COMP3220 — Document Processing and the Semantic Web

Week 01 Lecture 1: Introduction and Overview

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COMP3220 2021H1

Abstract

In this lecture we will do a brief overview of what the unit is about, and we will cover practical issues regarding the unit.

Update February 19, 2021

Contents

Reading

- Lecture Notes
- Unit guide

Acknowledgement of Country

I would like to acknowledge the traditional custodians of the land where I am located, the Darug and Guringai peoples, and pay my respects to their Elders both past and present.

Welcome to COMP3220!

. . . in which you will learn

- how to build software applications
- that use
  1. data mining
  2. knowledge about language
- to do useful things with documents
- with particular emphasis on Web solutions and documents.

1 Document Processing and the Semantic Web

Document Processing

Information Overload

- A lot of information is available as free text.
- The most natural form to write information is through free text.
- A great deal of digital information is available as free text.
- People can read and understand free text easily.
- But it's very hard for machines to process!

Document Processing and the Web

The Web

- The Web was initially conceived as a means to hyperlink documents.
- Most of the information available on the Web is (still) in the form of free text.
- This is what is often called unstructured data.

Why Document Processing for the Web?

1. Web search: We want to find information.
2. Spam filtering: We want to ignore (some) information.
3. Sentiment analysis: We want to classify information.
4. Text mining: We want to discover information.

The Semantic Web

Adding Semantics to the Web

- Web 1.0: The good, old-fashioned Web.
- Web 2.0: The social web.
- Web 3.0: The semantic web.

The Semantic Web is about adding meta-data so that machines can process it.

2 Example Applications

Conversational Interfaces

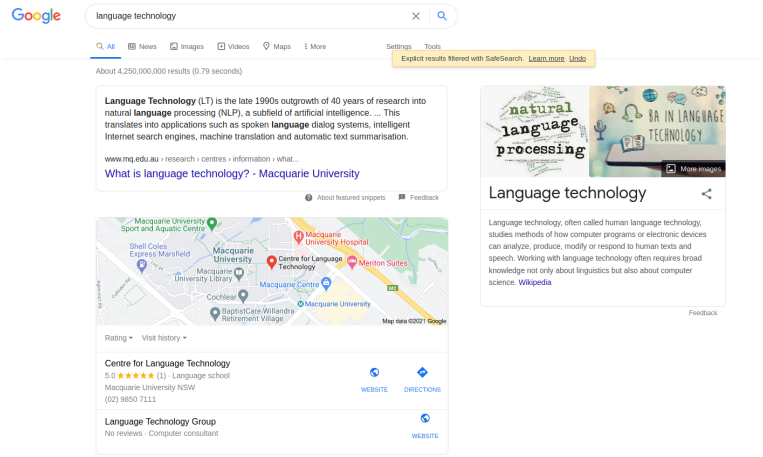
- Many platforms offer conversational interfaces where you can talk/write to in plain language.
- The aim is to produce a seamless user experience.
- Siri (Apple iOS), Google Assistant (Google, Android) are personal digital assistants that, among other things, answer your questions.
- Amazon's Echo and Google Home are products that use a speech interface to provide information and control smart devices.

Web Search

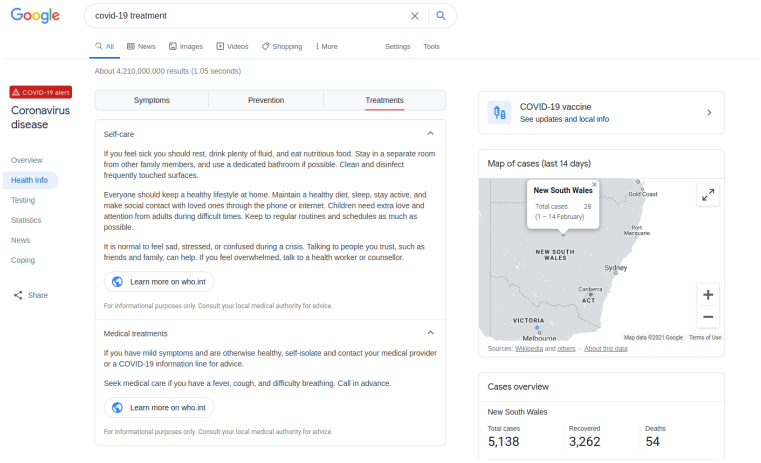
Results to queries asked in current search engines may be enriched with information mined from:

- Knowledge sources such as Google's Knowledge Graph.
- Text mining based on the characteristics of the query.

Google Search (16 Feb 2021)

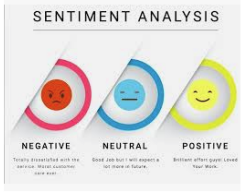


Google Search (16 Feb 2021)

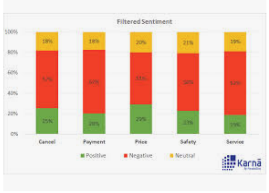


Sentiment Analysis

Very often used for analysis of opinions in social media.



