

Customer Complaint Guided Fault Localization Based on Domain Knowledge Graph

DASFAA - 2023

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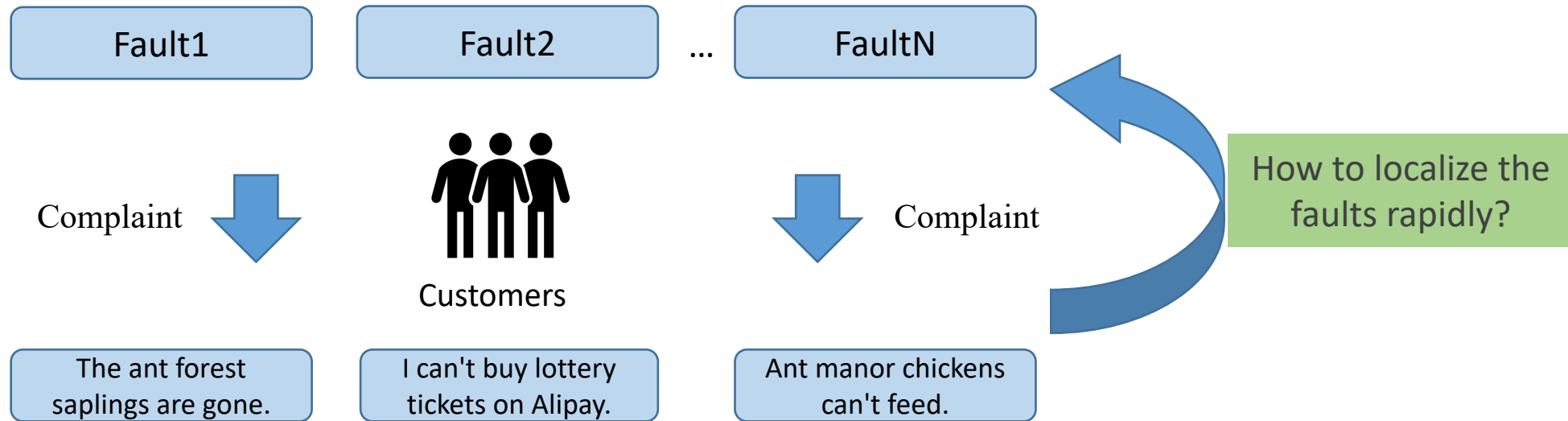
¹Southeast University, China, ²Ant Group



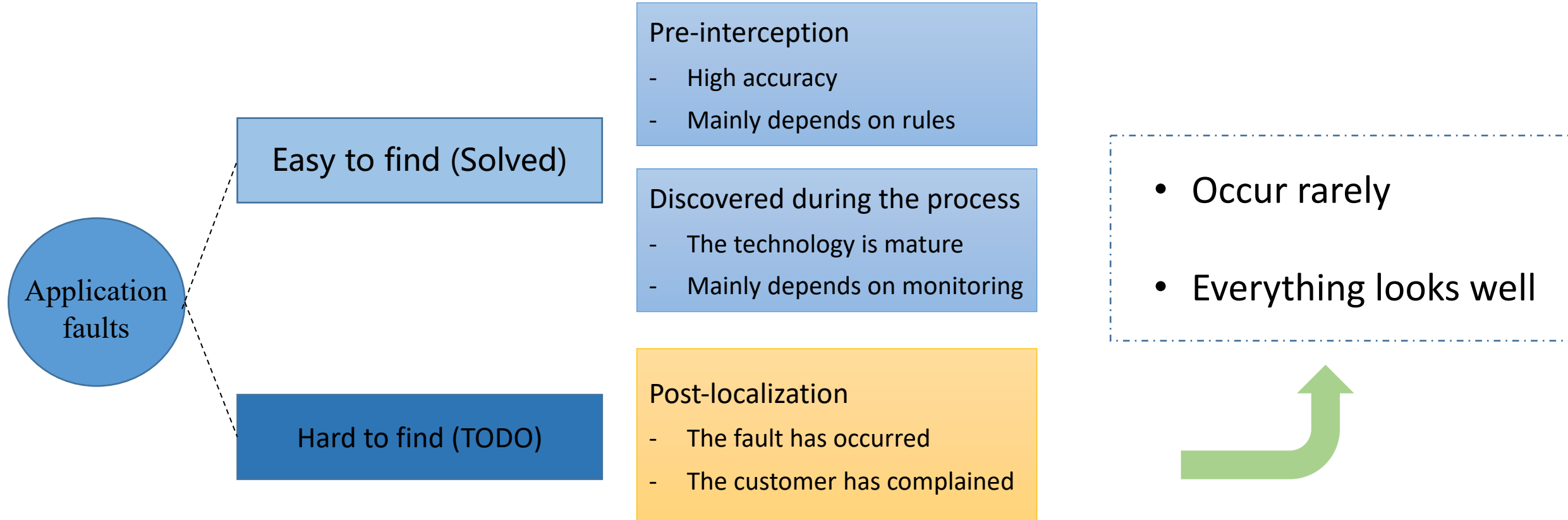
Knowledge Science and Engineering Laboratory



