Applied Natural Language Processing

Info 256
Lecture 1: Introduction (Jan 22, 2019)

David Bamman, UC Berkeley
Predictive text messaging

Will you order me a glass of c

“c”

q w e r t y u i o p

a s d f g h j k l

z x c v b n m

123 🎉 🎤 space

return
Grammar checking

London. Michaelmas term lately over, and the Lord Chancellor sitting in Lincoln's Inn Hall. Implacable November weather. As much mud in the streets as if the waters had but newly retired from the face of the earth, and it would not be wonderful to meet a Megalosaurus, forty feet long or so, waddling like an elephantine lizard up Holborn Hill.
Machine translation

Lasciate ogni speranza, voi ch'entrate translate

Lasciate ogni speranza, voi ch'entrate

Abandon all hope, ye who enter here
Speech Recognition

“Alexa, how many cups are in a quart?”
Question Answering

August 21, 2017
See more photos of the August 21 eclipse. Bottom line: After the August 21, 2017, eclipse, the next total solar eclipse visible from North America will be April 8, 2024.

When's the next total solar eclipse for North America? | Astronomy ...
NLP

If you’re interested in the core methods and algorithms, take Info 159/259 (NLP) instead.

• language modeling
• sequence labeling
• phrase-structure parsing
• dependency parsing
• dynamic programming
• MT
Applied NLP

How do we use the methodologies in NLP toward some end?
Software/Libraries

NumPy
SciPy
scikit
Keras
spaCy
TensorFlow
NLTK
NLP is interdisciplinary

- Artificial intelligence
- Machine learning (ca. 2000—today); statistical models, neural networks
- Linguistics (representation of language)
- Social sciences/humanities (models of language at use in culture/society)
Computational Social Science

Adamic and Glance 2005

Computational Journalism

Change in insured Americans under the ACA, NY Times (Oct 29, 2014)

Computational Humanities

Underwood 2018
Movie revenues

Input: text of movie review

Output: box office revenue

Joshi et al. (2010), "Movie Reviews and Revenues: An Experiment in Text Regression" (NAACL)
Geographical location

Input: tweet
Output: latitude, longitude

Wing and Baldridge (2011), “Simple supervised document geolocation with geodesic grids” (ACL)
Consumer sentiment

Input: tweets
Output: Gallup economic confidence score

O'Connor et al. (2010), "From Tweets to Polls: Linking Text Sentiment to Public Opinion Time Series" (ICWSM)
Hiring practices

Input: job ads
Output: gender ratio of applicants
Enculturation

Input: employee emails
Output: promotion to manager, time to separation

Srivastava et al. (2017), "Enculturation Trajectories: Language, Cultural Adaptation, and Individual Outcomes in Organizations" (Management Science)
• Data: Random acts of pizza (subreddit)

• Response: Is a request successful in getting a pizza?

Althoff et al. (2014), "How to Ask for a Favor: A Case Study on the Success of Altruistic Requests" (ICWSM)
Measurement

• This is fundamentally a problem of measurement: how do we design an algorithmic instrument that can transform a text into a quantity?
“TOM!” No answer. “TOM!” No answer. “What's gone with that boy, I wonder? You TOM!” No answer. The old lady pulled her spectacles down and looked over them about the room; then she put them up and looked out under them. She seldom or never looked through them for so small a thing as a boy; they were her state pair, the pride of her heart, and were built for “style,” not service--she could have seen through a pair of stove-lids just as well. She looked perplexed for a moment, and then said, not fiercely, but still loud enough for the furniture to hear: “Well, I lay if I get hold of you I'll--” She did not finish, for by this time she was bending down and punching under the bed with the broom, and so she needed breath to punctuate the punches with. She resurrected nothing but the cat. “I never did see the beat of that boy!” She went to the open door and stood in it and looked out among the tomato vines and “jimpson” weeds that constituted the garden. No Tom. So she lifted up her voice at an angle calculated for distance and shouted: “Y-o-u-u TOM!” There was a slight noise behind her and she turned just in time to seize a small boy by the slack of his roundabout and arrest his flight. “There! I might 'a' thought of that closet. What you been doing in there?” “Nothing.” “Nothing! Look at your hands. And look at your mouth. What is that truck?” “I don't know, aunt.”
"TOM!"

