RPND: A Rule Guided Link Prediction Model With Specific-Path Selection

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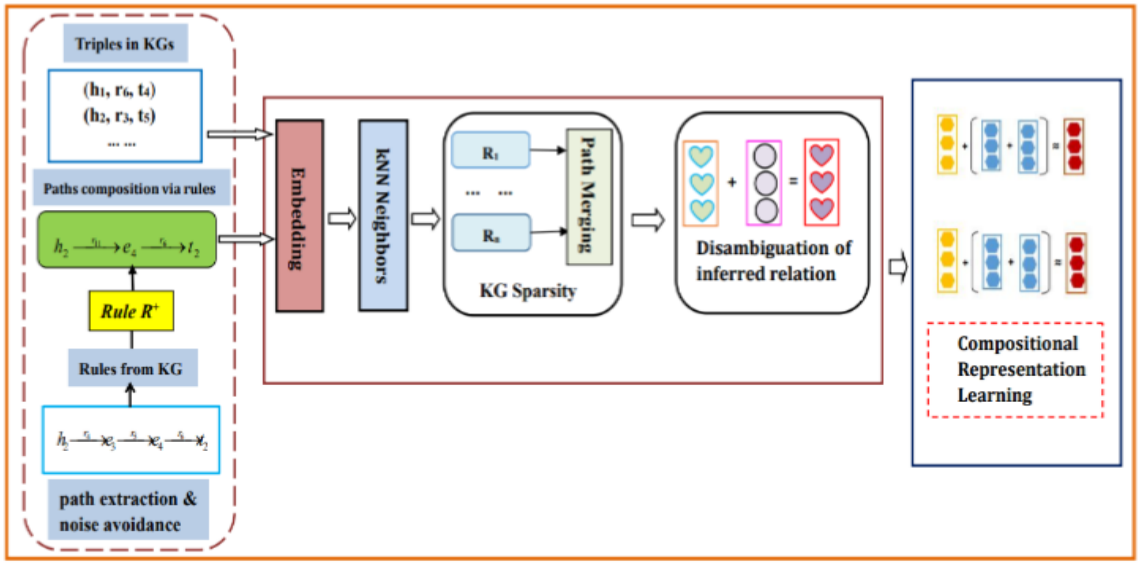
Problems & Ideas

- Problems of conventional stereo matching approaches:
  - Existing link prediction models cannot simultaneously handle path noise, ambiguity of inferred relation and path sparsity in knowledge graphs.
  - Existing path representation methods lack of a certain interpretability.

- Ideas: A joint link prediction models takes the issues of path noise, ambiguity of inferred relation, path sparsity and lack of interpretability into account.



Main Contributions

- Contributions:
  - We identify the issue of path noise, path sparsity, and the ambiguity of inferred relation, and present a novel rule guided link prediction model with path noise avoidance, disambiguation of inferred relation and alleviation of path sparsity simultaneously, named as RPND;
  - We resort to PRA algorithm to filter path noise and exploit the overlapping features between paths to dynamically integrate the paths with similar relations to alleviate the path sparsity.
  - We introduce the positional embedding techniques to disambiguate inferred relations. Meanwhile, we utilize logic rules to address the poor interpretability in path representation.

Relation prediction results on FB15K-237 and WN18RR

Models	FB15K-237				WN18RR			
	Hits@10 ↑	Hits@3 ↑	Hits@1 ↑	MRR ↑	Hits@10 ↑	Hits@3 ↑	Hits@1 ↑	MRR ↑
TransE[2013]	98.4	98.3	94.5	96.6	88.1	87.0	69.0	78.4
SimplE[2018]	97.9	**98.7**	95.5	**97.0**	75.8	75.5	65.8	73.0
ComplEx[2016]	97.1	97.0	87.9	92.3	88.2	88.0	77.5	84.0
RotatE[2019]	98.2	98.0	95.0	**97.0**	82.5	82.3	73.5	79.8
HypER[2019]	52.0	37.6	25.2	34.1	88.9	89.0	78.7	84.5
DisMult[2015]	93.5	93.6	80.5	87.5	53.0	46.6	41.3	45.2
ConvE[2018]	52.1	36.9	24.8	33.9	50.4	45.1	41.1	44.2
R-GCN[2018]	41.7	26.4	15.1	24.8	–	–	–	–
JSSKGE[2023]	55.3	40.9	29.8	36.8	55.7	48.6	42.8	47.6
McRL[2023]	55.9	40.9	28.3	37.7	57.6	53.0	47.7	49.1
MEGA[2024]	88.5	88.2	87.4	92.5	97.5	93.2	90.5	89.4
MGTCA[2024]	58.3	42.8	29.1	39.3	59.3	52.5	47.5	51.1
AdaGCN[2025]	54.6	39.6	27.5	37.0	54.8	50.1	45.0	47.2
RPND[*Ours*]	**98.6**	98.5	**96.2**	96.4	**98.4**	**94.6**	**91.6**	**92.5**