

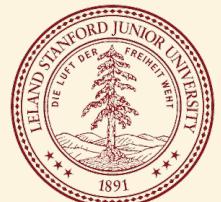
Taking sides using sentential complement predicates

The interplay of factivity and politeness in persuasion

Yiwei Luo, Beth Levin, Dan Jurafsky

{yiweil, bclevin, jurafsky}@stanford.edu

January 7, 2022 | LSA 97, Denver



Vaccine reduces risk of infection even in people who have already had Covid, the C.D.C. says.

Vaccines Sharply Cut Coronavirus Hospitalization, U.K. Studies Show

Russia claims to be the first country to develop coronavirus shots for animals.

[Sources: nytimes.com/2021/08/06/health/covid-vaccine-reinfection.html; nytimes.com/2021/02/22/world/europe/vaccine-studies-UK-hospital.html; nytimes.com/2021/03/31/world/europe/russia-covid-vaccine-animals.html]

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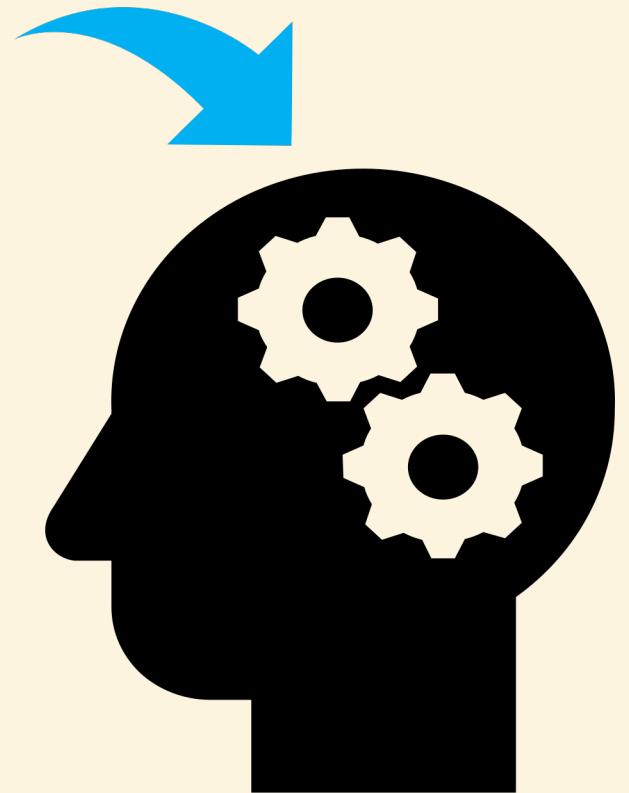
Vaccines Sharply Cut Coronavirus Hospitalization, U.K. Studies Show

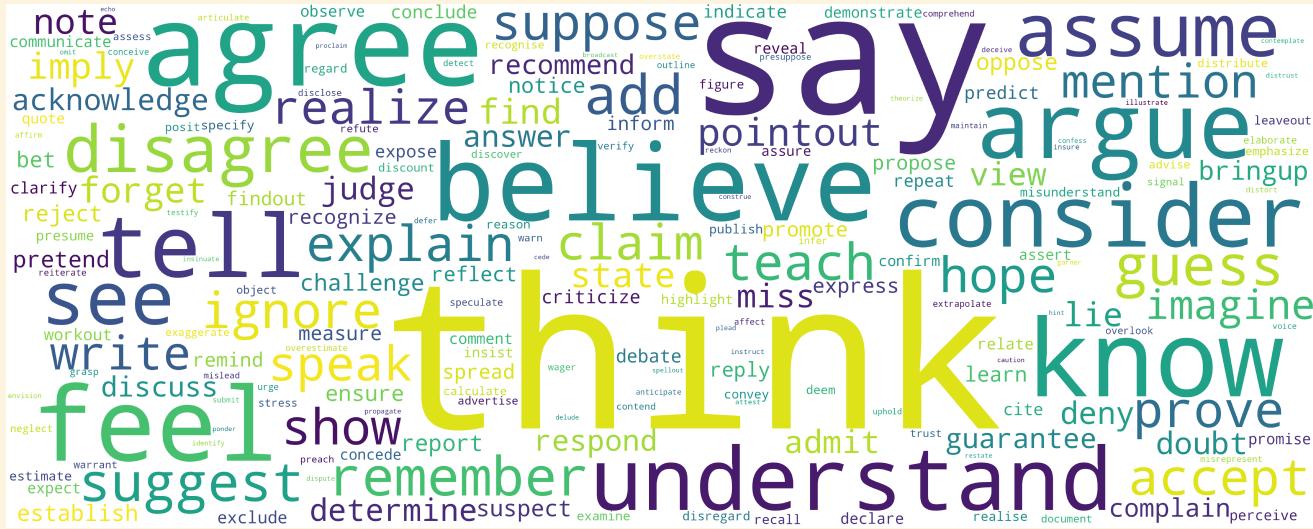


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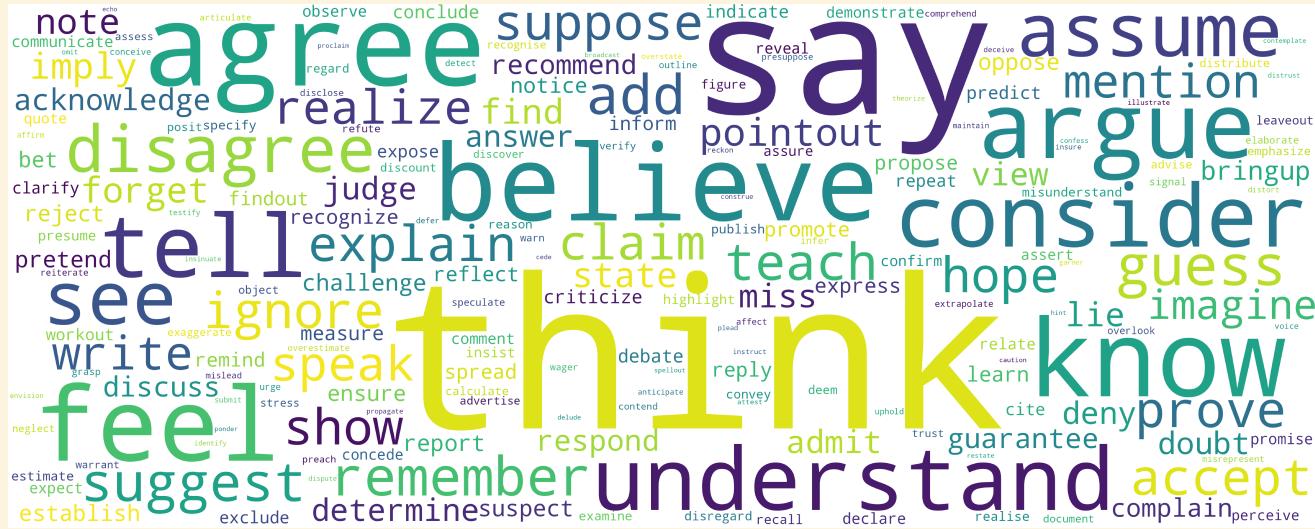
[Sources: nytimes.com/2021/08/06/health/covid-vaccine-reinfection.html; nytimes.com/2021/02/22/world/europe/vaccine-studies-UK-hospital.html; nytimes.com/2021/03/31/world/europe/russia-covid-vaccine-animals.html]