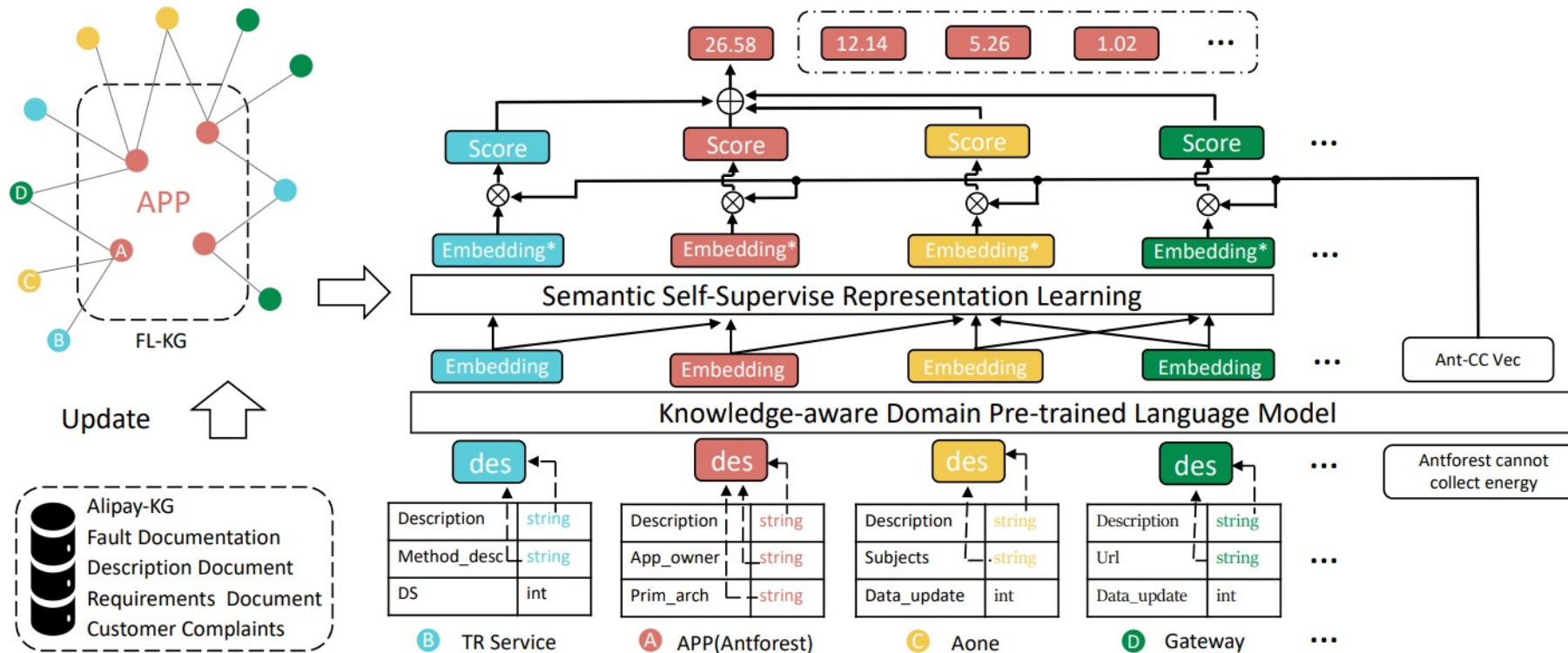
Background: In Alipay, customer complaint faults account for a high proportion.



