Conversation Analytics: Can Machine Read Between the Lines in Strategic Conversations?

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Outline

Agenda

Motivation

Real-Time Strategic Conversation

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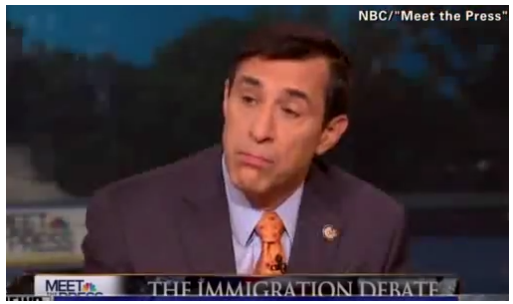
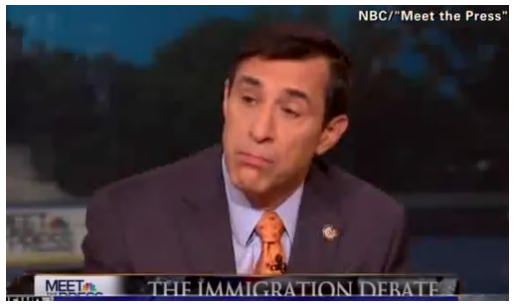
Research Questions

- How will the informed party behave?
- Can machine learning algorithms detect such behavioral cues?


MEET
THE IMMIGRATION DEBATE


NBC/"Meet the Press"
MEET
THE IMMIGRATION DEBATE


CBS/"Face The Nation
FACE the



- **David Gregory**: *... Can any illegal immigrant become legal in the United States without first going home?*
- **Marco Rubio:** *Well, the answer is threefold. Number one is we've got to win the confidence of the American people. It's a sequential approach. You can't just say, "We're going to deal with the 12 million people right up front." First, you've got to win the confidence of the American people that the federal government is serious about enforcing our immigration laws. And that's why I think border security and e-verify are so important.*

Evasiveness

Evasive answers are those not answering the questions, often filled with distracting information not directly related to the question.

- *Don't be afraid to turn their questions. If they ask you about ..., just say 'I want to talk today about the ...'*
- *You get to ask the questions you like. I get to give the answers I like.*

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All right, we know politicians are seasoned evaders. But what about the rest of us? Aren't we trained to be forthright?

- Outright lying and silence are out of the question.
- Responding with less relevant information can be a better option than revealing unfavorable or self-incriminating information.
- Such an evasive response likely indicates some subtle but negative aspect one wishes to hide.

Example: when asked for a comparison of pricing pressure between MAX and NGs models, the Boeing CEO replaced the question with his outlook on the production system and supply chain.

- Larcker & Zakolyukina (2012), through theoretical and experimental analyses, demonstrated that with sanction for lying, explicit lying is largely substituted by evasive "lying".
- Khalmetski et al. (2017) analyzed conference call transcripts using a deception lexcion to predict deceptive discussions (e.g., earnings restatement) and achieved performance as good as those based on financial and accouting variables.

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What will happen in an equilibrium?

Crawford & Sobel (1982) and Milgrom & Roberts (1986) conclude that the receiver's unique equilibrium strategy is the so-called "assume the worst" strategy:

- The receiver makes the inference that leads to the least favorable decision for the sender, conditional on the information available.

Incoherence

In linguistics, discourse coherence refers to "*the quality of being logically integrated, consistent, and intelligible*" (Perrault and Allen 1978) and indicates how well information is connected in verbal or written discourses (Foltz et al. 1998).

Cognitive Load (Hauch et al. 2015)

Deception induces greater cognitive load out of a need to avoid contradicting former statements or facts that the observer may know about. As a result, deceptive accounts appear less coherent.

Evasion Need

The need to avoid a direct answer or to switch to a different topic may lead to a less coherent response.

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Evasiveness

- $T^{Q}_{i,j}$: the topic vector of question j directed to sender i.
- $T^{A}_{i,j}$: the topic vector of sender i's answer to question j.

$$e_{i,j} \equiv 1 - \frac{T^{Q}_{i,j} \cdot T^{A}_{i,j}}{\| T^{Q}_{i,j} \| \cdot \| T^{A}_{i,j} \|}, \qquad e_i = \frac{\sum_{j=1}^{n} e_{i,j}}{n}.$$

A dataset[1] of 53 annotated segments from 6 political interviews.

- Brodie and Blair, Green and Miliband, O'Reilly and Hartman, Paxman and Osborne, Pym and Osborne and Shaw and Thatcher.
- Each interview was rated by 7 annotators for relevance and completeness.

	Irrelevance		Incompleteness		Both Aspects	
	Average	Majority	Average	Majority	Average	Majority
Pearson	0.3846	0.3065	0.3657	0.3032	0.4568	0.4187
	(0.0045)	(0.0256)	(0.0071)	(0.0273)	(0.0006)	(0.0018)
Spearman	0.3661	0.2866	0.3932	0.3318	0.4754	0.4357
	(0.0070)	(0.0375)	(0.0036)	(0.0152)	(0.0003)	(0.0011)

[1] http://mcs.open.ac.uk/nlg/non-cooperation/

Incoherence

We quantify how smooth a sender's thoughts flow within a response to evaluate the coherence of the response.

- Linguistic research on text coherence and cohesion has exploited the connection of neighboring text for measurement.
- Recent advancements in natural language processing often train deep learning models by predicting words in adjacent sentences and predicting following sentences.
- Our incoherence measure is based on a variant of BERT called the lite BERT for self-supervised learning of language representations, or ALBERT.
- The ALBERT model introduces a loss for sentence order prediction (SOP), which focuses on inter-sentence coherence to boost the performance of BERT in predicting the next sentence.

Annotated coherence score data[2] covering 4 domains:

- Q&A for Yahoo Answer
- Product review from Yelp
- Emails released by the State Department from Hillary Clinton's office
- Emails from the Enron Corpus.

Each domain has 1,200 paragraphs, with a total of 4,740 paragraphs after dropping 60 very short paragraphs.

- Each paragraph was rated by 8 raters on coherence using a three-point scale, from 1 (less coherent) to 3 (very coherent).
- Among the 8 raters for each text, 3 are experts who have prior linguistic annotation experience and the rest are recruited via Amazon Mechanical Turk.

[2] Lai and Tetreault (2018)

Domain	Total data num	Train pos num	Train neg num	Batch size	Epoch num	Test num	Corr Coef
Yahoo	1200	200	200	64	5	800	-0.472***
Enron	1200	200	200	64	5	800	-0.469***
Clinton	1200	200	200	64	5	800	-0.408***
Yelp	1200	200	200	64	5	800	-0.413***

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Context

Conference Call

Conference calls are held in conjunction with earnings announcements as a form of voluntary disclosure.

1. Managers present and interpret company performance during the quarter.
2. Analysts ask questions and request additional information.

Data

- S&P 500 earnings conferences calls from 2006 to 2018.
- Stock price return data from CRSP
- Earnings surprise data from the I/B/E/S database.

Results

	Next-Quarter Earnings Surprise[3]	Next-Day Abnormal Return[4]
Evasiveness	-0.0175**	-0.0053
Incoherence	-0.0198**	-0.0397**

[3]Controls: lagged earnings surprises, forecast dispersion, forecast revision, market equity, book/market, share turnover, $FF\alpha$, $FFCAR_{-30,-3}$, $FFCAR_{-2,-2}$,, question complexity

[4]Controls: $FFCAR_{00}$, $FFCAR_{-1,-1}$, $FFCAR_{-2,-2}$, $FFCAR_{-30,-3}$, $FF\alpha$, earnings surprises, market equity, book/market, share turnover, question complexity

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Conclusions

What we did ...

- proposed 2 machine learning-based measures to quantify evasiveness and incoherence in real-time strategic conversations;
- validated the measures in various contexts;
- demonstrated the business value through an application in earnings conference call analyses.

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Who can use ...

- equity analysts, stock traders, investors
- journalists, political commentators, job interviewers.