

A QUESTION-ORIENTED PROPAGATION NETWORK FOR NEWS READING COMPREHENSION

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Overview

Task: Build a question answering model that can read a news article and answer questions related to it.

Example:

Question: Where is Brittanee Drexel from?

Article: The mother of a 17-year-old Rochester, New York, high school student who vanished over the weekend on spring break in Myrtle Beach, South Carolina, says she did not give her daughter permission to go on the trip... Brittanee Marie Drexel's mom says she thought she was at the beach in New York, not South...

Answer: Rochester, New York

Challenges:

- ▶ News articles usually are long while the maximum input length of state-of-the-art question answering (QA) models such as BERT and RoBERTa is limited to 512.
- ▶ To answer a question, one need to synthesize information across different parts of an article.

Previous Approaches:

- 1) **Sliding Window Technique:** Limited by window size.
- 2) **Coarse-to-Fine Paradigm:** Not suitable for QA tasks that contain long answers that span multiple sentences.
- 3) **Sparse Attention Mechanism:** Rely on pre-defined hand-designed attention patterns.

Datasets:

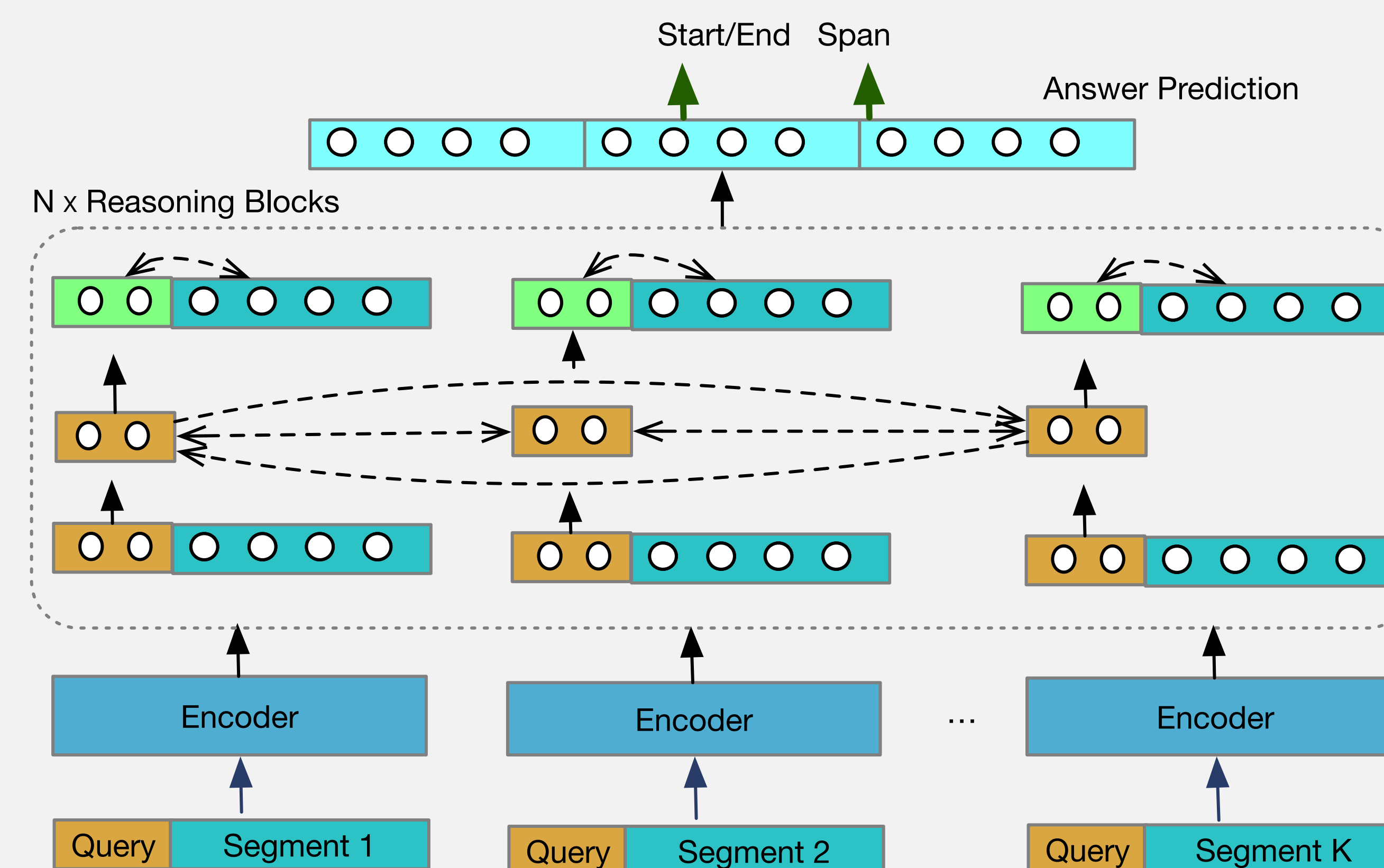
- * NewsQA (Trischler et al., 2017)
- * NLQuAD (Soleimani et al., 2021)
- * Quasar-T (Dhingra et al., 2017)

Method

Model Components:

- ▶ Context Encoding Module
- ▶ Multi-step Reasoning Module
 1. Question-Oriented Information Interaction
 2. Gate-Based Information Fusion
 3. Question-Guided Information Propagation
- ▶ Answer Prediction Module

Model Architecture:



Advantages:

1. Take the whole article into consideration and jointly learn to find question-related clues and make inference over them implicitly.
2. Does not rely on hand-designed patterns and directly aims at question-focused information.

Results

Performance on NewsQA (Trischler et al., 2017)

Model	EM(%)	F1(%)
FastQAExt	42.8	56.1
AMANDA	48.4	63.7
MINIMAL	50.1	63.2
DECAPROP	53.1	66.3
RoBERTa-large (sliding window)	49.6	66.3
CogLTX	55.2	70.1
QOPN (RoBERTa-base)	61.2	75.1
QOPN	65.5	79.8

Performance on NLQuAD (Soleimani et al., 2021)

Model	EM(%)	F1(%)	IoU(%)
BERT-base	25.0	64.0	53.8
BERT-large	30.3	67.9	58.4
RoBERTa-base	29.1	67.2	57.7
RoBERTa-large	33.4	71.1	62.4
Longformer	50.3	81.4	73.6
QOPN	54.0	82.9	75.8

Ablations

Model	EM	F1	IoU
QOPN(full model)	54.0	82.9	75.8
- Question-oriented interaction	47.0	79.4	71.2
- Gate-based fusion	52.8	82.3	75.1
- Question-guided propagation	51.2	80.9	73.3

Effect of Number of Reasoning Blocks:

