

Political Identity and Goal Inference Based on Voting Behavior

Jack Cook (jgacook@stanford.edu)
Symbolic Systems, Stanford University
Stanford, California

Maggie Goulder (mgoulder@stanford.edu)
Symbolic Systems, Stanford University
Stanford, California

Virginia Kathryn Steindorf (vsteindo@stanford.edu)
Symbolic Systems, Stanford University
Stanford, California

Abstract

Just as a person may be motivated by a specific goal towards a specific behavior, politicians are more strongly motivated by specific goals to influence how they vote for other politicians, bills, and policies. If a politician is more motivated by one goal, say political, environmental, or social, this builds a their political identity. People are extremely imprecise at inferring these political identities as most of these inferences are developed from imprecise psychological cues diluted by media sources or outside opinion. Goal inference computational models have been shown to accurately infer intention based on behavior. Our research used a fictional country and election to determine if it was possible to a) infer political identity as humans and b) match the subject data with the computational model. We found that political identity and goals are too nuanced to precisely model with our first few attempts, as oversimplified political scenarios do not inform the complex conscious and subconscious motivating factors of current politicians. Further, goals are not necessarily mutually exclusive, especially in politics.

Keywords: political identity; goal inference; voting behavior; voting history; computational modeling; political; economic; social

Introduction

As our lives progress, especially in a nation as politically involved as the United States, our votes become more weighty and relevant. The politicians we place in positions of power determine whether or not our friends will be legally recognized for their marriage, whether or not our children will be able to attend the best schools, how much of our income we will have to sacrifice to taxes, and how much of our environment we can save from influences like mining, drilling, and pollution. Our votes determine where we send our troops to fight and die for us, who of the oppressed and impoverished receive our aid, how well our businesses will survive or thrive, who receives the best health care, and whether or not our criminals are killed under the death penalty.

With the greater repercussions and implications resulting from the candidates we elect to office, it becomes essential

to understand the political identities of our candidates, and for the politicians, to understand the political identity of the public. More recent studies have more narrowly examined the psychological, social, and socioeconomic factors that create this political identity and influence voter behavior. Drew Westen's popular book, *The Political Brain*, examines the role of emotion on political behavior, taking a psychological approach to understanding voter behavior. Similarly, Kahneman and Tversky's theory of loss aversion has often been applied to voting behavior as another example of how subtle psychological forces shape political identity.

Although the psychological methods we use are particularly imprecise at shaping our inferences regarding political identity, is it possible for us to accurately infer political identity based on voting behavior through cognitive probabilistic models? An unbiased and computational model of this cognitive inference process could create an unbiased, standardized assessment to inform and influence voting behavior for both politicians and the public. A model such as this would be centered on the theory of rational behavior: rational agents tend to achieve their desires as optimally as possible, given their beliefs. If our actions are determined by our goals, then we may infer our goals based on our behavior. Not only has research proven that adults are extremely skilled at this type of inference (people instantly and subconsciously infer and pursue the goals perceived in others' behavior), but it is so intrinsic to our cognitive wiring that infants have displayed goal inference based on abrupt changes in behavior (Dik, September 2007, Woodward 1998). To construct a computational model would allow clarity of fine-tuned comparisons and visual mappings of people's judgments.

In a landmark publication titled *The American Voter*, Campbell, Converse, Miller, and Stokes identified inherited partisan identity as the key factor affecting voter behavior, establishing the foundation for future research and debate. Our research will attempt to take that voter behavior and build a model that can infer political identity as we do.

Methods

In order to assess our research question, we attempted to format a behavioral situation from which it would be uniformly possible to infer political identity without the threat of impeding, overlapping intention, and bias. Through multiple iterations and tests, we designed a survey the results of which we tested against our computational model.

We distributed three different versions of our finalized survey, each with the same hypothetical scenario, but assessing different combinations of behavior for goal inference. In addition to the qualitative results from the selection of the goal based on the voting behavior of the hypothetical candidates, we realized through the inconsistencies of the results and unintended interpretations of the survey that qualitative interviews could inform the intuitions arising from our survey and thus some potential pitfalls and correlations between the survey and the model.

