Can You Unpack That?
Learning to Rewrite Questions-in-Context

Ahmed Elgohary, Denis Peskov, Jordan Boyd-Graber

Department of Computer Science, UMIACS, iSchool, Language Science Center
University of Maryland, College Park

CLIP
COMPUTATIONAL LINGUISTICS & INFORMATION PROCESSING

UNIVERSITY OF MARYLAND 18 56

Question-in-Context Rewriting Task

Anna Vissi: 1983–1989: Collaboration with Nikos Karvelas

In May 1983, she married Nikos Karvelas, a composer, with whom she collaborated in 1975 and in November she gave birth to her daughter Sofia. After their marriage, she started a close collaboration with Karvelas. Since 1975, all her releases ...

Question 1: What happened in 1983?

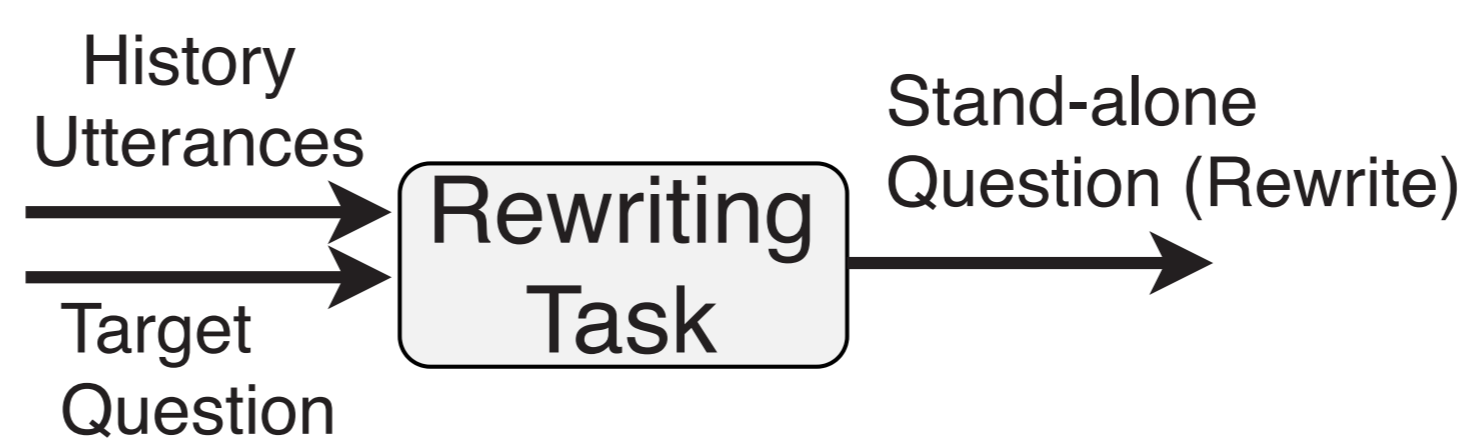**Answer 1:** In May 1983, she marries Nikos Karvelas, a composer

Question 2: Did they have any children?

Answer 2: In November, she gave birth to her daughter Sofia

Question 3: Did she have any other children?

