Measuring and Explaining Political Sophistication Through Textual Complexity

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New Directions in Analyzing Text as Data Conference Northeastern University, October 14-15, 2016

Political sophistication in the public mind

The state of our union is ... dumber:

How the linguistic standard of the presidential address has declined

Using the Flesch-Kincaid readability test the Guardian has tracked the reading level of every State of the Union



Source: The Guardian, February 2013

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• Citizen comprehension of political speech

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• Fit a model that can be applied to other texts

Name of Method	Author	Year	Citations
Flesch Reading Ease	Flesch	1948/49	3,793
SMOG	McLaughlin	1969	1,402
Dale-Chall	Dale and Chall	1948	1,389
Gunning Fog Index	Gunning	1952	1,232
Flesch-Kincaid Level	Kincaid et al	1975	1,093
Fry Graph	Fry	1968	1,007
Spache Formula	Spache	1953	355
Coleman-Liau	Coleman and Liau	1975	261

Commonly used 'reading ease' measures in order of citation via Google scholar at the time of writing.

- Flesch Reading Ease (FRE) Score
 - Developed to measure average grade level of students based on ability to answer multiple-choice questions after reading a text

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$$206.835 - 1.015 \left(\frac{\# \text{ of words}}{\# \text{ of sentences}}\right) - 84.6 \left(\frac{\# \text{ of syllables}}{\# \text{ of words}}\right)$$

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- Consider this sentence
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- Consider this sentence
 - Indeed, the shoemaker was frightened.
 - FRE = 16.23
 - Forsooth, the cordwainer was afeared.
 - FRE = 16.23
- No measure of the difficulty of the words (or any other grammatical challenges)

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• Is this really the quantity we're interested in?

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• designed for educational research, not political texts;

- designed for educational research, not political texts;
- validated on schoolchildren, not adults; and

- designed for educational research, not political texts;
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These problems are straightforward to fix.

A modern solution: crowdsourcing binary comparisons



In an inclusion of your of the speed of light in a vacuum is the same for all observers, regardless of the motion of the light source. It was originally proposed in 1905 by Albert Einstein in the paper "On the Electrodynamics of Moving Bodies".

the "right" one.

or when the light source is moving toward the observer.

Einstein figured out that this was because older physical

theories only considered one group of observers and

assumed that their view point, or reference frame, was

Formed all possible 1- and 2- sentence snippets from the SOTU corpus

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- Formed all possible 1- and 2- sentence snippets from the SOTU corpus
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• sufficient connectivity that we could scale all of them

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 - sufficient connectivity that we could scale all of them
- Coded 2,000 of these comparisons three separate times, so 6,000 total data points

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Identify Which Of Two Text Segments Contains Easier Language

Instructions -

Text A	Text B		
To this offer no definitive answer has yet been received, but the gallant and honorable spirit which has at all times been the pride and glory of France will not ultimately permit the demands of innocent sufferers to be extinguished in the mere consciousness of the power to reject them.	We are not only examining major problems facing the various modes of transport; we are also studying closely the inter- relationships of civilian and government requirements for transportation.		
Which text is easier to read and understand?			
Text A easier	Text B easier		

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Extant measures have undesirable statistical properties.

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No way of evaluating "model fit" for measures applied to a new context

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Extant measures have undesirable statistical properties.

- No way of evaluating "model fit" for measures applied to a new context
 - No way of comparing different measures in a given context

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We can model this!

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 Using only the labels from crowdsourcing, we fit an unstructured Bradley Terry model to scale the snippets and generate a rank ordering and λ score for each

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- When "plugging in" values of covariates to evaluate older texts, we will use the word frequency from the decade in which they originate

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We thus estimate the relevant β̂_r's and can then "plug in" covariates to evaluate other texts

Results

	All variables	Simple Model
Characters per sentence	-0.01^{*}	-0.01*
	(0.00)	(0.00)
Proportion of 3-syllable words	-1.04^{*}	-1.31^{*}
	(0.34)	(0.28)
Proportion of words from Dale-Chall	-0.41	
	(0.28)	
Proportion of adpositions	-0.99^{*}	-1.11^{*}
such as to, with, from, under	(0.48)	(0.46)
Mean word frequency (/'the')	-1.74^{*}	-1.68^{*}
	(0.35)	(0.35)
Proportion of conjunctions	0.70	
	(0.71)	
PCP	0.663	0.662
AIC	7419.90	7419.09

Speeches in 2016 Campaign Debates



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SOTU Re-evaluated



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We can check the predictive ability of extant measures on our ranked snippets

	AIC	% Correct
FRE	7,893	0.602
Dale-Chall	7,895	0.603
FOG	7,619	0.638
SMOG	7,726	0.574
Spache	7,665	0.635
Coleman-Liau	8,219	0.552

Results–Refit FRE Model

	FRE, refit	Sentence only	Syllables only
Mean syllables/word	-1.34^{*}		-0.71^{*}
	(0.12)		(0.11)
Mean words/sentence	-0.07*	-0.06^{*}	
	(0.00)	(0.00)	
РСР	0.66	0.64	0.53
AIC	7494.81	7625.82	8275.97

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Standard errors in parentheses. indicates significance at p < 0.05

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• Incoporate more syntactic information

R package

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🍰 kbenoit Merge bra	anch 'master' of http://gi	hub.com/kbenoit/sophistication			Latest comn	nit c355489 a day ago
R_package	Update package b	y adding data_corpus_presdebates2	016			a day ago
analysis	Merge branch 'ma	ster' of https://github.com/kbenoit/	sophistication			a day ago
crowdflower	Reogranize the re	po; fix BT factor order				24 days ago
🖬 data	Correct republicat	i candidate covars data object				a day ago
.gitignore	Update .gitignore					24 days ago

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README.md

Measuring the sophistication of political text

Keneth Benoit, Kevin Munger, and Arthur Spirling

Update README.md