

Simplified Multi-view Graph Neural Network for Multilingual Knowledge Graph Completion

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Frontiers of Computer Science, DOI: [10.1007/s11704-024-3577-3](https://doi.org/10.1007/s11704-024-3577-3)

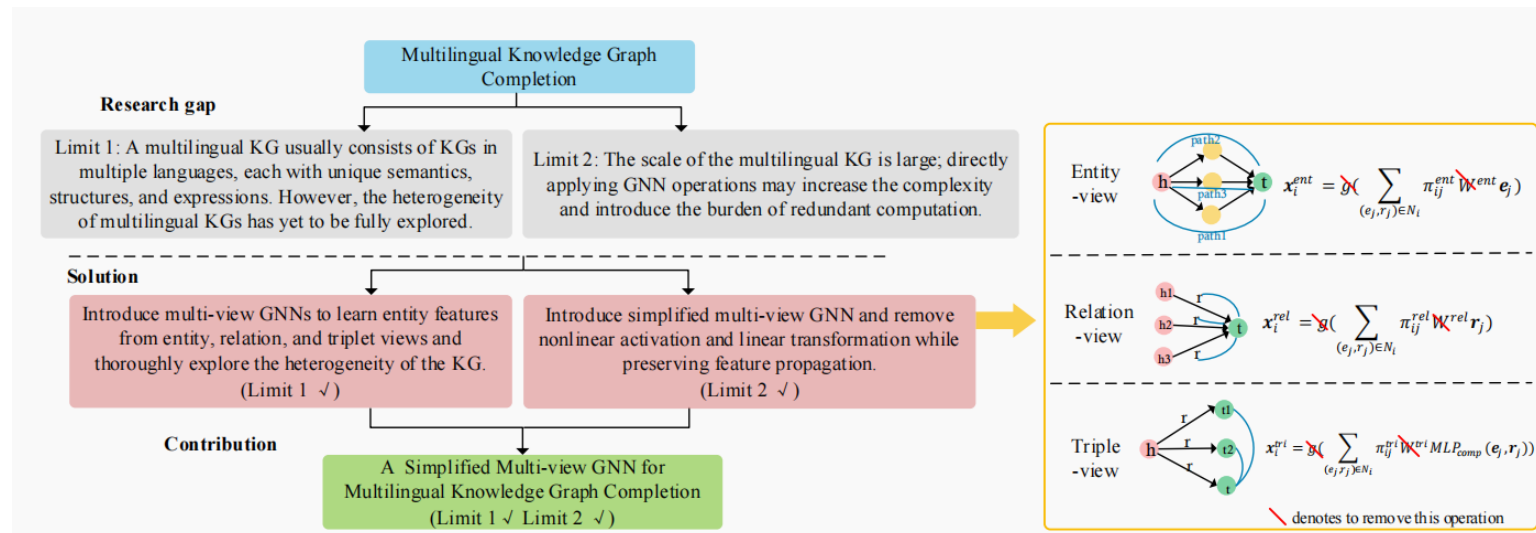
Problems & Ideas

Problems:

- A multilingual KG usually consists of KGs in multiple languages, each with unique semantics, structures, and expressions. However, the heterogeneity of multilingual KGs has yet to be fully explored.
- The scale of the multilingual KG is large; directly applying GNN operations may increase the complexity and introduce the burden of redundant computation.

Ideas:

- Introduce multi-view GNNs to learn entity features from entity, relation, and triplet views and thoroughly explore the heterogeneity of the KG.
- Introduce simplified multi-view GNN and remove nonlinear activation and linear transformation while preserving feature propagation.



Motivation and contribution.

Experimental results

Table 1: MKGC experimental results on dataset DBP-5L.

Method	Align.	EL			JA			FR			ES			EN		
		H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR
Monolingual Baselines																
TransE [11]	0%	13.1	43.7	24.3	21.1	48.5	25.3	13.5	45.0	24.4	17.5	48.8	27.6	7.3	29.3	16.9
RotatE [12]	0%	14.5	36.2	26.2	26.4	60.2	39.8	21.2	53.9	33.8	23.2	55.5	35.1	12.3	30.4	20.7
DisMult [46]	0%	8.9	11.3	9.8	9.3	27.5	15.8	7.4	22.4	13.2	6.1	23.8	14.5	8.8	30.0	18.3
KG-BERT [27]	0%	17.3	40.1	27.3	26.9	59.8	38.7	21.9	54.1	34.0	23.5	55.9	35.4	12.9	31.9	21.0
Multilingual Baselines																
KEnS [15]	100%	26.4	66.1	-	32.9	64.8	-	22.3	60.9	-	25.2	62.6	-	14.4	39.6	-
SS-AGA [16]	100%	30.8	58.6	35.3	34.6	66.9	42.9	25.5	61.9	36.6	27.1	65.5	38.4	16.3	41.3	23.1
AlignKGC [43]	50%	58.2	88.6	69.4	49.3	78.7	60.1	48.4	79.4	59.5	48.0	76.6	58.0	31.7	59.8	41.3
JMAC [17]	50%	55.2	97.5	71.7	53.3	91.4	66.8	49.3	91.3	64.5	45.4	88.2	61.0	29.5	72.7	44.6
SM-GNN	50%	62.6	98.0	76.9	59.4	94.2	72.5	56.8	94.3	71.2	54.9	91.3	69.0	36.6	74.5	50.3

Table 2: MKGC experimental results on dataset E-PKG.

Tip: The bolder ones mean better.

Method	Align.	DE			EN			ES			FR			IT			JA		
		H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR	H@1	H@10	MRR
Monolingual Baselines																			
TransE [11]	0%	21.2	65.5	37.4	23.2	67.5	39.4	17.2	58.4	33.0	20.8	66.9	37.5	22.0	63.8	37.8	25.1	72.7	43.6
RotatE [12]	0%	22.3	64.3	38.2	24.2	66.8	40.0	18.3	58.9	33.7	22.1	64.3	38.2	22.5	64.0	38.1	26.3	71.9	41.8
DisMult [46]	0%	21.4	54.5	35.4	23.8	60.1	37.2	17.9	46.2	30.9	20.7	53.5	35.1	22.8	51.8	34.8	25.9	62.6	38.0
KG-BERT [27]	0%	21.8	64.7	38.4	24.3	66.4	39.6	18.7	58.8	33.2	22.3	67.2	38.3	22.9	63.7	37.2	26.9	72.4	44.1
Multilingual Baselines																			
KEnS [15]	100%	24.3	65.8	-	26.2	69.5	-	21.3	59.5	-	25.4	68.2	-	25.1	64.6	-	33.5	73.6	-
SS-AGA [16]	100%	24.6	66.3	39.4	26.5	69.8	41.5	21.0	60.1	36.3	25.9	68.7	40.2	24.9	63.8	38.4	33.9	74.1	48.3
JMAC [17]	50%	34.7	71.5	48.9	46.2	78.5	59.4	34.8	68.7	47.9	34.2	73.1	49.2	40.5	73.0	54.0	58.1	81.9	67.3
SM-GNN	50%	38.4	74.6	52.3	47.4	79.7	60.1	34.5	68.5	47.7	37.3	76.8	52.3	41.2	74.4	54.4	59.9	81.8	68.1

Conclusions:

1. The effect of the multilingual KGC model is far better than that of the monolingual KGC model, which proves that the prediction of the target KG benefits from the KG of other languages, that is, the knowledge fusion effectiveness.
2. Our proposed SM-GNN model almost outperforms the strongest baseline JMAC model on both datasets, indicating that learning the features of entities from multiple views can more fully utilize the contextual information of KG.