

Supplementary Material: Explanation Regeneration via Multi-Hop ILP Inference over Knowledge Base

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1 Table S1: ILP Constraints

The following table lists some of the constraints used in ILP formulation:

Minimum and maximum number of active question constituents
A sentence/fact is active only if at least some of its constituent is active
Fact constituents must be connected to at least some constituent of answer
At least one answer and question constituent must be active
Maximum number of active facts
An edge is active if any of its connecting nodes are active
If an edge is active, at least one of its connecting nodes must be active
Maximum number of active constituents in a fact
Maximum number of repeated active constituents in a fact
A constituent node is active if anything connected to is active

2 Table S2: Example Output from Evaluation Models

The table below displays Fact chain of 5 obtained from different models for an example question with underlined correct answer. Here, among the two facts in the gold explanation fact chain, TF-IDF and Summarizer models only retrieve 1 out of the two facts. The first fact is ranked at position 6 by BERT and reranked to position 5 by our model while the second fact ranked at position 3 by BERT is reranked to position 1 by our model.

<p>Question: All stars in the universe go through a life cycle. What factor determines how stars progress through this cycle? [0]: the radiation that is present in the star [1]: the amount of energy the star consumes [2]: <u>the quantity of mass with which the star began</u> [3]: the location of the star in the universe</p>
<p>Gold Explanation Fact Chain :</p> <ol style="list-style-type: none"> 1. stars change type during their life cycles 2. a star's mass determines the star's type
<p>TF-IDF Top 5 :</p> <ol style="list-style-type: none"> 1. a main sequence star is a stage in the life cycle process of stars 2. organisms move through the stages of the life cycle 3. a star's mass determines the star's type 4. a white dwarf is a stage in the life cycle process of stars 5. a red giant is a stage in the life cycle process of stars
<p>BERT Top 5:</p> <ol style="list-style-type: none"> 1. quantity means amount 2. a factor impacts something 3. a star's mass determines the star's type 4. a main sequence star is a stage in the life cycle process of stars 5. all living things have life cycles
<p>Summarizer Top 5:</p> <ol style="list-style-type: none"> 1. quantity means amount 2. a main sequence star is a stage in the life cycle process of stars 3. stars change type during their life cycles 4. a cycle is a kind of process 5. the life cycle of a massive star is a sequential process, with stages of birth, main sequence star, red giant, supernova
<p>ILP & Regression Top 5:</p> <ol style="list-style-type: none"> 1. a star's mass determines the star's type 2. the life cycle of a mid-sized star is a sequential process, with stages of birth, main sequence star, red giant, white dwarf 3. the life cycle of a massive star is a sequential process with stages of birth, main sequence star, red giant, supernova 4. a main sequence star is a stage in the life cycle process of stars 5. stars change type during their life cycles