

CSE440: Natural Language Processing II



Dr. Farig Sadeque
Assistant Professor
Department of Computer Science and Engineering
BRAC University

Lecture 1: Introduction

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Class Expectation

What can we expect?

- Some linguistics knowledge
- A whole lot of algorithms. This is an **algorithms** course
- A bunch of programming

What this course is not:

- This is not a linguistics course. We will learn whatever linguistics we require during the course
- This is not a machine learning/neural network course. There will be a refresher within the first couple of weeks, but for deeper understanding, please take the respective courses.

Class Expectations

- Several semesters of programming
- Primary language: Python
- Linguistics experience helpful, not required
- Mathematical experience helpful, not required
 - As long as you can understand some maths notation, you will do well

Course Structure

- Attendance: 5%
- Assignments/project: 20%
- Quiz (best 2 out of 3): 20%
- Midterm: 25%
- Final 30%

Course Contents

- Books, lectures, assignments etc.
- <https://drive.google.com/drive/folders/1swyAN-PsxtXiq0Ggtl18FWRPlsAXShHN?usp=sharing>



Course Plan

Linguistics essentials

- Sentence segmentation
- Tokenization
- Lemmatization/Stemming
- Parts-of-Speech tagging
- Named Entity Recognition
- Parsing
- Coreference Resolution

Machine Learning Essentials Review

- Probability Review
- Naive Bayes, Logistic regression
- Splits, metrics, statistical significance
- Essential ML maths refresher

Text Categorization and Representations

- Representation basics
- Word embeddings
- Contextual embeddings
- Text Categorization Algorithms

Sequence tagging

- Sequence tagging basics
- Markov Models
- Deep Learning Architectures: Recurrent Neural Network
- Transfer Learning with Pretrained Language Models

Parsing

- Parsing Basics
- Constituency Grammar
- Constituency Parsing
- Dependency Parsing

Translation

Coreference

Text Generation: Encoder-Decoder Algorithm

Question Answering

Why is NLP Hard?



Ambiguity

- Phonetics: I scream? Ice cream?
- Morphology: Union-ized? Un-ionized?
- Syntax: Squad helps dog bite victim.
 - Squad helps a dog to bite a victim?
 - Squad helps a dog-bite victim?
- Semantics: Ball: an orb, or a dance?
- “High-end” nonsense: Colorful green ideas sleep furiously.
- Discourse: see that photo again

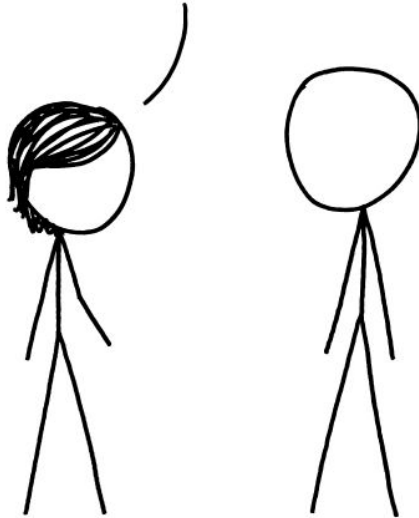
Variability

He bought it

- He purchased it
- He acquired it
- It was bought by him (and all other synonyms with passive voice)
- It was sold to him
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Language Change

I DON'T MEAN TO GO ALL LANGUAGE
NERD ON YOU, BUT I JUST LEGIT
ADVERBED "LEGIT," VERBED "ADVERB,"
AND ADJECTIVED "LANGUAGE NERD."



Language Change

- English beats up other languages in dark alleys, then rifles through their pockets for loose grammar and spare vocabulary
- Example: We eat beef, but we raise cows.
- Fun video: <https://www.youtube.com/watch?v=Jl3K63Rbygw>