

Conversational Question Answering on Heterogeneous Sources

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CONVINSE allows ConvQA systems to operate over heterogeneous sources

ONE INFORMATION SOURCE HARDLY FITS ALL INFORMATION NEEDS

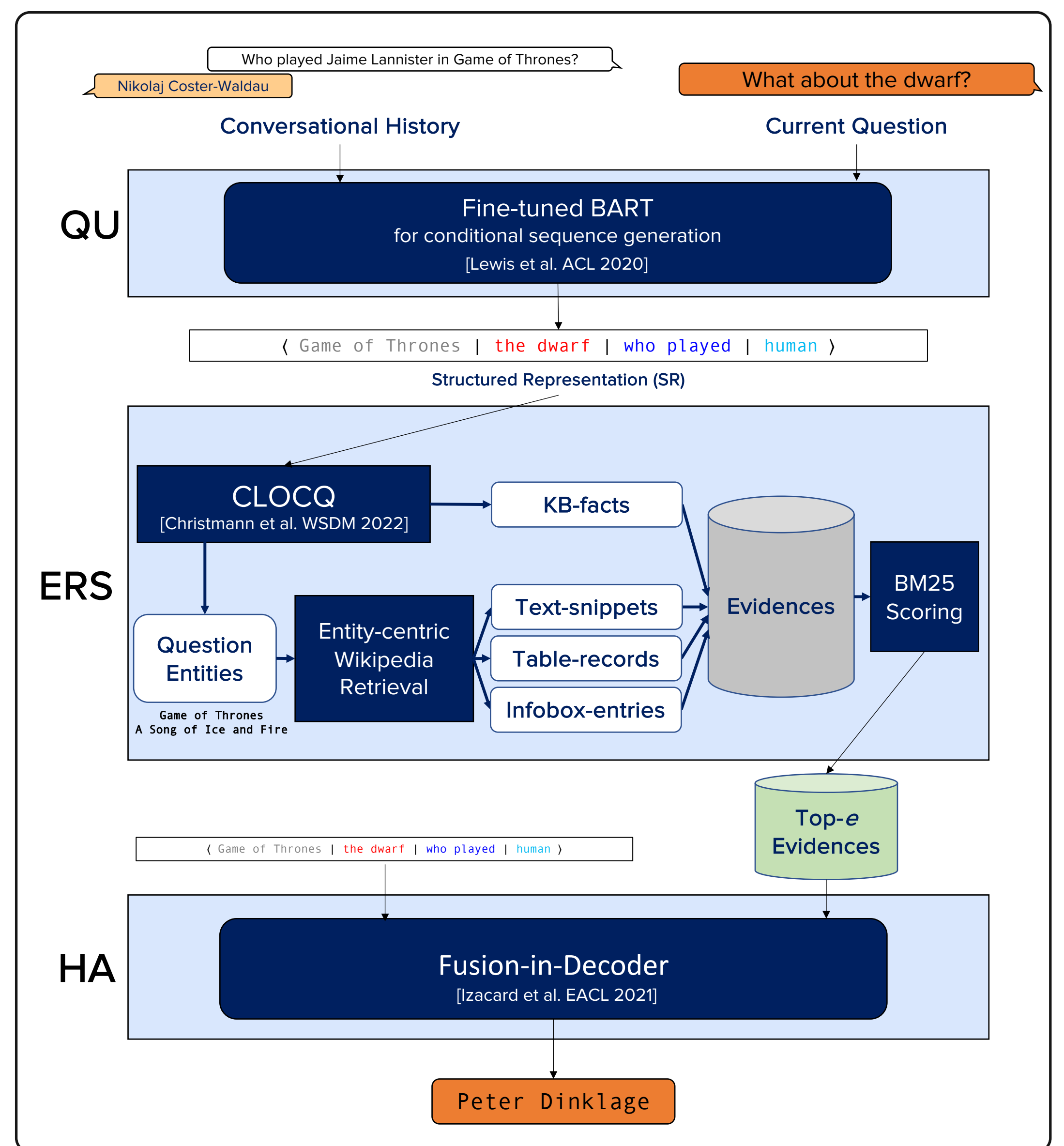
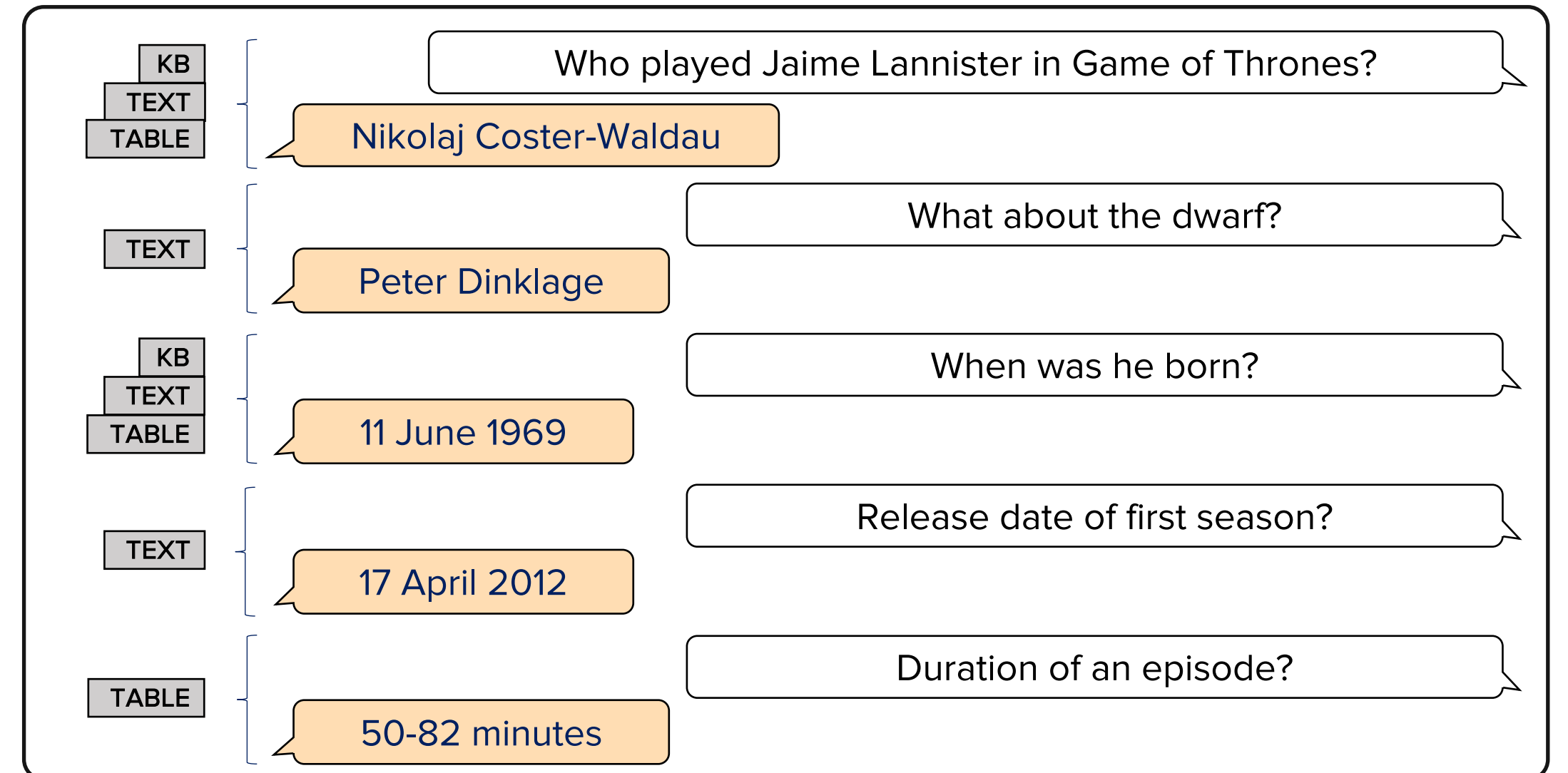
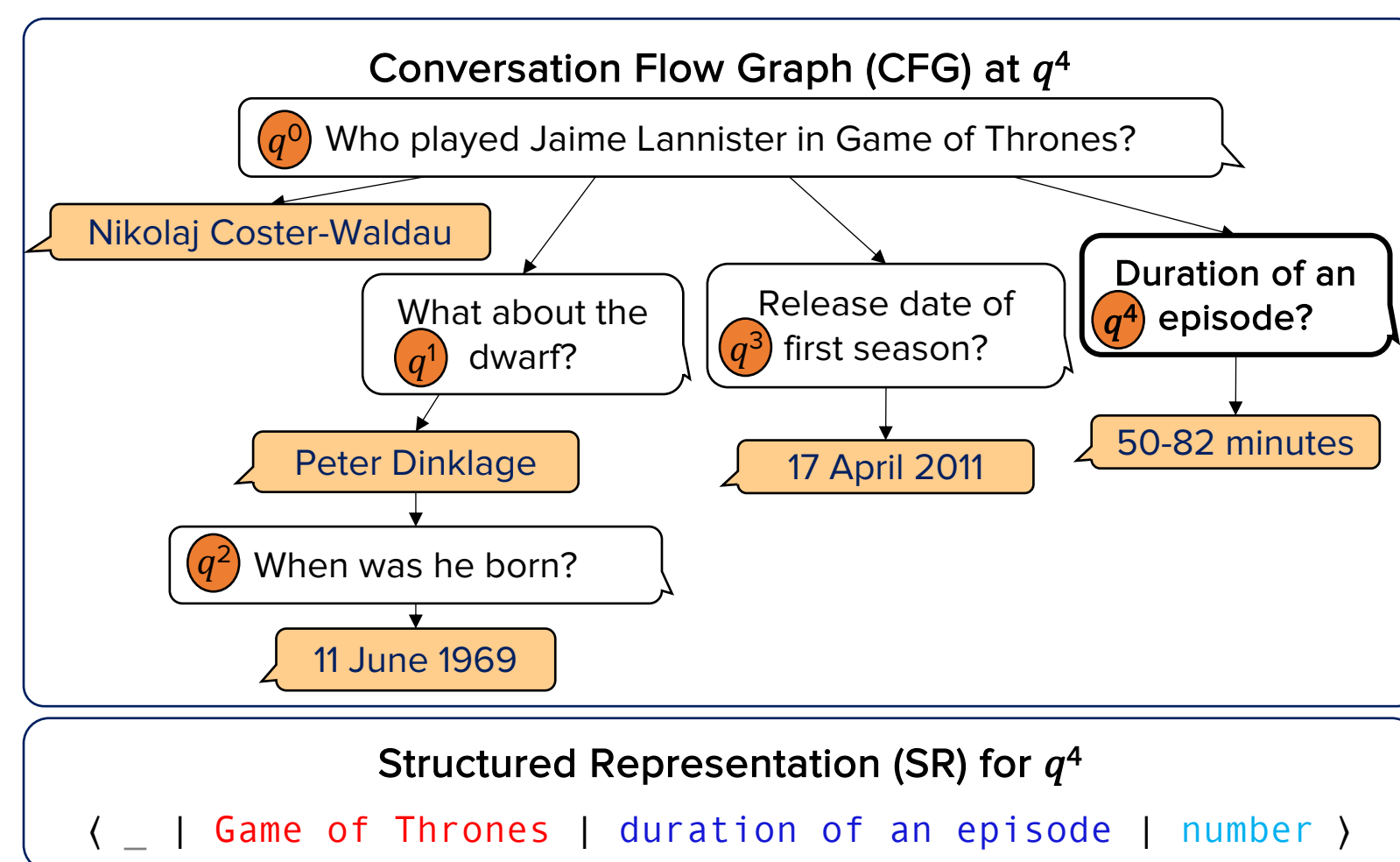
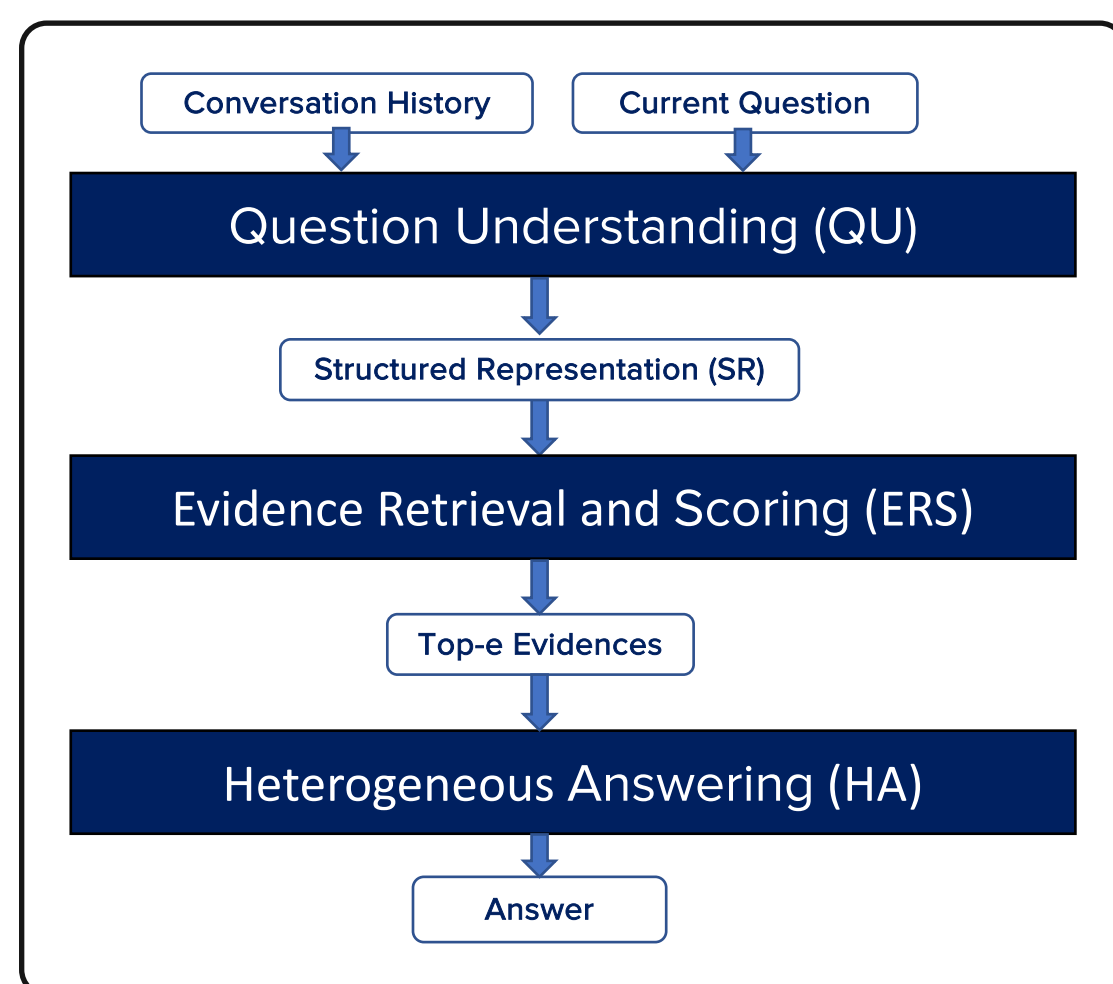
- ★ Different questions (more conveniently) answerable via different information sources
- ★ Existing ConvQA systems operate over either only knowledge bases, only text, or only tables
- ★ Source-specific choices are taken for individual modules in the ConvQA system