Answer 3: I don't know
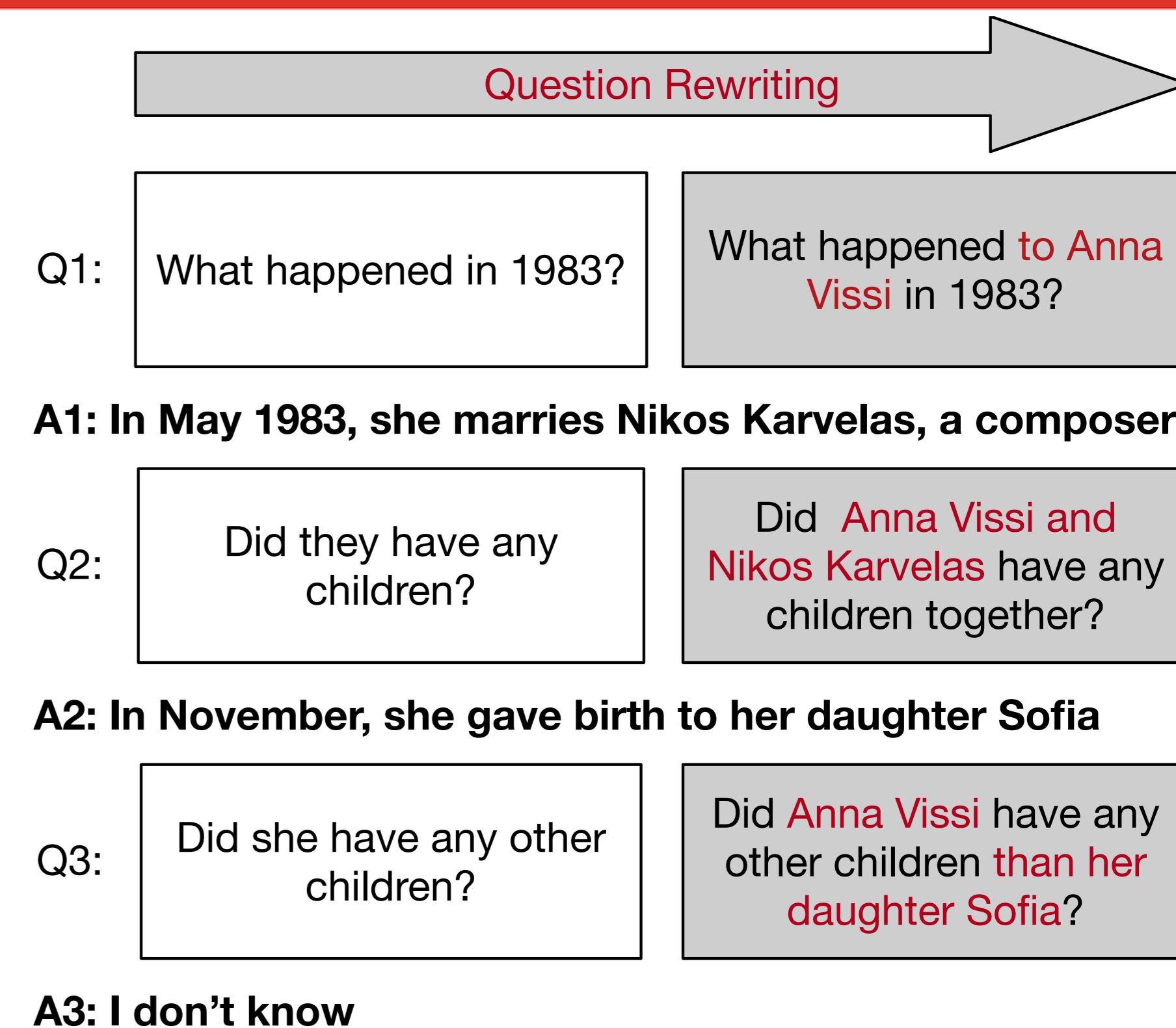
Example from QuAC (Choi et al., 2018)

History Utterances → Rewriting Task ← Target Question → Stand-alone Question (Rewrite)

History Utterances
Anna Vissi + What happened in 1983 + In May 1983, she marries Nikos Karvelas, a composer

Target Question
Did they have any children?

Rewrite
Did Anna Vissi and Nikos Karvelas have any children together?

Question Rewriting →

Q1: What happened in 1983? → What happened to Anna Vissi in 1983?

A1: In May 1983, she marries Nikos Karvelas, a composer

Q2: Did they have any children? → Did Anna Vissi and Nikos Karvelas have any children together?

A2: In November, she gave birth to her daughter Sofia

Q3: Did she have any other children? → Did Anna Vissi have any other children than her daughter Sofia?

