

O

Going beyond vocabulary and grammar: Automatic analysis of rhetorical features in L2 writing

Masaki Eguchi, Ph.D.

Learner Corpus Research and Applied Data Science Lab

Linguistics Department, University of Oregon

* This is a part of my Ph.D. dissertation study defended in May, 2023.



duolingo english test



MICHIGAN
LANGUAGE ASSESSMENT

NFMLTA

NATIONAL FEDERATION OF MODERN
LANGUAGE TEACHERS ASSOCIATIONS

tirf

The International Research Foundation
for English Language Education

UNIVERSITY OF
OREGON

—(Modified) Essay submitted to “Introduction to Politics” for illustration

- The existence of free media is the practical implementation of freedom of speech - one of the institutions underpinning modern liberal democracies. Media assumes two quite distinct roles in politics: both as a “neutral observer” and as “one of the primary actors on the political scene.”
- The existence of free media is **often regarded** as the practical implementation of freedom of speech - one of the institutions underpinning modern liberal democracies. **As Judith Lichtenberg argues in the introduction to Democracy and the Mass Media**, media assumes two quite distinct roles in politics: both as a "neutral observer" and as "one of the primary actors on the political scene."



Rhetorical features of stance in academic writing

- (Epistemic) Stance:

Writer's display of their recognition of alternative knowledge claims.

The language you speak **determines** your thoughts.

People say that the language you speak determines your thoughts.

(Martin & White, 2005)

- Stance-taking characterizes interpersonal dimensions of discourse

- Independent from the propositional content itself (Hunston & Thompson, 2000; Halliday & Matthiessen, 2014)

- Uses of (epistemic) stances impact how content instructors grade written assignments across disciplines (e.g., Gardner et al., 2018; Lancaster, 2014; Wu, 2007)

- disciplinary credentials (e.g., Chang & Schleppegrell, 2011)



Functionally oriented L2 measurement is needed

- SLA research: Describe **patterns** and **rates** of L2 development (Ortega, 2012)
- Measurement is central (Ellis & Barkhuizen, 2005; Norris & Ortega, 2003, 2009)
 - **Complexity** (Biber et al., 2011; Bulté & Housen, 2012; Jarvis, 2013; Kyle 2016; Kyle & Crossley, 2015, 2018; Wolfe-Quintero et al., 1998)
 - **Accuracy** (Foster & Wigglesworth, 2016)
 - **Fluency** (Tavakoli & Skehan, 2005)
 - **Communicative/ Functional Adequacy** (Kuiken & Vedder, 2017; Revesz et al., 2014)
- Socio-functional approach is less dominant
 - Biber and colleague (1989, 2004, 2006a, 2006b): Semantic classes of noun, verb, adjectives
 - Polio & Yoon (2018): Classified adverbial clauses into temporal, concessive, etc.
 - Or **in-depth discourse analysis** (with small sample sizes; N = 30; Lancaster, 2014, Wu, 2007)



Current corpus tools do not offer immediate solutions

- Very few corpus tools can disambiguate **rhetorical functions**
- Biber Tagger categorizes followings as “communication verb”
 - (e.g., Biber , 1989)

The authors **suggest** that ...

Their findings **suggest** that

We also **suggest** that

Our findings **suggest** that



Other-sourced



Self-sourced

The goals of dissertation

- To develop a Natural Language Processing (NLP) tool that can conduct **discourse-aware analysis of stances**
- => A tool that considers “co-textual information” of stance expressions and categorize them into discourse categories

