Understanding Politics via Discourse Contextualization

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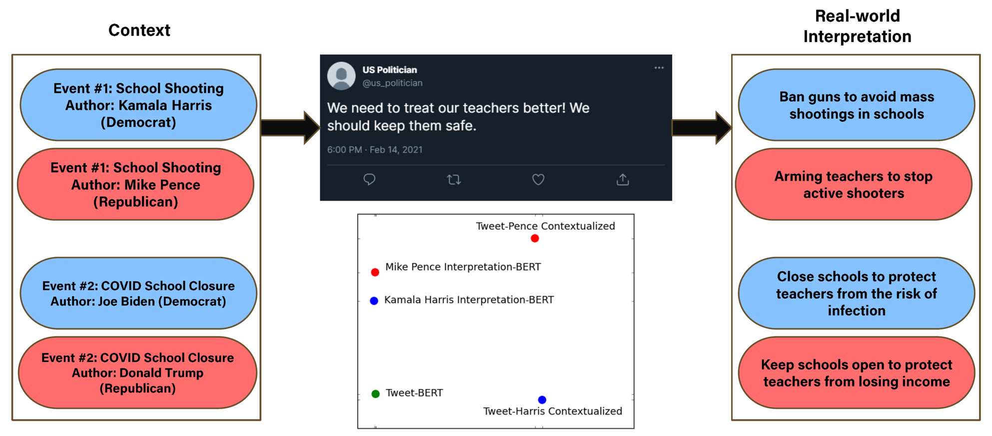
Abstract

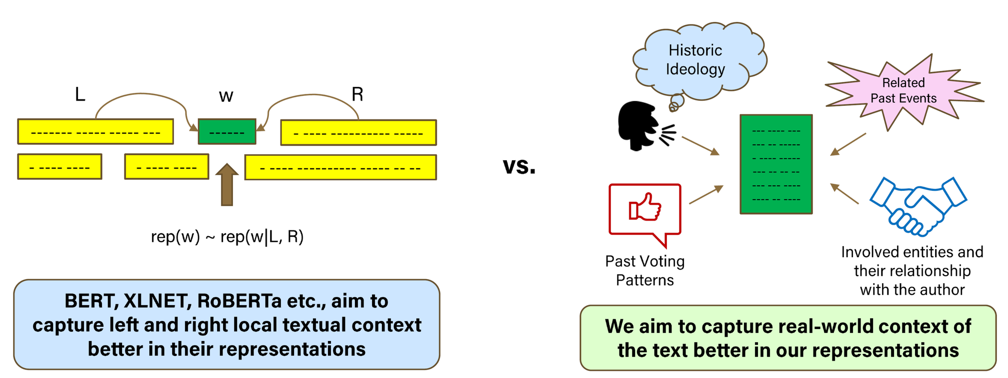
- Politicians' reactions and arguments in context of various events reflect a fairly consistent set of agendas. In spite of recent advances in Pretrained Language Models (PLMs), those text representations are not designed to capture such subtle nuances.
- We propose a Compositional Reader model consisting of encoder and composer modules, that captures and leverages such information to generate effective representations for entities, issues, and events.

Motivation

- Political text tends to be concise and subtle, especially on social media. Same text could signal starkly different real-world actions depending on the author and the surrounding context. This calls for a representation model that can contextualize based on the real-world context of the text.



Approach



Challenge: How can this massive amount of political content be used to create principled representations of politicians, their stances on issues and legislative preferences?

