Heuristics-Driven Link-of-Analogy Prompting Document-Level Event Argument Extraction

- In-context learning (ICL) 抽取论元的问题
  - 选取哪些样例对抽取论元有帮助？
  - 事件类型、论元类型多，样例只能覆盖很小的集合
  - CoT 难以用于非推理任务（多步 → 单步）

StrategyQA

Q: Would a moose hypothetically be too much for a minotaur to devour whole?
A: A moose is about 1,000 pounds. A minotaur is about 1,000 pounds. Thus, a moose would be too much for a minotaur to devour whole. So the answer is yes.

Document-Level EAE

D: a given document ……
Q: What is the giver in the document?
A: In the document, "Qataris" donated millions to the Cliton Foundation. So the giver is "Qataris".

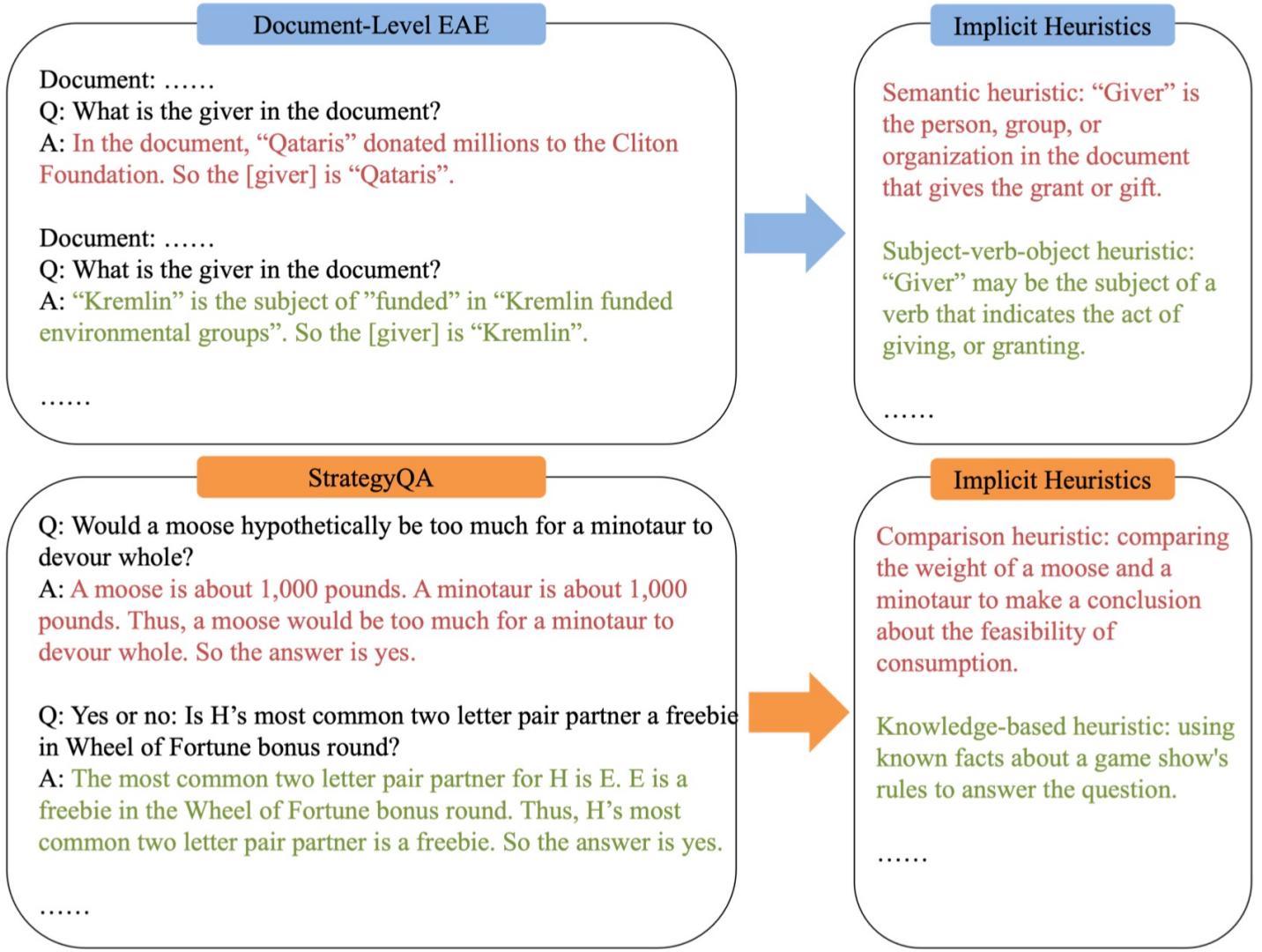
Math Word Problems

Q: Ali had a collection of seashells. He started with 180 seashells. He then gave away 40 seashells to his friends. He also gave 30 seashells to his brothers. If he sold half of the remaining seashells, how many seashells did he have left?
A: He started with 180 seashells. He gave away 40 to his friends and 30 to his brothers. That means he gave away 40 + 30 = 70 seashells. He has 180 - 70 = 110 seashells left. He sold half of them, so he has 110 / 2 = 55 seashells left. The answer is 55.

Natural Language Inference

Q: "A woman wearing all white and eating, walks next to a man holding a briefcase."
Based on this premise, can we conclude the hypothesis "A female is next to a man." is true?
OPTIONS:
- yes
- no
- it is not possible to tell
A: A woman is another word for a female. The answer is yes.

