ESRA: Explainable Scientific Research Assistant

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Abstract

- We introduce Explainable Scientific Research Assistant (ESRA), a literature discovery platform that augments search results with relevant details and explanations.
- ESRA provides three main features: explanation (for why a paper is returned to the user), list of facts (that are relevant to the query), and graph visualization (drawing connections between the query and each paper with surrounding related entities).
- The experimental results with humans involved show that ESRA can accelerate the users’ search process with paper explanations and helps them better explore the landscape of the topics of interest by exploiting the underlying knowledge graph.
- We provide the ESRA web application at http://esra.cp.eng.chula.ac.th/

Introduction

Existing literature search platforms:
- Mostly present only metadata of papers
- Cannot suggest next search term because users need to reflect on the knowledge of the papers

We introduce Explainable Scientific Research Assistant (ESRA), a literature discovery platform that abstracts of papers to create a scientific knowledge

Pipelines

There are two important pipelines in ESRA which are uses for extracting a knowledge graph and searching.

Knowledge Graph Construction Pipeline

This pipeline is for extracting knowledge from the abstracts of papers to create a scientific knowledge graph.

Paper Searching Pipeline

This pipeline is for retrieving ranked papers, explanations, fact list, and graphs to show on the web application.

Results and Evaluation

Knowledge graph construction

- We compare four models including SciIE [1], DyGIE++ [2], SpiERT [3], and our model.
- We later evaluate the models on three different tasks, including NER, RE, and CR.
- Our model is the combination of two models – SciIE for the CR task and SpiERT for the best performance on NER and RE tasks.

Conclusion: Our model can retain the performance of SpERT on NER and RE tasks, while it slightly sacrifices the performance of SciIE on CR task.

Human Evaluation

- We recruited 32 participants from Computer Science and Engineering areas.
- Three dimensions are focused—understandability, usefulness, and visual appeal.
- The score ranges from 1 to 5—strongly disagreed, disagreed, neutral, satisfied, and strongly satisfied, respectively.

Conclusion: The average score from all participants on each dimension falls within the range between 3.6 and 4.2, meaning that our system could reasonably satisfy users with some room for further improvement.

Feature Comparison

Table below compares prominent features of existing graph-based literature platforms to our ESRA system.

Conclusion

Our literature discovery platform, ESRA, uses a scientific knowledge graph to enhance user’s experience. Based on the human evaluation, ESRA can help users screen through papers faster using the generated explanations and capture important facts about the query and the papers using the fact list and the graph visualization. In the future, we aim to expand the coverage of our knowledge graph by extracting facts from the full documents to enhance the quality of ESRA results.

References

[1] Yi Luan et al., “Multi-task identification of entities, relations, and coreference for scientific knowledge graph construction”. EMNLP 2018