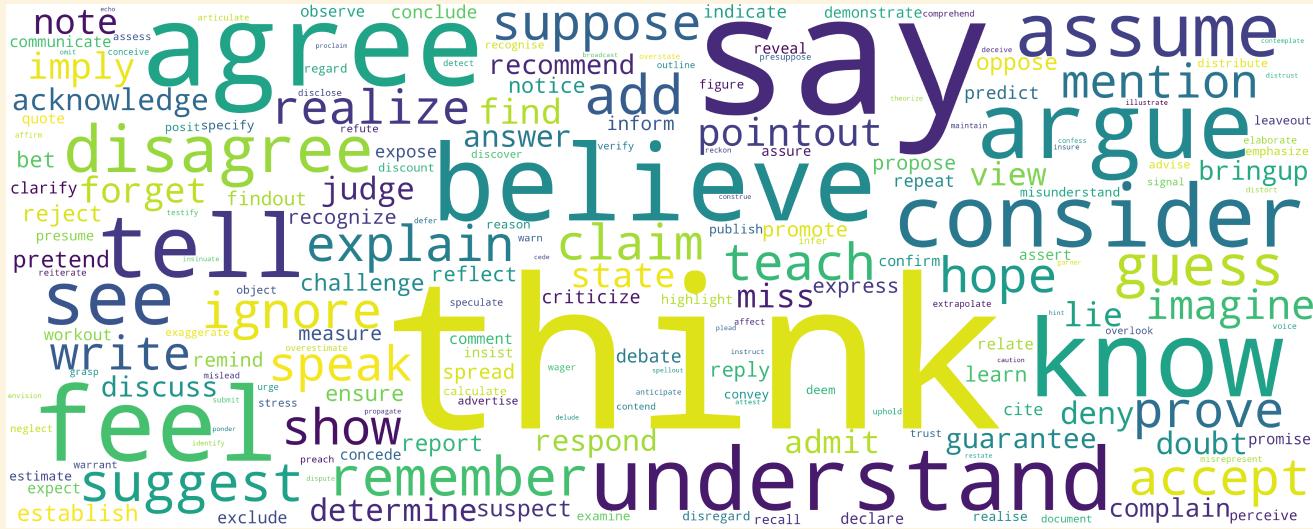
What is the effect of verb choice on audience belief?





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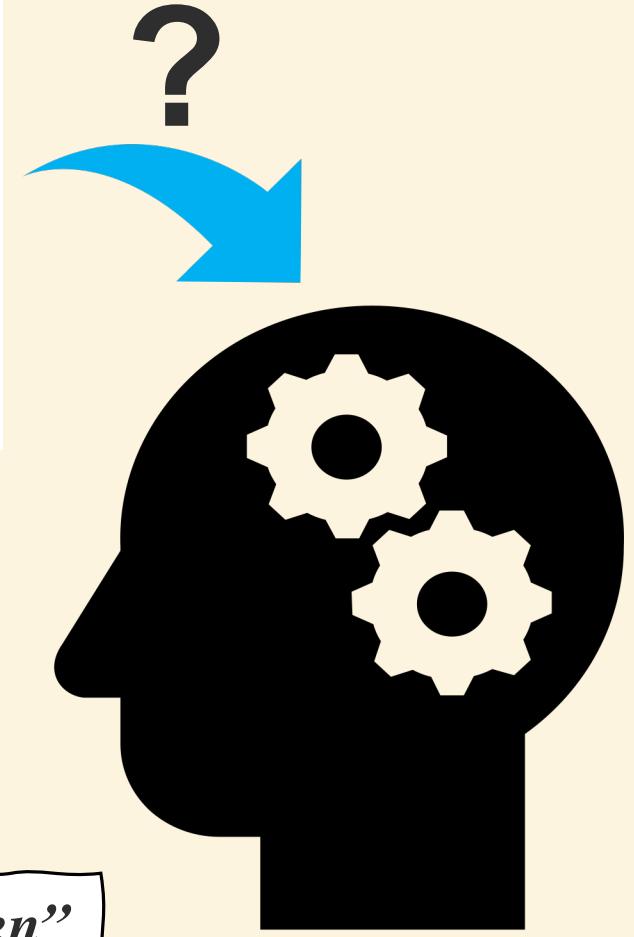
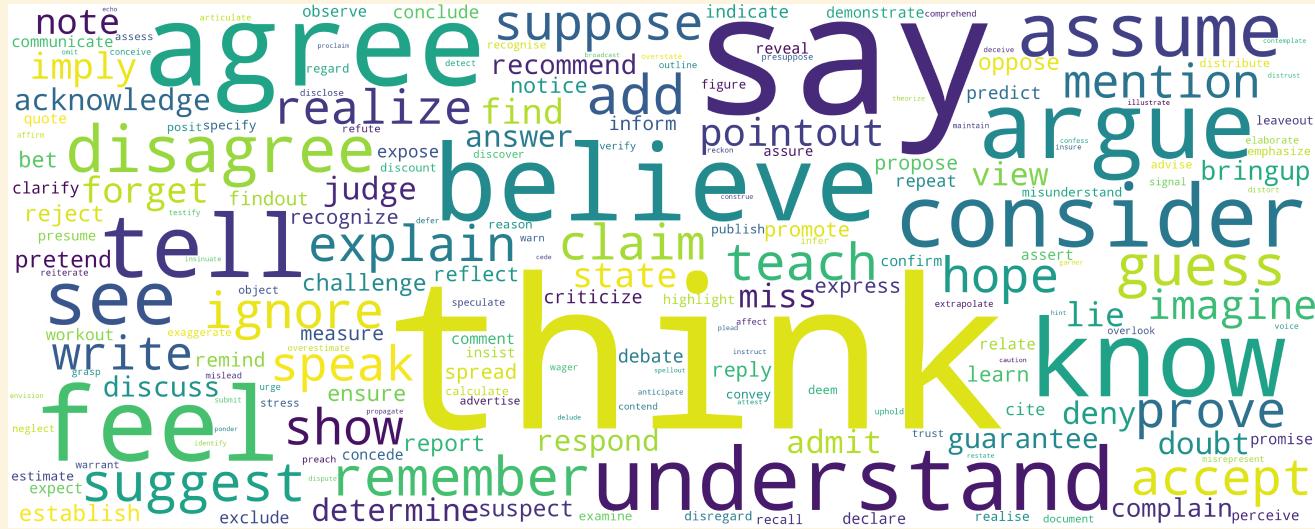




What is the effect of verb choice on audience belief?



“Police claim suspect tried to suffocate officer”

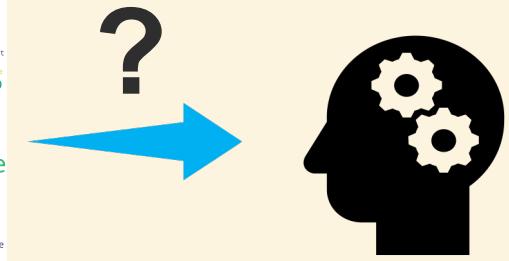
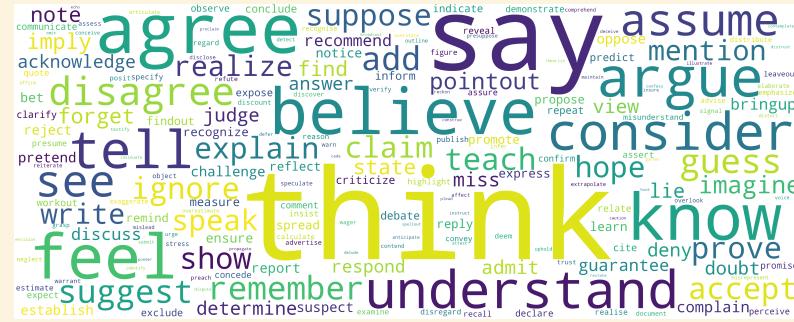


What is the effect of verb choice on audience belief?

