



Political ideology of Politicians

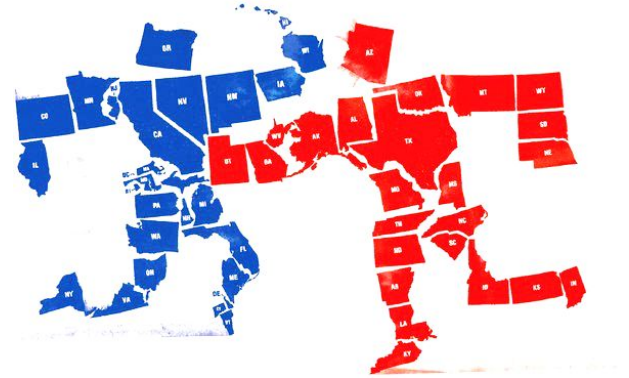
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Background

- 2016 Polling
 - Democrats- 89% vote for Hillary
 - Republicans- 88% vote for Trump
- Increased polarization of parties
- Party trumps views and beliefs
- Short term factors and candidate image have disproportionate influence





Purpose and Motivation

- High levels of partisanship voting- views ignored in favor of party allegiance
- Lobbying groups give politicians ratings on issues
- Ratings help voters determine where politicians stand
- How useful are those ratings? What can they really tell voters?



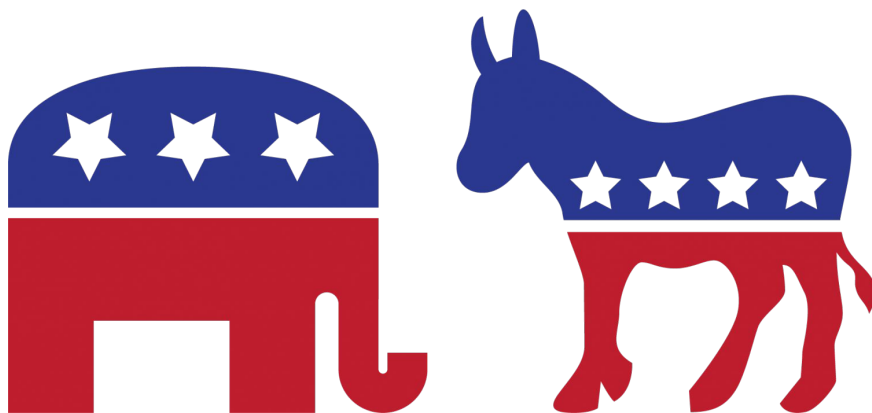
Data

- California Polytechnic State University
 - Originally from: electoral-vote.com
- Generalized to lawmakers
- Reflective on the political atmosphere from when the data was taken
- Cases:427



Response Variable

- IsDemocrat is a binary variable
 - 1 if the lawmaker is a Democrat
 - 0 if the lawmaker is a Republican
- ACLU scores





Explanatory Variables



THE
AMERICAN
CONSERVATIVE
UNION


- Political party
- Score by American Conservative Union
- Score by American Civil Liberties Union
 - Liberal
- Score by Children's Defense Fund



Children's Defense Fund

A strong, effective, independent voice for *all* the children of America

More explanatory variables:



Americans for Tax Reform (ATR): Americans For Tax Reform is a conservative grassroots lobbying organization that seeks to reduce all taxation in all levels of government founded by Conservative and influential lobbyist Grover Norquist. Their scores are thought to be connected to how the lawmaker votes. Scores are from 0-100.

Americans for Democratic Action (ADA): Americans for Democratic Action Is a non profit organization that seeks a commitment to liberal and progressive policy and advocacy. It was founded by Eleanor Roosevelt in 1947. Lawmakers get 5 points for every vote that matches with their policy. Scores are from 0-100.

Traditional Values Coalition (TVC): Traditional Values Coalition is a Christian Conservative organization that seeks to spread evangelical Christian values and represents over 20,000 churches in America. It is widely considered by many to be a LGBTQ hate group. It is unclear how they score lawmakers. Scores are from 0-100.

NAACP: A Non-profit organization that advocates for the rights and equality of African Americans and minorities.



METHODS



Methods:



MLR: We want to create a model to try to predict the ACLU score of the lawmakers.