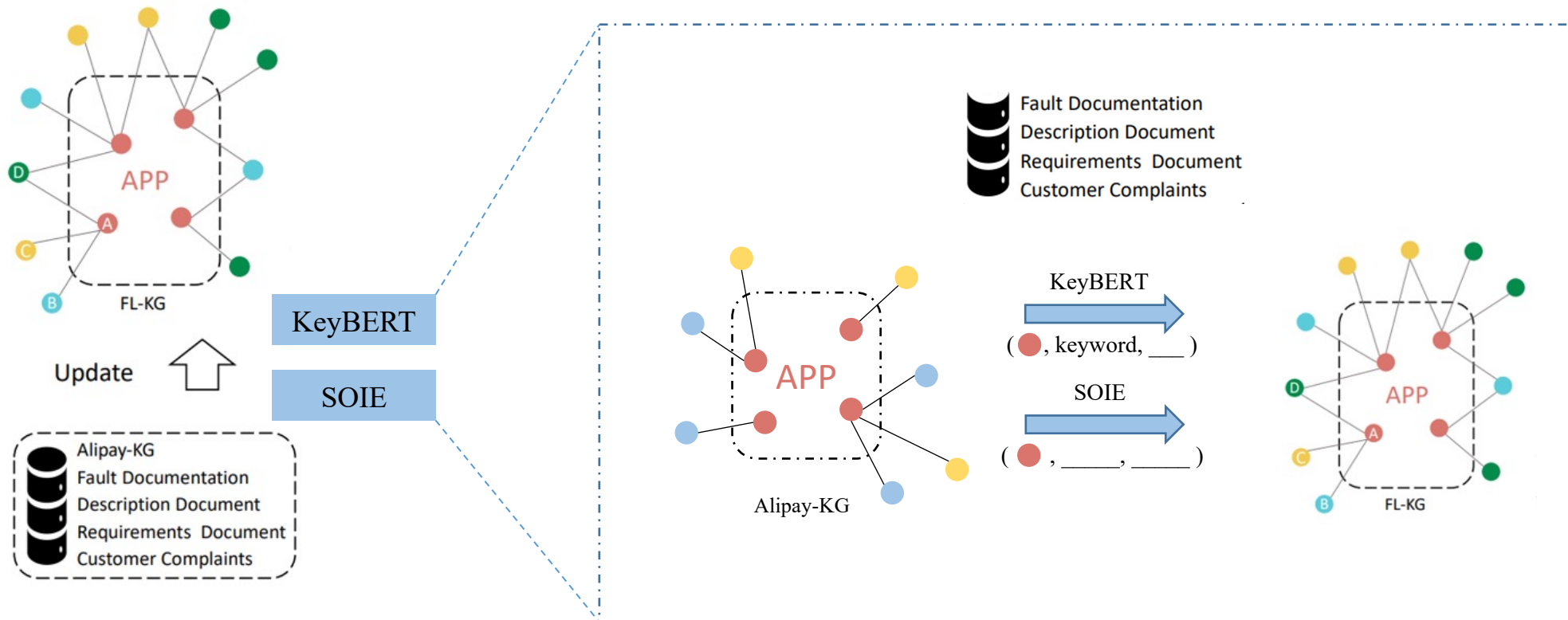
Challenge: Lacking historical failure data and deterministic information



