NLP Special Topics

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Texas A&M University
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• Piazza: CSCE 689, Special Topics in Natural Language Processing: Information Extraction

• course page: http://faculty.cse.tamu.edu/huangrh/Spring16_nlp_ie_v3.html
Paper presentations: 25%
Paper summaries: 10%
Class participation: 10%
Mid-term Project: 25%
Final-term Project: 30%
Submitting Paper Summaries

• Due before each class

• Email Subject Line:
  paper_summary_week_m_day_n (m: 1, 2, 3...; n: 2 or 4)

• Email content: 2 lines (line 1: First Name, Last Name, line 2: UIN)

• paper summary: a plain text file attachment, at most a page.
Paper Summaries and Presentations

• Problem definition and motivation.
• Possible Downsteam Applications (as described in the paper and your thoughts)
• Proposed solution/algorithm/method.
• Strengths of the proposed method.
• Weakness of the proposed method.
• Your thoughts to improve on the proposed method.

• We should meet and talk about the paper a few days before the presentation.
Tentative Project Timeline

• 2/16 -- Proposal report and presentation. report due before class, report length: 1 page, presentation: 3 minutes.

• 3/22 -- Midterm project report and presentation. report due before class, report length: at most 3 pages, presentation: 5 minutes.

• 4/26 -- Final report and presentation. report due before class, report length: at most 8 pages, presentation: 15 minutes.
Project Submission

• By the end of the semester: code and data.
Submitting Project Reports

• Email Subject Line: project_proposal or project_mid_term or project_final_term

• Late Policy: 20% reduction per day.
Basic Recipe of Forming a Project

- Choose a Topic and do a quick survey
- Prepare data
- Think about evaluation methods
- Start to work on it
Applications

- Sentiment Analysis
- Question-Answering
- Text Summarization
Why sentiment analysis?

- **Movie**: is this review positive or negative?
- **Products**: what do people think about the new iPhone?
- **Public sentiment**: how is consumer confidence? Is despair increasing?
- **Politics**: what do people think about this candidate or issue?
- **Prediction**: predict election outcomes or market trends from sentiment


**Scherer Typology of Affective States**

- **Emotion**: brief organically synchronized ... evaluation of a major event
  - angry, sad, joyful, fearful, ashamed, proud, elated
- **Mood**: diffuse non-caused low-intensity long-duration change in subjective feeling
  - cheerful, gloomy, irritable, listless, depressed, buoyant
- **Interpersonal stances**: affective stance toward another person in a specific interaction
  - friendly, flirtatious, distant, cold, warm, supportive, contemptuous
- **Attitudes**: enduring, affectively colored beliefs, dispositions towards objects or persons
  - liking, loving, hating, valuing, desiring
- **Personality traits**: stable personality dispositions and typical behavior tendencies
  - nervous, anxious, reckless, morose, hostile, jealous
Question Answering

One of the oldest NLP tasks (punched card systems in 1961)

Question:
What do worms eat?

Potential Answers:
Worms eat grass
Horses with worms eat grass

Birds eat worms
Grass is eaten by worms

Simmons, Klein, McConlogue. 1964. Indexing and Dependency Logic for Answering English Questions. American Documentation 15:30, 196-204
WILLIAM WILKINSON’S “AN ACCOUNT OF THE PRINCIPALITIES OF WALLACHIA AND MOLDOVIA” INSPIRED THIS AUTHOR’S MOST FAMOUS NOVEL

Bram Stoker
Apple’s Siri

“Do I need an umbrella tomorrow in San Francisco”

Yes, San Francisco should get rain tomorrow:

Weekly Forecast

<table>
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<tr>
<th>TUES</th>
<th>WED</th>
<th>THU</th>
<th>FRI</th>
<th>SAT</th>
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Types of Questions in Modern Systems

• Factoid questions
  • Who wrote “The Universal Declaration of Human Rights”?
  • How many calories are there in two slices of apple pie?
  • What is the average age of the onset of autism?
  • Where is Apple Computer based?