- **Model Selection:** We used **Stepwise** selection in R, to find the best model for predicting the ACLU score of lawmakers. Using this we get that the best model is $\text{lm}(\text{ACLU} \sim \text{ATR} + \text{ADA} + \text{TVC} + \text{Party} + \text{ACU} + \text{NAACP})$

ANOVA: We perform an ANOVA test to examine whether at least one of these predictors is associated with ACLU score.

BOOTSTRAP: The validity of t-tests, etc. in MLR models rely on assumptions that may not be met. But we still wanted to test for significance using methods based on simulation.

We also built a **Multiple logistic model**: The data in the data set contains observations about lawmakers, and whether they were Democrats (outcome is a 2 level factor variable, Democrat/Republican). The goal is to determine the association with ADA, ACLU, NAACP, CDF, and ACU scores the likelihood of a congressman being Democrat.

Nested likelihood ratio test:

ANOVA: ANOVA test for the explanatory categorical variable (Party) and ACLU Score.



RESULTS



MLR MODEL FOR PREDICTING ACLU SCORES

$$\widehat{ACLU} = 93.331 - 0.123 \cdot ATR + 0.277 \cdot ADA - 0.186 \cdot TVC - 30.081 \cdot PartyR - 0.376 \cdot ACU - 0.128 \cdot NAACP$$

```
## Call:
## lm(formula = ACLU ~ ATR + ADA + TVC + Party + ACU + NAACP, data = voter_guide)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -35.849  -3.601  -0.768   3.220  37.165
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  93.33116    5.30684  17.587 < 2e-16 ***
## ATR          -0.12315    0.06615  -1.862  0.063508 .
## ADA           0.27744    0.08777   3.161  0.001711 **
## TVC          -0.18637    0.04850  -3.843  0.000145 ***
## PartyR       -30.08121    4.13524  -7.274  2.37e-12 ***
## ACU          -0.37593    0.06918  -5.434  1.05e-07 ***
## NAACP        -0.12759    0.08338  -1.530  0.126869
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.169 on 344 degrees of freedom
## (76 observations deleted due to missingness)
## Multiple R-squared:  0.9604, Adjusted R-squared:  0.9597
## F-statistic: 1390 on 6 and 344 DF, p-value: < 2.2e-16
```



Multiple Linear Regression: INTERPRETING COEFFICIENTS


Intercept: The predicted ACLU Score of a Lawmaker who is a Democrat is **93.331** when holding other predictors in the model constant.

ADA: It is predicted that as a lawmaker's ADA score increases by one point that the lawmaker's ACLU score will increase by **0.277 points** on average holding the other variables in our model constant.

ATR: It is predicted that as a lawmaker's ATR score increases by one point that the lawmaker's ACLU score will decrease by **0.123 points** on average holding the other variables in our model constant.

TVC: It is predicted that as a lawmaker's TVC score increases by one point that the lawmaker's ACLU score will decrease by **0.186 points** on average holding the other variables in our model constant.

Multiple Linear Regression: INTERPRETING COEFFICIENTS



Party R: It is predicted that a Republican lawmaker's ACLU score will be 30.081 points lower on average than a Democratic lawmaker's ACLU score holding other predictors in the model constant.