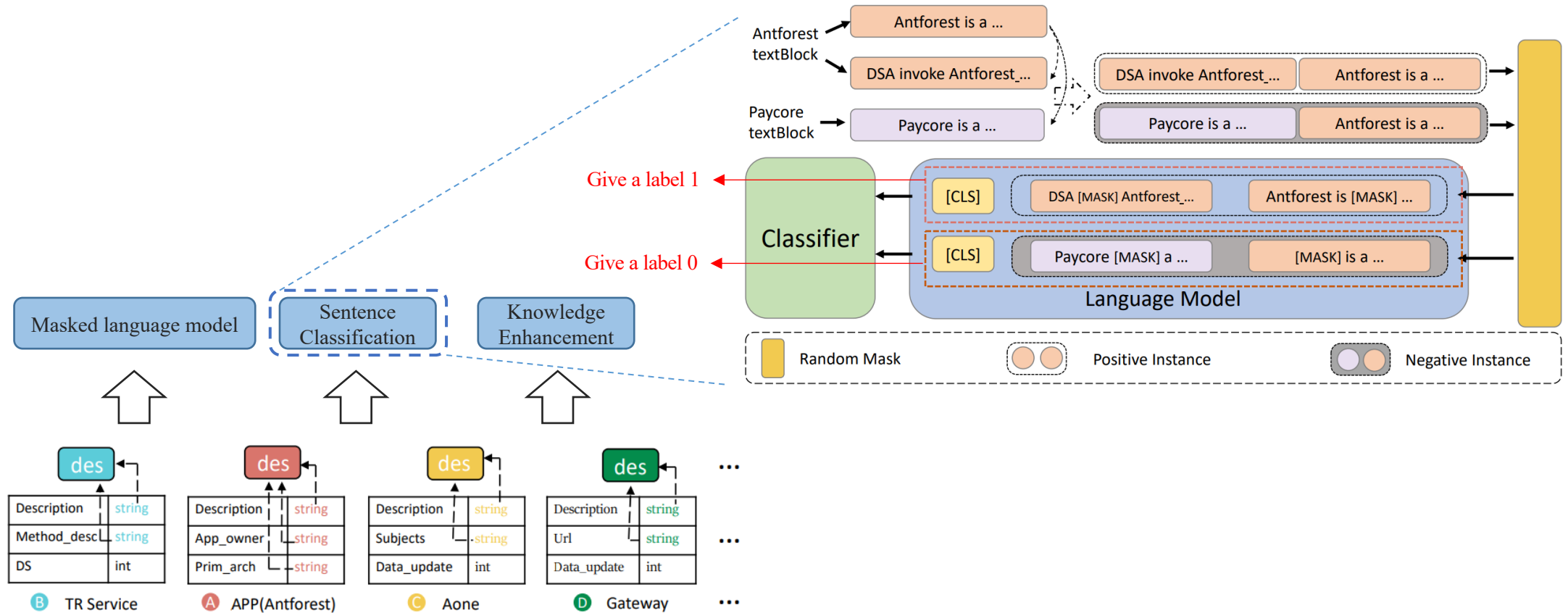
Methodology: Unsupervised Fault Localization (UFL)



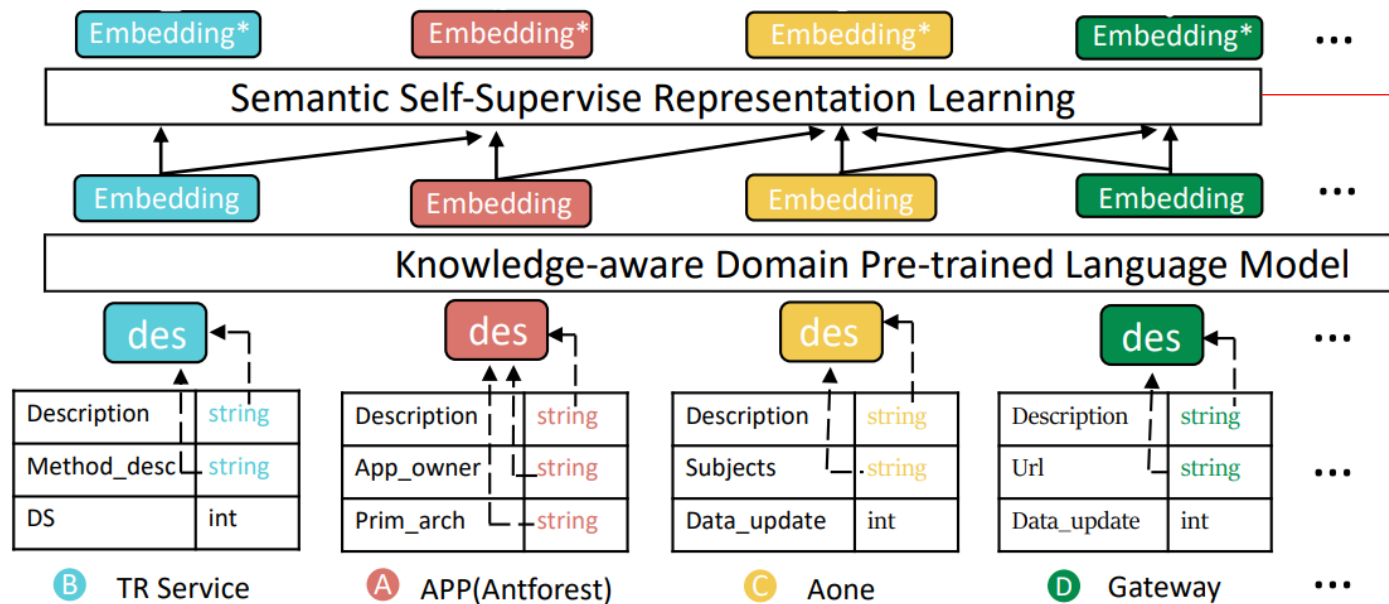
Update of Domain Knowledge Graph for Fault Localization