Remaining talk

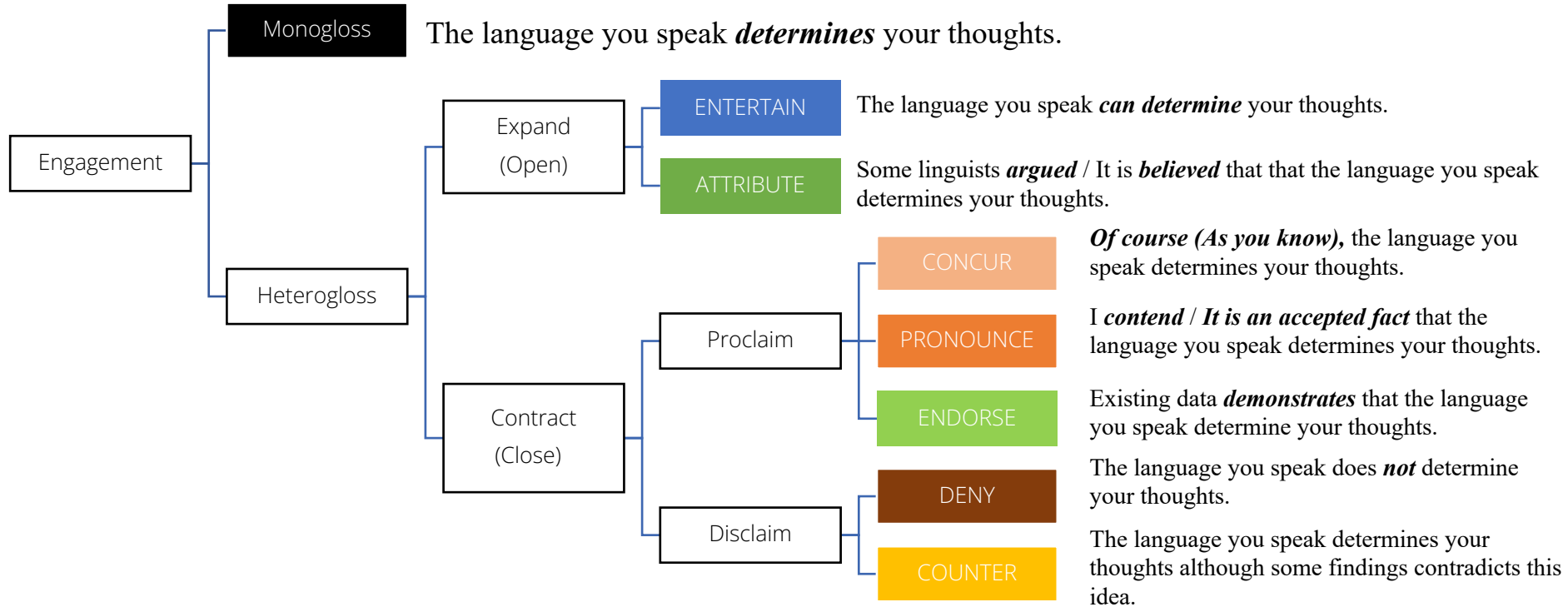
- How I developed this tool (see Eguchi & Kyle, 2023)
- Demonstrate how rhetorical features predict L2 essay scores



Development of Engagement Analyzer

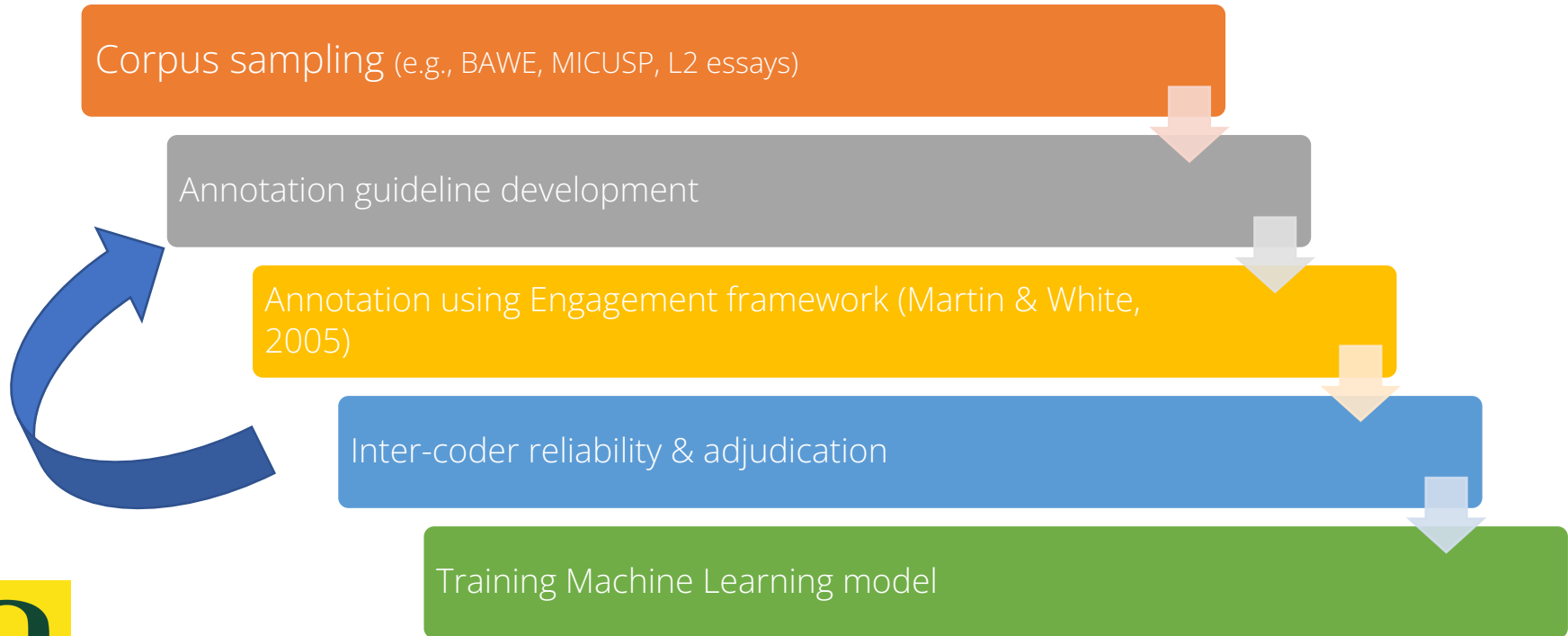
Can a machine be trained to perform automated discourse analysis?