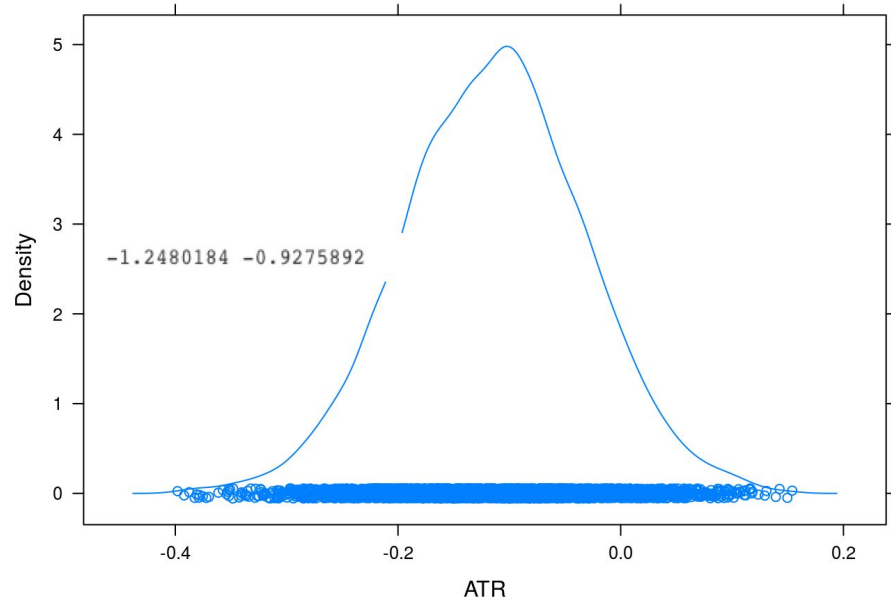
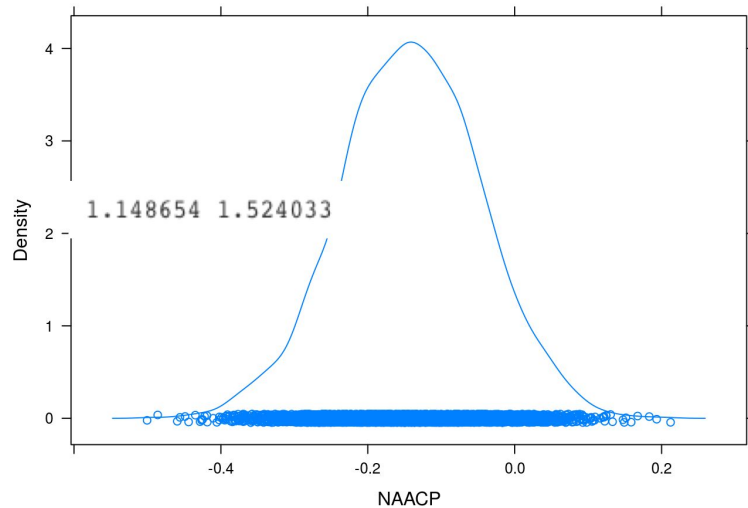
ACU: It is predicted that as a lawmaker's ACU score increases by one point that the lawmaker's ACLU score will decrease by 0.376 points on average holding the other variables in our model constant.

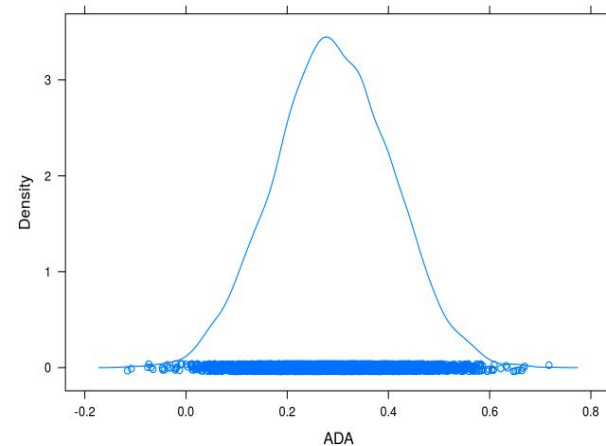
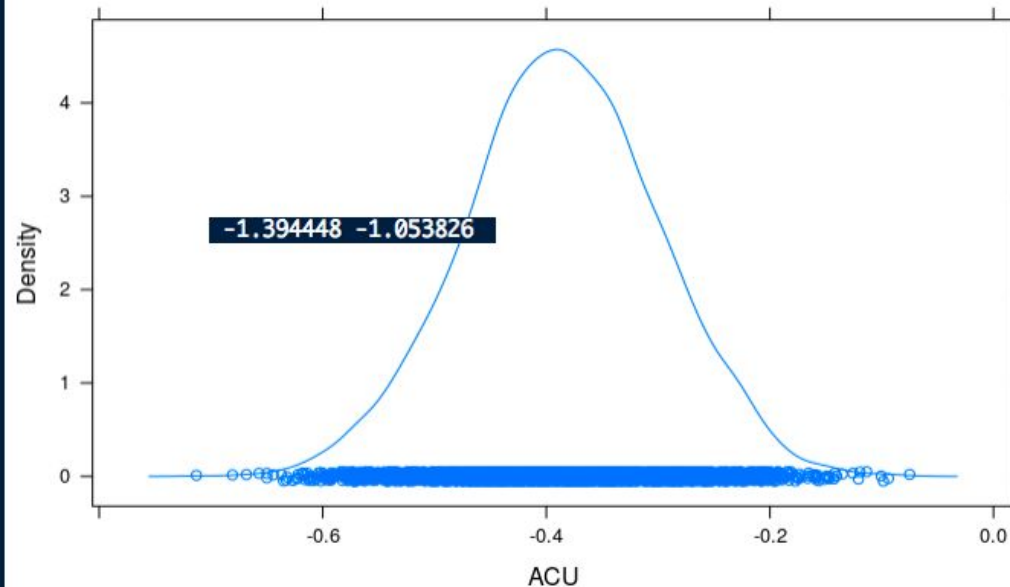
NAACP: It is predicted that as a lawmaker's NAACP score increases by one point that the lawmaker's ACLU score will decrease by 0.128 points on average holding the other variables in our model constant.

