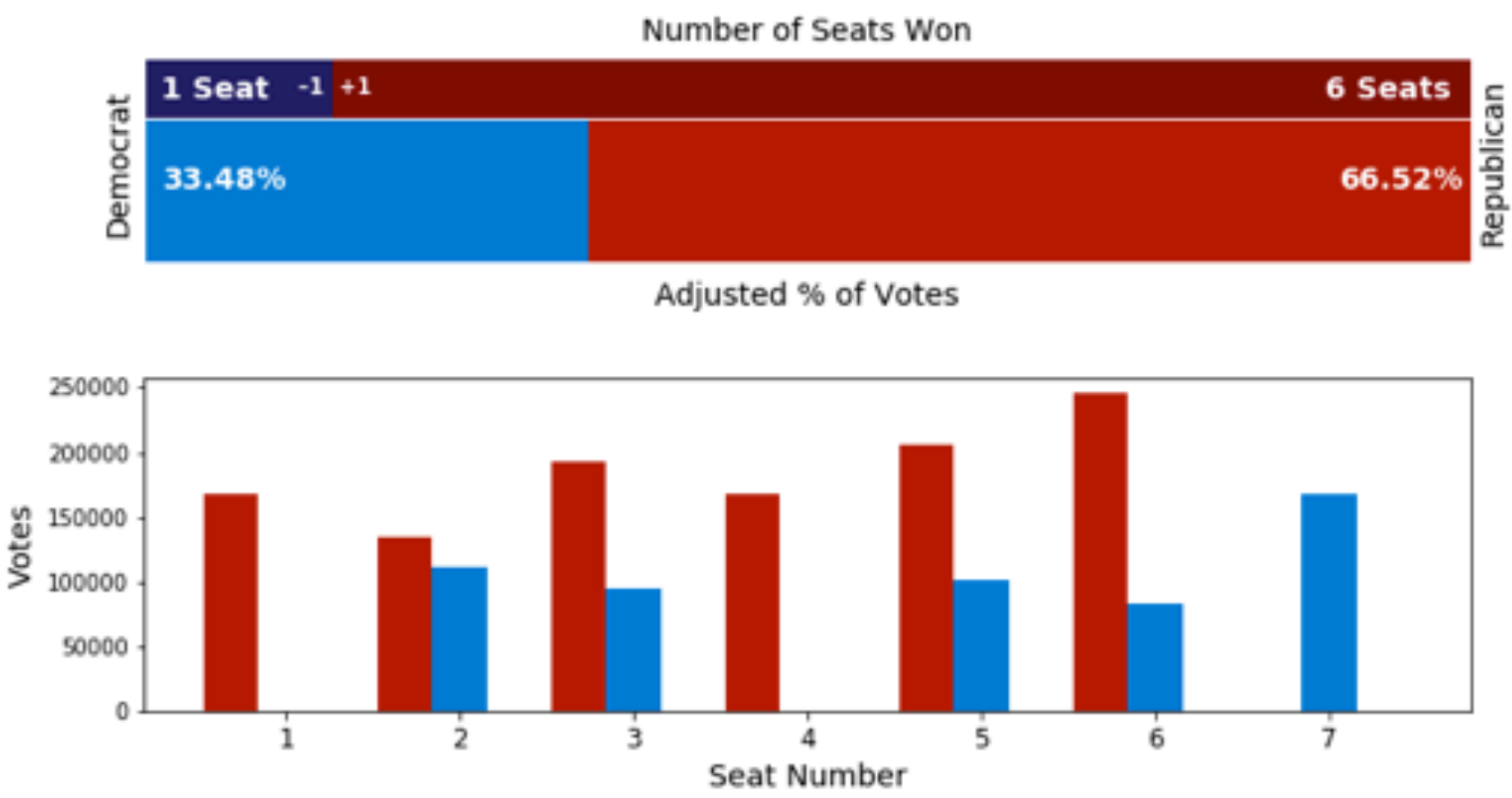
.....

