Automatically Suggesting Example Sentences of Near-Synonyms for Language Learners

Chieh-Yang Huang[1], Nicole Peinelt[2], Lun-Wei Ku[1]

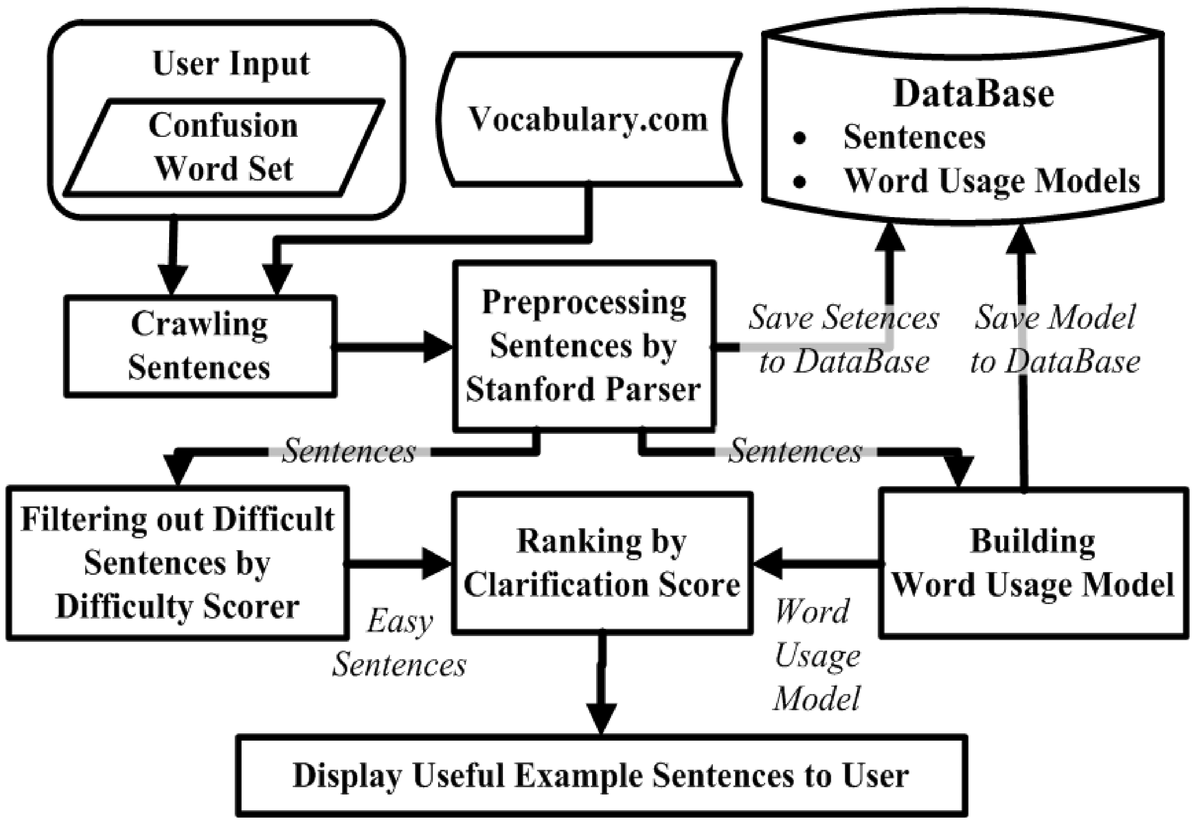
[1] Academia Sinica, Taipei, Taiwan. {appleternity, lwku}@iis.sinica.edu.tw

[2] The Alan Turing Institute, UK. npeinelt@turing.ac.uk

Introduction

- Previously, we have developed **GiveMeExample**, a system that could automatically suggest example sentences which best highlight the difference between near-synonyms.
- In this paper, we further enhance **GiveMeExample** by
  - Improve word usage model by Bi-LSTM.
  - Add Language support for Chinese.
  - Provide sentences illustration.

Framework



Difficulty Scorer

- Extract syntactic feature and lexical feature.
- Apply linear regression to estimate the difficulty score.
- Data collection
  - English training data is manually labeled by a native speaker, who considers both difficulty of syntactic structure and lexicons.
  - Chinese training data is collected from mock tests for Hanyu Shuiping Kaoshi (HSK). The difficulty degree of a extracted sentence is set to the proficiency degree this sentence comes from.
- GiveMeExample provides three levels for learner, including **beginner**, **medium** and **advanced learner**.

