Learning Adaptable Patterns for Passage Reranking

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Abstract

Goal:
- Build and Answer Passage Reranking module that requires no manual feature engineering and learns robust and adaptable syntactic/shallow semantic features

Previous work:
- Represent each q/a pair with a large number of features capturing lexical, syntactic, semantic similarities between question and its answer
- Rely on Kernel Learning to automatically extract and learn powerful discriminative syntactic patterns
- Exploit semantically motivated relational linking between question and answer passages to learn robust and adaptable syntactic patterns

Kernel Answer Passage reranker

Preference reranking with kernels
Pairwise reranking approach [Crammer & Singer, 2002]
- Given a set of q/a pairs \( \{a, b, c, d, e\} \), where \( a, c \) are relevant
- Encode a set of pairwise preferences:
  \( a \gg b, c \gg e, a \gg d, \ldots \)
  via preference kernel:
  \[
  P_K((a,b),(c,e)) = \frac{1}{\sqrt{K(a,c)(b,e)}}
  \]
  \[
  K(a,c) = K((Q_a,A_a),(Q_c,A_c)) = K_{TR}(Q_a, Q_c) + K_{TR}(A_a, A_c) + K_{Tree}(a,c)
  \]

Semantic Linking
- Use Question Category (QC) and Focus Classifiers (FC) to find question category and focus word
- Run NER on the answer passage text
- Connect focus word with related NERs (according to the question category) in the answer

Semantic linking with QC + FC + NER

Feature Vector model
- Lexical
  - Term-overlap: n-grams of lemmas, POS tags, dependency triplets
- Syntactic
  - Tree kernel score over shallow syntactic and dependency trees
- QA compatibility
  - Question category
  - NER relatedness – proportion of NER types related to the question category

Conclusions
- Treat q/a pairs directly encoding them into linguistic structures augmented with semantic information
- Structural kernel technology to automatically extract and learn syntactic/semantic features
- Semantic linking using question and focus classifiers (trained with same tree kernel technology) and NERs
- Our kernel-based approach coupled with semantic linking allows for learning adaptable syntactic patterns, e.g. using Answerbag model on TREC

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