The system of Engagement (Martin & White, 2005)



The Engagement Discourse Treebank (EDT) project

A total of 126,411 tokens with 4,688 sentences were fully manually annotated
Adapted Fuoli's (2018) Step-wise annotation procedure



Annotated data—*show*

The graph (see Appendix Five) ^{ENDOPHORIC} shows ^{MONOGLOSS | Primary} a general pattern from a number of sociolinguistic studies and ^{PRONOUNCE | Primary} clearly shows that the higher the social class, the higher the percentage use of prestige forms and the lower the social class, the lower the use of prestige forms.

The graph shows :
clearly shows that:

Indicating the location of information (MONOGLOSS)
Emphasizing that the content is valid (PRONOUNCE)

Medea quickly ^{MONOGLOSS | Primary} showed her barbarism, by firstly ^{MONOGLOSS | Secondary} killing her own brother to aid her escape and by then ^{MONOGLOSS | Secondary} killing King Pelias of Iolcus, who ^{MONOGLOSS | Secondary} was Jason's uncle.

Medea showed:

behavior (MONOGLOSS)

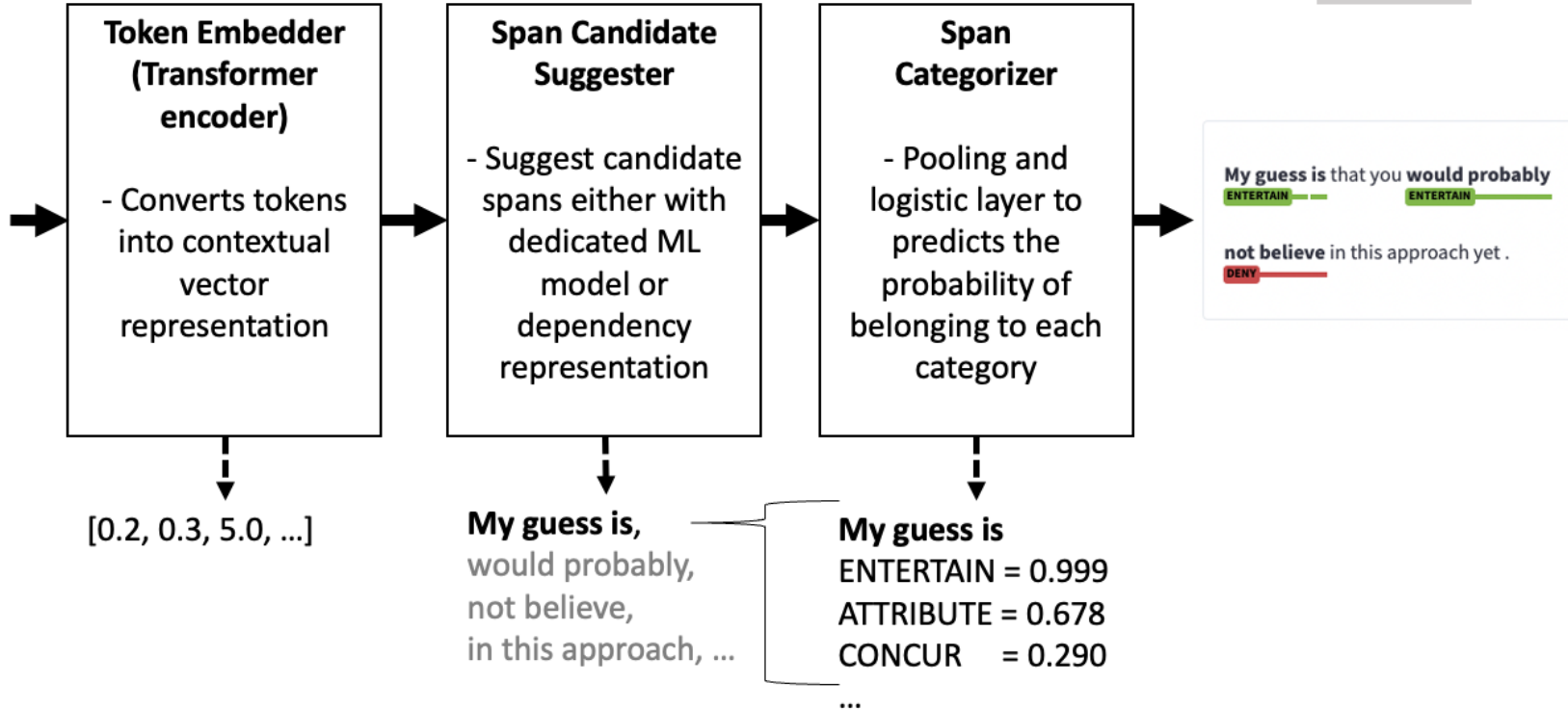
The Engagement Analyzer pipeline

—Intuitive explanation of the “black box”

INPUT

OUTPUT

My guess is that you would probably not believe in this approach yet.



Results

Human annotation baselines		
<i>Category</i>	<i>Read & Carroll (2012)</i>	<i>Our annotator agreement</i>
ATTRIBUTION	.379	0.6
COUNTER	.603	0.85
DENY	.451	0.87
ENTERTAIN	.459	0.83
MONOGLOSS	NA	0.81
PROCLAIM	.336	0.4