No answer.

"TOM!"

No answer.

"What's gone with that boy, I wonder? You TOM!"

No answer.

The old lady pulled her spectacles down and looked over them about the room.
Tom no answer Tom no answer what’s gone with that boy, I wonder? you Tom! no answer the old lady pulled her spectacles down and looked over them about the room.
"TOM!"

No answer.

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The old lady pulled her spectacles down and looked over them about the room.
What makes language hard?

- Language is a complex social process
- Tremendous ambiguity at every level of representation
- Modeling it is AI-complete (requires first solving general AI)
What makes language hard?

• Speech acts ("can you pass the salt?)
  [Austin 1962, Searle 1969]

• Conversational implicature ("The opera singer was amazing; she sang all of the notes").
  [Grice 1975]

• Shared knowledge ("Clinton is running for election")

• Variation/Indexicality ("This homework is wicked hard")
  [Labov 1966, Eckert 2008]
Ambiguity

“One morning I shot an elephant in my pajamas”
Ambiguity

“One morning I shot an elephant in my pajamas”

Animal Crackers
Ambiguity

“One morning I shot an elephant in my pajamas”
Ambiguity

verb noun

“One morning I shot an elephant in my pajamas”

Animal Crackers
I made her duck

[SLP2 ch. 1]

- I cooked waterfowl for her
- I cooked waterfowl belonging to her
- I created the (plaster?) duck she owns
- I caused her to quickly lower her head or body
- ...

Information theoretic view

“One morning I shot an elephant in my pajamas”

encode(X) → decode(encode(X))

Shannon 1948
"One morning I shot an elephant in my pajamas"
“Raw” data

• We often want to make claims about the world using textual data.

• Data is not self-evident, neutral or objective

• Data is collected, stored, processed, mined, interpreted; each stage requires our participation.

• What is the process by which the data you have got to you?

Gitelman and Jackson (2013)
Administrivia

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Office hours: Wednesdays 10am-noon, 314 SH — or by appointment

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Info 256

• Each class period will be divided between:
  • a short lecture; and
  • in-class lab work using Jupyter notebooks

• Students must prepare for each class and submit homeworks before class; attendance in class is required.
Grading

• Homeworks (40%)
• Participation (10%)
• Group project (50%)
Late submissions

• All homeworks are due on the date/time specified, before each class. We’ll go over the homework in class, so no late homeworks.

• You can drop 2 homeworks.
Homeworks

• Homeworks will be frequent; you are free to discuss them at a high level with your classmates, but all coding must be done individually.

• If you use or build on others' code (e.g., from StackOverflow), you must cite its source.

• UC Berkeley code of conduct: http://sa.berkeley.edu/code-of-conduct
Participation

• Participation includes:
  
  • Coming to class and working in groups (attendance is required!)
  
  • Peer assessment of homework and project deliverables.
  
  • Answering Piazza questions from your classmates
Course project

• Semester-long project (involving 1-3 students), involving natural language processing in support of an empirical research question.

• Project proposal/literature review
• Midterm report
• 8-page final report, workshop quality
• Project presentation
ACL 2019 workshops

- BioNLP 2019
- BlackboxNLP 2019: Analyzing and interpreting neural networks for NLP
- The Thirteenth Linguistic Annotation Workshop (LAW XIII)
- The Third Workshop on Abusive Language Online
- Second Workshop on Storytelling (StoryNLP)
- Joint Workshop on Multiword Expressions and WordNet (MWE-WN 2019)
- 1st International Workshop on Computational Approaches to Historical Language Change
- The 14th Workshop on Innovative Use of NLP for Building Educational Applications (BEA)
- 4th Workshop on Representation Learning for NLP (RepL4NLP-2019)
- Gender Bias in Natural Language Processing

http://www.acl2019.org/EN/workshops.xhtml
Github

• Course homework will be on Github: [https://github.com/dbamman/anlp19](https://github.com/dbamman/anlp19)

• Sign up for an account right now if you don’t have one!
In class

- anlp19/0.setup

- Install anaconda environment + libraries we’ll use frequently.