Survey Design

The survey is designed so that participants may infer the political identity of a member of the public, Sally, if she votes for a specific candidate with a known voting history. The most difficult element of this design was to build the profiles of hypothetical candidates free of bias and unwarranted expectation. The initial survey design featured five ambiguously motivated bills on which candidates voted yes or no. These bills featured issues such as whether or not to increase the salaries of teachers we intended to ambiguously motivate by our three goals (social, economic, or environmental.) The fault in this design is that the survey itself would ultimately assess how people categorized said bill, rather than the intentions of the politicians and their votes.

Our next design featured a voting history in which the candidate could abstain, and thus voted on the category of bill for which he/she was most passionate. However, initial release of this survey design revealed that people attempting to infer goals automatically began to categorize the candidates based on our familiarity with the American political system and party divide, and the stereotypes associated with each party. Thus, we decided to use a completely hypothetical country, “Lelandia,” fleshed out in our survey to be unique from American standards and to squelch any subconscious attempts to categorize the hypothetical candidates into political parties.

Lelandia is a nation with a rapidly emerging global economy and a functional democracy. Its swift economic prosperity is owed in a large part to the wealth of natural resources that it is exploiting in order to propel its growth. The development of these resources is fundamental to the growth and future prosperity of Lelandia and there is enormous political and social pressure to push development in order to maintain the country's economic explosion. Despite this prosperity, it is not immune to the problems that are typical of an emerging nation: the country's education system needs reform, social and civil rights issues demand attention in keeping with the country's increasing modernity, and there is a call to consider environmental issues more seriously.

Further, the survey featured not one voting session as political history, but two voting sessions to give participants a sense of voting consistency between sessions. If Sally were to vote for a specific candidate, or multiple candidates in multiple elections, we asked our participants to infer her dominant political motivation. Ten students completed each survey version.

Model Design

Our computational model was structured after Goodman and Tenenbaum's model regarding Sally and goal inference with a vending machine. The situation for which this computational model infers Sally's goal appears structurally analogous to our voting situation. In Goodman and Tenenbaum's model, Sally is faced with a vending machine with three buttons, just as Sally is faced in an election with three candidates – and each of these buttons with unequal probabilities will produce three different types of food, just as we as with unequal probability each of the candidates vote for specific political, environmental, or social issues.

The model is based on a rejection query that samples an arbitrary number of trials to determine the goal when a specific candidate (or combination of candidates) is selected. Through a series of queries, it infers these goals and displays the probability of each, or the proportion those goals occurred given the sample action matched the queried action.

Qualitative Interviews

We chose the purposeful sampling technique wherein which we selected the most extreme participant cases and asked them to perform a think-aloud-protocol, or cognitive walk-through whilst completing our survey to analyze their mental processes. This involved a pre-training segment where we explained to the participants what we expected during the exercise: to verbalize each thought whilst completing the survey. Their responses were recorded via the application Voice Memo and later analyzed for common themes.

Results

We analyzed our quantitative results for the computational model against our survey results for the survey model. Further, we analyzed our qualitative interviews for common codes and themes.

Quantitative Results

Two versions of the survey show intuitions against the computational model for A or B centered surveys.