A3: I don't know

Data Collection Interface

One question is shown at a time to encourage crowdworkers to *only* use the previous utterances.

Topic: Anna Vissi, 1983-1989: Collaboration with Nikos karvelas
8 questions in total.

Question 1: What happened in 1983? ☐ Understandable alone

Edit: what happened in 1983 to Anna Vissi?

Answer: In May 1983, she married Nikos Karvelas, a composer

Question 2: Did they have any children? ☐ Understandable alone

Edit: Did Anna and Nikos have any children?

Answer: In November she gave birth to her daughter Sofia

Question 3: Did she have any other children? ☐ Understandable alone
Make sure you mention other than what/whom in your edit using one of "other than", "in addition to", "aside from", "besides", "together with", "along with". More Details?

Edit: Did Anna and Nikos have any children?

Submit

Compact instructions always displayed. Detailed instructions can be viewed by clicking "View Instructions"

View Instructions

- Each question should make sense completely by itself.
- Just replacing pronouns is not enough.
- Copy from the topic, **previous** questions and answers as often as possible.
- **Never use any information provided after a question is asked** (below the edit box)
- **Carefully use Understandable alone.**
- **Do not come up with a different or better question.**
- Never look up additional information on the web.
- Do not count only on passing the checks. **We review the edits manually.**
- When in doubt, check the instructions.

Question-specific instructions displayed automatically based on keywords in the questions.

After an edit is typed in, javascript checks monitor and warn about common errors. The answer and next question are displayed after the checks are passed.

Dataset Quality

▸ **Number of question-rewrite pairs**

Training	Development	Testing
31,538	3,418	5,571

▸ **Average number of tokens**

Original	Rewrite
6.43	9.95

▸ **Manual inspection of 50 question-rewriting**

Characteristic	Ratio
Grammatical English	1.0
Question Meaning Unchanged	0.95
Answer Not Referenced	0.98
Correct Coreferences	1.0
Understandable without Context	0.90

▸ **Failure cases**

ORIGINAL: Was this an honest mistake by the media?
REWRITE: Was the claim of media regarding Leblanc's room come to true?
→ Changed Meaning

ORIGINAL: What was a single from their album?
REWRITE: What was a single from horslips' album?
→ Needs Context

ORIGINAL: Did they marry?
REWRITE: Did Hannah Arendt and Heideg-ger marry?
→ Valid Rewrite

Question Rewriting Baselines

▸ **Baselines**

Target Question: *Did she have any other children?*

Copy: No change. Rewrite = Target Question
Did she have any other children?

