Multi-Choice Question Answering System of WIP at the NTCIR-12 QALab
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Introduction

World History Questions of Japanese University Entrance Exam (English Subtask)

PROBLEM DEFINITION: Given a multi-choice question, output the correct option. The questions include: true-false question, slot-filling question, factoid question, timeline question and etc.

CHALLENGE: Apart from IR approach, how knowledge base can help with this task?

Knowledge Base Solver

INTUITION
- Entities within a true assertion is more related to each other than a false assertion
- Entities in a true option is more related to the entities in the question instruction and relevant underlined sentences of the question
- The connectivity of entities in knowledge base can reflect relatedness
  - Connectivity: number of edges divided by number of entities

Assumption Connectivity: See the 1st example in the introduction

Question-Option Connectivity: See the 2nd example in the introduction

METHOD
- GBDT to incorporate IR score and knowledge base features
- Learning to rank
  - Rank each option pair
  - KB features:
    - Assertion connectivity
    - Connectivity between question side (question instruction + underlined background) and option side
    - Number of entities in question, option, and assertion
    - Length of option and assertion
    - Features indicating the type of the question

Timeline Question Solver

- Detect entities and events in each item
  - String matching and Illinois Wikifier
- Use the start time of the entities and events to rank the items
- Start time comes from World History Ontology and Wikipedia

Experiments

EXPERIMENTAL SETUP
- Data
  - Cross validation
  - 2011 National Center Test dataset for test

EXPERIMENTAL RESULTS
- 34 points (precision 33.3%) in 2011 test dataset
  - Our timeline module can answer 2 out of 3 timeline questions in training set.
    - Our method can’t detect any entities or events in some items of the failed one

Conclusions
- Entity connectivity in knowledge base is a useful feature
- Using the start time of entities and events is sufficient to generate timeline for some questions

Framework

Question Classification
- Slot Filling
  - There is at least one blank mention in the question instruction
- Double True-or-False
  - Problem Definition: Given 2 sentences, judge the correctness of them
  - There is a list of 2 sentence items in the question data section of the xml data file
- Timeline
  - Problem Definition: Sort several events according to their time
  - There is a list containing more than 2 items in the question data section
- Vanilla True-or-False
  - Problem Definition: Given 4 sentences, pick the true (or false) one
  - Questions don’t belong to the 3 types above and has at least 5 words in each option
- Factoid
  - Questions don’t belong to the 4 types above

Assertion Generation
- Slot Filling
  - Fill the blank. The filled sentence is the assertion
- Double True-False
  - Each sentence forms an assertion
- Timeline
  - Treated specially by timeline question solver
- Vanilla True or False
  - Each sentence forms an assertion
- Factoid
  - Concatenate the question instruction and the option
  - If the instruction refers to an underlined sentence, we also concatenate the underlined sentence

Information Retrieval (IR) solver
- Corpus: all Wikipedia articles
- Query: assertion
- Use Lucene for sentence level index
- Return the score of the highest ranked sentence

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