Banks Meeting: Data Selection

2009-02-24

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http://www.bbn.com/NLP/OntoNotes

Motivation

- **Very skewed sense distribution**
- **Need balanced data with the rare senses well represented**
  - **The fact that a sense is rare in WSJ doesn't mean it's also rare in some other domain**
  - **May need a specific (rare) sense for text mining**
- **Verb *add***
  - **288 instances of the predominant sense**
  - **22 instances of the rare sense (7%)**
  - **To get 22 instances of the rare sense, need to annotate 310 instances!**
- **Can we do better?**

Data Selection Plan for Web Text

- 2-way translations of Arabic, Chinese and English to create parallel corpora
- Document selection
- Sentence selection

Document Selection from 2M docs

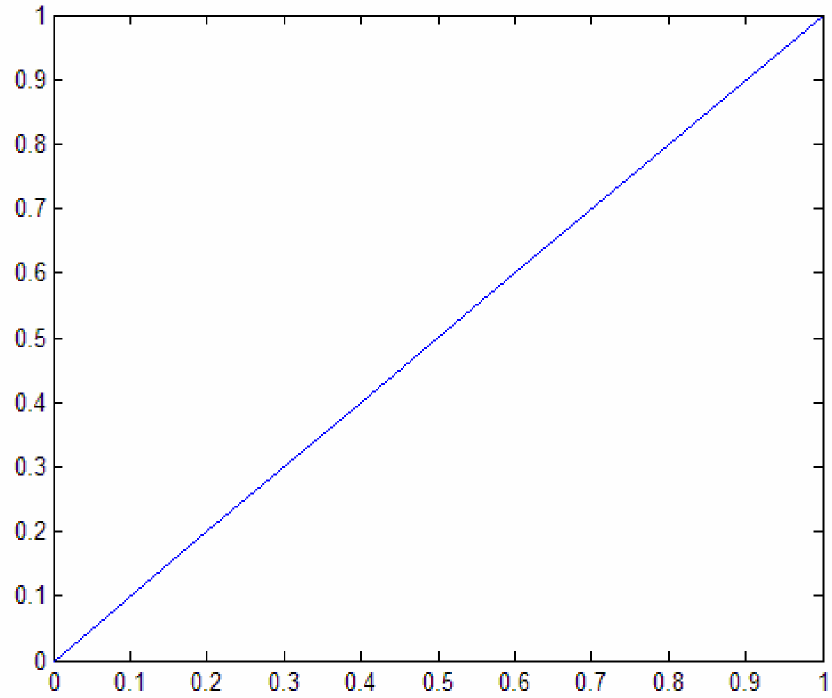
- Histograms for each doc completed and merged.
- Document profile for every doc being generated:
  - 400 nouns, 1000 verbs (440 new verbs and 530 old verbs with < 15 instances) on target list
  - 3 features generated for each doc:
    - how many verbs from list are present?
    - how many nouns from list are present?
    - is the doc weblog data?
  - Also produces wc of doc and total of hits from target list (doesn't count repetitions of the same word)
  - Pick top 2000 docs based on features
- Filtered for spam, etc., selected top 70K of docs

Sentence Selection

- Use “Document” set as test data for “sentence” data
- Select lemmas (verbs and nouns)
  – Histogram of verbs in web text
  – Histogram of verbs missing senses
  – Pick overlap that has the most instances in “Document” set
- Select sentences for top 50 verbs in overlap
  – Random sampling
  – Batch Mode Active learning
  – Language Model
- Expected results
  – 200K words of data = 10K sentences
  – Avg of 50 instances @ for 100 verbs/100 nouns

Random Sampling

- **Annotate all instances of the verb**
- **X: Number of instances (%), Y: Rare Sense Recall**



Approach 1 - Active Learning

- **Run an automated system that provides confidence values**
- **Extract the lowest confidence instance, hand-correct it, add it to the training data**
- **Repeat**
- **Simulations using previously tagged data indicated half the additional data provides the same performance improvement as random sampling**
  - **Chen, Stein, Ungar, Palmer, NAACL-06**
  - **Zhu, J. and E.H. Hovy. IJCNLP-08, EMNLP-07**