In-context examples 背后的抽象规则



LLM 从样例中学习：

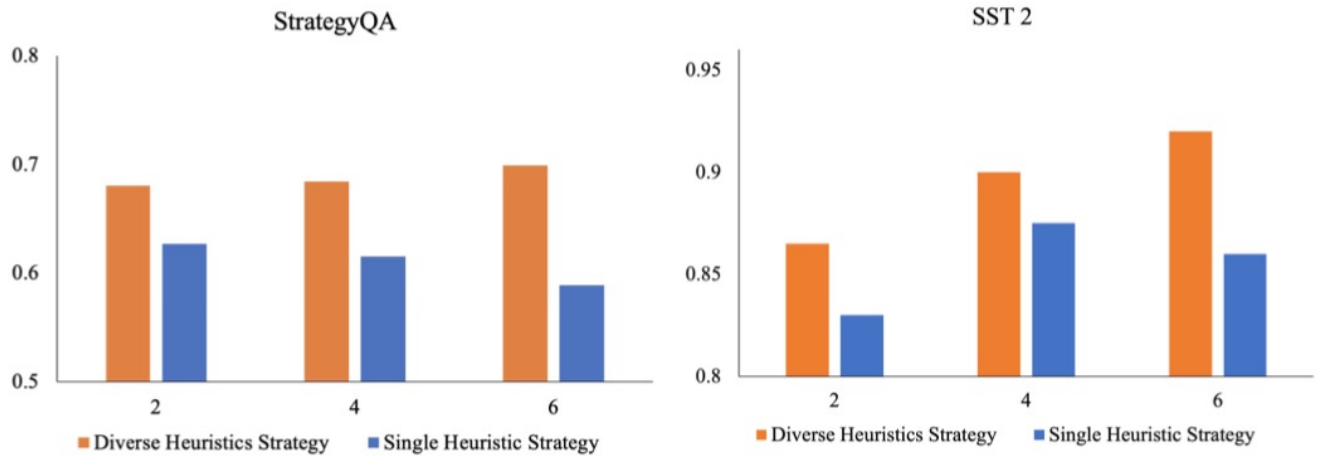
- 识别隐式规则
- 将规则用于推理