Pronoun Sub: Substitute pronouns with conversation topic
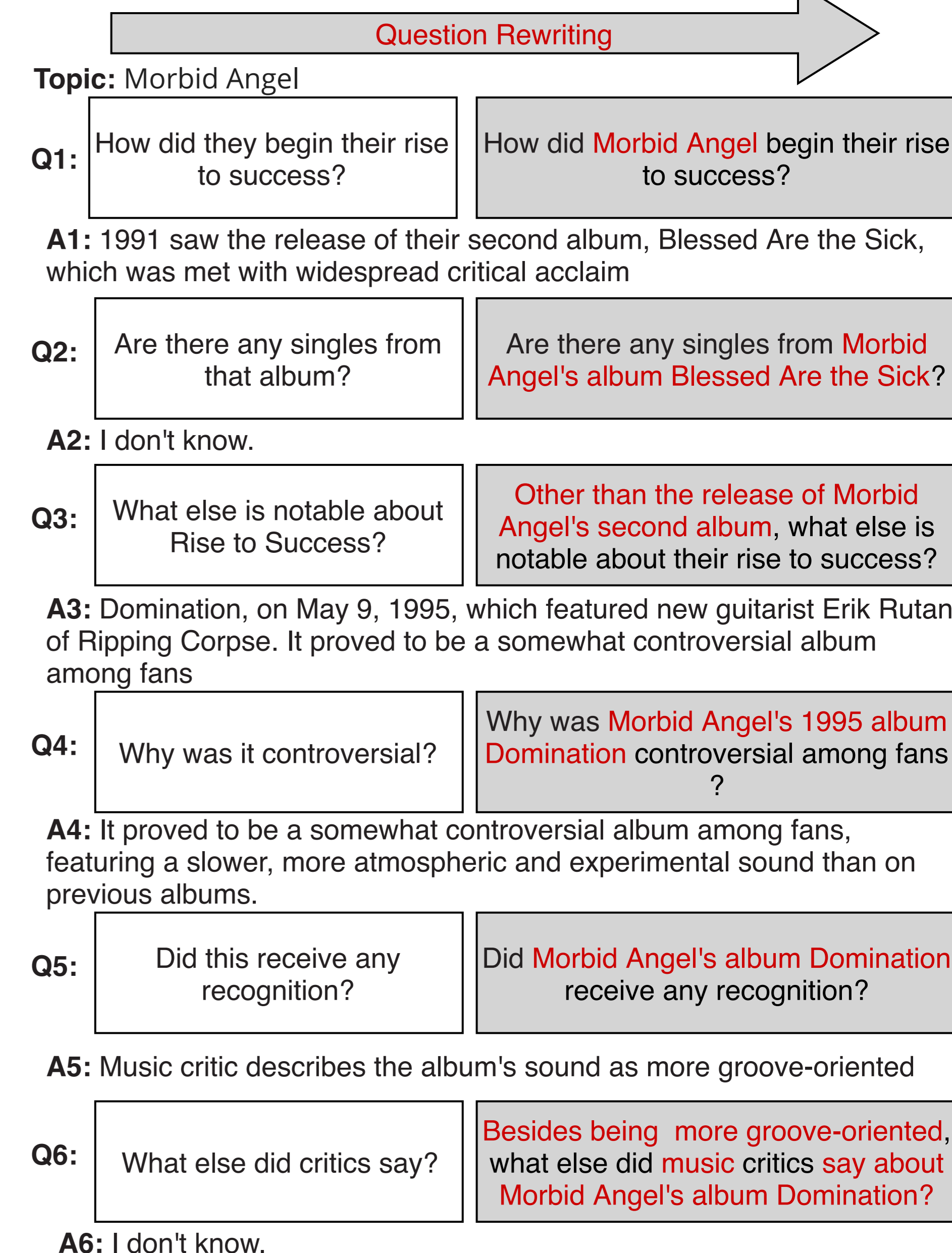*Did Anna Vissı have any other children?*

Seq2Seq: Trained a seq-to-seq with copy mechanism

Human Rewrites: Two rewrites by two different workers

▸ **Results in BLEU**

	Dev	Test
Copy	33.84	36.25
Pronoun Sub	47.72	47.44
Seq2Seq	51.37	49.67
Human Rewrites		59.92

Error Analysis

Seq2Seq output	Reference
Tendency to produce short rewrites	
What did Chamberlain's men do?	What did Chamberlain's men do during the Battle of Gettysburg?
How many games did Ozzie Smith win?	How many games did the Cardinals win while Ozzie Smith played?
Did 108th get to the finals?	Did the US Women's Soccer Team get to the finals in the 1999 World Cup?
Related entities distract the model	
Did Gabriel Batistuta reside in any other countries, besides touring in the Copa America?	Besides Argentina, did Gabriel Batistuta reside in any other countries?
Struggles with listing multiple entities mentioned in different parts of the history	
Did La Comedia have any more works than La Comedia 3?	Did Giannina Braschi have any more works than United States of Banana, La Comedia and Asalto al tiempo?

Full Example

Question Rewriting →

Topic: Morbid Angel

Q1: How did they begin their rise to success? → How did Morbid Angel begin their rise to success?