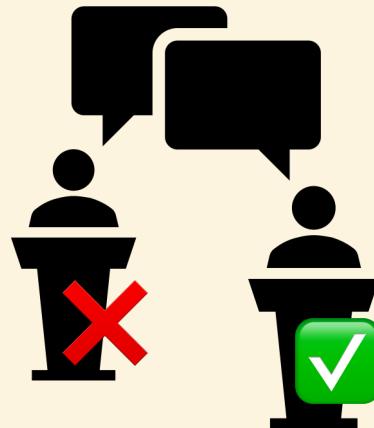


"Biden argues inflation has not risen"

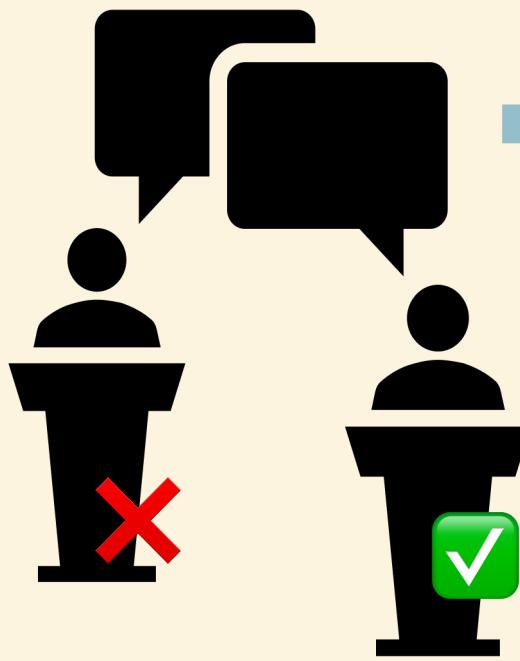
Question:



Solution:



Computationally study
verb persuasiveness w/
corpus of 528K social
media arguments



Understand theoretical phenomena (e.g., factivity) in real discourse

Inform messaging principles for positive social impact

Corpus: The ChangeMyView Subreddit

The screenshot shows the homepage of the Change My View (CMV) subreddit. At the top, there's a navigation bar with the subreddit icon, the name "Change My View (CMV)", a "Join" button, and links for "Posts", "Wiki", and "Rules". Below the navigation is a search bar with a "Hot" dropdown menu. The main content area displays a post by user "u/Funboxtha3rd" from 3 hours ago. The post title is "Delta(s) from OP CMV: I am pretty far left in most of my views, but I am a staunch believer that restricting guns will not help violence in the U.S.". The post content discusses growing up in online communities like 4chan and experiencing racism and hate firsthand. It argues that violent acts won't change even if 4chan is removed. Below the post are options to "Comment", "Share", "Save", and "More". To the right of the post is a sidebar titled "About Community" which describes the subreddit as a place for posting opinions to understand other perspectives. It includes statistics: 1.5m Members and 2.1k Online users, and notes it was created on Jan 16, 2013. There are also "Filter by flair" and "Related Communities" sections, with "r/socialjustice101" listed under related communities.

Corpus: The ChangeMyView Subreddit

The screenshot shows the homepage of the r/Change My View (CMV) subreddit. At the top, there's a navigation bar with the subreddit name "Change My View (CMV)" and a "Join" button. Below this is a prominent yellow box containing a "Content Warning" message with exclamation mark icons. The main content area features a post by a user named "Delta(s) from OP". The post text discusses growing up in online communities like 4chan and 8chan, mentioning racism and hate, and the fascination with interacting in anonymous communities. It also notes that people who commit violent acts will continue to do so regardless of whether guns are available. The post has 319 comments, a share button, and a save button. To the right of the post are sidebar filters for "Filter by flair", "Delta(s) from OP", and "Related Communities" (r/socialjustice101). A "Join" button is also present in the sidebar.

To put it frankly, I grew up in the communities that produced the Buffalo shooter. My parents were largely out of the picture when it came to monitoring my interactions, so I was raised on 4chan and mid 2000's online gaming, where racism and hate was (and still is) rampant. I was exposed to all of it at a young age. I believe I am a decent person and an exception. It just always fascinated me in a sick way to see how truly terrible humans could be when interacting in entirely anonymous communities.

From growing up in those online communities, I can tell you that people who want to commit violent acts will continue to commit violent acts, guns or not. You can take 4chan away and it won't change. These people congregated before 4chan existed and this hatred fueled violence still happened.

319 Comments Share Save ...

Created Jan 16, 2013

Filter by flair

Delta(s) from OP

Related Communities

r/socialjustice101 Join

Original Post from User A

Posted by [REDACTED] 7 years ago

CMV: People dont eat meat because they think its morally okay, they just dont give a shit about morality. [...]

[Source: reddit.com/r/changemyview/comments/3fyt6x/cmv_people_dont_eat_meat_because_they_think_its/]

Original Post from User A

Posted by [REDACTED] 7 years ago

CMV: People dont eat meat because they think its morally okay, they just dont give a shit about morality. [...]

Reply from User B

While I agree that a lot of people [sic] opinions towards eating meat is [...]

as for the health reason, well, any nutritional study shows that SOME meat is beneficial [...]

[Source: reddit.com/r/changemyview/comments/3fyt6x/cmv_people_dont_eat_meat_because_they_think_its/]

Original Post from User A



Reply from User B

Original Post from User A

Reply from User B

A awards B a "Delta" if they find B's argument persuasive

Here's a Δ for changing the perspective. We agree [...]

Original Post from User A

Reply from User B

A awards B a "Delta" if they find B's argument persuasive

Here's a Δ for changing the perspective. We agree [...]

Moderator confirms the exchange



DeltaBot MOD  · 5 hr. ago

∞Δ

Confirmed: 1 delta awarded to [REDACTED].

Original Post from User A

Reply from User B

A awards B a "Delta" if they find B's argument persuasive

Here's a Δ for changing the perspective. We agree [...]

Label of a
persuasive

argument!

Moderator confirms the exchange



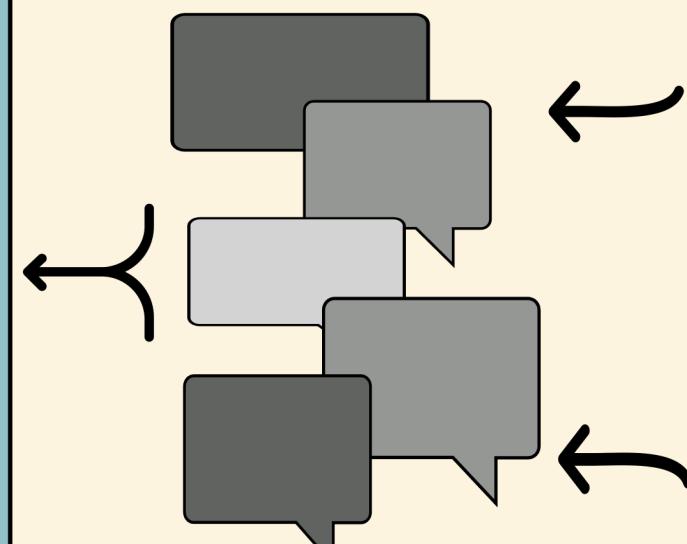
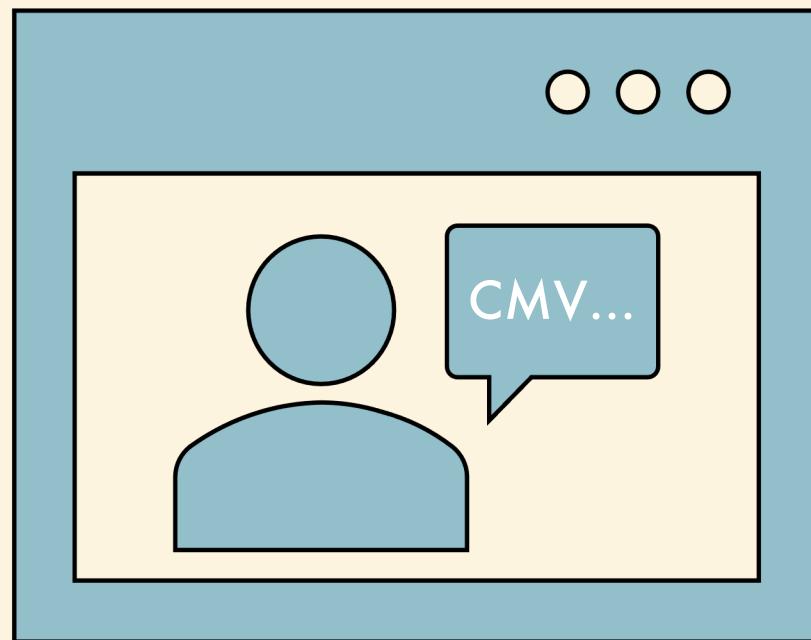
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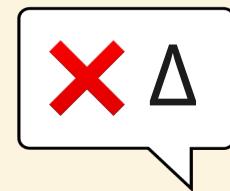
Confirmed: 1 delta awarded to [REDACTED].

