

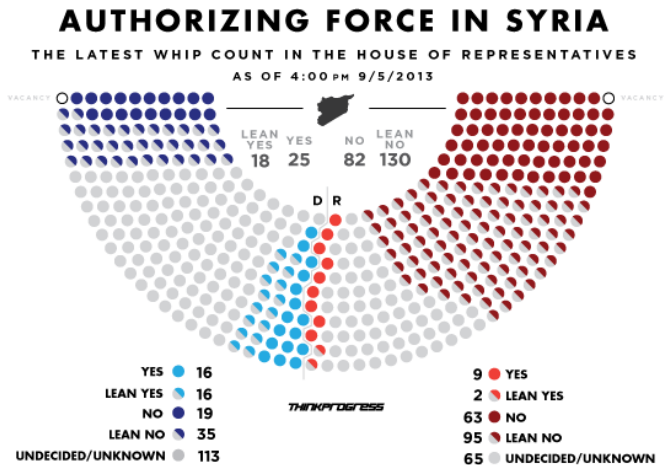


# Computational Social Science

Natural Language Processing: Jordan  
Boyd-Graber  
University of Maryland

INTRODUCTION

## Counting / Predicting Votes



## Stance Prediction



- Predict how people feel about issue
- Traditionally: from votes

## Stance Prediction










- Predict how people feel about issue
- Traditionally: from votes . . . how does text fit in?

## Big Money: Lobbying










- You're an environmental non-profit / coal miner
- States are voting on carbon taxes
- Whom/how do you lobby?

## One-dimensional Ideal Point using Votes

				
	YEA	NAY	NAY	YEA
	NAY	YEA		YEA
	YEA		YEA	NAY

## One-dimensional Ideal Point using Votes

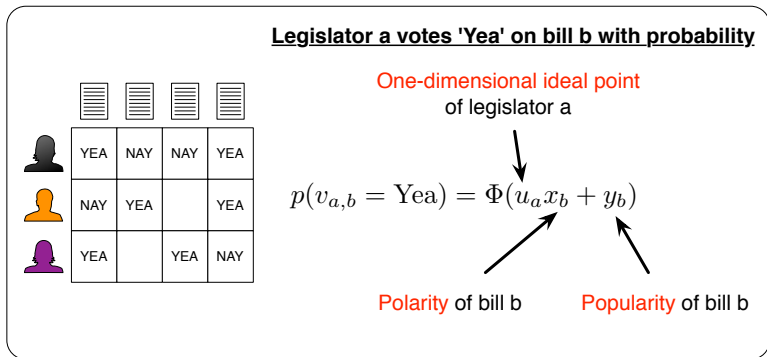
Legislator a votes 'Yea' on bill b with probability

				
	YEA	NAY	NAY	YEA
	NAY	YEA		YEA
	YEA		YEA	NAY

$$p(v_{a,b} = \text{Yea}) = \Phi(u_a x_b + y_b)$$

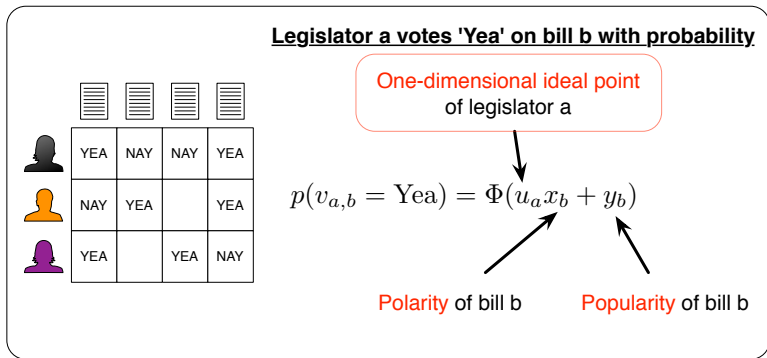
$$\Phi(\alpha) = \frac{\exp(\alpha)}{\exp(\alpha) + 1}$$