Utah Election Results

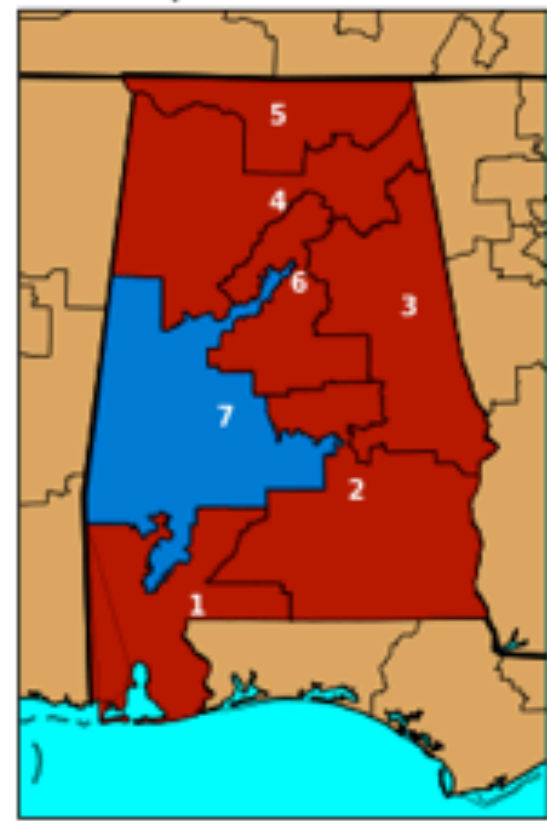


ALABAMA

Alabama Election Results



State Map with Seat Numbers



STATES THAT FAVOR DEMOCRATS



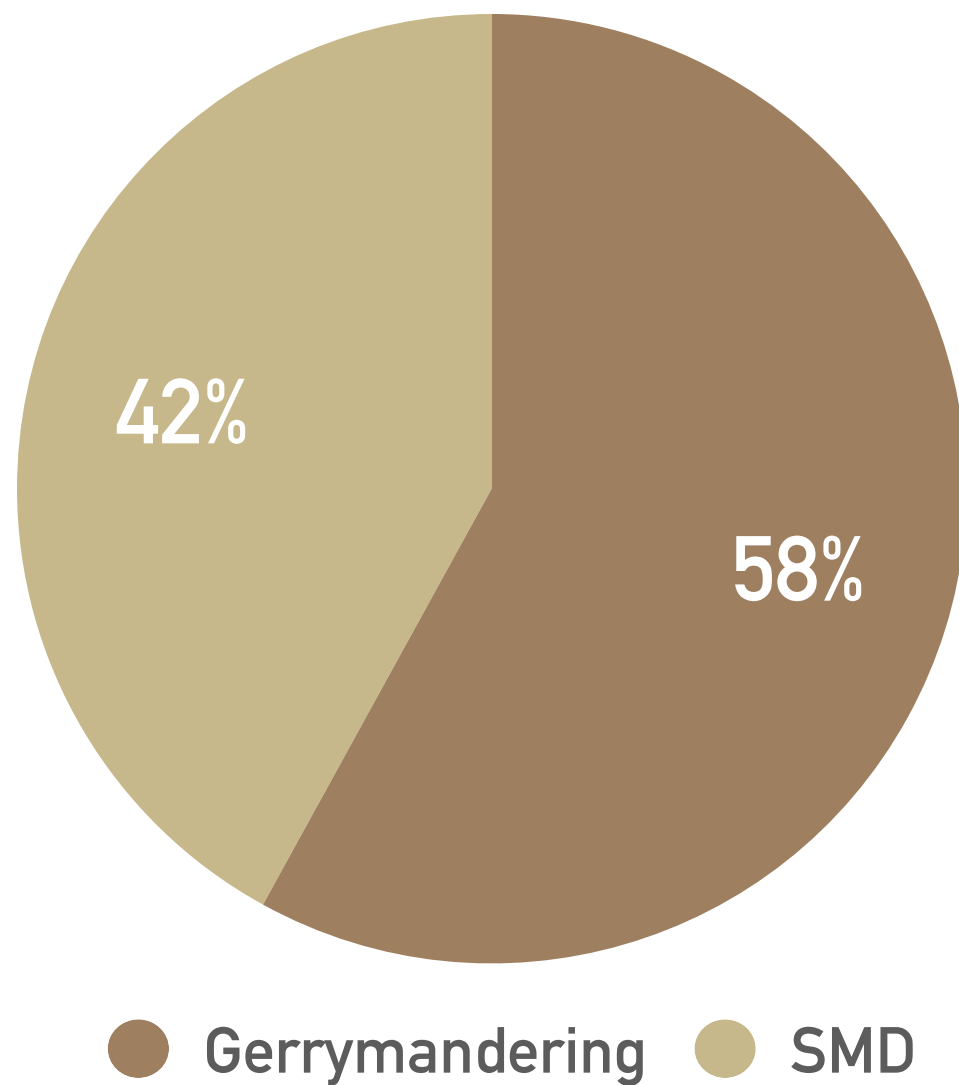
State	Number of seats won?	Evidence of cracking?	Evidence of packing?	Wiggly district lines?	Most likely: SMD or Gerrymandering?
CA	4	No	No	Yes	SMD
CT	1	Yes	No	Yes	Gerrymandering
IL	1	Yes	Yes	Yes	Gerrymandering
MA	1	Little	No	Yes	SMD
MD	1	Yes	Yes	Yes	Gerrymandering

