**Slides 1**

Our project is about gerrymandering, the intentional drawing of district lines to benefit one party. In early October, just a few months ago, the Supreme Court was holding hearings on a gerrymandering case for the state of Wisconsin.

**Slide 2**

To understand gerrymandering think about a state that is granted 6 seats in the US House of representatives. A seat corresponds to a district. This hypothetical circular state shows a configuration that will elect 5 green and 1 purple candidate.

**Slide 3**

What if we divided this state in a differently? Under this new configuration we’d see not 5 green candidates elected, but 2; and we’d see not 1 purple candidate elected, but 4. Clearly we can change election results by changing district lines.

**Slide 4**

This is important because it can result in representation issues. Take a look the results of the 2016 election Republicans won the majority vote, but while they had 1% more votes, they were able to win 24% more seats.

**Slide 5**

With that in mind, our project tries to answer this question: Is gerrymandering the cause of this disproportional representation, or are there other factors in our electoral system that are causing this problem?

**Slide 6**

Often people look for strangely shaped districts and wiggly district lines as a sign of gerrymandering. Contrast Iowa and North Carolina, for example. But can we measure gerrymandering?

**Slide 7**

In the Wisconsin Case they tried to use a metric called “efficiency gap” to measure gerrymandering. It calculates the proportion of wasted votes relative to total votes in an election.

**Slide 8**

For example, blue voters on the right won 5 districts with simple majority, therefore wasting zero votes. Red voters wasted 4 votes per district totaling 20 wasted votes. The efficiency gap here is 20% favoring the blue party.

**Slide 9**

But can we trust this metric? That is our second question project question. To answer it we calculate the efficiency gap a few different ways and test its effectiveness in measuring gerrymandering.

**Slide 10**

We found many visualizations that address gerrymandering. Here we see one from the company Silicon Valley Data Science. It shows how squiggly a district is, and it contrasts actual vs. expected wins for the state.

**Slide 11**

Princeton has an elaborate visualization that runs three statistical tests to assess the likelihood of gerrymandering. States are graded on a scale from “unlikely”, in green, to “very likely”, in red.

**Slide 12**

This visualization by Patrick Han provides excellent insight. See the blue line projecting to the right at the top, much further than at the bottom. Democrats in Alabama had enough votes to elect two representatives.

**Slide 13**

The main visualization we use in our project was inspired by Han’s work. We added the district level election results plot in the bottom left. For the data at hand, we can fully analyze a state using this visualization.

**Slide 14**

We produced three computations of the efficiency gap metric. This plot shows one of them: percentage number of seats lost by a part in each state. Kansas and Utah appear at the top, followed by North Carolina.

**Slide 15**

If we analyze Kansas we see republicans disproportionally won an extra seat. Analysis of the district votes, as well as the district map do not support a claim this state is gerrymandered.

**Slide 16**

Along the same lines, Utah election results too favored republicans, but the republican victory seems to result from the single member district electoral system, rather than spurious manipulation of district lines.

**Slide 17**

Alabama is different. Blue votes are “packed” in district 7, which is rather strangely shaped. And blue votes are diluted, or “cracked” among adjacent districts 2, 3 and 6. This helped republicans to win a close race in district 2.

**Slide 18**

After analyzing one by one all states with disproportional results, or lost seats, we concluded the efficiency gap is a poor identifier of gerrymandering. The criteria for our final analysis are captured in this table.

**Slide 19**

We conclude lost seats result from gerrymandering in 58% of the cases. That means the remaining 42% of the seats lost appear to result from the single member district electoral system, rather than gerrymandering.

**Slide 20**

In the states where democrats lost seats republicans were likely favored by gerrymandering in 65% of the cases, whereas democrats benefited from gerrymandering 38% of the cases.

We conclude by saying that democrats should invest in initiatives to combat gerrymandering.