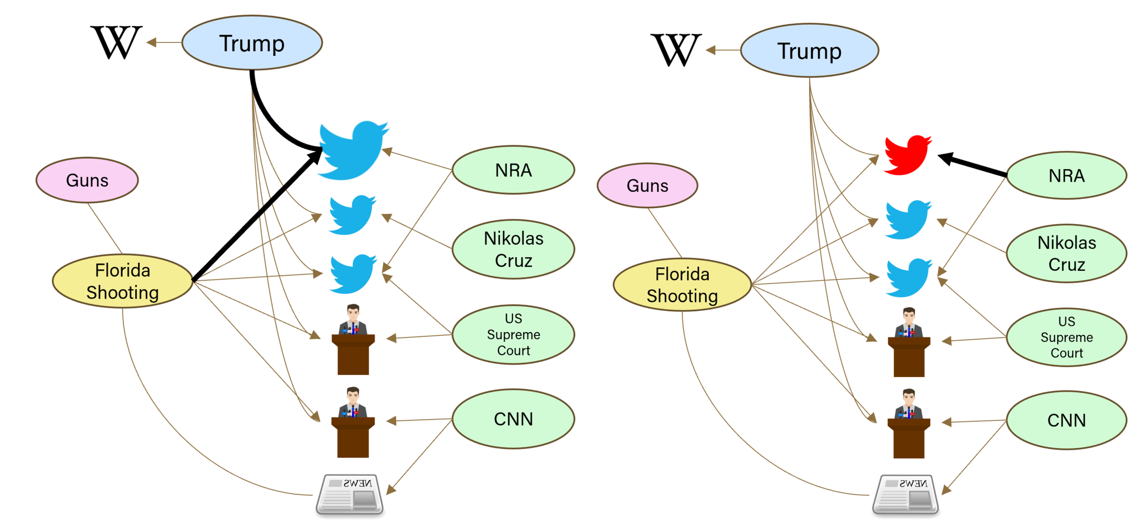
Data Summary

- We collected US political data for 8 issues: *Guns, LGBTQ rights, Abortion, Immigration, Economic-Policy, Taxes, Middle-East & Environment*

Data	Count	Data	Count
News Events	367	Tweets	86,409
Author Entities	455	Press Releases	62,257
Ref. Entities	10,506	Perspectives	30,446
Wikipedia	455	News Articles	8,244
Total Docs	187,811		

(a) Summary Statistics of Collected Data

Learning Tasks

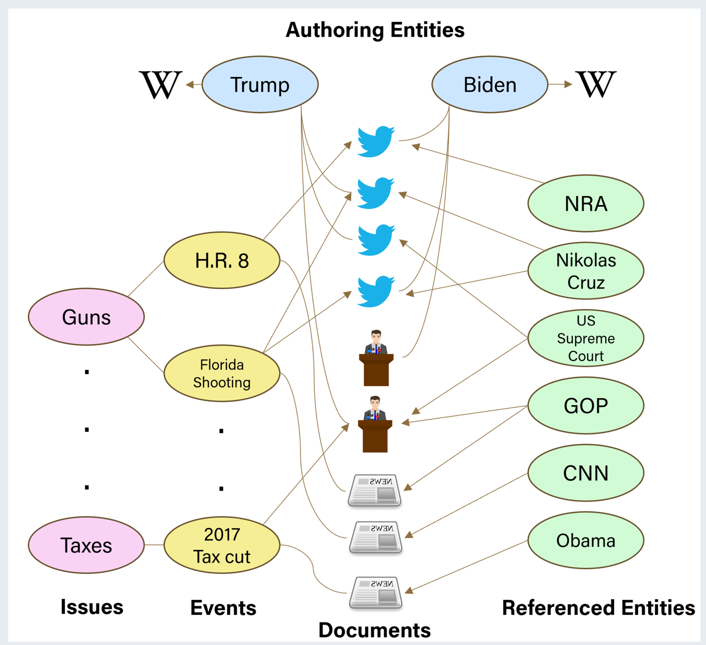


(b) Authorship Prediction: Is this tweet "**Donald Trump talking about Florida Shooting**"? (c) Referenced Entity Prediction: Is the masked entity in the document **NRA**?

