

Language Models Can Improve Event Prediction by Few-Shot Abductive Reasoning

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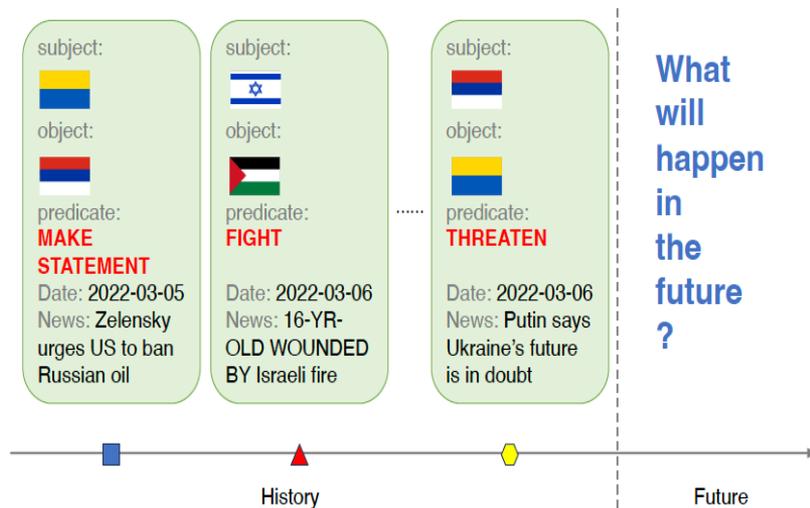
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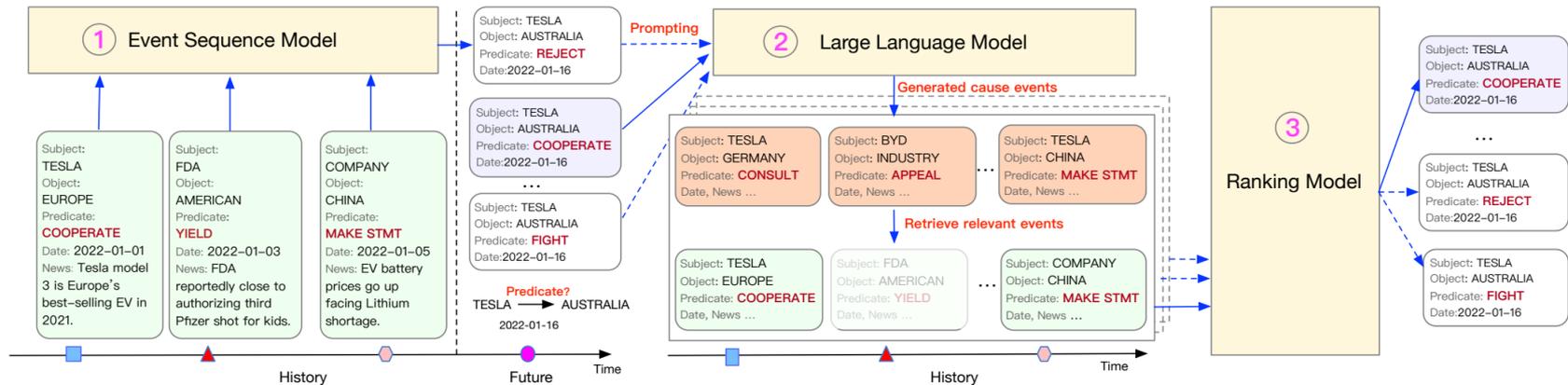
Our Problem

Event data usually comes with texts, how to effectively use textual information for event prediction?

