An Overview of Biomedical Entity Recognition

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MEBI 591C

21 April 2010

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- NER: Named Entity Recognition, techniques for named entity identification.

Problems in Entity Identification

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  - English: capitalization indicates proper names. Very language dependent. What of messages using all capital letters (telegrams, military message traffic)?
  - Other languages: ?
- Ambiguity
  - Will Smith: the actor? rapper? director? movie producer? UK comedien? football player?
  - May: the month? A girl named May? The verb *may* at the beginning of a question: *May I sit down?*

Problems in Entity Identification (cont.)

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- Unknown Names
  - New names are introduced constantly, mandating constant updates to a lexicon or rule set.

Outline

Methods for NE Identification

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- **Hybrid Systems**: combining two or more methods.
- **Voting**: use several different statistical techniques where each method gets a vote. Choose the result with the most votes.

Computational Linguistic Statistical Methods

- Find statistical patterns when rule based patterns cannot be used.
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- Requires
  - A set of features defined to characterize the data
  - Training data to establish patterns for use in classification
  - A sufficient amount of training data
  - Training data that is representative of the target corpus

Common Statistical Methods

- Naive Bayes
- HMM (Hidden Markov Model)
- MaxEnt (Maximum Entropy)
- SVM (Support Vector Machine)
- CRF (Conditional Random Fields)

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  - Annotated corpus: used to define the lexicon, and provide training data
  - Statistical method: method used for pattern recognition

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- Segmentation primary method for NP Chunking

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- POS tag a common feature for segmentation tasks

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* EOS == End of Sentence

BER Checklist

- Use NLP techniques for NER
  - POS Tagging
  - Segmentation
  - Word Sense Disambiguation

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- Augment with biomedical lexicon
- Allow for new "unkown" entities

i2b2 Concepts

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- Relation and Assertion tasks build on the Concepts task

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Concept Syntax Highly Varied

More than just NP chunks:

NP (noun phrase):	*high grade fever*
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* With restrictions on the type of PP (prepositional phrase) that may be used.

Q: what is the definition of a partial noun phrase?

Outline

Category: Medical Problems

- Disease name, syndrome, sign, symptom
- Mental or behavioral status
- Virus or bacterium
- Injury
- Abnormality

Concern: this could be a very long list of entities.

Category: Treatments

- Medications: brand names, generic names, collective names
- Biological substances
- Drugs, treatment delivery devices
- Treatment procedures, related devices and hardware

Category: Tests

- Test procedures
- Panels and tests on body fluids
- Physiologic measures and vital signs
- Physical examination

Outline

Exclude from Categories

Medical Problems

- Normal states of health
- Physiologic measurements, vital signs
- Verbs describing outcome

Treatments

- Verbs indicating application of treatment

Tests

- Verbs indicating application of treatment
- Test values and measurements
- Mentions of tests stated as problems

Partial noun phrases are exluded from all Concept Categories.

Methods for Exclusion

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2. New concept mapping to Concept Category? How will that be done?
3. Low data volume: the i2b2 test data set will be small, and may not be sufficient for training.
4. What is a *partial noun phrase*?

Partial Noun Phrase Exclusion

Definition is by example, and seems incomplete.

Medical Problem: He was a [*moderately obese*] man in acute respiratory distress.

- *moderately obese* is marked as a partial noun phrase.
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Treatment: [The needle jejunostomy tube] was utilized on the first post[operative] day.

- operative (in postoperative) is marked as a partial noun phrase.
- unclear as to what this example really shows.

Recommendations

1. Find Comprehensive Lexicon: UMLS or something like it, addressing wide range of biomedical entities.
2. Mix of POS Tagging and NP Chunking: low data volume gives more opportunities to focus on precision and recall where high throughput not needed.

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3. Low data volume: supplement with additional corpora to test and train UW system.
4. GENIA corpus: use the GENIA corpus for training and test data. i2b2 annotation may be required.
5. Additional clinical data: acquire more annotated clinical data. Some annotation by the i2b2 team may be needed.

Recommendations (cont.)

1. Use Metamap: develop scheme for mapping Metamap (UMLS) concepts to i2b2 Semantic Categories. Use Metamap to vet concepts and assist in i2b2 concept classification. Given low data volume this seems reasonable.

Questions?