CITATION	NA	0.95
ENDOPHORIC	NA	0.62
JUSTIFYING	NA	0.82
SOURCES	NA	0.57
Accuracy		0.72
macro avg F1		0.67
weighted avg F1		0.72

Category	Human annotation baselines		End-to-end models trained on adjudicated data					
	<i>Read & Carroll (2012)</i>	<i>Our annotator agreement</i>	spaCy default		RoBERTa+LSTM		Dual-RoBERTa	
			<i>M</i>	<i>Min</i>	<i>M</i>	<i>Min</i>	<i>M</i>	<i>Min</i>
ATTRIBUTION	.379	0.6	0.703	0.666	0.756	0.724	0.694	0.654
COUNTER	.603	0.85	0.852	0.739	0.857	0.820	0.877	0.857
DENY	.451	0.87	0.856	0.822	0.855	0.785	0.882	0.819
ENTERTAIN	.459	0.83	0.840	0.792	0.845	0.821	0.834	0.766
MONOGLOSS	NA	0.81	0.801	0.741	0.821	0.779	0.789	0.773
PROCLAIM	.336	0.4	0.669	0.613	0.741	0.703	0.703	0.683
CITATION	NA	0.95	0.905	0.887	0.944	0.895	0.919	0.879
ENDOPHORIC	NA	0.62	0.724	0.600	0.660	0.545	0.731	0.605
JUSTIFYING	NA	0.82	0.813	0.777	0.784	0.648	0.808	0.748
SOURCES	NA	0.57	0.705	0.636	0.751	0.663	0.689	0.599
Accuracy		0.72	0.703	0.689	0.723	0.673	0.706	0.677
macro avg F1		0.67	0.715	0.695	0.728	0.696	0.721	0.706
weighted avg F1		0.72	0.719	0.706	0.740	0.697	0.720	0.661

Comparing two versions of an excerpt

Edited

The existence of free media **is** the practical implementation of
 freedom of speech - one of the institutions underpinning modern
 liberal democracies . Media **assumes** two quite distinct roles in
 politics : both as a “ neutral observer ” and as “ one of the primary
 actors on the political scene . ”

