Rethinking Temporal Knowledge Graph Extrapolation: Prioritizing Historical Events Over Graph

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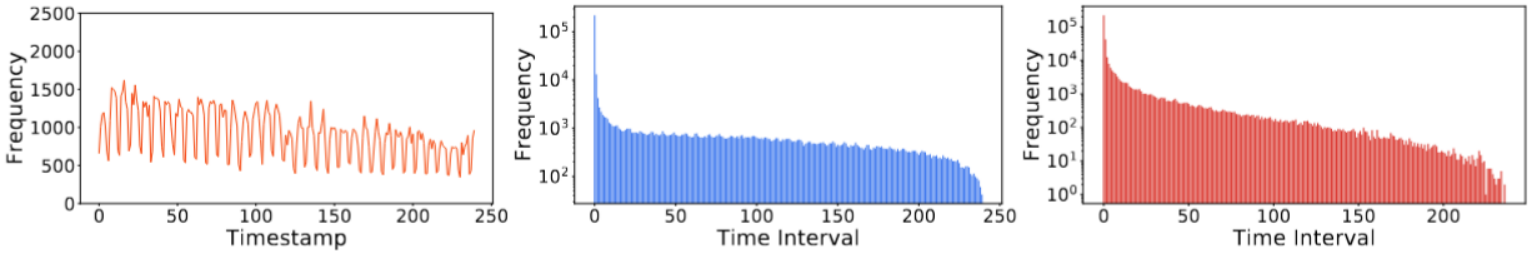
Problems & Ideas

- Problems in Current TKG Models:
  - **Overemphasis on Graph Structures**: Existing Temporal Knowledge Graph (TKG) models rely heavily on graph-based techniques (e.g., GNNs, RNNs) to capture relationships.
  - **Limitations in Capturing Temporal Patterns**: Many models truncate temporal data into short windows to enhance computational efficiency. Besides, existing methods rank candidate entities without bias, failing to prioritize frequent entities for repetitive events or less frequent entities for new events.
- Ideas: Prioritize Historical Temporal Information & Shift from Graph-Based to Historical-Driven Models



(a) Frequency of new events under different timestamps.

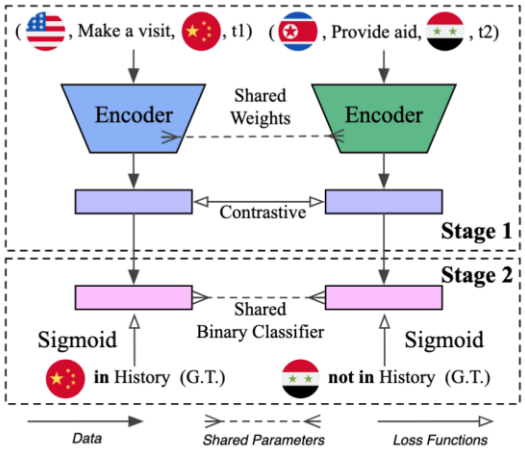
(b) Frequency of time intervals between the first and current occurrence of repetitive events.

(c) Frequency of time intervals between the latest and current occurrence of repetitive events.

Statistics of new and repetitive events on ICEWS18 dataset.

Main Contributions

- Contributions:
  - **Highlighting the Importance of Historical Information:** Advocate for prioritizing historical temporal data over intricate graph structures to improve reasoning performance.
  - **A Historical-Driven Model:** Propose a contrastive learning framework to distinguish between repetitive and new events.
  - **Empirical Validation Across Diverse Datasets:** CENET outperforms all graph-based and historical-sequence models across all datasets, with significant improvements in event-based TKGs (8–13%) and public KGs (9–12%).



The framework of contrastive learning for TKG.

Method	ICEWS18	ICEWS14	GDELT	WIKI	YAGO
Graph-Based Model					
RE-NET	36.19	38.42	32.43	48.01	63.29
xERTE	30.71	26.44	-	-	58.46
RE-GCN	24.99	24.43	21.74	39.82	59.98
HIP	43.51	45.73	46.35	53.82	66.32
Historical-Sequence-Based Model					
TLogic	30.09	32.23	17.65	57.43	63.80
CyGNet	40.58	41.77	44.53	50.48	64.26
GenTKG	37.20	21.70	18.50	-	71.50
CENET	**47.10**	**49.61**	**55.99**	**68.33**	**84.03**

The experimental results.