Building Dynamic Knowledge Graph from Procedural Text

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Project Overviews and Goals

Knowledge Graphs(KGs) organize information in a structured form. However, there are lots of challenges in constructing knowledge graphs efficiently from text. Due to the variety of natural language, it is nontrivial to extract entities and their relationships. The situation becomes even more absorbing when the state of the entities changes over time in procedural text such as recipes. Our goal is to exploit efficient methods of tracking the temporal states change of entities in procedural text. We can conduct the tracking of state change at two levels: sentence-level [1] or process-level [2]. Beyond that, how to better utilize these graphical representations in the downstream task is also a worthy research topic, which is not a requirement for this project.
The project steps can be summarized as follows:

1. Get acquainted with the related works, datasets (ProPara [1], Recipes [3]), and the techniques ([1-5]) for dynamic knowledge construction from the procedural text.
2. Implement one or more SOTA methods. It can be roughly decomposed into two steps: (1) entities/states extraction from the procedural text (2) dynamic graph construction with the extracted entities/states.
3. Propose your own methods to better handle the temporal state change in procedural text. This step is highly encouraged but it is a bonus, not a requirement.
4. Evaluate all implemented methods, especially their performance on capturing the temporal characteristic of dynamic knowledge graphs.

Requirements

1. Strong programming skills (proficiently with Pytorch or Tensorflow)
2. Good knowledge of natural language processing, especially knowledge graphs.
3. Acquaintance with related works.
4. Good English especially in writing.

Proposed for

A master student majoring in Computer Science, Communication System or Data Science. It is a master project.

Related Works

[1] Dalvi, Bhavana, et al. "Tracking State Changes in Procedural Text: a Challenge Dataset and Models for Process Paragraph Comprehension." *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics*. 2018.
[2] Tandon, Niket, et al. "Reasoning about Actions and State Changes by Injecting Commonsense Knowledge." *Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing.* 2018.
[3] Kiddon, Chloé, et al. "Mise en place: Unsupervised interpretation of instructional recipes." *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing.* 2015.
[4] Das, Rajarshi, et al. "Building Dynamic Knowledge Graphs from Text using Machine Reading Comprehension." *International Conference on Learning Representations*. 2018.
[5] Berant, Jonathan, et al. "Modeling biological processes for reading comprehension." *Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP*). 2014.