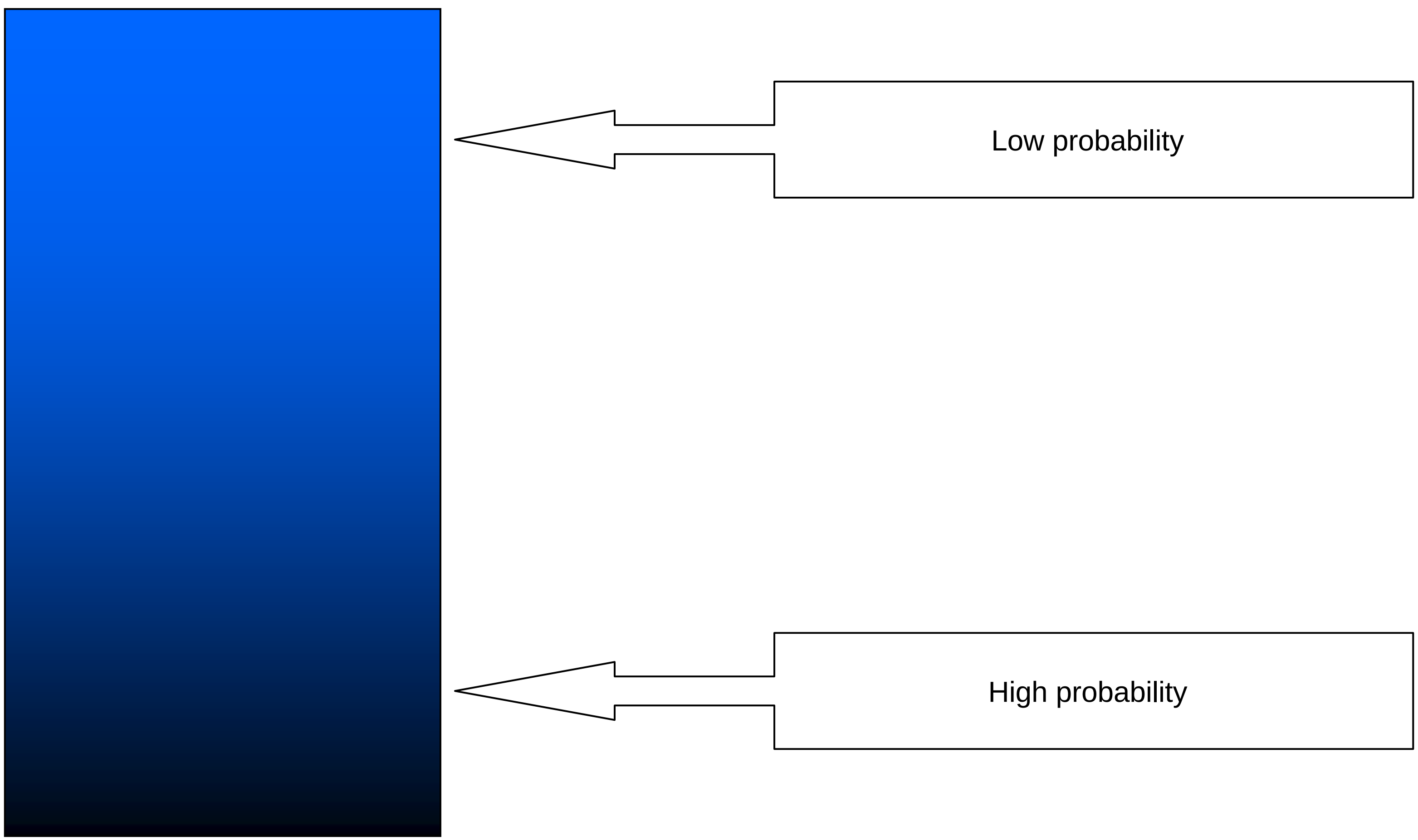
But

- **Very impractical for a sense tagging project**
  - **Human annotators have to sit and wait while a single instance is being selected and again during retraining**
- **Batch Mode Active Learning.**
  - **Select the 50 lowest confidence instances at one time,**
  - **hand correct all of them,**
  - **retrain,**
  - **repeat if necessary**