Knowledge-aware Domain Pre-trained Language Model



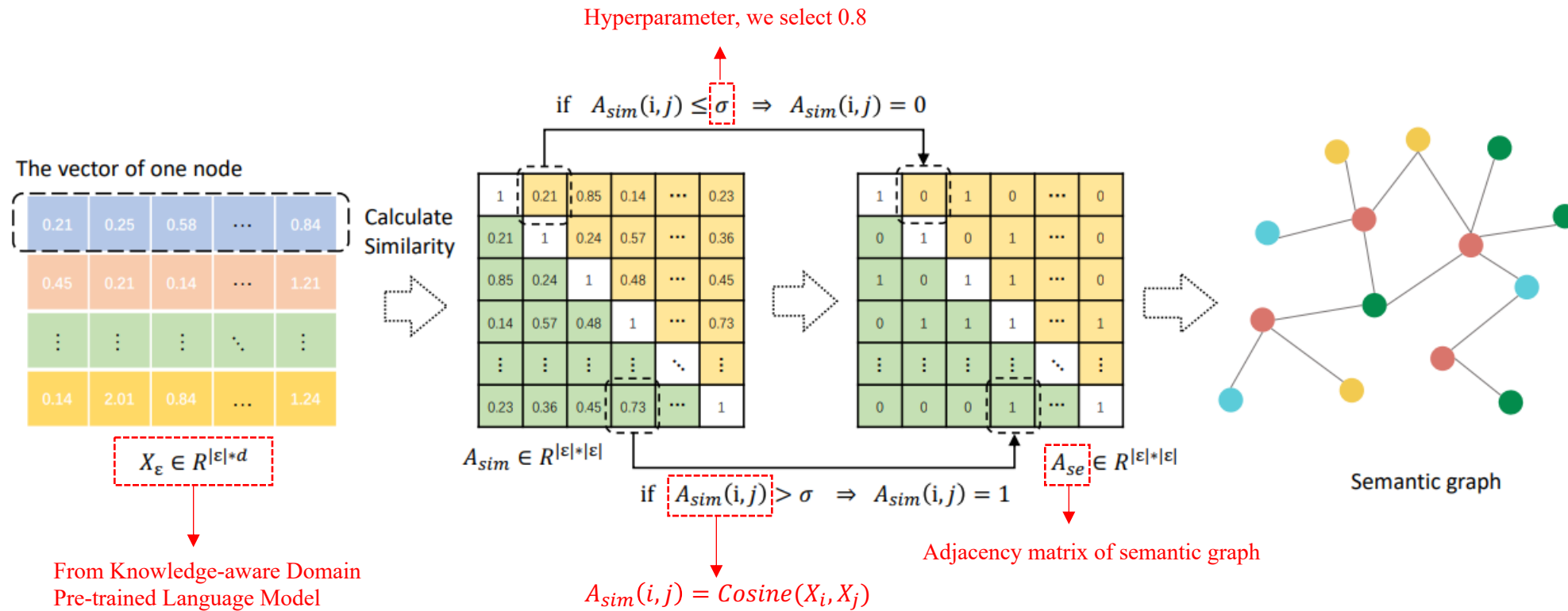
Semantic Self-Supervised Graph Representation Learning



We propose a hierarchical self-supervised learning object.