## One-dimensional Ideal Point using Votes

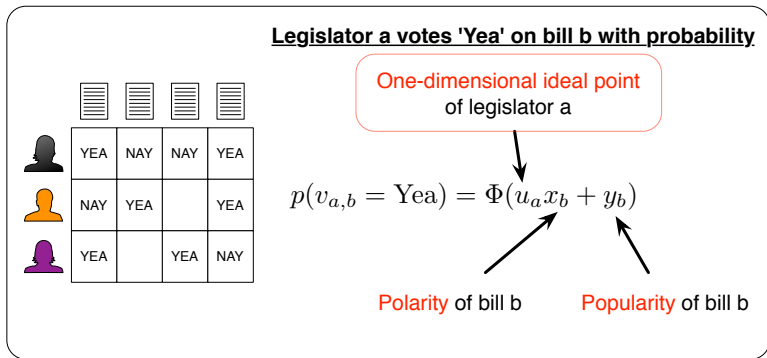




## One-dimensional Ideal Point using Votes










## One-dimensional Ideal Point using Votes



## Multi-dimensional Ideal Point using Votes

Legislator a votes 'Yea' on bill b with probability








				
	YEA	NAY	NAY	YEA
	NAY	YEA		YEA
	YEA		YEA	NAY

$$p(v_{a,b} = \text{Yea}) = \Phi \left( \sum_{k=1}^K u_{a,k} x_{b,k} + y_b \right)$$

## Multi-dimensional Ideal Point using Votes

**Legislator a votes 'Yea' on bill b with probability**

Multi-dimensional ideal point of legislator a








				
	YEA	NAY	NAY	YEA
	NAY	YEA		YEA
	YEA		YEA	NAY

$$p(v_{a,b} = \text{Yea}) = \Phi \left( \sum_{k=1}^K u_{a,k} x_{b,k} + y_b \right)$$

K dimensions

## Multi-dimensional Ideal Point using Votes

**Legislator a votes 'Yea' on bill b with probability**

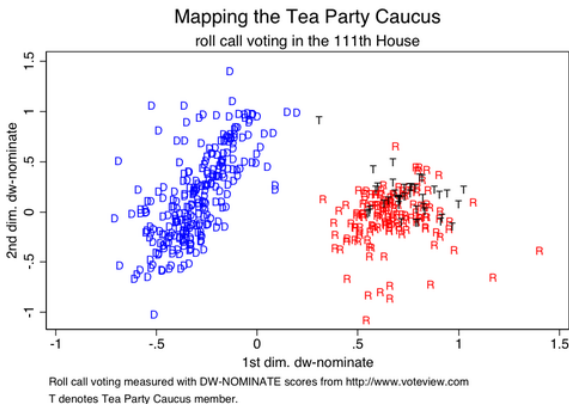
				
	YEA	NAY	NAY	YEA
	NAY	YEA		YEA
	YEA		YEA	NAY

Multi-dimensional ideal point of legislator a

$$p(v_{a,b} = \text{Yea}) = \Phi \left( \sum_{k=1}^K u_{a,k} x_{b,k} + y_b \right)$$

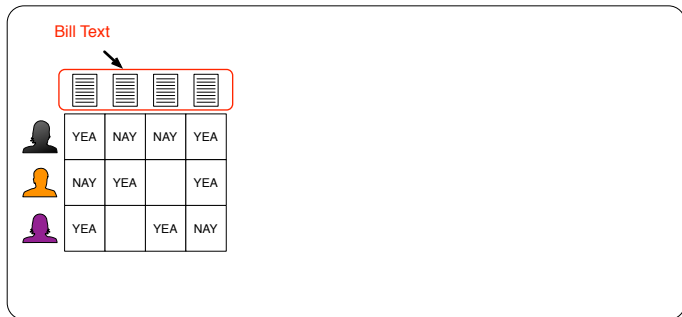
K dimensions

## DW Nominate: Deep Learning from Political Science










- Latent representation of bills / voters
- Common formalism in political science / online quizzes

## Multi-dimensional Ideal Point using Votes & Text



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	NAY	YEA		YEA
	YEA		YEA	NAY








$$p(v_{a,b} = \text{Yea}) = \Phi \left( x_b \sum_{k=1}^K u_{a,k} \vartheta_{b,k} + y_b \right)$$



## Multi-dimensional Ideal Point using Votes & Text

**Legislator a votes 'Yea' on bill b with probability**

Multi-dimensional ideal point of legislator a

				
	YEA	NAY	NAY	YEA
	NAY	YEA		YEA
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$$p(v_{a,b} = \text{Yea}) = \Phi \left( x_b \sum_{k=1}^K u_{a,k} \vartheta_{b,k} + y_b \right)$$

Topic proportion of bill b estimated from its text

## Challenges / Future Problems

- Consistent representations across cultures / languages
- Dealing with politicians without voting records
- Different kinds of text: social media, floor speeches, campaign speech
- Donations?

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