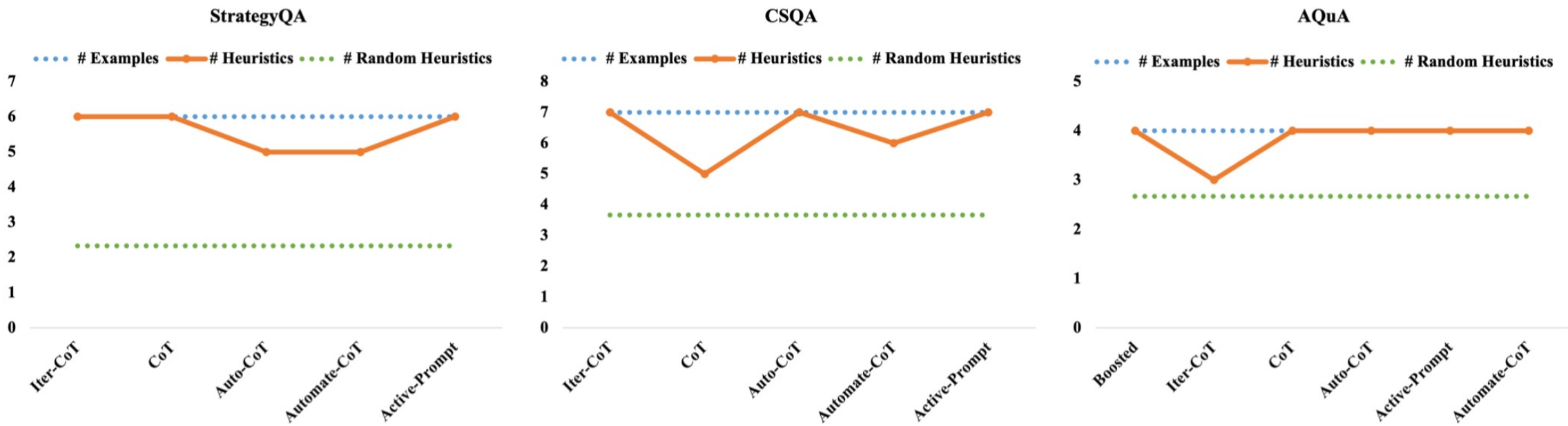
直接基于规则推理

LLM 的样例学习

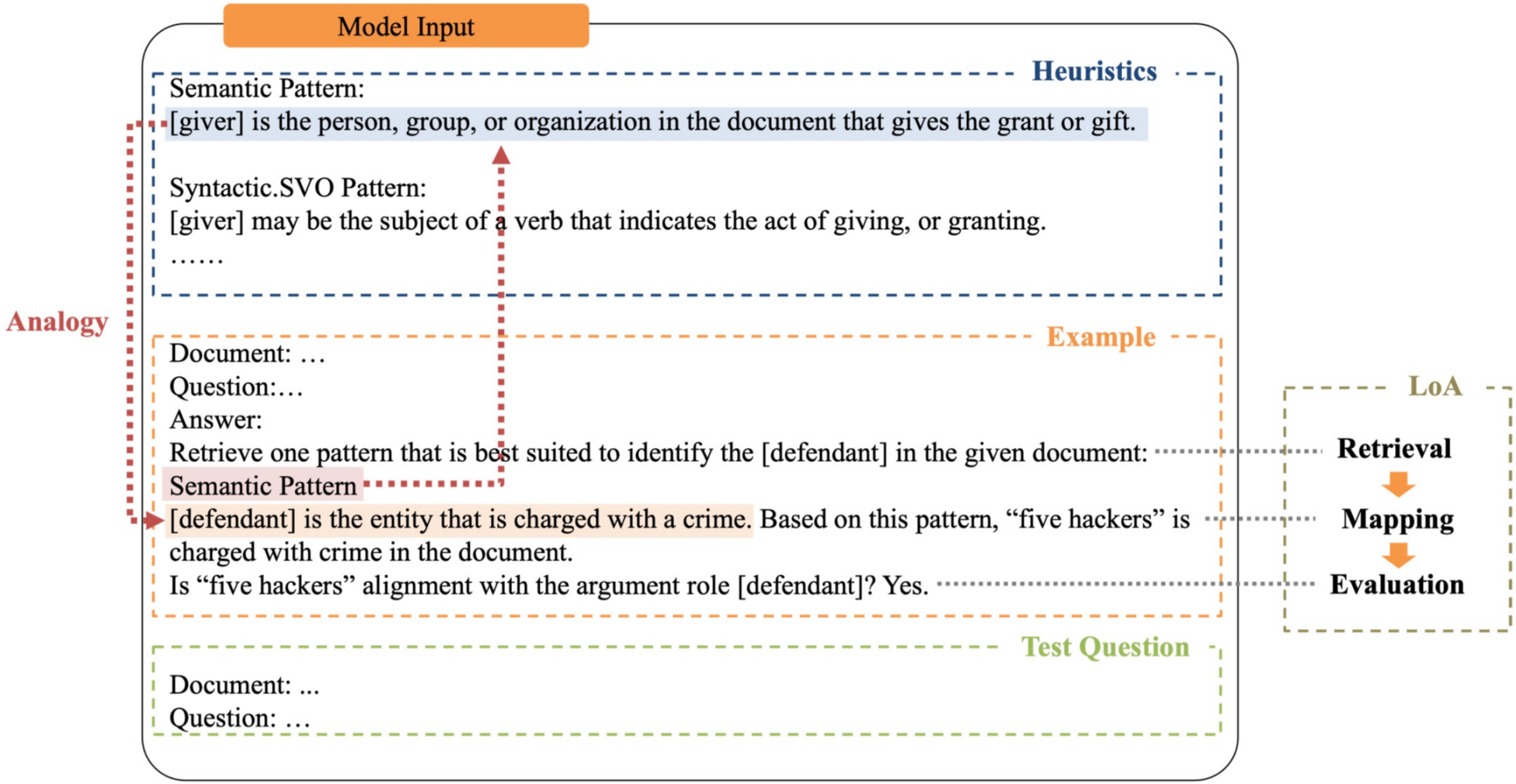
- 选取包含规则的代表性样例
  - GPT-4 识别背后的规则 (??)

