COMP SCI 397
Course Project Final Report
Tracking State Changes in Procedural Text

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Abstract

In this project we worked on the recent AI2 question-answering benchmark called ProPara. This data set is comprised of procedural text paragraphs covering different topics (e.g. photosynthesis) and the objective is to keep track of how state of entities involve through time (e.g. water or light gets absorbed by the plant). Our approach follows the Pro-Global model from the original ProPara paper. We show how our results compare to the published results and also run some error analysis on the results of the original paper.

1 Introduction

Answering questions about paragraphs that describe processes is still a challenging task for machine reading comprehension systems. This genre of text is pervasive (e.g. manuals, recipes, road safety rules, scientific protocols, etc.) and understanding them often requires keeping track of how the worlds state evolve over time. For instance, consider the paragraph describing photosynthesis in Figure 1. If the system is asked the question: "Where is sugar produced?", it is expected to answer "In the leaf". To answer the question, the system needs to infer the state changes of each entity in the paragraph and the causality between such change events (which are often implicit, making this a challenging task). The dataset is further detailed in the following section.

2 Data Set

To evaluate our system, we use the ProPara procedural text benchmark which contains 488 crowdsourced paragraphs and 3100 sentences total. This data set is comprised of procedural text paragraphs covering different topics together with a human annotated table that describes the state (location and existence) of entities in this paragraph. Figure

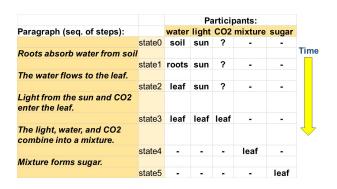| Paragraph (seq. of steps):		Participants:				
		water	light	CO2	mixture	sugar
Roots absorb water from soil	state0	soil	sun	?	-	-
The water flows to the leaf.	state1	roots	sun	?	-	-
Light from the sun and CO2 enter the leaf.	state2	leaf	sun	?	-	-
The light, water, and CO2 combine into a mixture.	state3	leaf	leaf	leaf	-	-
Mixture forms sugar.	state4	-	-	-	leaf	-
	state5	-	-	-	-	leaf

Figure 1: ProPara participant grid.

1 shows an instance of the training data which constitutes of a paragraph about photosynthesis and the annotated state change grid. The state change grid contains information about where an entity (e.g. water or light) is at each step. Note that "?" indicates the location is unknown, and "-" indicates the entity doesn't exist during that step.

3 Model and Implementation

TODO

4 Evaluation and Results

During testing the system will 4 categories of questions from the output state change grid:

1. What are the Inputs? That is, which participants existed before the procedure began

2. What are the Outputs? That is, which participants existed after the procedure ended?

3. What are the Conversions? That is, which participants were converted to which other participants?

4. What are the Moves? That is, which participants moved from one location to another?

The evaluation code was made available here by AI2 team, that outputs precision, recall and F1 score for each category.

5 Conclusion

TODO