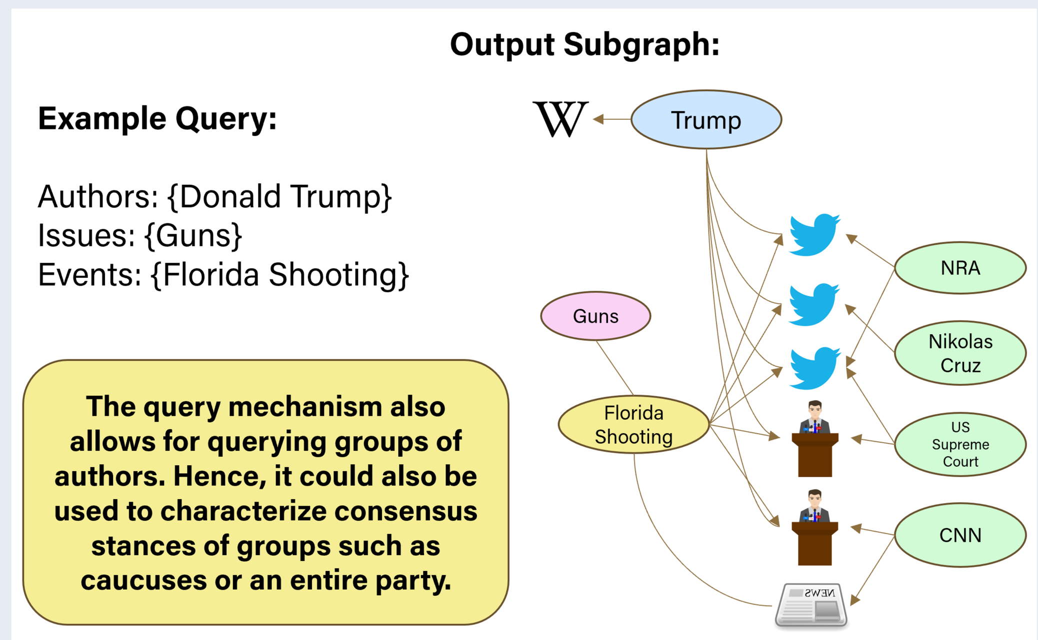
Evaluation Tasks

- We aim to evaluate how well our representations reflect the actual meaning of the text in its real-world context. We design multiple quantitative tasks and qualitative visualizations to verify our hypothesis:
  - ∗ Political Grade Data Alignment and Prediction
  - ∗ Roll-Call Vote Prediction
  - ∗ PCA visualizations of individual stances and group stances
  - ∗ Opinion Descriptor Generation
  - ∗ Contextualized visualization of ambiguous, opinionated text
- National Rifles Associations (NRA) and League of Conservation Voters (LCV) release issue-specific ratings of US politicians. We evaluate whether our representations are effectively able to:
  - ∗ Align with the grades in a zero-shot setting (Grade Paraphrase Task)
  - ∗ Predict grades given their public discourse (Grade Prediction Task)

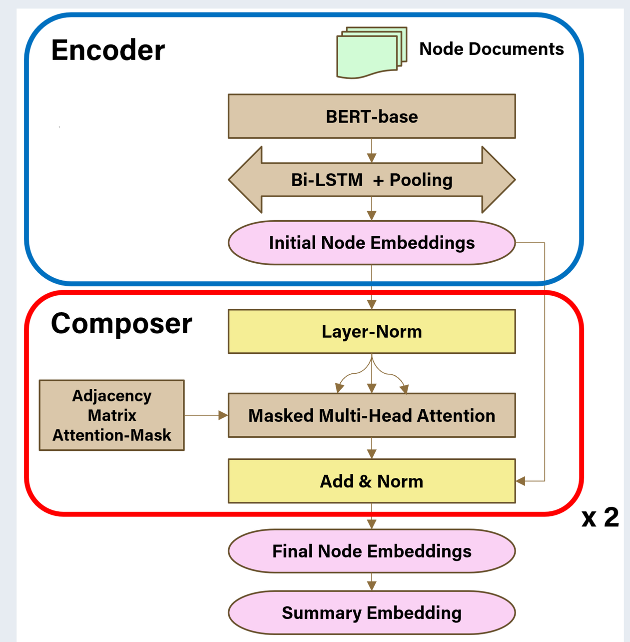
Compositional Reader Pipeline



(d) Example Overview of Complete Data Graph



(e) Query-based Subgraph Generator



(f) Architecture of Compositional Reader Model

Learning Tasks Results

- We design a BERT adaptation baseline. Its architecture is same as Encoder's. Encoder's parameters are trained via back-propagation through Composer. BERT adaptation is directly trained on learning tasks.

Model	IS Acc	IS F1	OS Acc	OS F1
Authorship Prediction				
BERT Adap.	93.01	92.31	95.56	95.20
Comp. Reader	99.49	99.47	99.42	99.39
Reference Entity Prediction				
BERT Adap.	76.57	75.21	76.26	73.67
Comp. Reader	78.52	77.51	78.98	78.62

(g) Accuracy and F1 on test sets of learning tasks are reported. IS denotes In-Sample performance (test authors are included in training set). OS is Out-of-Sample performance (train and test authors are mutually exclusive).

Quantitative Evaluation Results

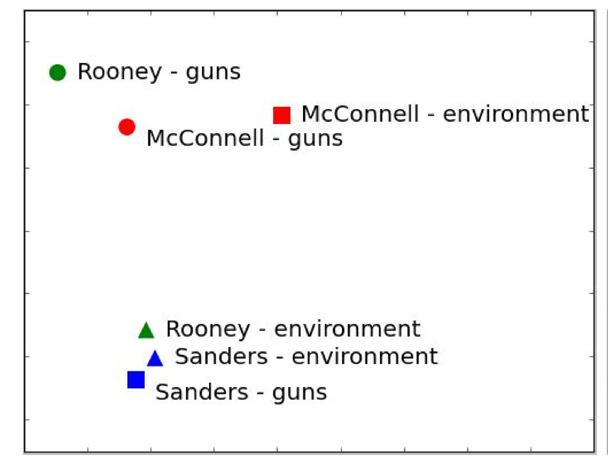
Model	Paraphrase All Grades	Paraphrase A/F Grades	NRA Val Acc	NRA Test Acc	LCV Val Acc	LCV Test Acc
BERT	41.55%	38.52%	55.93 ± 0.72	54.83 ± 1.79	54.28 ± 0.31	52.63 ± 1.21
BERT Adap.	37.54%	42.62%	71.23 ± 3.93	69.95 ± 3.33	60.58 ± 1.56	59.09 ± 1.77
Encoder	56.16%	48.36%	83.95 ± 1.24	81.34 ± 0.86	65.10 ± 0.46	63.42 ± 0.35
Comp. Reader	63.32%	63.93%	84.19 ± 0.98	81.62 ± 1.23	65.55 ± 1.33	62.24 ± 0.56

