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Can Unsupervised Knowledge Transfer from Social Discussions Help Argument Mining?

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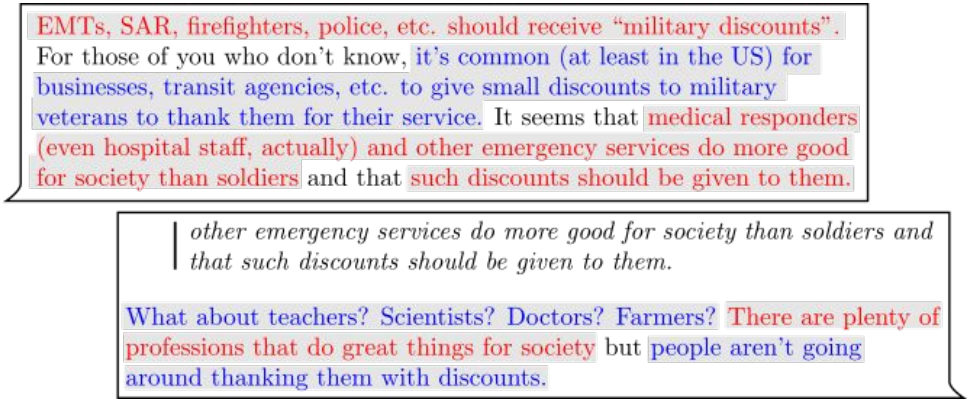
Argument Mining in a nutshell

Broadly, 2 tasks:

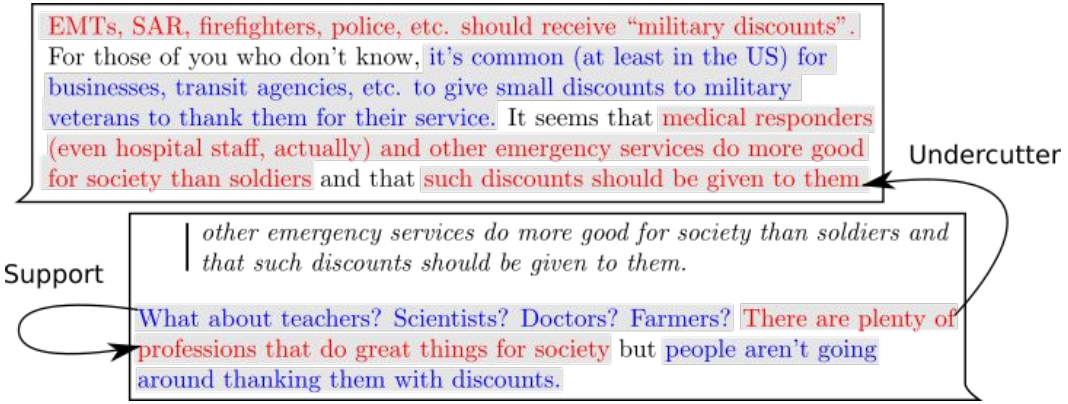
1. Identify the argument components (e.g, claims and premises)



Argument Mining in a nutshell

Broadly, 2 tasks:

1. Identify the argument components (e.g, claims and premises)
2. Identify the relationships between those components



Argument Mining: Major Challenges

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  - ◆ Even simplest argumentation models incur high cognitive load of the annotator
  - ◆ Unsupervised/semi-supervised learning is tricky for token-level boundary detection
- ➔ Domain dependence
  - ◆ Style of argumentation varies greatly among different domains

Transfer Learning via Selective MLM

Discussion threads in *r/ChangeMyView* subreddit

- Large, open source of public argumentation

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Hypothesis: **Can we make a pretrained language model aware of argumentative discourse by making it predict such markers?**

Transfer Learning via Selective MLM

u/DurianMD:
CMV: Religion is not violent or not violent, its followers are. So, my belief is that while religion can inform the views of people, it is far more likely that religion will be used to justify actions that would have been executed any way. I think that most Jewish people don't want to stone adulterers and most Muslims don't want to stone non believers.

u/recycled_kevlar:
Your stance relies on the assumption that religion has no influence on the actions of its followers beyond the superficial. Yet something must exist that allows this pattern to occur. Ill narrow it down to religion or culture. So, you are correct if you assume the culture dominates the religion, and you are incorrect if the reverse is true. With this in mind, I think its safe to assume the truth is somewhere in between, with both the religion and the culture somehow influencing the unrest we see.