N=15,395
total posts

34.3 replies per
post (on average)



9.4% of replies
receive a Δ
(on average)



Original Post from User A

Posted by [REDACTED] 7 years ago

CMV: People dont eat meat because they think its morally okay, they just dont give a shit about morality.

Reply from User B

While I agree that a lot of people [sic] opinions towards eating meat is [...]

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Many arguments signal stance toward a proposition...

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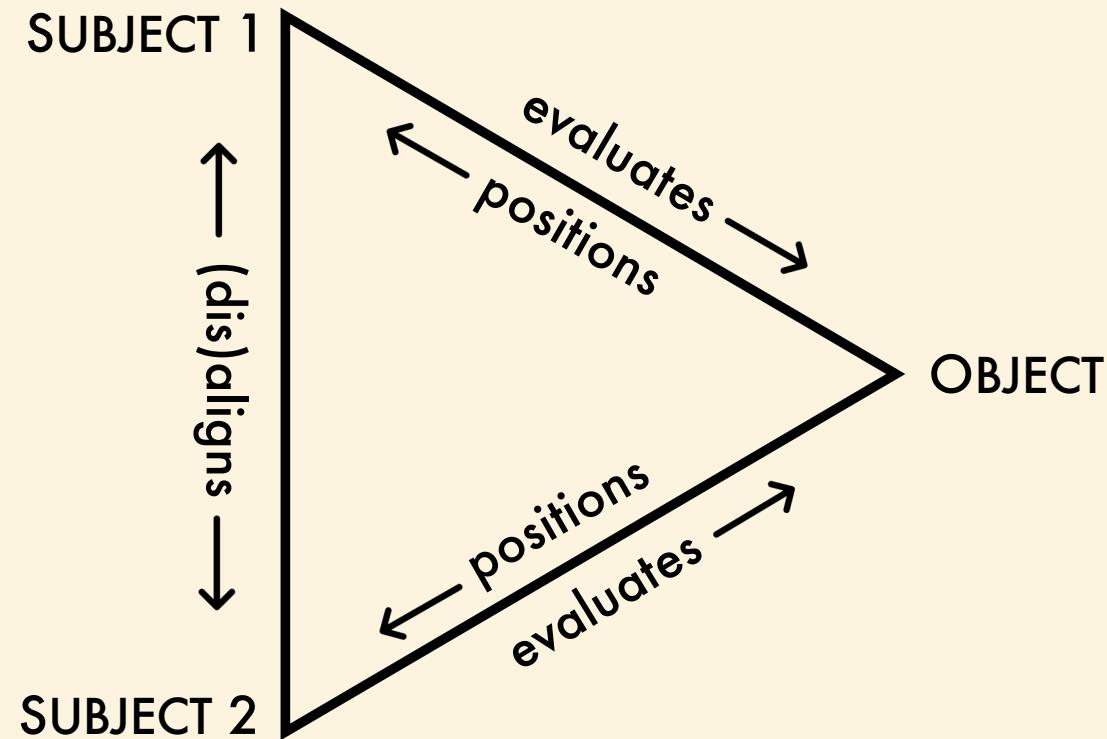
... but some also signal stance toward *interlocutor*.

While I agree that a lot of people [sic] opinions towards eating meat is [...]

as for the health reason, well, any nutritional study shows that SOME meat is beneficial [...]

Many arguments signal stance toward a proposition...

Framework: DuBois's Stance Triangle



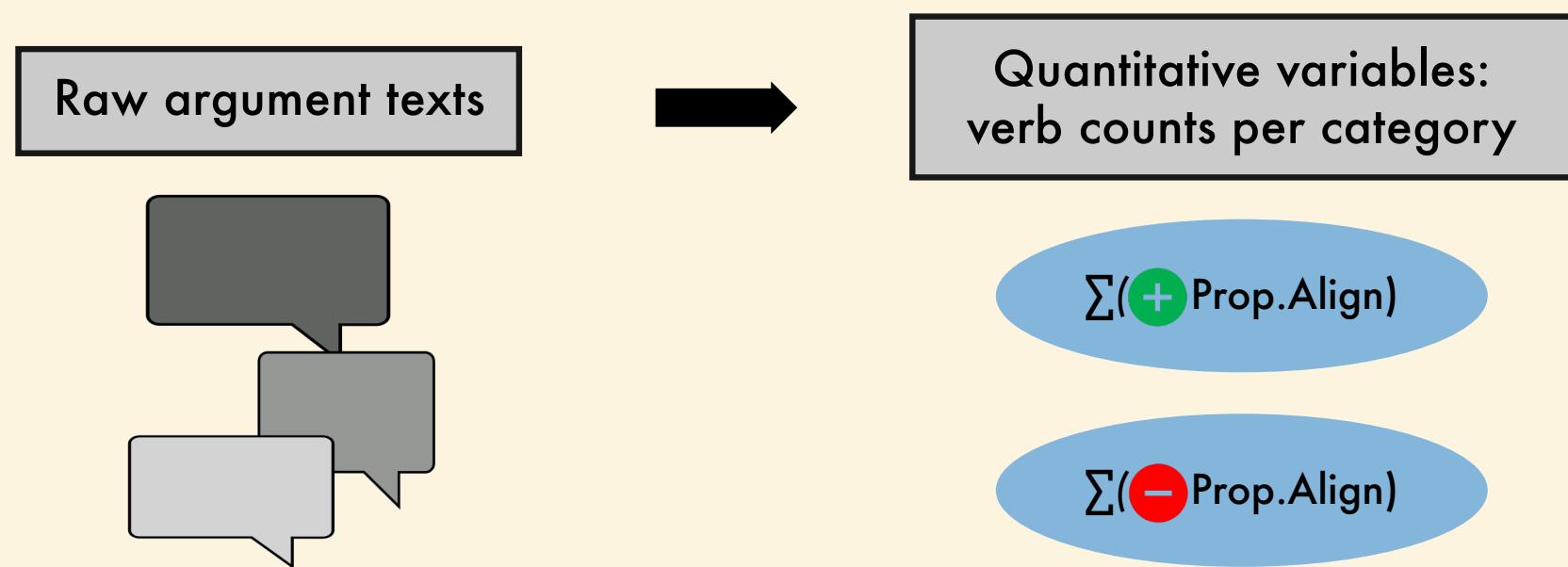
[DuBois 2007]