Looking at the anova output we can see that at least one of our predictors are statistically significant. We can see that this model explains 96% of the variability of ACLU scores of lawmakers

Bootstrap

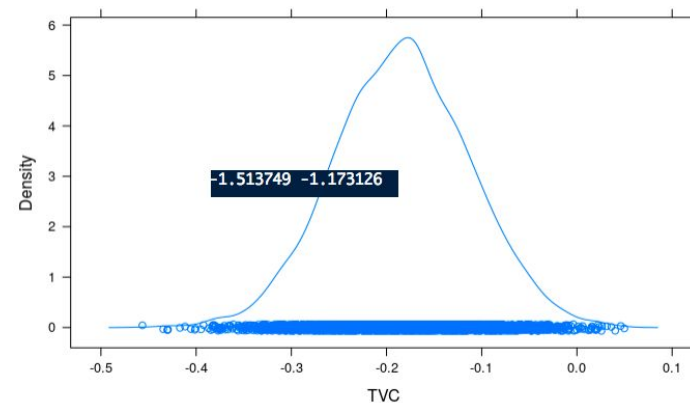
We performed a bootstrap sampling to create bootstrap distributions of the different coefficients predictors in the model in order to see which of the individual predictors are useful. We created a 95% confidence interval for coefficient of each predictor.





```
## [1] 0.8826002 1.3328107
```

- Zero not included in CI
- Each predictor associated with ACLU score
- Possible multicollinearity



Multicollinearity

```
##          ATR          ADA          TVC isDemocrat          ACU
## ATR      1.0000000 -0.9460512  0.9103474 -0.9466776  0.9584667
## ADA     -0.9460512  1.0000000 -0.8983682  0.9546573 -0.9210491
## TVC      0.9103474 -0.8983682  1.0000000 -0.8723352  0.9400124
## isDemocrat -0.9466776  0.9546573 -0.8723352  1.0000000 -0.8839630
## ACU      0.9584667 -0.9210491  0.9400124 -0.8839630  1.0000000
## NAACP   -0.9191940  0.9797150 -0.8793711  0.9208150 -0.9142144
## ACLU    -0.9630078  0.9548280 -0.9269578  0.9500562 -0.9481752
##          NAACP          ACLU
## ATR      -0.9191940 -0.9630078
## ADA       0.9797150  0.9548280
## TVC      -0.8793711 -0.9269578
## isDemocrat 0.9208150  0.9500562
## ACU      -0.9142144 -0.9481752
## NAACP     1.0000000  0.9296409
## ACLU      0.9296409  1.0000000
```

- Predictors highly correlated
- Possible multicollinearity problem
 - Scores based on similar/same criteria