GENERAL APPROACH: SEAMLESS INTEGRATION OF HETEROGENEOUS SOURCES

- 1. Question Understanding (QU):**
Derive an intent-explicit representation of an incoming question and its conversational context.
- 2. Evidence Retrieval and Scoring (ERS):**
Harness this intent-explicit representation to uniformly capture the most relevant evidences. Specifically, evidences from different sources are verbalized (brought to textual form), and then treated alike.
- 3. Heterogeneous Answering (HA):**
Answer the information need from these most relevant evidences.

STRUCTURED REPRESENTATION TO MATCH WITH HETEROGENEOUS SOURCES

- ★ Key idea: Capture information need in a structured way, based solely on the conversation so far
- ★ Structured representation (SR) similar to logical form for matching with heterogeneous sources
- ★ Categorize information need into `< context | entity | relation | answer type >`
- ★ Individual fields filled with surface forms from ongoing conversation
- ★ Construct SRs for training via distant supervision from pure sequences of question-answer pairs



ConvMix requires information from heterogeneous sources for answering

Books	Movies	Music	TV Series	Soccer
Who wrote Slaughterhouse-Five? Kurt Vonnegut [KB, Text, Info]	Who played Ron in the Harry Potter movies? Rupert Grint [KB, Text]	What was the last album recorded by the Beatles? Let It Be [KB, Text, Table]	Who is the actor of Rick Grimes in The Walking Dead? Andrew Lincoln [KB, Text, Table]	Which national team does Kylian Mbappé play soccer for? France football team [KB, Text, Table, Info]
Which war is discussed in the book? World War I [KB, Text]	Who played Dumbledore? R. Harris, M. Gambon [Text, Table]	Where was their last paying concert held? Candlestick Park [Text]	What about Daryl Dixon? Norman Reedus [KB, Text, Table]	How many goals did he score for his home country in 2018? 9 [Table]
What year was its first film adaptation released? 1972 [KB, Text, Table, Info]	What's the run time for all the movies combined? 1179 minutes [KB, Info]	What year did they break up? 1970 [KB, Text, Info]	did he also play in Saturday night live? Yes [Text]	place of his birth? Paris [KB, Text, Info]
Who directed it? George Roy Hill [KB, Text, Table, Info]	Who was the production designer for the films? Stuart Craig [KB, Text, Table]	Who was their manager? Brian Epstein [KB, Text]	whom did he play? Daryl Dixon [Text]	award he got in 2017? Golden Boy [KB, Table]
What was the final film that he made? Funny Farm [KB, Text, Table]	Which movie did he win an award for working on in 1980? The Elephant Man [Text]	What was their nickname? Fab Four [KB, Text]	production company of the series? NBC Studios [KB, Text, Info]	Who is the award conferred by? Tuttosport [KB, Text, Info]

ConvMix dataset for heterogeneous ConvQA

- ★ Natural, crowdsourced ConvQA benchmark
- ★ 3,000 conversations with 16,000 questions
- ★ Meta-data like completed forms, paraphrases, entities
- ★ Wikidata KB, Wikipedia text, tables and infoboxes

Results on ConvMix

CONVINSE	0.342* ★
Question Rewriting	0.271
Question Resolution	0.282
Prepend all	0.300
Prepend init+prev	0.312
Prepend prev	0.257
Prepend init	0.254
Original	0.110

Precision@1 on ConvMix, adapting QU methods to the task (ERS and HA kept static across baselines).