STATES THAT FAVOR REPUBLICANS

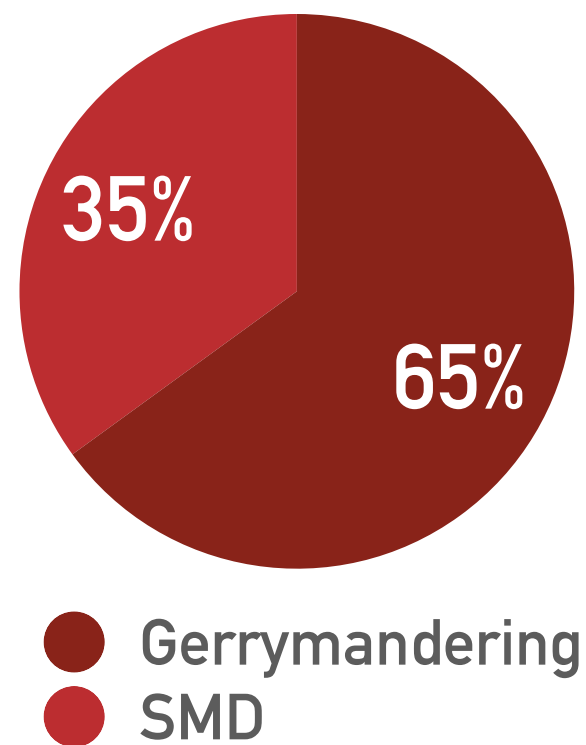
State	Number of seats won?	Evidence of cracking?	Evidence of packing?	Wiggly district lines?	Most likely: SMD or Gerrymandering?
NC	3	Yes	Yes	Yes	Gerrymandering
PA	3	Yes	Yes	Yes	Gerrymandering
OH	2	Yes	Yes	Yes	Gerrymandering
TX	2	Some	Some	Yes	SMD
AL	1	Yes	Yes	Yes	Gerrymandering
FL	1	Some	Some	Yes	SMD
GA	1	Yes	Yes	Yes	Gerrymandering
IN	1	Yes	Yes	Yes	Gerrymandering
KS	1	Some	No	No	SMD
MI	1	Some	Some	Yes	SMD
MO	1	No	No	Yes	SMD
OK	1	Some	No	Yes	SMD
SC	1	Yes	Yes	Yes	Gerrymandering
TN	1	Some	Some	Yes	SMD
UT	1	Yes	Yes	Yes	Gerrymandering
VA	1	Yes	Yes	Yes	Gerrymandering
WI	1	Yes	Yes	Yes	Gerrymandering

CONCLUSIONS

Cause of Lost Seats



Republican Favored States



Democrat Favored States