Approach 2: Language Model
Precipitating out Rare senses

- **Compute a language model (wsj+brown+ebn+ectb)**
- **Compute probability (perplexity) for each instance of the verb**
  - **n-size windows around the target verb**
  - **logprob <instance> / total words**
- **Rank the instances by probability**

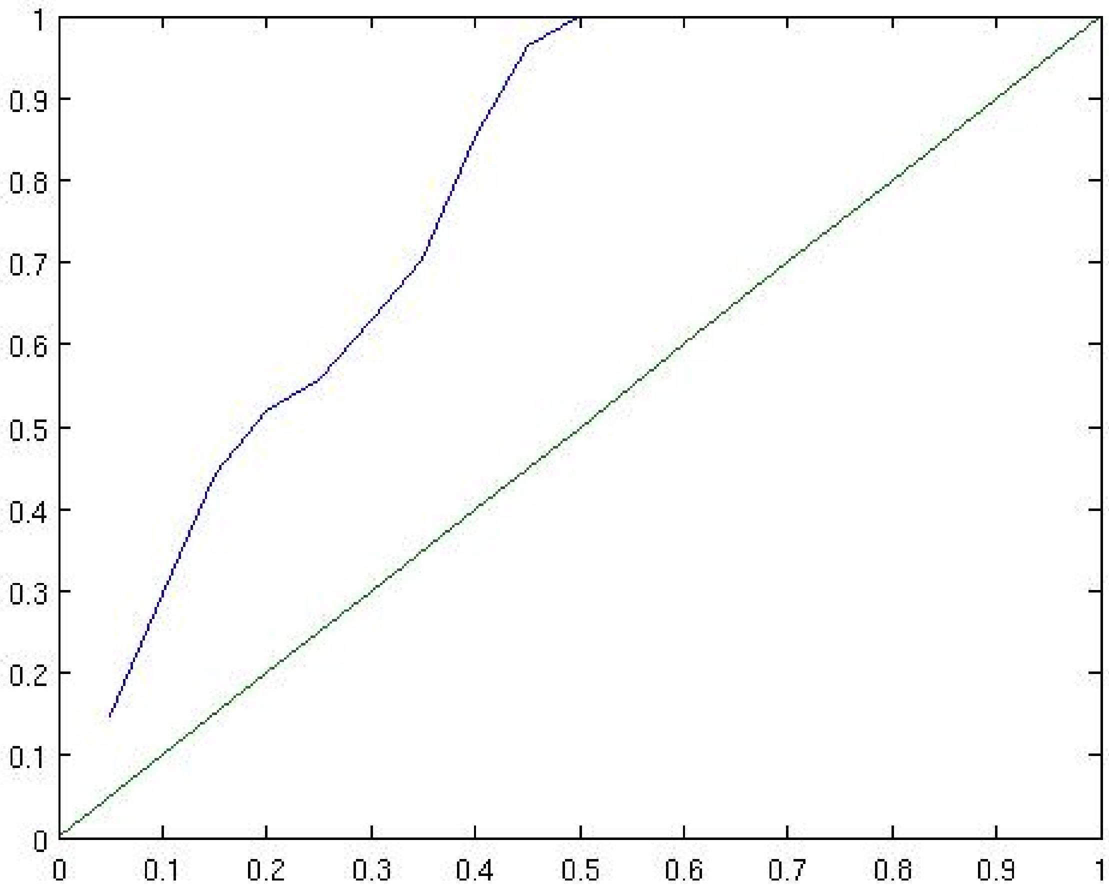
Higher Concentration of the Rare Sense Instances at the Top



Verb *point*:
Recall vs. Number of Instances

x: Number of Instances

y: Recall



Exp #1: Top ½ of instances

lemma	rare	precision	recall
account-v	0.12	0.21	0.93
add-v	0.07	0.10	0.73
admit-v	0.18	0.19	0.55
allow-v	0.06	0.08	0.69
compare-v	0.08	0.16	1
explain-v	0.10	0.12	0.6
maintain-v	0.11	0.11	0.53
point-v	0.15	0.29	1
receive-v	0.07	0.08	0.6
remain-v	0.15	0.20	0.65
worry-v	0.15	0.22	0.73

2-sense verbs
rare sense < 20%

(at least 100 instances)

average baseline: 0.11

average precision: 0.16

average recall: 0.73