

Development Center

Pitt SCI NOUR

- •When writing an argumentative piece, you need to include relevant evidence to support your opinion.
- •With multiple sub-topics in an argument, any piece of evidence could relate to one or more topics.
- •NLP algorithms can miss context and be overly inclusive when determining topic presence.

		Data & N	le
 287 essays were gathered from the eRevise system (Correnti et al., 2024) and human coded. 	Day 1 Read article First Draft	Automated Feedback	D R F
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School Hospital Farming Malaria care, health, hospital, treatment, doctor, electricity, disease, water, sick, medicine, generator, die, etc.

Baseline Algorithm:

•Keywords assigned to topic based on first appearance in 8 word window.

Weighted-Keys Algorithm:

- Sentence-level
- Dependent keywords
- Keywords assigned to multiple topics.
- Those that are vague without context.
- •Keywords removed if they are inaccurate.
- Dependent keyword handling
- Bigrams or max topic in window.
- Independent keyword handling
 - Cosine similarity using GloVe (Pennington et al., 2014).

Natural Language Processing for Determining Evidence Used in **Argumentative Essays**

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	Results & Disc			
Algorithm	ICC	Agreement	Карра	
aseline	0.6880	50.87%	0.3643	
aseline _{UNIQUE}	0.7505	57.14%	0.4471	
Veighted-Keys _{DEPENDENT}	0.8183	65.85%	0.5626	
Veighted-Keys _{REMOVE}	0.8508	67.25%	0.5837	
Veighted-Keys	0.8798	70.73%	0.6271	

Note: The baseline was developed separately but tested, like the weighted-keys algorithm, which was also developed, on the 287 essays.

•Undercounting is the most prevalent problem, possibly due to identifying only one topic per sentence. • Topics are not evenly distriubted in presence.



Human

They have supplies for kids at school. The kids can eat at schools now because of the food and water they have. Everyone now has a bed net when it used to be high for the people but cheap for us. They used to not be able to go to school now almost everyone is able to go to school. The kids used to have to help with the chores and be tired because they had no food so they had no energy now they have lots of energy to help with chores without getting tired.



- •Humans identify multiple topics in a sentence.
- Similar patterns are identified by human and automated raters.

Future Work

•Determining when a window has more than one topic, allowing for more human like annotation. •Keywords are manually decided and weighted, creating an algorithm to determine these automatically would allow the system to be used more widely.

Literature & Acknowledgements

Richard Correnti, Elaine Lin Wang, Lindsay Claire Matsumura, Diane Litman, Zhexiong Liu, Tianwen Li. Supporting Students' Text-based Evidence Use via Formative Automated Writing and Revision Assessment. *The Routledge* International Handbook of Automated Essay Evaluation, 2024. Jeffrey Pennington, Richard Socher, and Christopher Manning. 2014. GloVe: Global Vectors for Word Representation.

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- Each component of the weighted-keys algorithm is significantly better at predicting the score than baseline.
- •Removing keywords that are less telling is slightly more impactful than making keywords dependent.

Weighted-Keys

They have supplies for kids at school. The kids Farming can eat at schools now because of the food and water they have. Everyone now has a bed net when it used to be high for the people but cheap for us. They used to not be able to go to school now almost everyone is able to go to school. The kids used to have to help with the chores and be tired because they had no food so they had no energy now they have lots of energy to help with chores without getting tired.

Takeaways from NOUR

I learned a lot during the 12 weeks of NOUR, including how to make this poster. I've learned how to conduct research and ask good questions, how to present and organize data, and much more. From here, I plan to continue working with the eRevise team until my graduation in December. In the meantime, I will also look into and apply to grad programs.