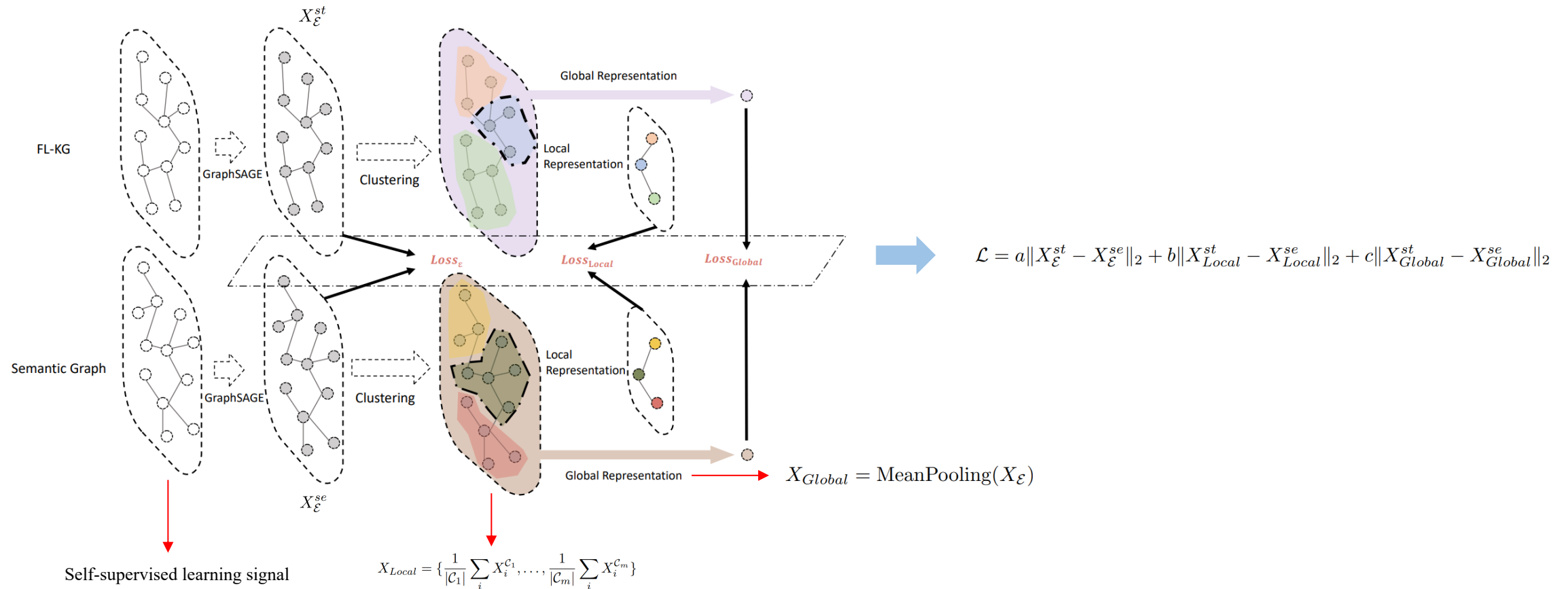
Semantic Self-Supervised Graph Representation Learning

Semantic Graph Construction



Semantic Self-Supervised Graph Representation Learning

Hierarchical Self-Supervised Learning Method



Results

2

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Methods	HR@10	HR@50	HR@100	HR* @10	HR* @50	HR* @100	MR*	MRR*
Word2vec	15.79%	27.63%	39.47%	16.67%	30.56%	45.83%	<u>547.31</u>	0.0649
Bert	6.25%	15.62%	21.85%	6.67%	16.67%	23.33%	2321.73	0.0572
Bert [†]	17.19%	<u>35.94%</u>	<u>45.31%</u>	18.33%	<u>38.34%</u>	<u>48.35%</u>	1758.09	0.0959
Roberta	9.38%	17.19%	31.25%	10.18%	18.37%	33.34%	2351.09	0.0673
Roberta [†]	<u>20.31%</u>	31.25%	34.38%	<u>21.67%</u>	35.13%	38.33%	1977.75	0.0939
ERNIE	7.81%	20.31%	28.13%	8.33%	21.67%	30.01%	2369.01	0.0468
ERNIE [†]	16.75%	35.50%	41.75%	18.03%	38.17%	44.66%	1797.27	0.0947
ALBert	9.12%	18.75%	28.13%	10.07%	20.11%	30.20%	2712.65	0.0690
ALBert [†]	17.19%	28.13%	35.94%	18.35%	30.14%	38.33%	1458.25	0.0974
UFL _{base}	15.63%	32.81%	40.63%	16.76%	35.62%	43.31%	1838.09	0.0978
UFL _{+dm}	23.44%	35.94%	42.19%	25.14%	38.34%	45.43%	2009.79	0.0983
UFL _{+kg}	30.26%	59.21%	64.47%	34.33%	67.16%	73.13%	242.60	0.2011
UFL	51.32%	84.21%	85.53%	58.21%	95.52%	97.01%	97.62	0.2710