Original

The existence of free media **is often regarded** as the practical
 implementation of freedom of speech - one of the institutions
 underpinning modern liberal democracies . **As Judith Lichtenberg**
 argues in the introduction to **Democracy and the Mass Media** ,
 media assumes two quite distinct roles in politics : both as a "
 neutral observer " and as " one of the primary actors on the
 political scene . "

From British Academic Written English corpus (0070c)
 —(Modified) Essay submitted to “Introduction to Politics” for illustration



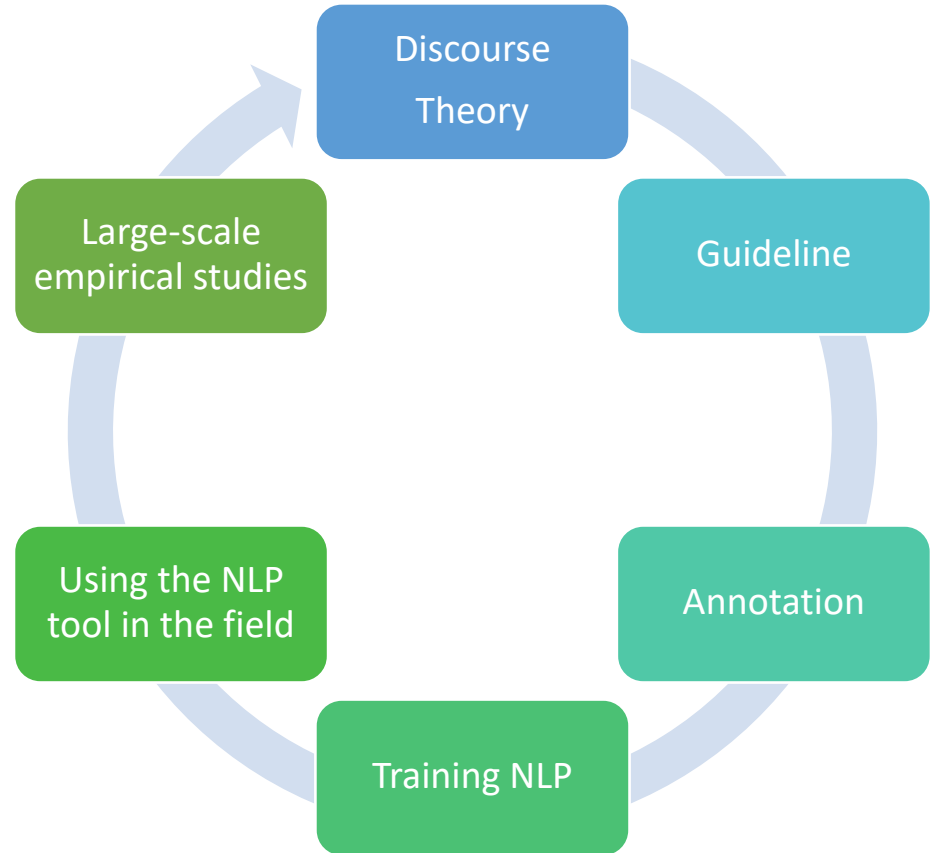
Do rhetorical features of Engagement predict L2 essay scores above and beyond existing linguistic measures?

*Due to the nature of the data, this part is not shared publicly this time.

Conclusion

Towards NLP for Applied Linguistics

- The ML approach may provide a useful toolkit for large-scale analysis of discourse features.
- We should work together to come up with “useful” NLP tasks for our downstream tasks.



Acknowledgements

Dr. Kristopher Kyle

Aaron Miller & Ryan Walker (Undergrad students at Univ. of Oregon)



The International Research Foundation
for English Language Education



NATIONAL FEDERATION OF MODERN
LANGUAGE TEACHERS ASSOCIATIONS



UNIVERSITY OF
OREGON

Going beyond vocabulary and grammar: Automatic analysis of rhetorical features in L2 writing



Engagement Analyzer
NLP conf. paper



Engagement Analyzer
demo

Masaki Eguchi



masakie@uoregon.edu



@eaglemasaki



The International Research Foundation
for English Language Education



duolingo english test



MICHIGAN
LANGUAGE ASSESSMENT



NATIONAL FEDERATION OF MODERN
LANGUAGE TEACHERS ASSOCIATIONS



UNIVERSITY OF
OREGON