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I suppose I was taking a harsh stance when I assumed that religion had no effect on behavior, when it obviously does. I still think the culture dominates religion to a great extent, however I cannot ignore that religion does have an effect on culture to some extent.

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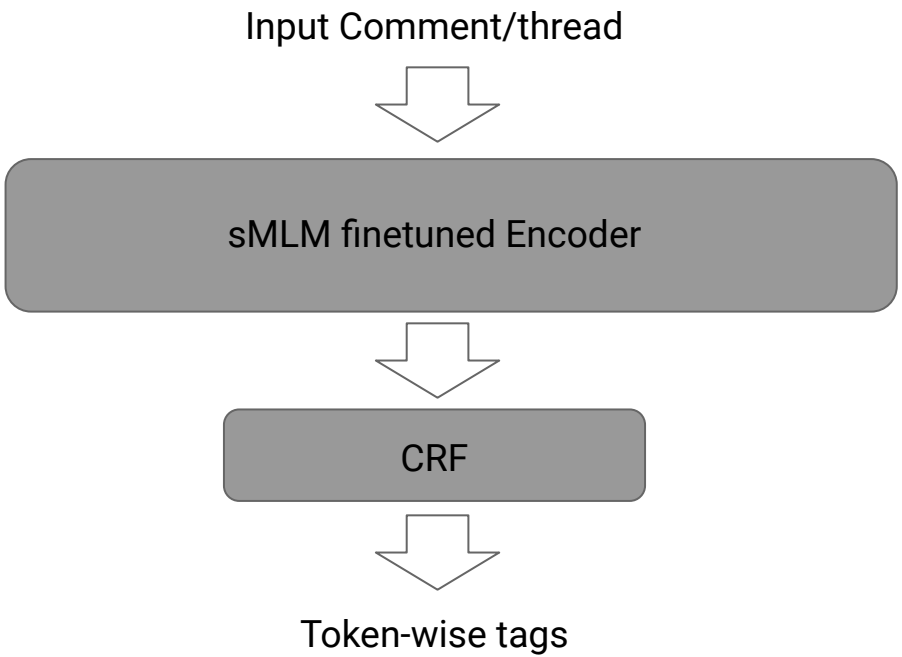
- Finetune a pretrained Transformer-based LM to predict these markers given the context and use for downstream AM tasks
- Incorporate complete thread context with Longformer
  - Replace user names with special tokens and global attention