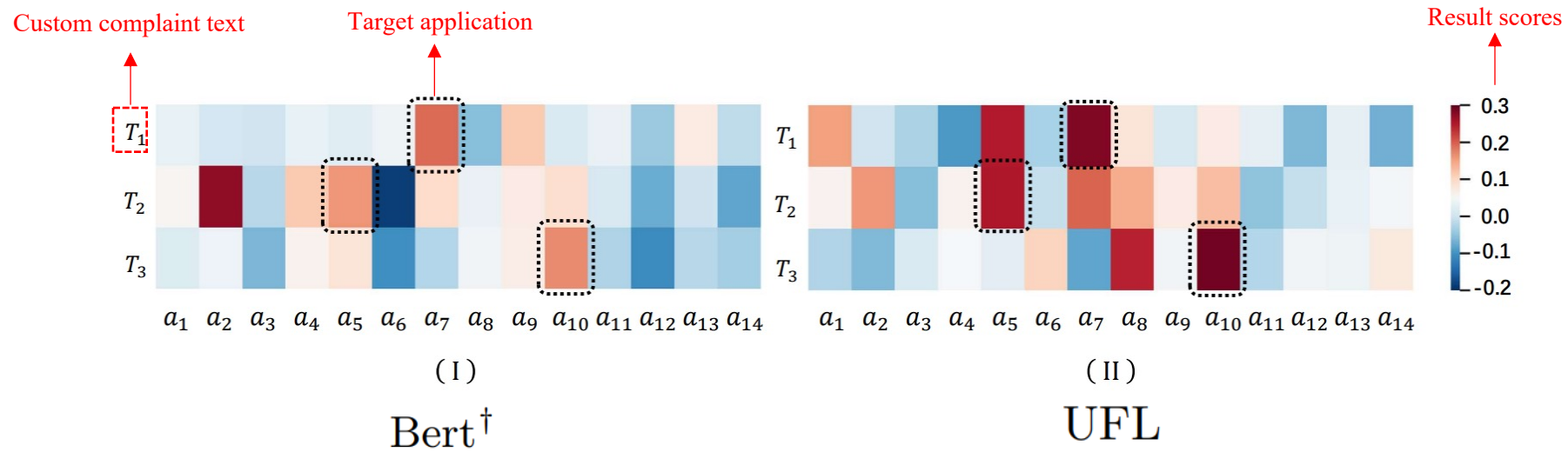
1. Our baseline model, which have been transferred with a special symbols, shows that all metrics are improved after transferring in customer complaint fault localization.
2. The metrics with an ‘*’ present the result after we remove some cases that cannot be localized based on semantics.

Results

Methods	HR@10	HR@50	HR@100	HR* @10	HR* @50	HR* @100	MR*	MRR*
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1. UFL_{base} only does knowledge enhancement on open source pre-trained language models.
2. UFL_{+dm} combines knowledge enhancement with domain transfer.
3. UFL_{+kg} introduces Alipay-KG and injects more domain-related knowledge

Case study



It can be seen from the figure that although our method may raise the score of non-target applications, the score of target applications will increase more.

Conclusion

- We introduce the domain knowledge graph to solve the problem of customer complaint faults localization, which can obviously improve the hitting ratio for fault localization according to the experiments.
- We propose a novel hierarchical self-supervised learning method to integrate the semantic and structural features of the knowledge graph.
- We conduct comprehensive experiments on a real-world dataset that contains customer complaints faults of the Alipay application in the last three years to demonstrate the effectiveness of our proposed method.

Thanks