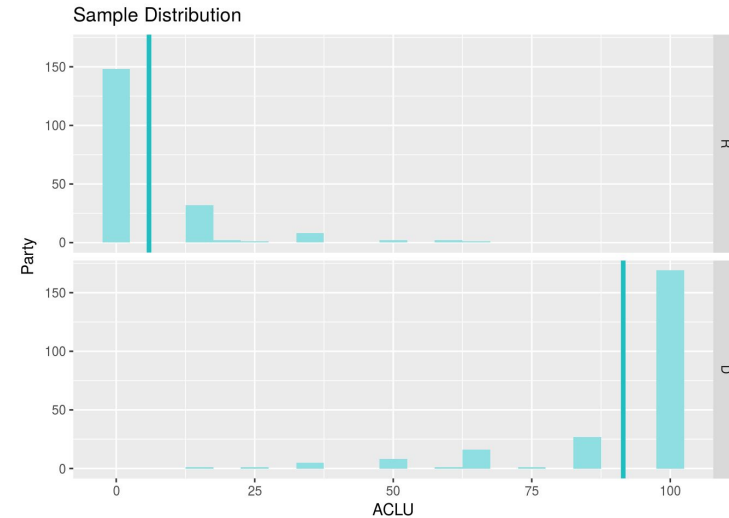
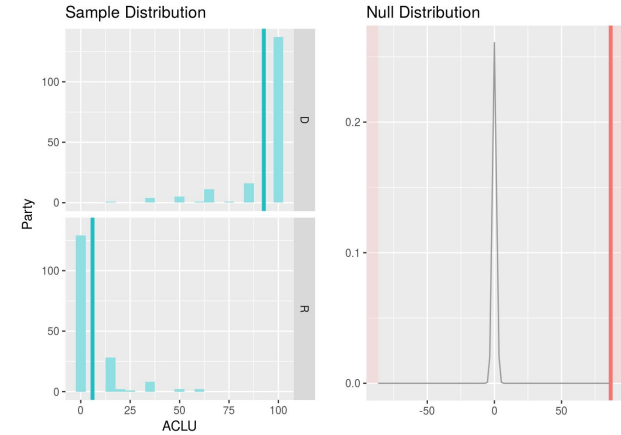
ANOVA: categorical variable



There is enough statistically significant (at the 5% level) evidence for us to reasonably conclude that there is a difference between the average mean ACLU of lawmakers depending on their political party.

95% CI: the true difference of mean ACLU scores :
[-88.3955 , -82.7808]

- 0 is not included in our interval





Multiple logistic model

$$\text{Log(odds)} = -0.332 + 2.803(\text{ACLU}) + 41.728(\text{ADA}) + 14.489(\text{NAACP}) + -26.538(\text{ACU}) + 2.121(\text{CDF})$$

$$\hat{\pi} = \frac{e^{-0.332 + 2.803(\text{ACLU}) + 41.728(\text{ADA}) + 14.489(\text{NAACP}) + -26.538(\text{ACU}) + 2.121(\text{CDF})}}{1 + e^{-0.332 + 2.803(\text{ACLU}) + 41.728(\text{ADA}) + 14.489(\text{NAACP}) + -26.538(\text{ACU}) + 2.121(\text{CDF})}}$$



Odds ratio

- **ACLU:** It is predicted that as a lawmakers ACLU increases by one point, their odds of being a Democrat will be **16.494 times** the odds of a lawmaker who has an ACLU score of one point less holding all other factors in our model constant.
- **ADA:** **1.325×10^{18} times**
- **NAACP:** **1961068.430 times**
- **ACU:** **2.983×10^{-12} times**
- **CDF:** **8.339 times**

Nested likelihood ratio test

We have evidence that model 2 is useful for predicting the likelihood of a lawmaker being a Democrat:

- Model 3 was not useful
- Model 4 is useful.

```
## Likelihood ratio test
##
## Model 1: isDemocrat ~ ACLU
## Model 2: isDemocrat ~ ACLU + ADA
## Model 3: isDemocrat ~ ACLU + ADA + NAACP
## Model 4: isDemocrat ~ ACLU + ADA + NAACP + CDF + ACU
##   #Df   LogLik Df   Chisq Pr(>Chisq)
## 1    2 -22.6910
## 2    3  -5.5763  1 34.2295  4.898e-09 ***
## 3    4  -5.5251  1  0.1024  0.748933
## 4    6   0.0000  2 11.0502  0.003986 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```



Discussion

Question: How are these scores related to each other?

- Scores highly correlated- based on similar metrics

Question: How correlated are these scores related to a politician's party?

- Most important model- logistic model
- We have evidence that there is a relationship between these scores and a politician's political party.



Final Thoughts

- The scores seemed to lie on the extreme end. Through looking at our data we can see that a politician would either receive a high score around 95-100 or a zero- there were very few moderate scores.
 - This suggests that these scores are very partisan.
- Our data was taken in 2007 which was a less partisan time so our conclusions might not reflect entirely what is happening today in our political climate.
- We also don't know how lawmakers are influenced by these scores and do the scores reflect how these organizations give to politicians' campaigns?