Argument Component Identification



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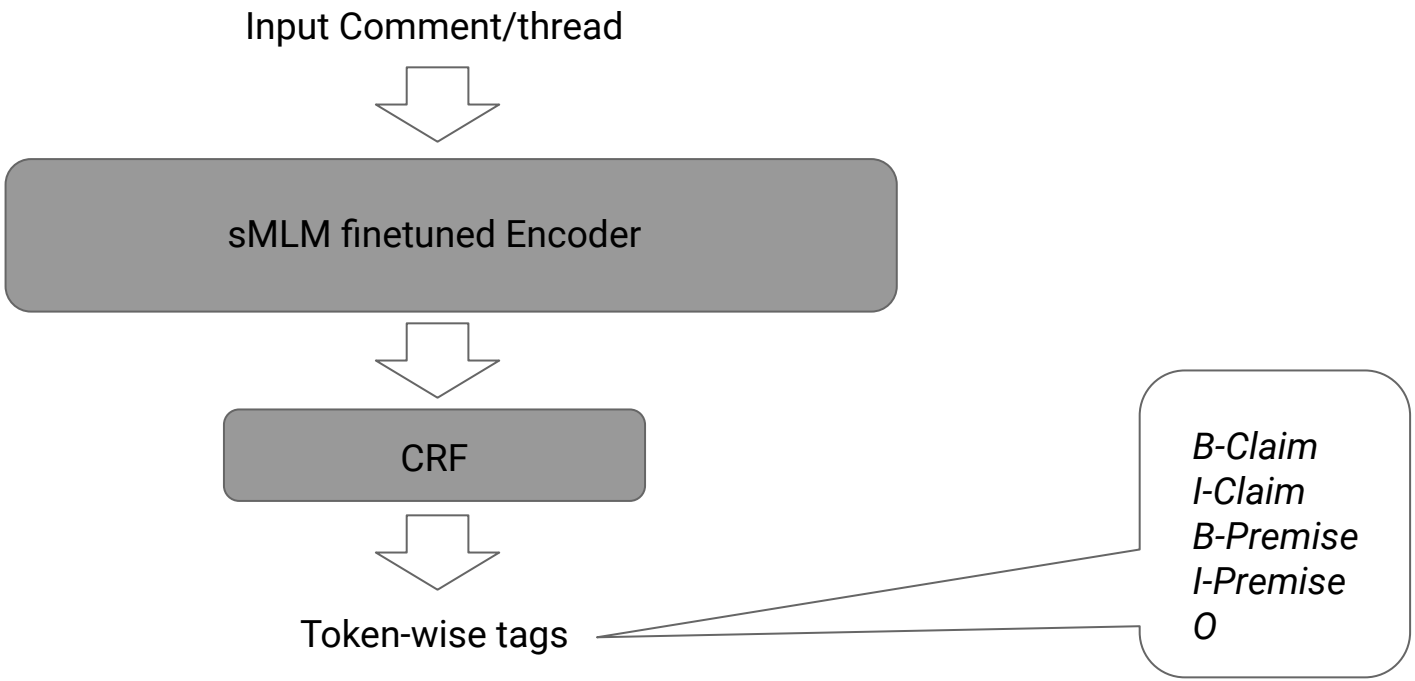
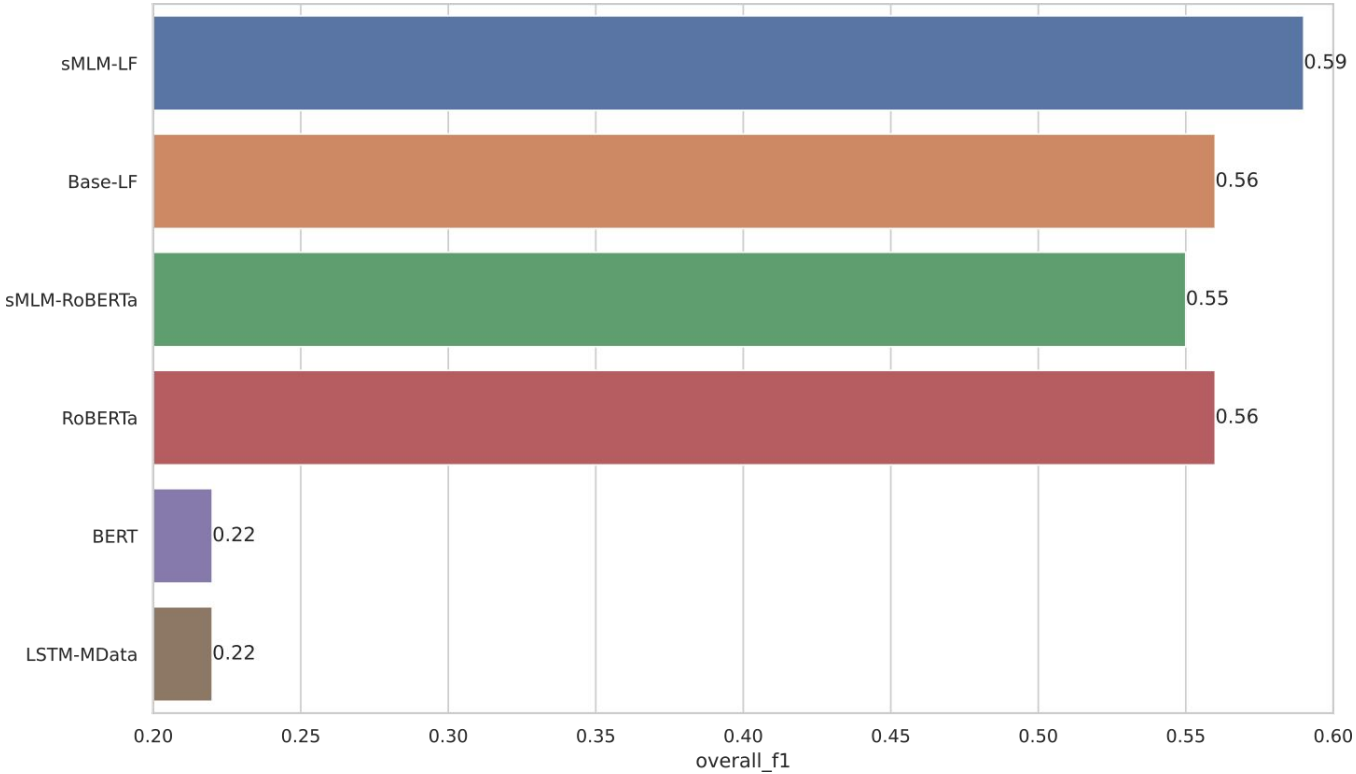


