Two-Stage Classification Approach for Machine Comprehension

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Machine Comprehension Via SQUAD 2.0 Dataset

Given a Paragraph,

- find the right answer span within the paragraph
- OR abstain from answering

In meteorology, precipitation is any product of the condensation of atmospheric water vapor that falls under **gravity**. The main forms of precipitation include drizzle, rain, sleet, snow, **graupel** and hail... Precipitation forms as smaller droplets coalesce via collision with other rain drops or ice crystals **within a cloud**. Short, intense periods of rain in scattered locations are called "showers".

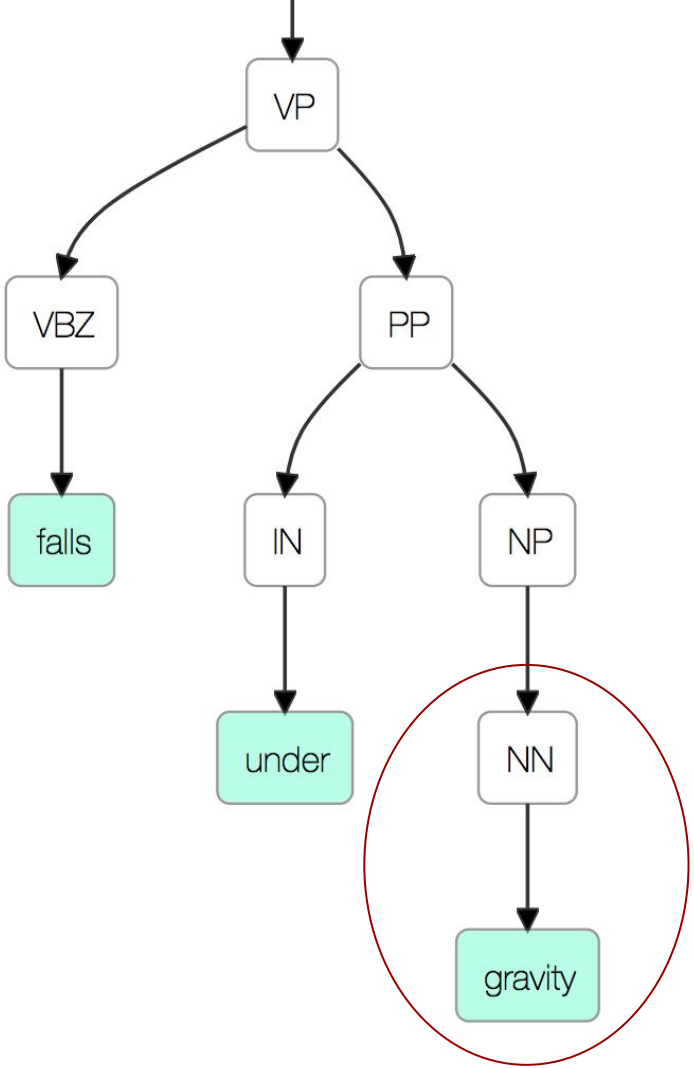
What causes precipitation to fall?
gravity

Hypothesis

- Answers are extractive.
- **Answer Span is a constituent of the best candidate sentence.**
- Approach is on two stages:

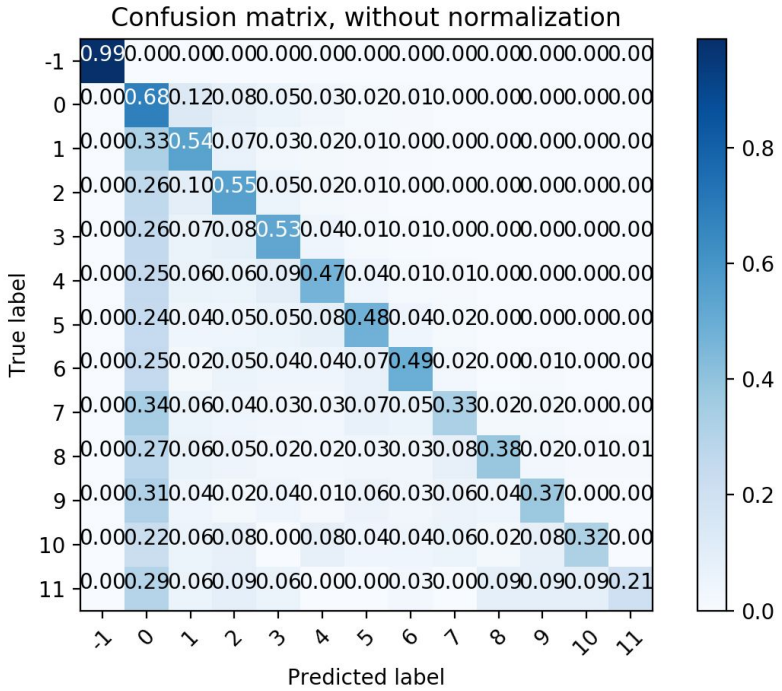
(1) Find the best candidate sentence.

(2) Find the best Constituent within (1)



Stage1 Logistic Regression Classifier

- Finds the best candidate sentence within a paragraph.
- A null-category is added as a dedicated class.
- Features used on Q and each S:
  - Cosine Similarity. InferSent (Conneau et al, 2017)
  - Lexical Overlap : Jaccard Index
  - POS overlap: Jaccard Index
  - **0.71 F1 score**



Stage2 Logistic Regression Classifier

- Finds best candidate constituent within a sentence.
- Features used between Q and each C in a sentence:
  - **Contextual Similarity**: **Cos(Q, $C_{[-2,+2]}$)** , **Cos(Q, $C_{[-3,+3]}$)**
  - **Distributional Distance**: Glove **Cos(Q, $C_{[-2,+2]}$)**
  - **Constituent Label**: e.g. **Wh-NP**
  - **Matching Word Frequencies**: $Match = \sum tfidf(W_q \cap W_c)$
  - **Lengths**: Number of words to the left and to the right of the span.

Results

- F1 Score: 0.35 : equivalent to Exact Match metric
- Predictions are NOT distant from the exact match.
- Information from NER, SRL and Dep. Parsing would greatly improve the performance of the approach.
- References:
  - Ref: [1] A. Conneau, D. Kiela, H. Schwenk, L. Barrault, A. Bordes, *Supervised Learning of Universal Sentence Representations from Natural Language Inference Data*