- 规则的多样性





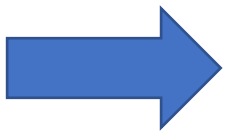
完整框架



Heuristics-Driven Link-of-Analogy Prompting: Enhancing Large Language Models for Document-Level Event Argument Extraction

What is the most critical and profound heuristic at play in each of the following examples? If any two examples share the same heuristic, please indicate this connection. Use no more than two sentences to illustrate the heuristics of each example.

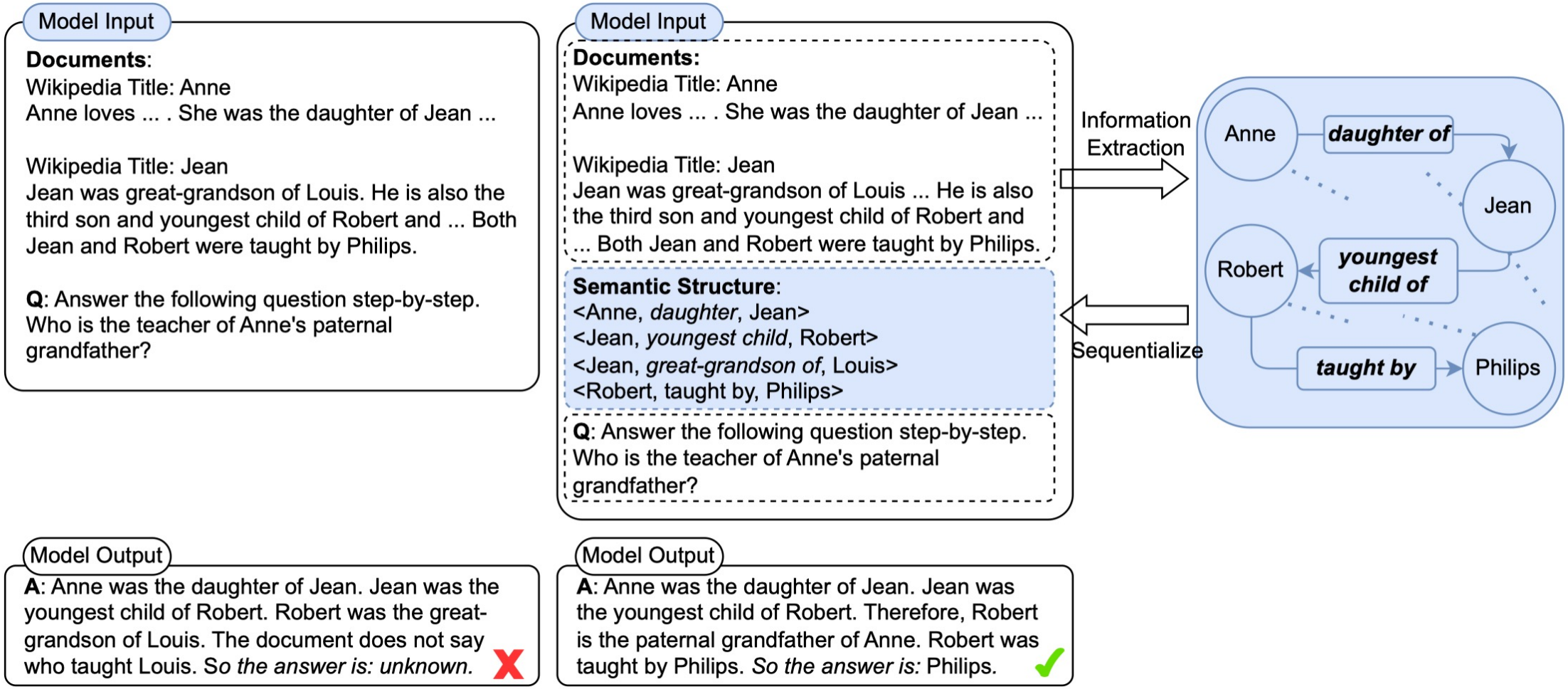
example 1
Q: Did the death of Helen Palmer have a significant effect on Dr. Seuss?
A: Helen Palmer was Dr. Seuss's wife. The death of a spouse can have a significant effect on a person. Thus, the death of Helen Palmer could have a significant effect on Dr. Seuss. So the answer is yes.