Prediction: Alignment is persuasive

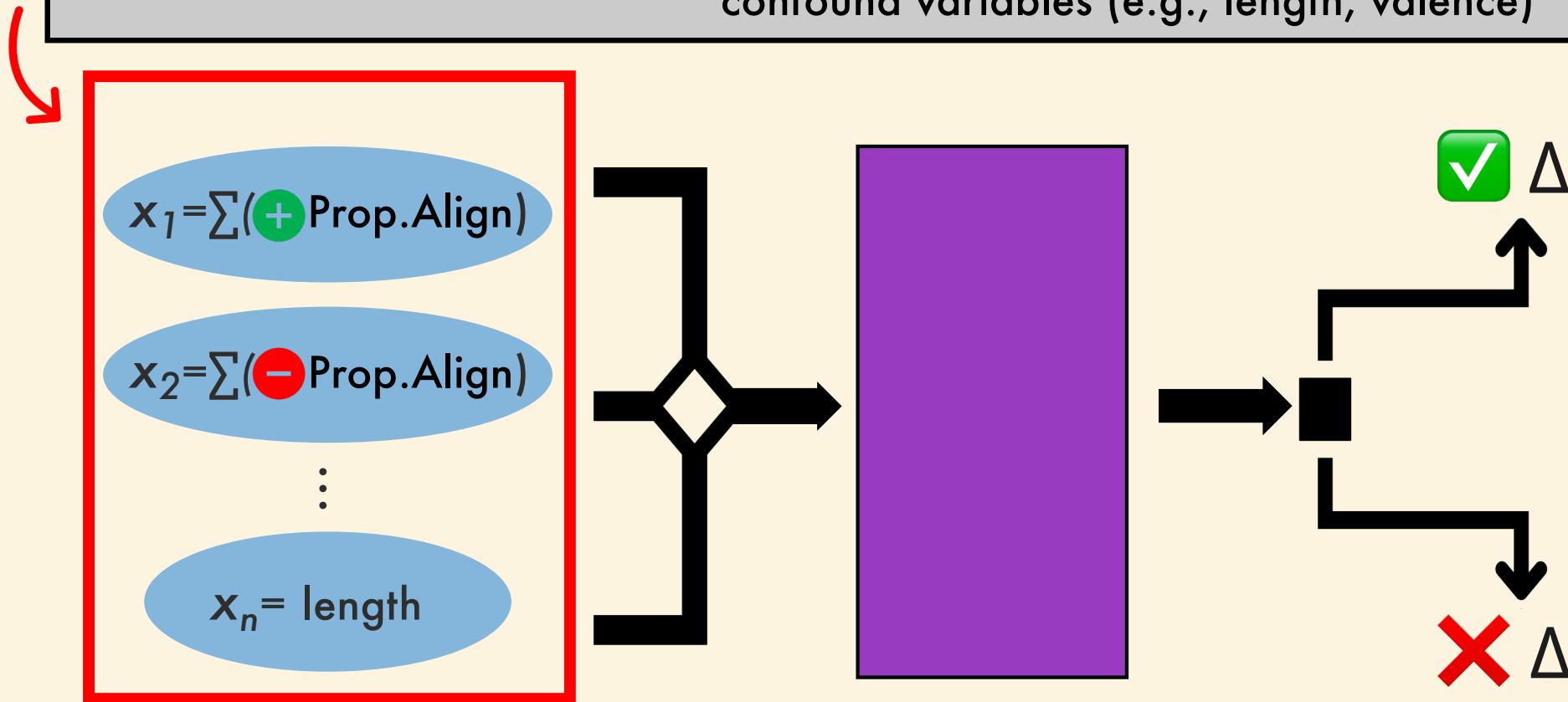
Stance type Alignment Persuasiveness

	+	✓	
PROPOSITION	+	✓	
INTERLOCUTOR	+	✓	
	-	✗	
	-	✗	

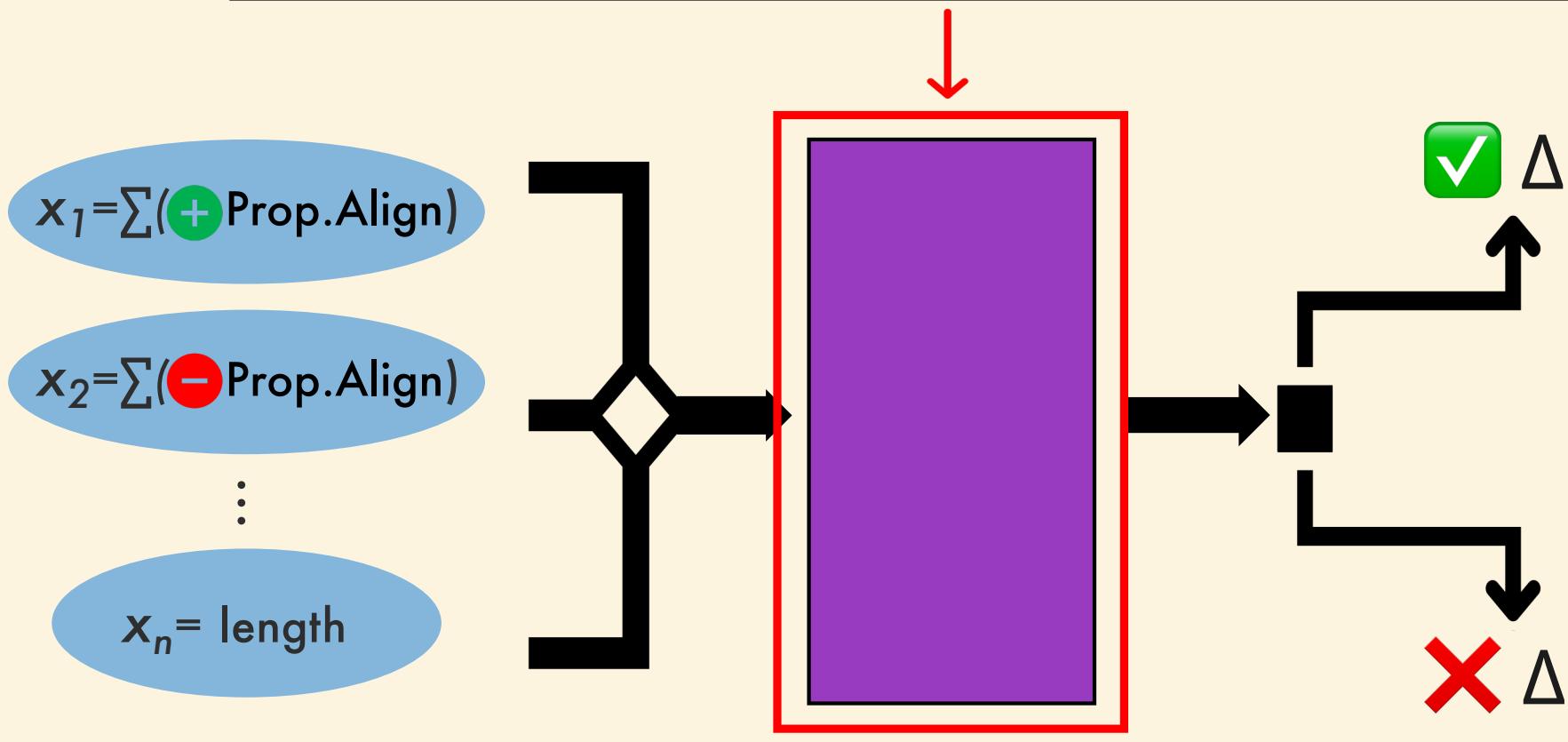
Testing predictions: Measure alignment of arguments via counts of verbs per alignment category



Extracted variables, x_1, \dots, x_n = counts of verbs from each alignment type;
confound variables (e.g., length, valence)