Formally, suppose we are given an event sequence $s_{[0,T]} = \{k_1@t_1, k_2@t_2, \dots, k_I@t_I\}, t_i \in R, e_i \in E$, Our goal is to **predict the time t_i and type k_i of next event, with the knowledge of its ground-truth time k_i or certain attributes of the type k_i if the event has a structure (e.g., subject, predicate)**



Our Key Idea: Integrate LLM into Event Prediction



Event Sequence Model

- propose predictions based on history
- a prediction may be time, type,
- or an attribute of type (e.g., predicate)
- most probable prediction under model may not be correct

Large Language Model

- guess causes for each proposal, via few-shot abductive reasoning.
- each guessed cause works as a query
- retrieve similar events from history, as evidence for this proposal

Ranking Model

- learn to score each combo of proposal and retrieved evidence
- higher score = better compatibility
- rank proposals based on score
- model trained by contrastive learning

Prompt for LLM Abductive Reasoning

Define the context and instruction

```
I want you to do the reasoning over social events. I given you an effect event and you give me four or five cause events. An effect event is an event that happens. A cause event is believed to be one of the causes that have triggerred the effect event to happen. Each event consists of a time, a type (that includes subject, predicate, object), and a news headline describing the event.
```

```
The predicates are restricted to the 20 options below.
```

```
1. MAKE STATEMENT
```

```
: // Full list are in Appendix E.4.
```

```
20. ENGAGE IN MASS VIOLENCE
```

```
Now I give you 10 examples. In each example, the first event is the effect and the next several events are the causes that happened earlier.
```

```
: // Examples are in Listing 2.
```

```
Now please generate possible causes for
```

```
effect
predicate: CONSULT
time: 2022-07-05
subject: CHINA PM
object: YELLEN
```

```
## Example 1
```

```
effect
predicate: APPEAL
time: 2022-04-23
subject: GERMANY
object: GREEN PROJECT
```

```
reasoning:
-----
```

```
cause event 1
predicate: REDUCE RELATIONS
time: 2022-04-21
subject: EUROPE
object: RUSSIA
headline: Europe determined to ban Russian energy exports.
```

```
cause event 2
predicate: DISAPPROVE
time: 2022-03-16
subject: EUROPE
object: RUSSIAN
headline: Europe can endure painful transition to live without Russian oil.
```

```
: // Other causes are in Appendix E.4.
```

```
## Example 2
```

```
: // Other examples in Appendix E.4.
```

Effect event in few shot examples

A few cause event in few shot examples

Experiments on Real Datasets

Event model proposes M predictions (time, type, or attribute of type)

- Our LLM-based framework reranks the M predictions
- RMSE (for time; lower = better): how close top-ranked time prediction is to the ground-truth time
- Mean rank (for type or attribute; lower = better): where the ground truth type/attribute stands in the list
- Our LLM-based method is significantly better than SOTA event model
- More results and analysis in paper

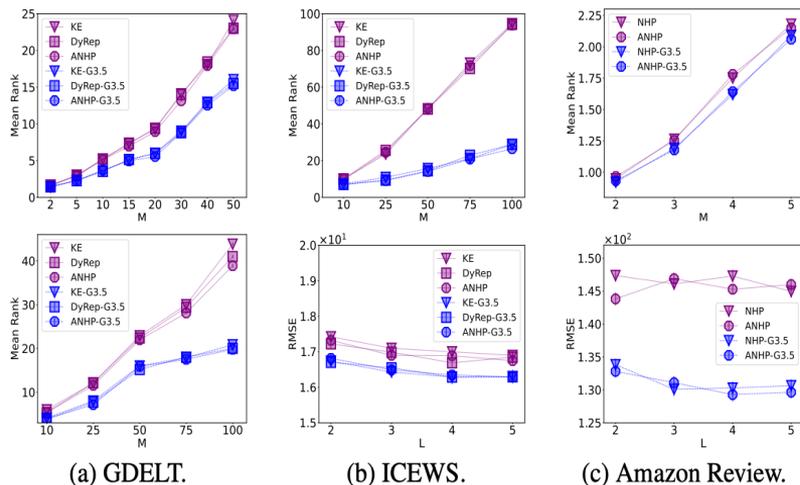


Figure 2: Prediction performance of different methods on each dataset. On GDELT, the upper figure is for object prediction, and the lower figure is for predicate-object joint prediction. On ICEWS, the upper figure is for object prediction, and the lower figure is for time prediction. On Amazon Review, the upper figure is for type prediction, and the lower figure is for time prediction.

Please come to our **poster** for

Model details !

Training details !

Work well ? Very well !

Please download our paper at