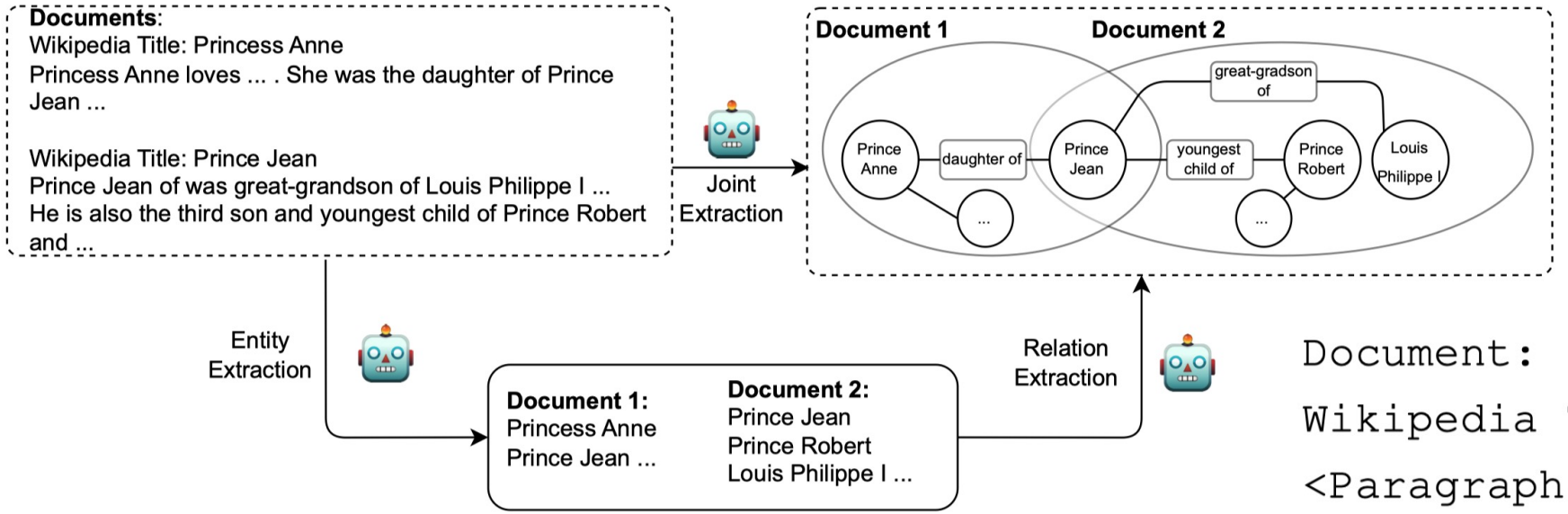
Example 1: This employs the "empathetic reasoning" heuristic, assuming that because most people would be significantly affected by the death of a spouse, so too would Dr. Seuss.

