

Domain-specific Korean Relation Extraction methodology using Prompt with Meta-Information

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Abstract. Many existing studies in the relation extraction task have achieved outstanding performance by fine-tuning the pre-trained language model. However, fine-tuning hinders the ability to generalize due to the gap with the learning objective during the pre-training. This study proposes a prompt-based fine-tuning methodology for extracting relations in a specific Korean domain by utilizing a prompt-based learning method that solves downstream tasks through the MLM objective of pre-training. In the case of the experiment, the domain adaptability of this methodology is demonstrated by conducting an experiment on the traditional cultural heritage corpus with distinct domain characteristics, and the effectiveness of the prompt-based meta-information injection as knowledge is validated by using meta-information, that is, entity type information and semantic information of relation type as a kind of knowledge information. Although the prompt-based fine-tuned models with the meta information injection perform tasks using only the MLM objective, and the number of parameters is small compared to the existing fine-tuning methodology, most of them show their efficiency and effectiveness by indicating a tendency to slightly increase in terms of performance.

Keywords: Korean Relation Extraction system, Prompt-based learning, Domain-specific Relation Extraction, Prompt using Meta-Information.

1 Introduction

As relational extraction extracts structured relational information, it plays an important role in information extraction and knowledge base construction. This study proposes a methodology of relation extraction for a specific Korean domain by using a prompt-based fine-tuning approach. That is, through a prompt-based methodology that solves problems by considering the downstream task as an MLM task of pre-training, we verify whether it is possible to train a model with comparable performance and sufficient adaptability even in a specific Korean domain. Also, for the effectiveness of learning process we inject meta-information that can be helpful in relation extraction, i.e., entity type information and the semantic information of relation labels, into the prompt as knowledge. In the end, we present whether the

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prompt-based learning model can efficiently solve problems in a specific Korean domain while showing similar or improved performance compared to the existing fine-tuning methodologies.

2 Experiment results

According to Table 1, among the models to which prompt-based learning is applied, multilingual BERT and XLM-RoBERTa-base, which are multilingual models, compared with those trained with conventional fine-tuning approach, showed a slight increase of 0.495%p and 0.37%p on average, respectively when initialized manually with meta information and at random. KLUE-BERT-base and KLUE-RoBERTa-base, which are pre-trained language models in Korean, showed a slight decrease compared to the fine-tuning approach-based models, except for the case of KLUE-RoBERTa-base to which meta information was injected.

In general, the prompt-based fine-tuning compared to the conventional fine-tuning methodology uses only MLM to perform the downstream task, so the number of required learning parameters is relatively small, so the time required for training is about 75% less on average. Also, in terms of performance, the model trained with the prompt-based fine-tuning method showed a tendency to converge quickly. Compared to the model to which the existing fine-tuning methodology was applied, which recorded very low performance on average at the beginning of training, these prompt-based models showed performance over 80 points of performance from the first epoch. This can be interpreted as showing the strength in terms of learning efficiency.

Table 1. This table shows the experimental performance of each model based on the variations of training methodology in each task. The micro f1 score for the test set was recorded.

Models	Prompt w/Meta-Info	Prompt w/Random	Fine-tuned
<i>Multilingual Models</i>			
Multilingual BERT	90.50 (+0.56)	90.37 (+0.43)	89.94
XLM-RoBERTa-base	89.90 (+0.21)	90.32 (+0.53)	89.79
<i>Korean Models</i>			
KLUE-BERT-base	90.36 (-0.41)	90.72 (-0.05)	90.77
KLUE-RoBERTa-base	90.83 (+0.05)	90.69 (-0.09)	90.78

3 Conclusion

This study proposes a prompt-based fine-tuning methodology for Korean relation in a specific domain. By conducting an experiment on the traditional cultural heritage corpus with distinct domain characteristics, the domain adaptability of the prompt-based methodology was demonstrated. In addition, the effectiveness of this prompt-based knowledge injection was experimentally proven by carefully initializing

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prompts using meta-information, that is, entity type information and semantic information of relations labels as a kind of knowledge information. The models trained by prompt-based fine-tuning that utilizes prompt construction and meta-information injection show a tendency of slight increase in performance, although they have fewer parameters to learn and convergence is fast compared to the existing fine-tuning baselines. In other words, compared to the complex fine-tuning model structure for learning the added feature information, the proposed prompt-based fine-tuning approach showed its effectiveness and efficiency even though it maintains a relatively lightweight model structure by only using MLM objective.

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