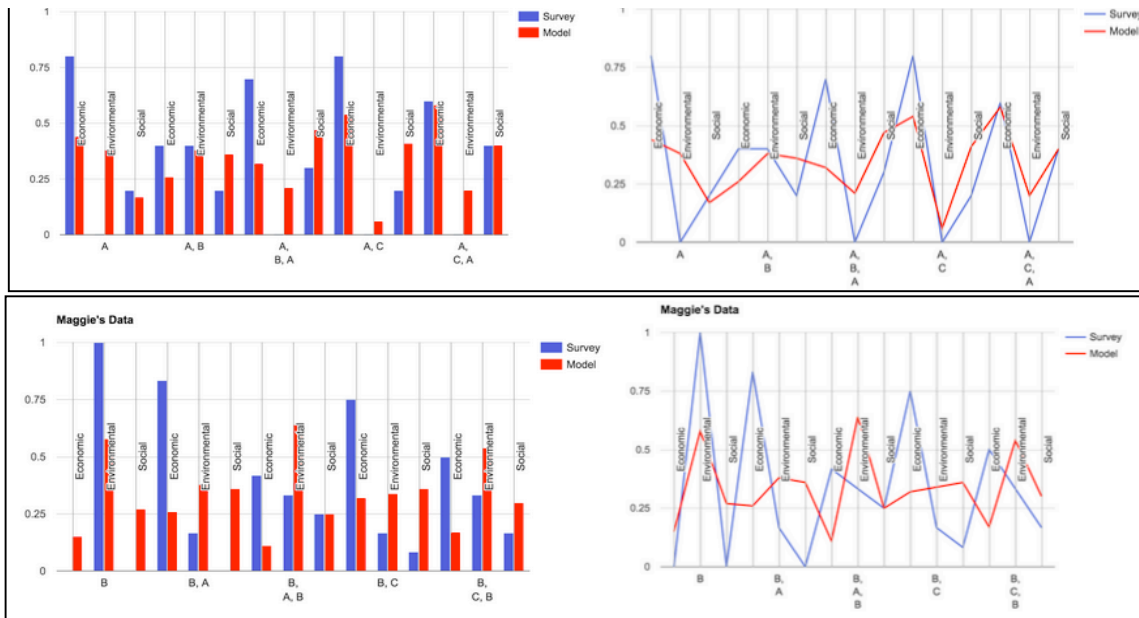


Figure 1: (Top) A-oriented survey: participants' intuitions in blue against the model results in red (Bottom) B-oriented survey: participants' intuitions in blue against the model results in blue.

Qualitative Results

For each version of the survey, 1-2 participants were identified with outstanding responses, or strong feelings regarding the structure of the survey. We asked these participants to perform a think-aloud-protocol when executing the survey, and then asked them how they felt about the survey and their intuitions as to what it meant to assess. We found these common themes from our interviews.

Voting History Interpretation Inconsistency

While the explanation of the survey specified that the two charts displaying voting histories were from two voting sessions, and the percentages implied expressed interest in issues of the particular topic, people were generally confused by this structure, as it is so dissimilar to familiar voting systems.

"Ok, so candidate A voted on economic bills the majority of times in both sessions...but does that just mean that the majority of the bills were economic? Or that they only cared about those bills? Or that they voted only yes on those bills? I'm not really sure if this is right, but I'm assuming you guys meant they are more economic than environmental or social." (Participant 3, A-oriented Survey)

Session and Multiple Election Correlation

Additionally, although we provided multiple voting sessions to show consistency of behaviors between the two sessions, in several cases, participants thought that multiple voting sessions corresponded only with questions asking about two elections, as if each session specifically corresponded with an election.

Discussion

It's clear from observing the graphical data that there is a significant discrepancy between the two rounds of data collection. This is easily explained by the design of the survey – the correlation between sessions for Politician A was far clearer (i.e. during both sessions he had consistently allocated a much higher proportion of his votes to the same issue) compared to Politician B. As a control to check for noise, we collected a round of Surveys in which Sally chose Politician B and had our survey subjects perform these. As was predicted and as can be seen in the results, survey subjects were much more uncertain about Sally and Politician B's goal. We were advised to introduce some noise into the survey, to make it a little more challenging for survey takers, but the results show that if a survey taker is told that there is even a small chance that a sample politician's goals may not be in alignment with their voting behavior, it triggers much greater caution in subject's goal inference assertions. If we had had even further rounds of data collection and model improvement, we ought to have found a technical way to represent a subject's uncertainty about uncertainty and accounted for it so the model's predictions would not have been so discrepant. The model here simply takes the most statistically likely political goal and displays that, but survey subjects are more inclined to distrust raw statistics, even if there is unconfirmed voting/goal misalignment.

The more salient voting record of Politician A lead to quite satisfying results: the model is out of step at a few points, but ultimately matches all the peaks and troughs of the survey data well. This is a simple result of the test subject being in a "hard statistical" frame of mind when presented with data that has an obvious correlation. Even so, there is clearly some room for the model to account for the minority of survey subjects who, in spite of the strong statistical correlation on paper, still hedged their bets and accounted for the possibility of Politician A being deceptive nonetheless.