Instruction: Your task is Event Argument Extraction. In this task, you will be provided with a document that describes an event. Your job is to extract and quote the entities (event arguments) from the document that correspond to each argument role associated with the event.
Specifically, you will use the patterns in the "Pattern List" below to identify event arguments. The answers should also satisfy the "Argument Format Principle" and "Argument Number Principle" below.

Structured Information for Explainable Multi-hop QA and Reasoning



Entity and Relation Extraction

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Document:
Wikipedia Title:  <Page Title>
<Paragraph Text>
Graph:
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Document:
Wikipedia Title:  <Page Title>
<Paragraph Text>
Entities:
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Document:
Wikipedia Title:  <Page Title>
<Paragraph Text>
<Entity 1>\n ... \n<Entity k>
Graph:
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实验结果

	EM	F1	Precision	Recall	EM	F1	Precision	Recall
Methods	HotpotQA				2WikiMultiHopQA			
Base	0.59	0.733	0.745	0.779	0.43	0.532	0.501	0.724
G-Full prompt	0.62	0.763	0.777	0.813	0.46	0.565	0.534	0.757
SG-Multi prompt	0.64	**0.785**	0.791	**0.849**	0.49	**0.601**	0.573	**0.772**
SG-One prompt	0.61	0.749	0.741	0.823	0.47	0.579	0.563	0.748

	F1	Precision	Recall	F1	Precision	Recall
Methods	CoT Setting			Few-shot Setting		
Base	0.716	0.729	0.830	0.6280	0.5970	0.7821
G-Full prompt	0.714	0.732	0.805	0.6065	0.5910	0.7802
SG-Multi prompt	0.728	0.731	**0.872**	0.5925	0.5596	**0.8205**

优点

- 忠于原文
- 推理更准确

Wikipedia Title: Marcel (song)
"Marcel" was the German entry in the Eurovision Song Contest 1963, performed in German by Heidi Brühl ...
Wikipedia Title: Heidi Brühl
Heidi Rosemarie Brühl (30 January 1942 in Gräfelfing, Upper Bavaria – 8 June 1991 in Starnberg) was a German singer and actress [...]

Graph:
("Marcel", performed by, Heidi Brühl)
(Heidi Rosemarie Brühl, was born in, Gräfelfing)
(Gräfelfing, located in, Upper Bavaria) ...

Question:
What is the place of birth of the performer of song Marcel (Song)?

Reasoning chian (base prompt):
The performer of the song "Marcel" is Heidi Brühl. According to the Wikipedia page about Heidi Brühl, she was born in Gräfelfing, Upper Sing in Germany. So the answer is: Germany Sing.

Reasoning Chain (SG-One prompt):
The performer of the song Marcel is Heidi Brühl. Heidi Rosemarie Brühl was born on January 30, 1942, in Gräfelfing, which is located in Upper Bavaria. So the answer is: Gräfelfing, Upper Bavaria.

Documents:
Wikipedia Title: Princess Anne of Orléans
Princess Anne of Orléans ... She was the daughter of Prince Jean, Duke of Guise and Princess Isabelle of Orléans.

Wikipedia Title: Prince Jean, Duke of Guise
Prince Jean of Orléans, Duke of Guise [...], was the third son and youngest child of Prince Robert, Duke of Chartres (1840 – 1910), grandson of Prince Ferdinand Philippe and great-grandson of Louis Philippe I, King of the French. ...
Graph:
(Princess Anne of Orléans, daughter of, Prince Jean)
(Prince Jean, was, grandson of Prince Ferdinand Philippe)
(Prince Jean, was, great-grandson of Louis Philippe I)
[...]
Question:
Who is the paternal grandfather of Princess Anne Of Orléans?

Documents:
Wikipedia Title: Princess Anne of Orléans
Princess Anne of Orléans ... She was the daughter of Prince Jean, Duke of Guise and Princess Isabelle of Orléans.

Wikipedia Title: Prince Jean, Duke of Guise
Prince [...] youngest child of Prince Robert, Duke of Chartres[...] Philippe and great- grandson of Louis Philippe I, [...]
Question:
Who is the paternal grandfather of Princess Anne Of Orléans?