Argument Component Identification

Performance on Reddit CMV-modes dataset for token-level component prediction



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Prompt-based method

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So then isn’t almost any compliment almost to be expected? I’ve spent a lot of time with similar problems -- how could I not know all the details and little tricks of these problems? I feel a compliment recognizes something given: I feel everyone is passionate about something, whether it be math or psychology or medicine. I don’t hear "you’re so good at biology" but I think I should.

USER-2 Then wouldn’t a complement be just an acknowledgement of the time and effort you put into something that most people see as hard or worthwhile? This implies the complement is meaningful.
(Most people don’t do this - either they don’t put the time and effort into something generally hard or worthwhile or the time and effort isn’t hard or worthwhile .)

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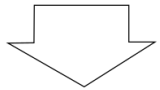

Create prompt from thread

<thread token sequence> **USER-1** said <component-1> [MASK][MASK][MASK] **USER-2** said <component-2>

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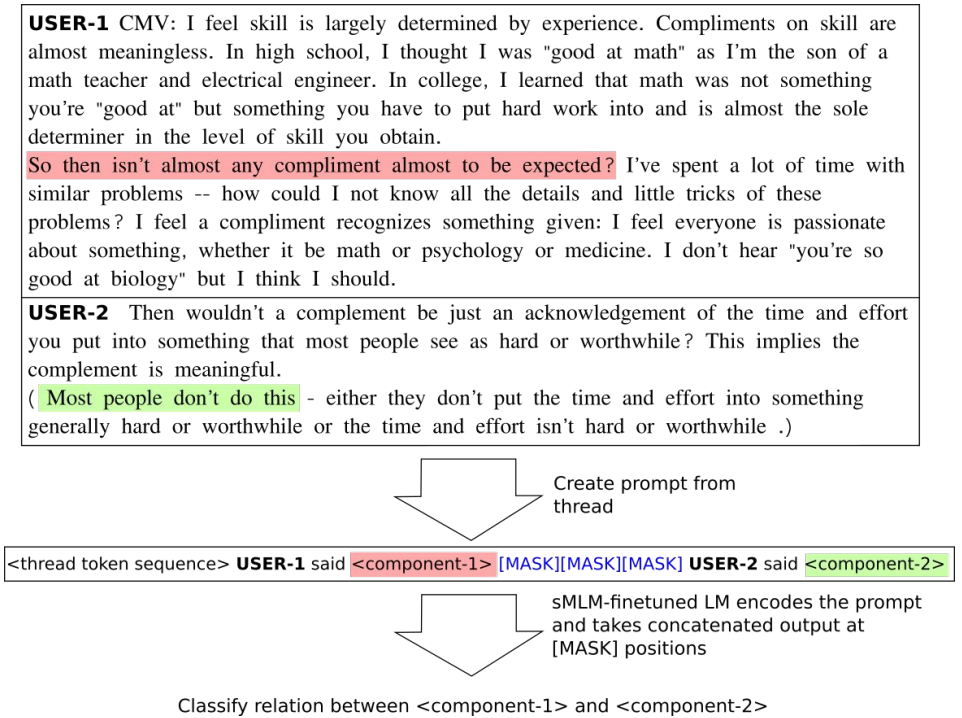