Model Upgrades

After comparing our qualitative data with the modified Sally Vending Machine model, it is clear there are some discrepancies between said data and our model. This is to be expected – our bastardization of the Sally model was crude, in large part because we had an ambitious goal and underestimated the number of factors, parameters, and variables that would make a better model. Plainly: we were trying to fit a glove on a foot. The Sally model captures one particular psychological facet, which is making inferences about inferences. Clearly this is appropriate for the particular scenario (what do we believe to be Sally’s goal food, given that she has pressed particular vending machine buttons that have a high probability of dispensing a particular food), but not wholly applicable to ours (what do we believe to be a politician’s policy goals given a distribution of their voting behavior with a small chance that they did not vote for their goal).

We heavily scaled back our model design early on in the project when it became clear to us that our surveys had the strong potential to induce bias within our survey subjects. The surveys became temporally and sequentially independent (i.e. two political sessions are given without any reference to temporal sequence) as well as eschewing any political parties, alliances, etc. Our model reflected these changes, becoming a scaled back rejection-query that simply reflected the survey taker’s inferences in terms of the raw statistics they were given as part of the survey packet.

To further improve the survey, many more iterations of quantitative/qualitative data collection would be required, but based largely on the qualitative data we collected in our surveys, we have some idea of good improvements to implement:

- i. A way to better reflect the fact that the survey displays data from multiple sessions, and the potential cognitive effect such data presentation has on the survey subject.
- ii. Extra parameters to account for the fact that Sally may have taken into account that a politician may have to vote against his goal for a session.
- iii. Ask survey subjects to define their real-world political alignment and factor that into the model as a parameter that affects how they perceive Sally’s choice.

In short: there is plenty of room to implement further model upgrades and parameterization based on what we learned throughout the experiment.

Challenges with Political Goal Inference

Despite our attempts to simplify the problem of political goal inference using the ‘vending machine’ model, our results show that this model does not perfectly translate to voting behavior. First, unlike receiving a bagel out of a vending machine instead of a cookie, voting is not mutually exclusive. For example, the vending machine model

assumes that receiving a bagel 70% of the time means *not* receiving a cookie 70% of the time. This works for the vending machine example; however, in the context of political behavior, voting for one issue 70% of the time does not necessarily mean voting against any other issue 70% of the time. For this reason, we need a more nuanced generative model to represent the problem of voting behavior, which we were not able to achieve in our first iteration of the experiment.

Second, our results suggest that the way the model computes probabilities of political motivation differs from how these computations are performed in human cognition. The model always considers all probabilities with equal importance, no matter how small. Thus, the model considers the observed behavior of voting pro-environment 20% of the time and pro-economic reform 80% of the time equivalent to a 20% and 80% likelihood of the environment and the economy being the primary political motivator, respectively. However, our survey results show that humans tend to ‘optimize’ by simply looking at the issue voted on the most (in this case, economic reform) and immediately identifying that as the political motivator. While the model distributes the relative probabilities of different issues being the main political motivator equally, human cognition performs differently in this case.

Conclusion

Loosely speaking, our survey and modeling data proves that it is certainly *possible* to infer pre-defined political goals based on the inference model we used, however our model is by no means as sufficient or precise as we would like it to be. The most concrete conclusion we can derive from this project is that a rejection-query model can predict specifically-categorized political goals, but that to obtain a more accurate, reliable model, far more testing, redesigning, and psychological knowledge are required. Our results show us that there are far more nuanced forces at play in political goal inference than can be captured by simple statistical inference. Even when presented with an obviously correlated presentation of likely political goals, there was still a slight tendency to vote in favor of the statistical minority. The nuanced inferences we obtained and discovered over the course of this project were certainly a crash course for our collective cognitive modeling skills – while the learning curve of the project was sufficiently steep to keep us busy for the quarter, we walked away with dozens of potential survey improvements, model upgrades, observed psychological phenomena and a wealth of theories on why and how our survey subjects make inferences about the political motivations of others. It is unfortunate that time was so against us – even a week more of project improvement could have yielded an even tighter model and better grasp of the prominent unknown factors we were facing. However, given our non-existent prior understanding of cognitive modeling, the results of this project give us a roadmap to better understanding the cognitive modeling process.

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