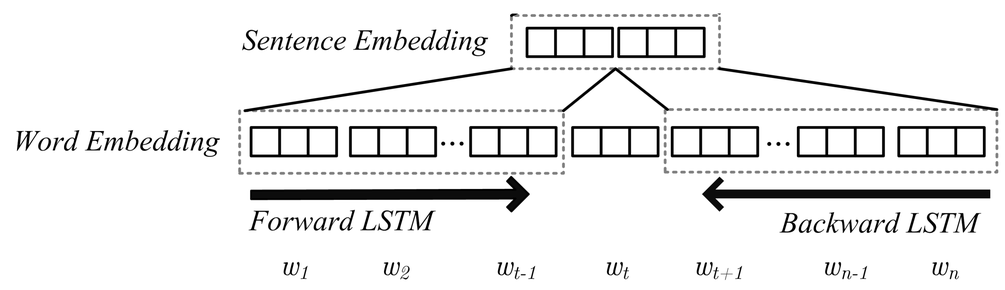
Clarification Score Function

- When searching for the useful example sentences of the target word w_i in word set W. There are two related factors.
  - **Fitness Score**:
    $P(s|w_i)$, measuring appropriateness between w_i a sentence s.
  - **Relative Closeness**:
    $\sum_{w_j \in W - w_i} P(s|w_i) - P(s|w_j)$, the idea is that s should fit the target word w_i but be inappropriate for the rest of words in W.
- We define the clarification scoring function as the multiplication of these two scores:

$$score(s|w_i) = P(s|w_i) * \sum_{w_j \in W - w_i} P(s|w_i) - P(s|w_j)$$

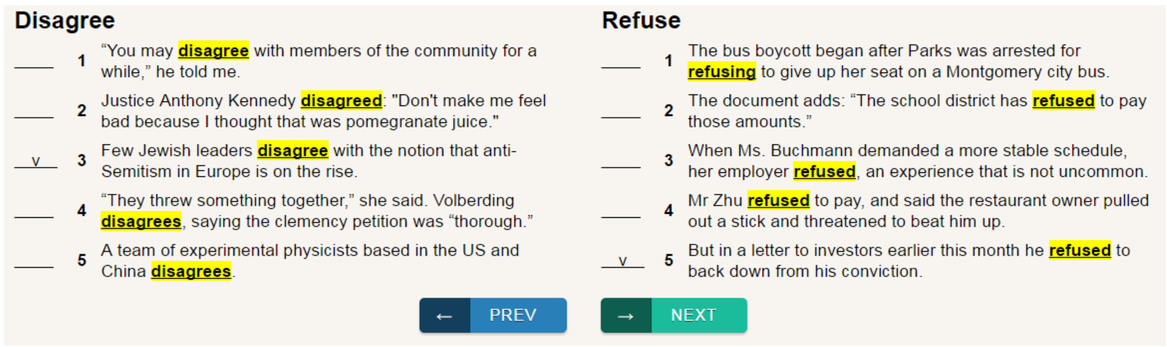
Word Usage Model

- Word Usage Model is used to estimate $P(s|w)$.
- We propose two model to estimate the probability.
  - Gaussian Mixture Model with context feature
  - Bi-directional Long Short-Term Memory Network



Evaluation and Discussion

- Evaluate word usage model by **Fill In The Blank** task. GMM and Bi-LSTM achieve 70.26% and 73.05%, respectively. The baseline 5-gram language model is 69.90%.
- Evaluate clarification scoring function by **Example Sentence Suggestion** task.
  - GMM and Bi-LSTM achieve 0.502 and 0.500, respectively.
  - Random-ordered is 0.423. First-seen baseline is 0.429.



- Analysis the suggestion result.

Differing Aspect	Near-synonym Pair	Score	Differing Aspect	Near-synonym Pair	Score
abstract vs. concrete	blunder - error	7/10	low vs. high degree	mist - fog	2/10
	维护 - 保护	6/10		经常-往往	3/10
formal vs. informal	child - kid	6/10	pejorative vs. favorable	skinny - slim	3/10
	购买 - 买	9/10		产生-造成	8/10

http://givemeexample.com/GiveMeExample