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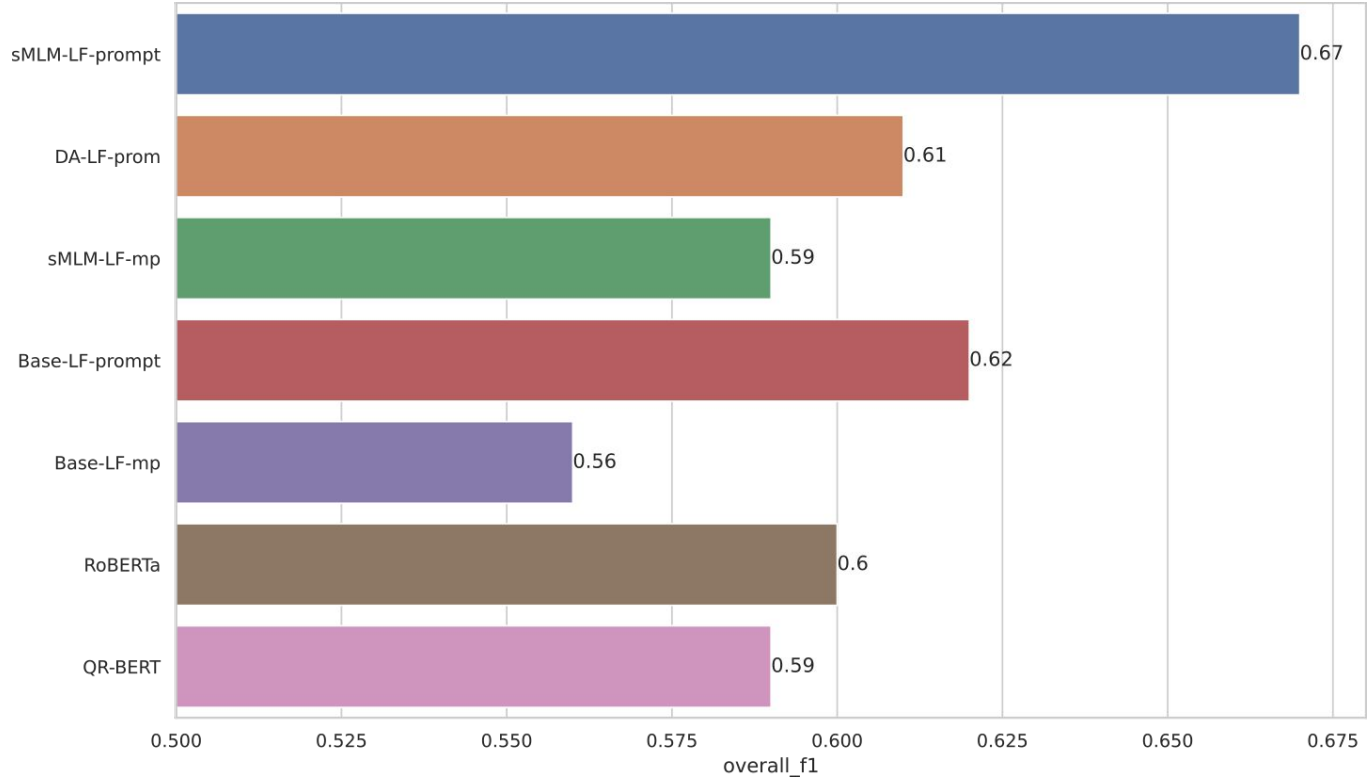

