EA²E: Improving Consistency with Event Awareness for Document-Level Argument Extraction

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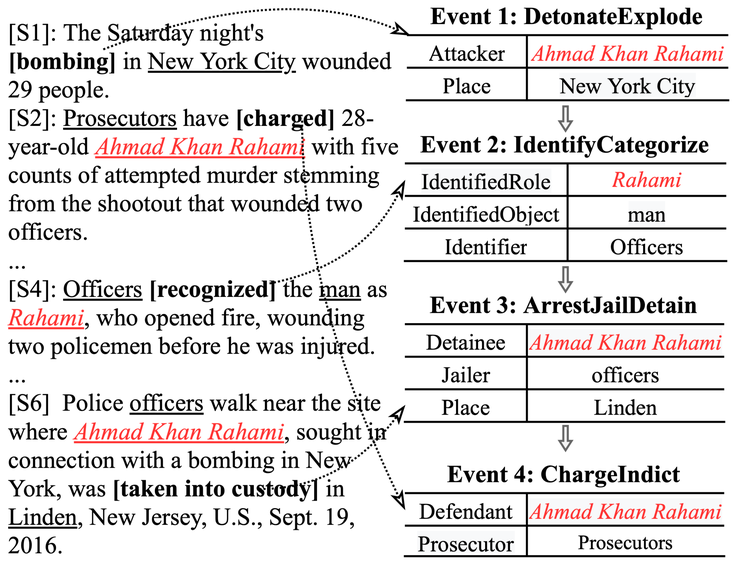
INTRODUCTION

Events are inter-related in documents. Motivated by the one-sense-per-discourse theory, we hypothesize that **a participant tends to play consistent roles across multiple events in the same document**.

For example, the *Attacker* in the *DetonateExplode* event is likely to be:

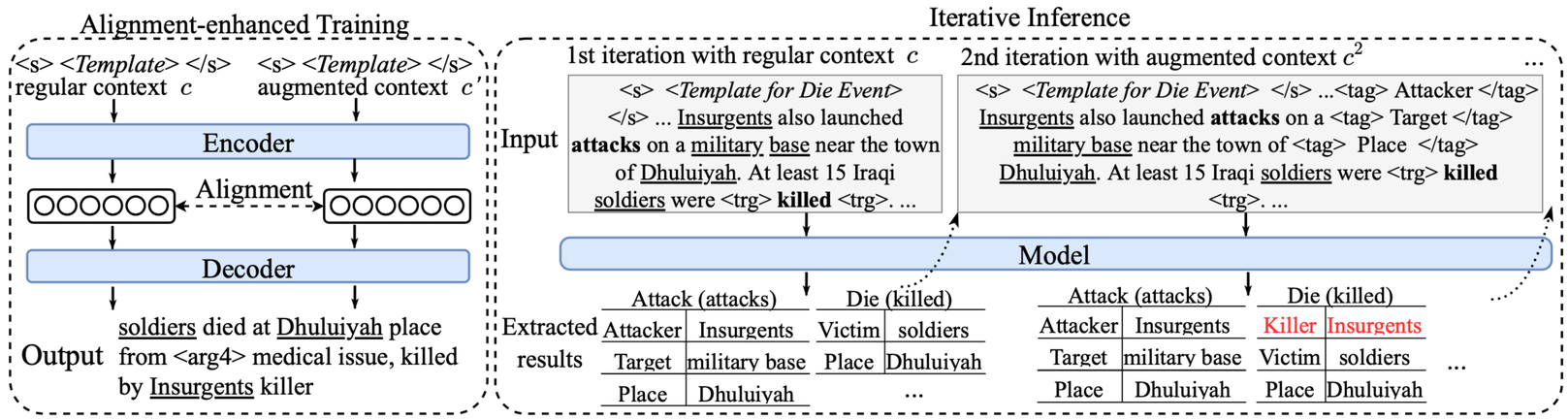
- the *IdentifiedRole* in the *IdentifyCategorize* event,
- the *Detainee* in the *ArrestJailDetain* event,
- as well as the *Defendant* in the *ChargeIndict* event.



Recent work models each individual event in isolation and therefore causes inconsistency among extracted arguments across events.

To improve event argument consistency, we introduce the Event-Aware Argument Extraction (EA²E) model with augmented context for training and inference.
Experiment results on WIKIEVENTS and ACE2005 datasets demonstrate the effectiveness of EA^{2}E compared to baseline methods.

METHOD



- Template: a pre-defined unfilled template for each type of event (eg. the template for Attack event is <arg> detonated or exploded <arg> explosive device using <arg> to attack <arg> target at <arg> place).
- Augmented context: tagging the argument labels of the other events

Alignment-enhanced Training

Pull close the argument representation distributions under regular context *c* and under augmented context *c'*.

Iterative Inference

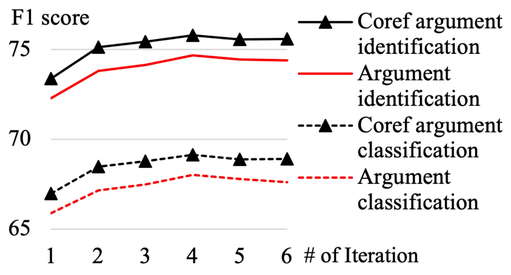
Explicitly introduces event awareness by utilizing extracted results in multiple inference iterations.

RESULTS & ANALYSIS

Model	Argument Identification						Argument Classification					
	Head Match			Coref Match			Head Match			Coref Match		
	P	R	F1	P	R	F1	P	R	F1	P	R	F1
BERT-CRF	72.66	53.82	61.84	74.58	55.24	63.47	61.87	45.83	52.65	63.79	47.25	54.29
ONEIE	68.16	56.66	61.88	70.09	58.26	63.63	63.46	52.75	57.61	65.17	54.17	59.17
BART-Gen	70.43	71.94	71.18	71.83	73.36	72.58	65.39	66.79	66.08	66.78	**68.21**	67.49
EA²E	76.51	**72.82**	**74.62**	77.69	**73.95**	**75.77**	70.35	**66.96**	**68.61**	71.47	68.03	**69.70**
EA²E w/o AT	**77.26**	71.23	74.12	**78.61**	72.47	75.42	**71.10**	65.54	68.21	**72.25**	66.61	69.32
EA²E w/o II	75.96	72.29	74.07	77.13	73.42	75.22	69.61	66.25	67.89	70.72	67.32	68.97

The upper table shows that EA²E performs better than strong baseline methods.

- Alignment-enhanced training brings a significant improvement but comes with higher training costs.
- Iterative inference brings unstable improvement. The right figure shows that more iterations brings higher performance only to a certain range.



CONCLUSIONS

We introduce Event-Aware Argument Extraction (EA²E) model to improve self-contained consistency in document-level event argument extraction.
We conclude that iterative inference brings higher performance only to a certain range of iterations and alignment-enhanced training brings significant improvement with costs.

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