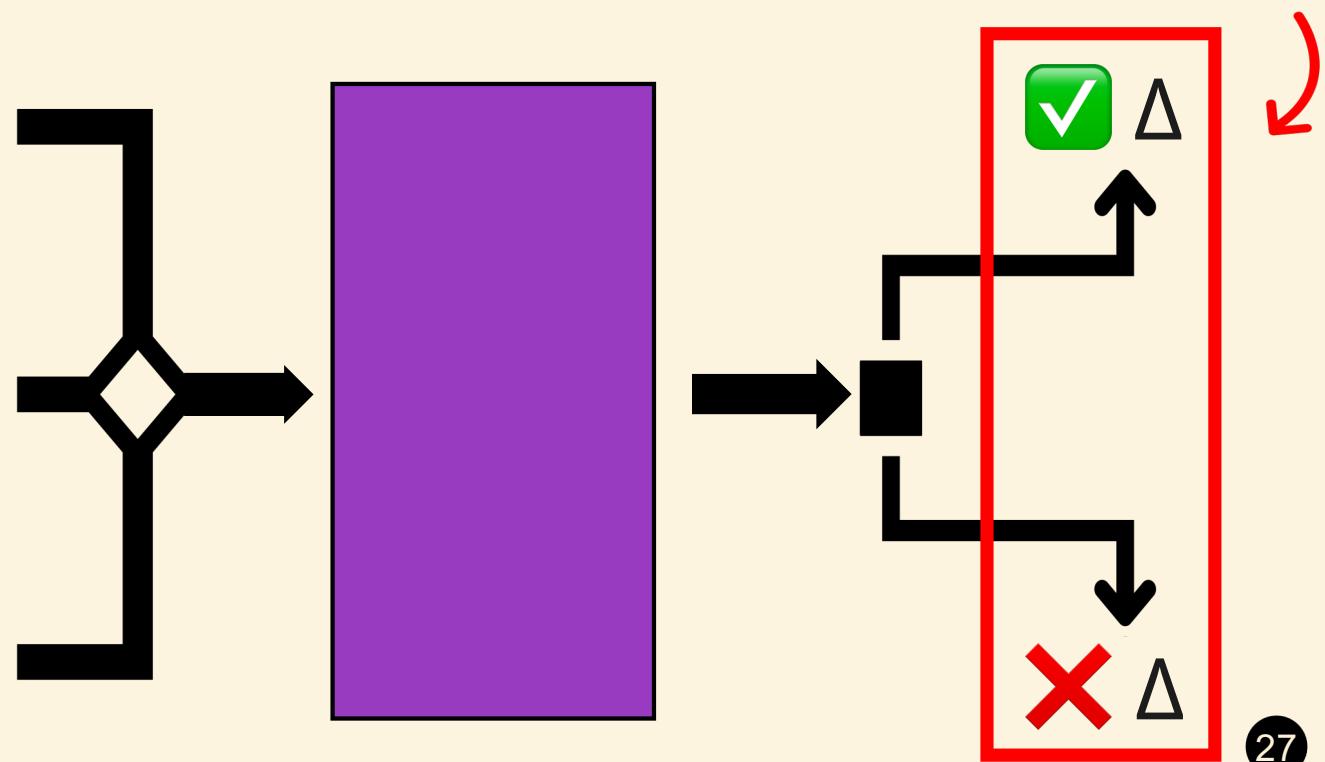


Logistic regression model to learn variable importance



... toward binary outcome:
persuasion or no persuasion

$$x_1 = \sum (+\text{Prop.Align})$$
$$x_2 = \sum (-\text{Prop.Align})$$
$$\vdots$$
$$x_n = \text{length}$$



Testing predictions: Translate alignment categories into representative verbs using lexicons

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	
	-	✗	
INTERLOCUTOR	+	✓	
	-	✗	

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	
	-	✗	
INTERLOCUTOR	+	✓	
	-	✗	

Testing predictions: Translate alignment categories into representative verbs using *newly curated lexicons*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	
	-	✗	
INTERLOCUTOR	+	✓	
	-	✗	

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	FACTIVE (ex: <i>know</i>)
	-	✗	

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons from prior work

Stance type	Alignment	Persuasiveness	Predicate Classes	
PRO	1) Speaker: "Sarah <u>knows</u> that [it's raining.] _C " » It's raining. ~ Speaker is committed to truth of C	-	X	FACTIVE (ex: <i>know</i>)

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>)
	-	✗	

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
2) "Sarah <u>argues</u> that [it's raining.] _C " ⇒ Sarah is committed to truth of C			FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>)
PROPOSITION			
	—	✗	

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>) VERIDICAL (ex: <i>show</i>)
	-	✗	

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons from prior work

Stance type	Alignment	Persuasiveness	Predicate Classes
3) "Sarah <u>shows</u> Emma that [it's raining.] _C " ⇒ C is true			FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>) VERIDICAL (ex: <i>show</i>)
PROPOSITION		-	X

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>) VERIDICAL (ex: <i>show</i>)
	-	✗	NON-FACTIVE (ex: <i>think</i>) NEG-FACTIVE (ex: <i>claim</i>)

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons from prior work

Stance type	Alignment	Persuasiveness	Predicate Classes
4) "Sarah <u>thinks</u> that [it's raining.] _C "	⇒ C is true	⇒ Sarah is committed to truth of C	FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>) VERIDICAL (ex: <i>show</i>)
5) "Sarah <u>claims</u> that [it's raining.] _C "	~ / ⇒ C is false		NON-FACTIVE (ex: <i>think</i>) NEG-FACTIVE (ex: <i>claim</i>)

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using lexicons *from prior work*

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>) VERIDICAL (ex: <i>show</i>)
	-	✗	NON-FACTIVE (ex: <i>think</i>) NEG-FACTIVE (ex: <i>claim</i>)

[Kiparsky, 1970; Karttunen, 1971; Hooper, 1974; de Marneffe et al., 2012, 2019]

Testing predictions: Translate alignment categories into representative verbs using *newly curated lexicons*

Stance type	Alignment	Persuasiveness	Predicate Classes
INTERLOCUTOR	+	✓	
	-	✗	

[DuBois 2004, 2007; Householder 1965]

Testing predictions: Translate alignment categories into representative verbs using *newly curated lexicons*

Stance type	Alignment	Persuasiveness	Predicate Classes
INTERLOCUTOR		agree, accept, acquiesce, concur, consent, echo	AGREE (ex: <i>concur</i>)

[DuBois 2004, 2007; Householder 1965]

Testing predictions: Translate alignment categories into representative verbs using *newly curated lexicons*

Stance type	Alignment	Persuasiveness	Predicate Classes
INTERLOCUTOR		acknowledge, admit, allow, cede, concede, defer, grant, recognise, recognize, yield	AGREE (ex: <i>concur</i>) CONCESSIVE (ex: <i>admit</i>)

[DuBois 2004, 2007; Householder 1965]

Testing predictions: Translate alignment categories into representative verbs using *newly curated lexicons*