Performance on CMV-modes dataset

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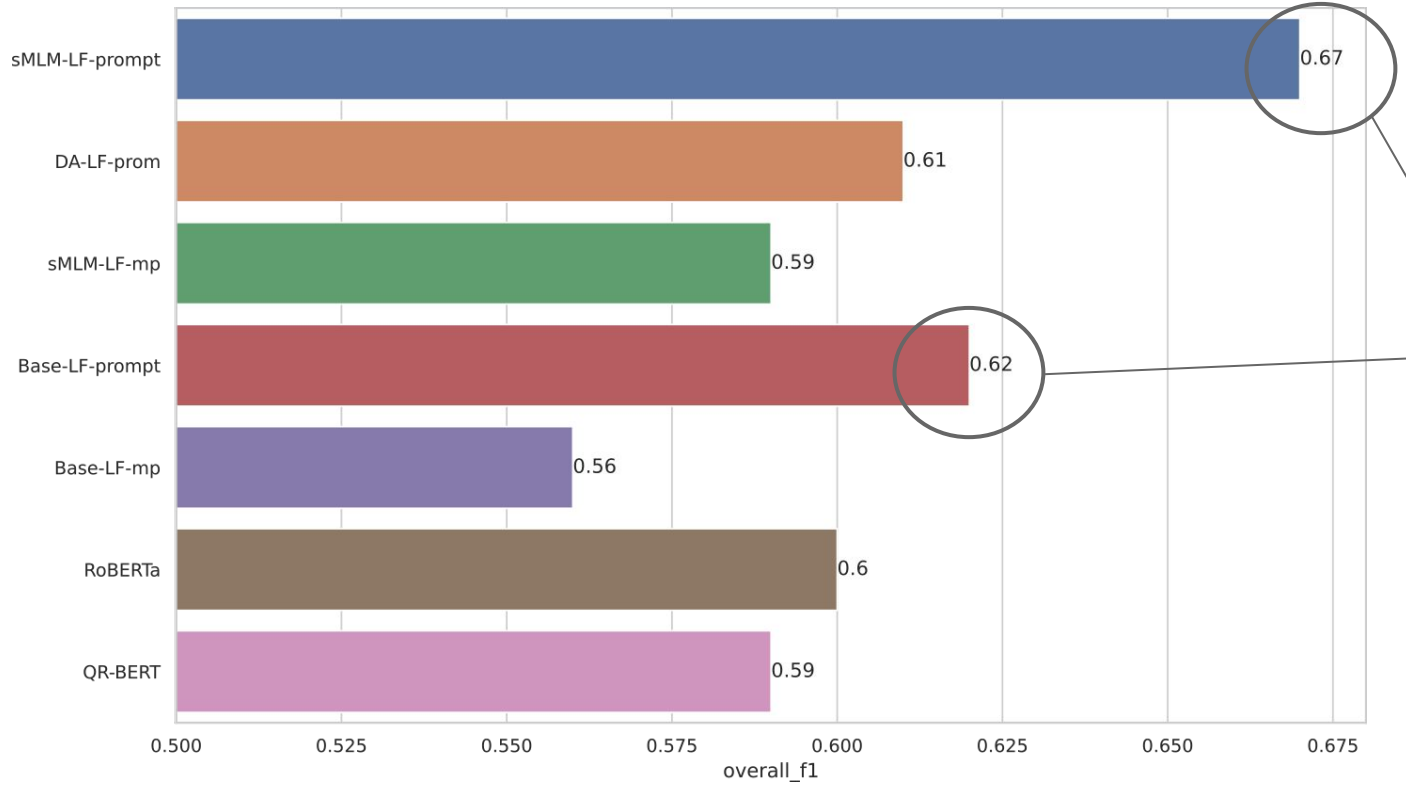