• Complex (narrative) questions:
  • In children with an acute febrile illness, what is the efficacy of acetaminophen in reducing fever?
  • What do scholars think about Jefferson’s position on dealing with pirates?
Text Summarization

- **Goal**: produce an abridged version of a text that contains information that is important or relevant to a user.

- **Summarization Applications**
  - *outlines or abstracts* of any document, article, etc
  - *summaries* of email threads
  - *action items* from a meeting
  - *simplifying* text by compressing sentences
What to summarize?
Single vs. multiple documents

- **Single-document summarization**
  - Given a single document, produce
    - abstract
    - outline
    - headline

- **Multiple-document summarization**
  - Given a group of documents, produce a gist of the content:
    - a series of news stories on the same event
    - a set of web pages about some topic or question
Query-focused Summarization & Generic Summarization

- **Generic summarization:**
  - Summarize the content of a document

- **Query-focused summarization:**
  - Summarize a document with respect to an information need expressed in a user query.
  - a kind of complex question answering:
    - Answer a question by summarizing a document that has the information to construct the answer
Information Extraction Tasks

- Named Entity Recognition
- Relation Extraction
- Event Extraction
- Coreference Resolution
Named Entity Recognition (NER)

- A very important sub-task: find and classify names in text, for example:

- The decision by the independent MP Andrew Wilkie to withdraw his support for the minority Labor government sounded dramatic but it should not further threaten its stability. When, after the 2010 election, Wilkie, Rob Oakeshott, Tony Windsor and the Greens agreed to support Labor, they gave just two guarantees: confidence and supply.
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Why Relation Extraction?

• Create new structured knowledge bases, useful for any app
• Augment current knowledge bases
  • Adding words to WordNet thesaurus, facts to FreeBase or DBPedia
• Support question answering
  • The granddaughter of which actor starred in the movie “E.T.”?
• But which relations should we extract?
Event Extraction

Event Roles in Terrorism Domain:

- Perpetrators, victims, targets, weapons

Lopez Albajar, former defense minister, was killed with pistols by three young individuals. His two bodyguards were also shot to death.

Perp: three young individuals.
Vct: Lopez Albajar
   His two bodyguards
Weap: pistols

Event Roles in Management Succession Domain:

- People and companies in corporate management changes.

Daniel Glass was named president of EMI Records Group, He succeeds Charles Koppelman.

Per_In: Daniel Glass
Per_Out: Charles Koppelman.
Post: president
Org: EMI Records Group
Coreference Resolution

“I voted for Nader because he was most aligned with my values,” she said.
Coreference Resolution

**S2** The active nuclear form of the NF-kappa B transcription factor complex is composed of two DNA binding subunits, NF-kappa B p65 and NF-kappa B p50, both of which share extensive N-terminal sequence homology with the v-rel oncogene product.

**S3** The NF-kappa B p65 subunit provides the transactivation activity in this complex and serves as an intracellular receptor for a cytoplasmic inhibitor of NF-kappa B, termed I kappa B.

**S4** In contrast, NF-kappa B p50 alone fails to stimulate kappa B-directed transcription, and based on prior in vitro studies, is not directly regulated by I kappa B.

**S5** To investigate the molecular basis for the critical regulatory interaction between NF-kappa B and I kappa B/MAD-3, a series of human NF-kappa B p65 mutants was identified that functionally segregated DNA binding, I kappa B-mediated inhibition, and I kappa B-induced nuclear exclusion of this transcription factor.
Ambiguities inherent in Language

- Language is succinct and expressive.
- Human resolve ambiguities naturally.
- Human own and can effortlessly resort to their rich common sense knowledge, domain knowledge and contexts.
Zipf’s Law

• the frequency of any word is **inversely proportional** to its rank:  \( f = \frac{K}{r} \)

• fat-tail, most words occur only a couple of times

• high lexical diversity -> data sparseness
- **Brown Corpus:** A balanced corpus of written American English in 1960 (except poetry!), 1 million words.
• the novel: “The Whale”, 44% words : one time
Following lectures

- IE summary: tasks and approaches
- NLP basics: syntax and semantic
- Machine Learning basics