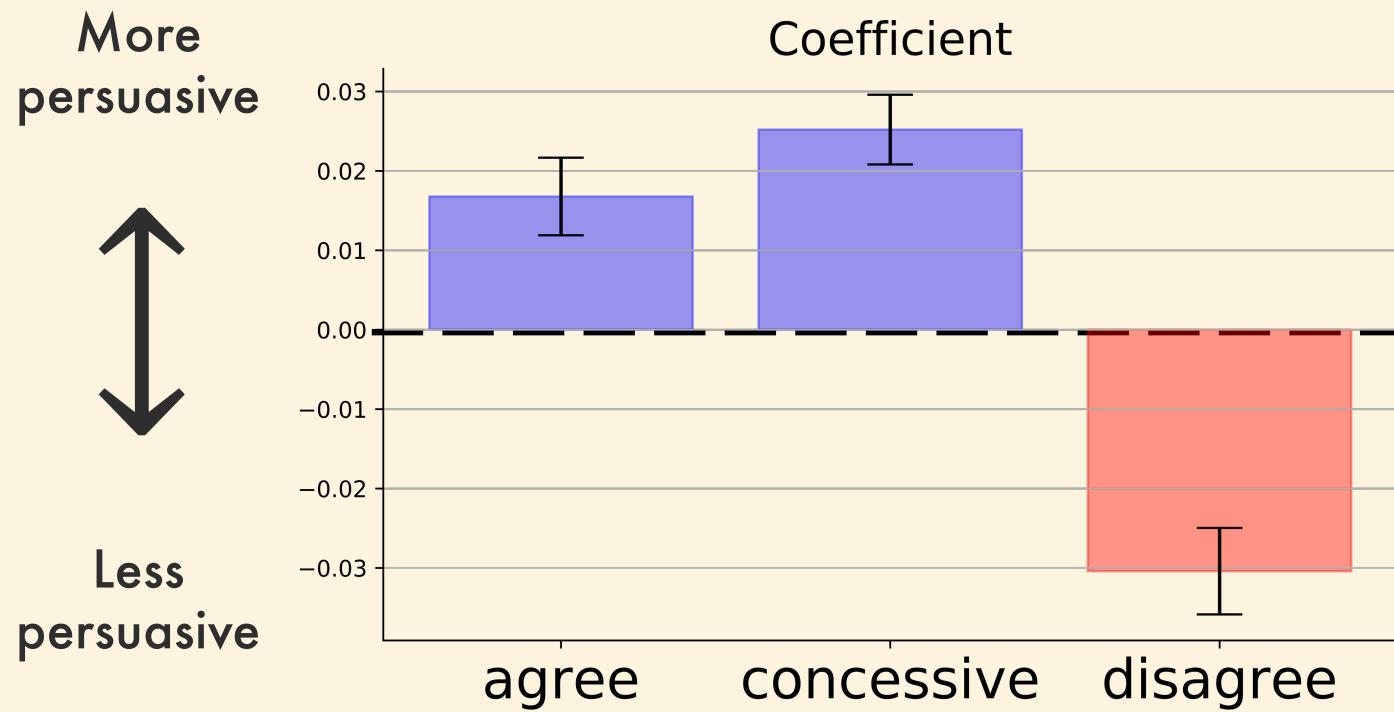
Stance type	Alignment	Persuasiveness	Predicate Classes
INTERLOCUTOR		deny, depart, deviate, disagree, disclaim, dissent, diverge, object, oppose, rebuff, refute, reject	AGREE (ex: <i>concur</i>) CONCESSIVE (ex: <i>admit</i>) DISAGREE (ex: <i>reject</i>)

[DuBois 2004, 2007; Householder 1965]

Testing predictions: Translate alignment categories into representative verbs using lexicons

Stance type	Alignment	Persuasiveness	Predicate Classes
PROPOSITION	+	✓	FACTIVE (ex: <i>know</i>) STRONG ASSERTIVE (ex: <i>argue</i>) VERIDICAL (ex: <i>show</i>)
	-	✗	NON-FACTIVE (ex: <i>think</i>) NEG-FACTIVE (ex: <i>claim</i>)
INTERLOCUTOR	+	✓	AGREE (ex: <i>concur</i>) CONCESSIVE (ex: <i>admit</i>)
	-	✗	DISAGREE (ex: <i>reject</i>)

Result: Interlocutor Alignment is persuasive



Result: Interlocutor Alignment is persuasive

Persuasive features	Unpersuasive features
<i>agree, concur, acknowledge, accept, concede</i>	<i>disagree, dispute, reject, refute</i>

Result: Interlocutor Alignment is persuasive



CMV: Gun control is wrong, and won't stop shootings. The real issue is a toxic culture, indoctrinating school systems, bad parenting, and a corporate monopoly on the distribution of information [...]

[Source: reddit.com/r/changemyview/comments/cmy1sy/cmv_gun_control_is_wrong_and_wont_stop_shootings/]

Result: Interlocutor Alignment is persuasive

 CMV: Gun control is wrong, and won't stop shootings. The real issue is a toxic culture, indoctrinating school systems, bad parenting, and a corporate monopoly on the distribution of information [...]

 I would agree with much of what you described about the toxic cultural experience in America. However, I am surprised you didn't make the connection between American culture and America's obsession with guns. Guns are the ultimate expression of America's nihilistic lust for individual power [...]

[Source: reddit.com/r/changemyview/comments/cmy1sy/cmv_gun_control_is_wrong_and_wont_stop_shootings/]

Result: Interlocutor Alignment is persuasive



CMV: Gun control is wrong, and won't stop shootings. The real issue is a toxic culture, indoctrinating school systems, bad parenting, and a corporate monopoly on the distribution of information [...]



I would agree with much of what you described about the toxic cultural experience in America. However, I am surprised you didn't make the connection between American culture and America's obsession with guns. Guns are the ultimate expression of America's nihilistic lust for individual power [...]



(Δ) I had never considered the symbolic meaning behind the gun itself as a commodification [...]

[Source: reddit.com/r/changemyview/comments/cmy1sy/cmv_gun_control_is_wrong_and_wont_stop_shootings/]

Result: Interlocutor Alignment is persuasive



CMV: Gun control is wrong, and won't stop shootings. The real issue is a toxic culture, indoctrinating school systems, bad parenting, and a corporate monopoly on the distribution of information [...]

I would agree with much of your experience in America. I think there is a disconnect between American culture and gun control. Guns are the ultimate expression of America's nihilistic lust for individual power [...]