Performance on CMV-modes dataset

Prompt-based models outperform mean-pooling counterparts

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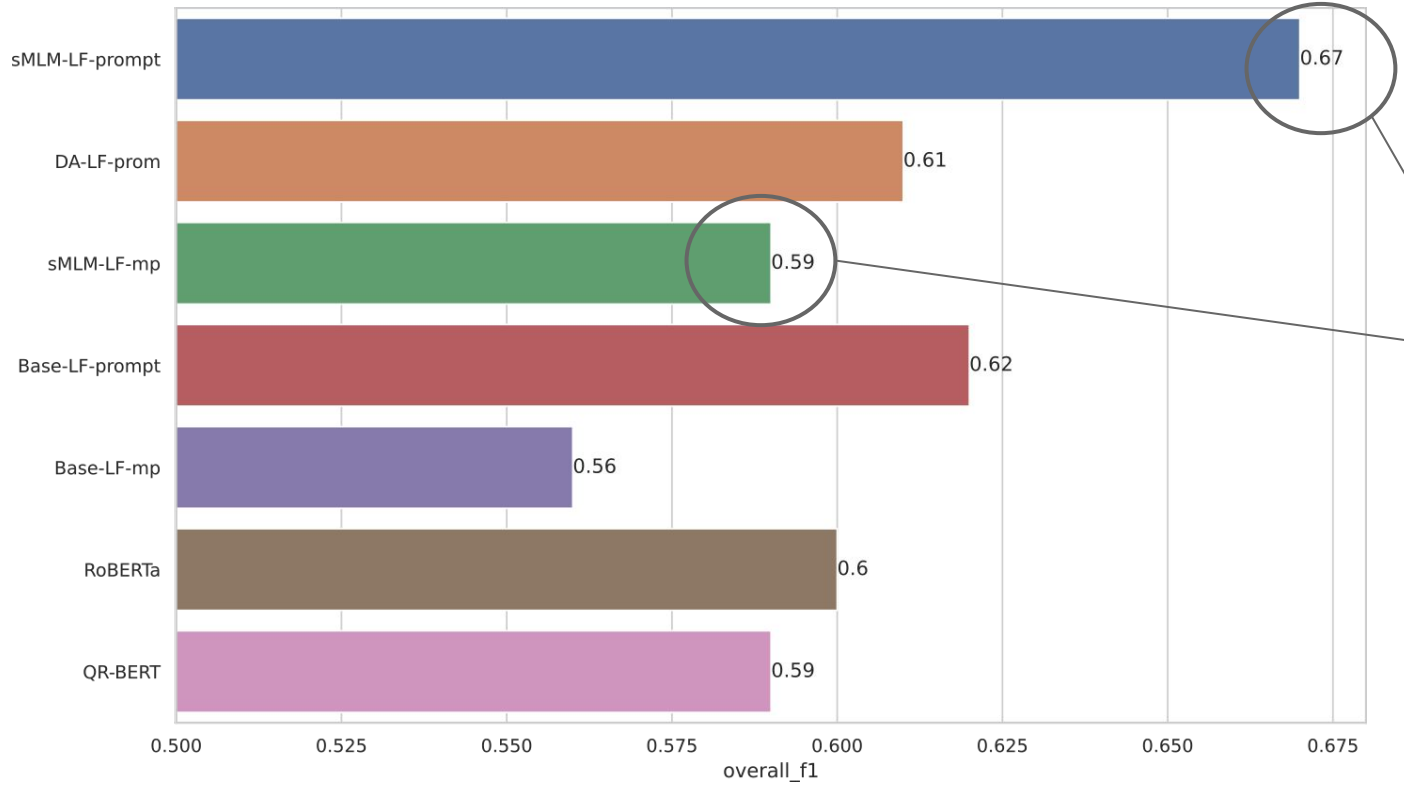
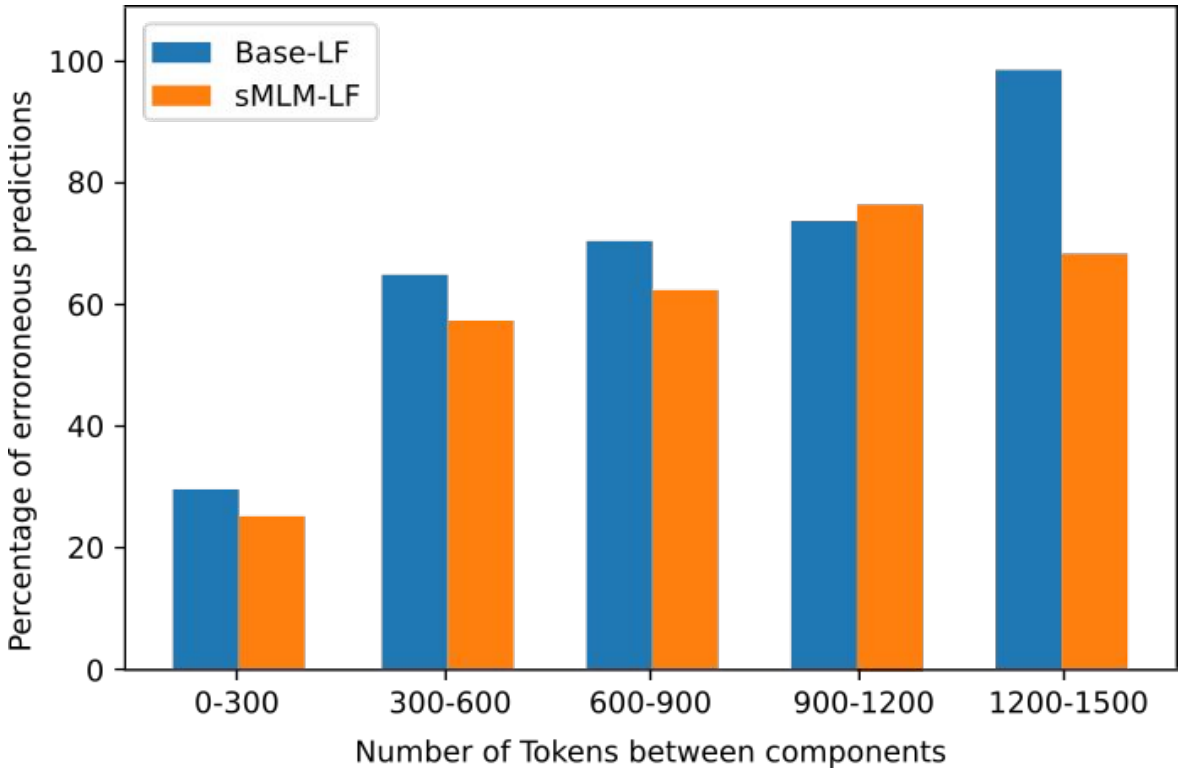


Performance on CMV-modes dataset

sMLM models outperform base and domain-adapted counterparts

Inter-component Relation Type Prediction

sMLM reduces relation type classification error among distant components



Does sMLM hurts generalizability?

Model	BC			OC			Data		
	P	R	F1	P	R	F1	P	R	F1
sMLM-LF	0.45	**0.52**	0.48	**0.39**	0.45	0.42	**0.50**	**0.48**	**0.48**
Base-LF	**0.49**	0.51	**0.50**	0.38	**0.50**	**0.43**	0.44	0.44	0.44

Relation types	Base-LF-prompt			sMLM-LF-prompt		
	P	R	F1	P	R	F1
Support	**0.91**	0.90	**0.91**	0.89	**0.92**	**0.91**
Contradict	0.60	**0.60**	**0.60**	**0.65**	0.55	**0.60**
Semantically same	0.74	**0.77**	0.75	**0.77**	0.75	**0.77**

Performance on Dr. Inventor dataset for component detection (top) and relation type prediction (bottom)

Thank you for your interest in our work!

Codebase available at: https://github.com/Jeevesh8/arg_mining