(h) Results of *'Grade Paraphrase'* and *'Grade Prediction'* tasks. Accuracy is reported. NRA and LCV denote respective *Grade Prediction* tasks.

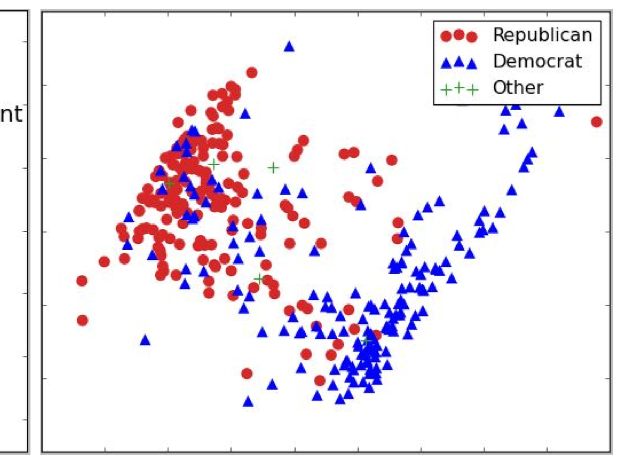
Session	Majority Class (%)	Accuracy (%)		Precision (%)		Recall (%)		F1 (%)	
		NW-GL	CR	NW-GL	CR	NW-GL	CR	NW-GL	CR
106	83.23	85.04	85.65	91.89	91.67	90.22	91.27	91.05	91.47
107	85.78	87.62	88.30	90.12	89.48	95.37	97.17	92.67	93.16
108	87.02	92.03	92.27	93.46	93.52	97.59	97.83	95.48	95.32
109	83.57	85.42	87.23	88.38	88.39	93.84	97.33	91.49	92.65
Average	84.90	87.53	88.36	90.96	90.77	94.26	95.90	92.67	93.15

(i) Roll Call Prediction Results. NW-GL represents the best performing model of [1] as replicated by us using their official implementation. CR represents Compositional Reader results. The improvements are statistically significant as per McNemar's test.

Qualitative Visualizations



(j) Individual Stances



(k) Issue *Guns*

Issue	Opinion Descriptors	Issue	Opinion Descriptors
Mitch McConnell	Republican	Nancy Pelosi	Democrat
abortion	fundamental, hard, eligible	*abortion*	future, recent, scientific
environment	achievable, more, favorable	*environment*	forest, critical, endangered
guns	foreign, meaningful, outdone	*guns*	constitutional, ironclad, fair
immigration	federal, sanctuary, imminent	*immigration*	immigrant, skilled, modest
Donald Trump	Republican	Joe Biden	Democrat
guns	terrorist, public, ineffective	*guns*	banning, prohibiting, ban
immigration	early, dumb, birthright	*taxes*	progressive, economic, annual

(l) Opinion Descriptor Labels for Politicians. They show the most representative adjectives used by the politicians in context of each issue.

Conclusion

- We tackle the problem of understanding politics, i.e., creating unified representations of political figures, capturing their views and legislative preferences, directly from raw political discourse data originating from multiple sources.
- We propose the Compositional Reader model that composes multiple documents in one shot to form a unified political entity representation, while capturing the real-world context needed for representing the interactions between these documents.

References

[1] Pallavi Patil, Kriti Myer, Ronak Zala, Arpit Singh, Sheshera Mysore, Andrew McCallum, Adrian Benton, and Amanda Stent. Roll call vote prediction with knowledge augmented models. In *Proceedings of the 23rd Conference on Computational Natural Language Learning (CoNLL)*, pages 574–581, Hong Kong, China, November 2019. Association for Computational Linguistics.

Acknowledgements

We thank Shamik Roy, Nikhil Mehta and the anonymous reviewers for their insightful comments. This work was partially supported by an NSF CAREER award IIS-2048001.

Resources

Code: https://github.com/pujari-rajkumar/compositional_learner