Agreement ≈ respect, empathy for other person's perspective

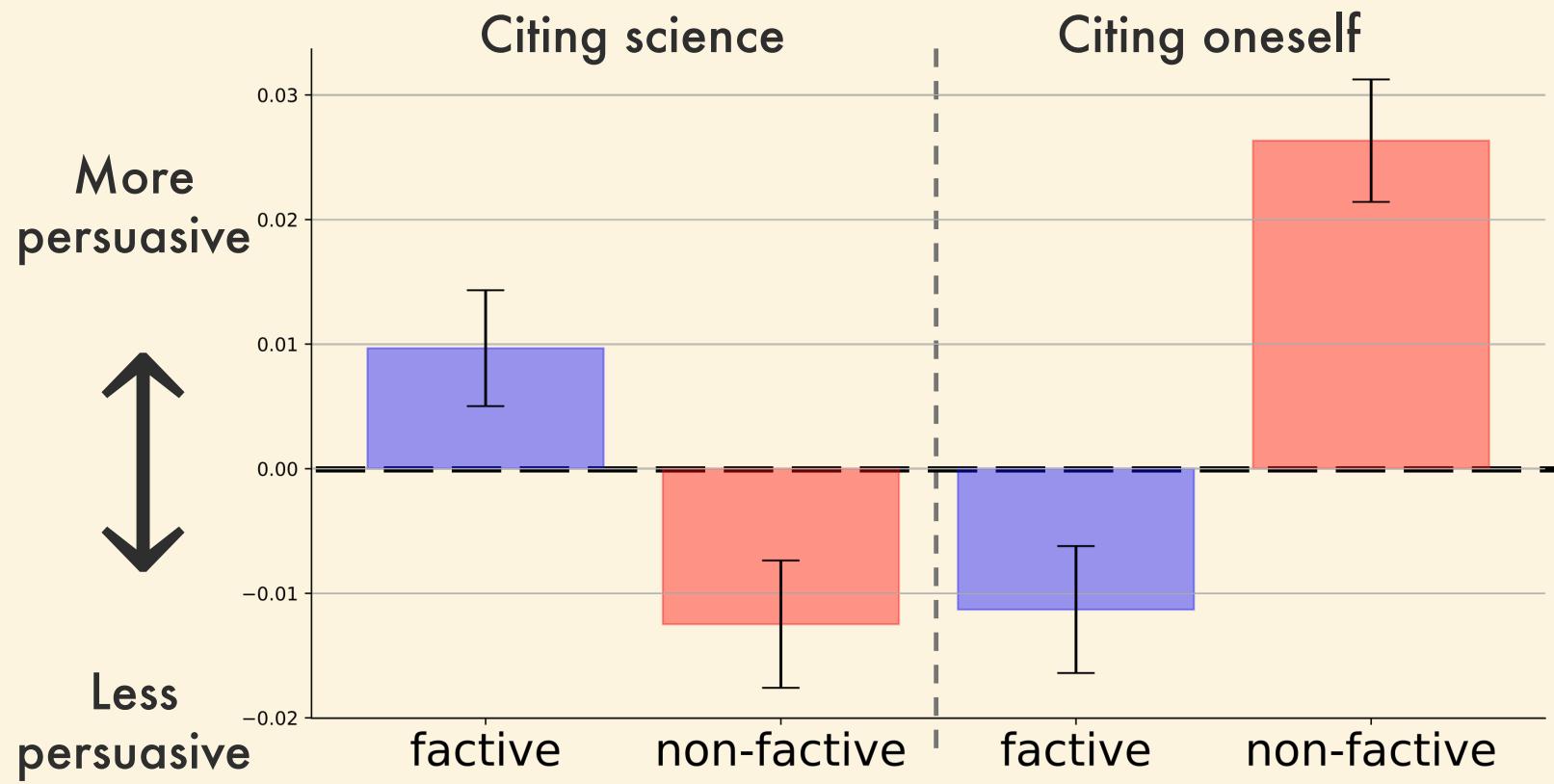
But the toxic cultural values didn't make the connection with guns. Guns are the ultimate expression of America's nihilistic lust for individual power [...]



(Δ) I had never considered the symbolic meaning behind the gun itself as a commodification [...]

[Source: reddit.com/r/changemyview/comments/cmy1sy/cmv_gun_control_is_wrong_and_wont_stop_shootings/]

Result: Persuasiveness of Proposition Alignment depends on whose ideas you're presenting



Result: Proposition Alignment is persuasive when citing science

Persuasive features	Unpersuasive features
<i>scientists know, studies point out, researchers understand, ...</i>	<i>scientists believe, studies suggest, economists think, ...</i>

Result: Proposition Alignment is persuasive when citing science

Persuasive features	Unpersuasive features
<i>scientists know, studies point out, researchers understand, ...</i>	<i>scientists believe, studies suggest, economists think, ...</i>

Result: Reverse pattern holds when citing one's own ideas!

Persuasive features	Unpersuasive features
<i>scientists know, studies point out, researchers understand, ...</i>	<i>scientists believe, studies suggest, economists think, ...</i>
	<i>I know, I understand, I point out, ...</i>

Result: Reverse pattern holds when citing one's own ideas!

Persuasive features	Unpersuasive features
<i>scientists know, studies point out, researchers understand, ...</i>	<i>scientists believe, studies suggest, economists think, ...</i>
<i>I believe, I think, I suppose, ...</i>	<i>I know, I understand, I point out, ...</i>

Result: Be committed when citing science



CMV: Sans Serif fonts are poorly designed because lowercase I (Pronounced "ell") and uppercase I (pronounced "eye") look exactly the same. We should therefore completely abandon their usage unless they are redesigned.

[Source: [reddit.com/r/changemyview/comments/kbccrc/cmv_sans_serif_fonts_are_poorly_designed_because/](https://www.reddit.com/r/changemyview/comments/kbccrc/cmv_sans_serif_fonts_are_poorly_designed_because/)]

Result: Be committed when citing science



CMV: Sans Serif fonts are poorly designed because lowercase I (Pronounced "ell") and uppercase I (pronounced "eye") look exactly the same. We should therefore completely abandon their usage unless they are redesigned.



Studies have shown that sans-serif fonts are more readable, especially for people with dyslexia. Especially for shorter texts and individual sentences or words [...]

[Source: reddit.com/r/changemyview/comments/kbccrc/cmv_sans_serif_fonts_are_poorly_designed_because/]

Result: Be committed when citing science



CMV: Sans Serif fonts are poorly designed because lowercase I (Pronounced "ell") and uppercase I (pronounced "eye") look exactly the same. We should therefore completely abandon their usage unless they are redesigned.



Studies have shown that sans-serif fonts are more readable, especially for people with dyslexia. Especially for shorter texts and individual sentences or words [...]



!Delta. I hadn't really considered how font designs could be more accessible for people with dyslexia or other conditions. That's a good point

[Source: reddit.com/r/changemyview/comments/kbccrc/cmv_sans_serif_fonts_are_poorly_designed_because/]

Result: Be committed when citing science



CMV: Sans Serif fonts are poorly designed because lowercase l (Pronounced "ell") and uppercase L (pronounced "eye") look exactly the same. We should therefore completely abandon their usage unless they are re

**Higher commitment
from science ≈ more
likely to be true**



Studies have shown that readable, especially for people with dyslexia. Especially for shorter texts and individual sentences or words [...]



!Delta. I hadn't really considered how font designs could be more accessible for people with dyslexia or other conditions. That's a good point

[Source: reddit.com/r/changemyview/comments/kbccrc/cmv_sans_serif_fonts_are_poorly_designed_because/]

Result: But be less committed when presenting your own views



CMV: The death penalty is never moral



[...] I believe that the risk that these people present to a free and just society can be so great that they cannot be allowed to live. I believe that such a case presents the only excusable use of the death penalty [...]



[...] Okay then I'll make an exception for this one weird edge case, !delta

[Source: reddit.com/r/changemyview/comments/wa4wt4/comment/ihyx7ss/]

Result: But be less committed when presenting your own views



CMV: The death penalty is never moral



[...] I believe that the risk that these people present to a free and just society can be so great that they cannot be allowed to live. I believe that such a case presents the opportunity for the death penalty [...]

Lower commitment from speaker ≈ less dogmatic



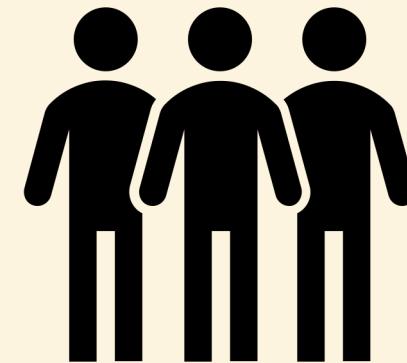
[...] Okay then I'll make an exception for this one weird edge case, !delta

[Source: reddit.com/r/changemyview/comments/wa4wt4/comment/ihyx7ss/]

Future directions

you're right
you're confusing possibly
I might argue
not sure I didn't consider
I would say maybe
I never realized I overlooked

Broader linguistic
strategies for politeness



Persuasive messaging
across demographics

Summary of contributions

Theoretical:

- Truth-bolstering effect of predicates depends on social context: confidence in proposition vs. confidence in oneself
- Novel lexicons of sentential complement predicates categorized for alignment

Summary of contributions

Practical persuasive strategies:

- Show empathy with your interlocutor's perspective
- Be committed when citing science
- Be less committed polite ≈ when presenting your own ideas

Summary of contributions

Data & tools available at: <https://github.com/yiweiluo/persuasion>

Thank you!

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Questions?

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