A1: 1991 saw the release of their second album, Blessed Are the Sick, which was met with widespread critical acclaim

Q2: Are there any singles from that album? → Are there any singles from Morbid Angel's album Blessed Are the Sick?

A2: I don't know.

Q3: What else is notable about Rise to Success? → Other than the release of Morbid Angel's second album, what else is notable about their rise to success?

A3: Domination, on May 9, 1995, which featured new guitarist Erik Rutan of Ripping Corpse. It proved to be a somewhat controversial album among fans

Q4: Why was it controversial? → Why was Morbid Angel's 1995 album Domination controversial among fans?

A4: It proved to be a somewhat controversial album among fans, featuring a slower, more atmospheric and experimental sound than on previous albums.

Q5: Did this receive any recognition? → Did Morbid Angel's album Domination receive any recognition?

A5: Music critic describes the album's sound as more groove-oriented

Q6: What else did critics say? → Besides being more groove-oriented, what else did music critics say about Morbid Angel's album Domination?

A6: I don't know.

Crowdsourcing Instructions

▸ In the given conversation between a student who asks questions about a topic of a Wikipedia article and a teacher who is answering the questions, each question can be understood as part of the ongoing dialogue. **Edit each question so that it makes sense by itself** without looking at the rest of the dialogue. Think how you would ask the same question to someone who has no idea about what the dialogue is about and has never seen any of the previous utterances and still get the same answer. For example, the question 'What was he like in that episode?' cannot be understood without knowing what 'he' and 'that episode' refer to. Both can be figured out by looking at the dialogue. If we edited the question to 'What was Daffy Duck like in Porky's Duck Hunt?', it would then make sense by itself.
▸ Reading and understanding all previous utterances is very important. **Do not just look for things like 'she' and 'that' and replace them.** For example, the question Who was the star? is still unclear. We need to specify 'star in what movie, series, episode, ..etc.?' as in Who was the star in Porky's Duck Hunt?. To make sure the edits are based on understanding the conversations rather than naive replacements, we will manually review a random group of the edits before accepting the work. We also run **pretty mild checks on the edits before allowing the HIT to be submitted.** The checks are meant to help you make valid edits, but they still can miss some invalid edits (rather than being too strict). So, do not count only on passing the checks and make sure that each edit makes sense by itself.
▸ Questions should stay in a **natural-sounding english** after editing. Do not use new words other than those in the conversation unless it is necessary. **Copy from previous questions, answers and conversation topic as often as possible. Never use any information provided after a question is asked.** Only use what was provided up to the question you are editing. When editing a question, **keep its original structure** whenever possible. For example, do not change 'Did they arrest him?' to 'Was Alex arrested?', but rather keep the original structure and do 'Did they arrest Alex?'. Do not come up with a different or better question. Stick to the given wording. It is okay to have pronouns in an edit as long as the edit has enough information about what the pronouns refer to. For example 'Where was Carroll when she joined the american party?' is a perfectly fine edit.
▸ Pay special attention to questions that ask if there is anything/anyone else or asking for telling more about something. It is important to mention in your edit **"anything/anyone else besides what/whom"**. For example, 'Are there any other interesting aspects about this article?' should be edited to something like 'Besides Death of a Ladies Man and End of the Century, are there any other interesting aspects about this article?' as in example 2 below. Notice that it is okay to keep 'this article' without replacing it with something else.
▸ If a question can be understood without looking at the rest of the conversation, mark it as Understandable alone. **Do not make unnecessary edits.** Try to keep the edits short as long as they make sense by itself. Although typos are quite rare, please fix any typos you encounter.
▸ We show one question at a time. After editing or marking a question as Understandable alone, we show its following question. After all questions are edited, we allow you to submit the HIT and optionally provide any feedback you have on the HIT.
▸ Never look up additional information on the web. Only use the given conversations.

Dataset Release

The CANARD dataset is available at
http://canard.qanta.org