A Study of using Syntactic and Semantic Structures for Concept Segmentation and Labeling

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**Motivation**

How do we convert a spoken request like “cheap Italian restaurants in Doha with take out” into a database query?

**Processing Steps**

Text/Speech

“cheap Italian restaurants in Doha with take out”

Semantic tagger

Semi-CRF

Discriminative probabilistic sequential model

Undirected graphical model

**State-of-the-art system**

Joint sequential segmentation/classification

- Semi-Markov CRFs (Sarawagi & Cohen 04)
- Discriminative probabilistic sequential model
- Undirected graphical model

**Our Approach: Reranking with Kernel Machines**

- Semi-CRF generates n-best hypotheses
- SVMs and convolution tree kernels are then used to learn a reranking function
- Such function can choose the best hypothesis by exploiting structural representations

**Results**

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Amazon Mechanical Turk was used to collect a corpus of sentences and gold-standard human annotations: 7,661 sentences (McGraw et al. 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgements</td>
<td>This research is developed by the Arabic Language Technologies (ALT) group at Qatar Computing Research Institute (QCRI) within the Qatar Foundation in collaboration with MIT. It is part of the Interactive sYstems for Answer Search (iyas) project.</td>
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</tbody>
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**Experiments**

- N-best Oracle accuracy shows great headroom for improving on the CRF baseline

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<th>CRF</th>
<th>All Feat.</th>
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- F1 scores for different feature combinations

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- F1 scores for different tree kernels on basic tree

**Conclusions**

- Structural kernels yield significant improvements.
- Partial tree kernel gives best results.
- Shallow tree is more helpful than other deep structures.
- Still large room for further improvement in the future.

**References**