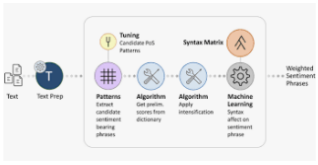
Sentiment Analysis and Classification
kdnuggets.com



Sentiment Analysis: Concept, Analysis ...
towardsdatascience.com

A Sentiment Analysis Approach to ...
medium.com

Sentiment Analysis: Concept, Analysis ...
towardsdatascience.com

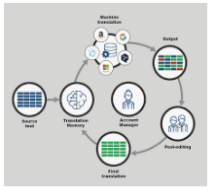


Sentiment Analysis | Lexalytics
lexalytics.com

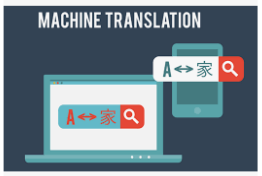
Sentiment Analysis: How Do
brandwatch.com

Machine Translation

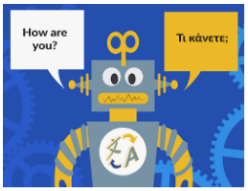
Deep learning has dramatically improved the quality of machine translation.



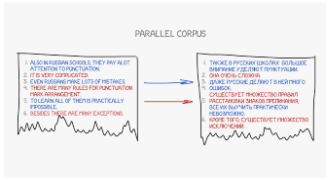
Machine Translation Service
translatemedia.com



Neural Machine Translation with Python ...
towardsdatascience.com



Machine Translation Explained ...
ciklopea.com



machine translation from the Cold War ...
medium.freecodecamp.org

A Machine Translation Solu...
transperfect.com

An Introduction to Machine Tran...
blog.globalizationpartners.com

The Semantic Web

Berners Lee et al. (2001)
The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation.

- The Semantic Web annotates the contents of Web documents with meaning.
- The Semantic Web provides mechanisms to specify meaning and reason with meaning.
- Still largely unrealised, but it has developed various technologies that are becoming increasingly useful.

3 Unit Practicalities

What This Unit is About

- COMP3220 explores the issues involved in building significant text processing applications.
  - Emphasis on *non-interactive* natural-language text processing systems.
  - Emphasis also on text processing relative to the Web.
- Programming language: Python.
- This unit has the following prerequisites:
  - COMP2110/COMP249, or
  - COMP2200/COMP257.

Staff

Rolf Schwitter: Unit convenor, lecturer (rolf.schwitter@mq.edu.au).

Diego Molla: Lecturer (diego.molla-aliod@mq.edu.au).

Abdus Salam: Tutor (abdus.salam@mq.edu.au).

Delivery

Lectures:
- Live zoom sessions on Monday 9-11am.
- Recordings will be available in iLearn.

Practicals:
- Register to your 2-hour block.
- There are online sessions (via zoom) and in-campus sessions.
- See timetables.mq.edu.au/2021/

Please Note
Practicals start from this week.

Web Resources

- The unit is available in iLearn `http://ilearn.mq.edu.au`.
- All the administrative material presented in this lecture is also available at this site.
  - Unit Outline.
  - Administrative Information.
  - Lecture Notes and recordings.
  - Pointers to Reading.
  - Other Useful Stuff.
- You are expected to keep up-to-date by using iLearn for:
  - Relevant news and information.
  - Discussions.
  - Submission of assignments.

Github

- Some of the material of this unit is available in a public github repository.
- `https://github.com/COMP3220/2021S1`
  - Lecture notes
  - Practicals
  - Code
- If you know how to use git, this will be the best way to make sure you have the latest versions.
  - git is one of the most popular version control systems.
  - Search the Web for tutorials and additional information on git.
- You can use the github browser interface to download individual files.

Learning Outcomes

1. Explain the main techniques that are used to develop and implement intelligent document processing applications.
2. Describe the functionality of the key components in document processing architectures.
3. Implement text processing applications using a programming language.
4. Apply web technology to document processing.

Textbooks

- Weeks 1 to 6 will use (mostly):
  - "NLTK Book": Steven Bird, Ewan Klein, Edward Loper. Natural Language Processing with Python — Analyzing Text with the Natural Language Toolkit. `http://www.nltk.org/book`
  - "Deep Learning Book": François Chollet. Deep Learning with Python. (available in the library).
  - Dan Jurafsky, James H. Martin. Speech and Language Processing. 3rd ed. draft. `https://web.stanford.edu/~jurafsky/slp3/`
- Weeks 7 to 12 are *not* based on any textbooks; we'll put a list of online texts.
- Every week there will be assigned readings; these readings are essential.
- The web site also has pointers to online resources.
  - Recommendations for additions are welcome.

Assessment

Assessment Components

- Assignment 1: 5%, due Week 3.
- Assignment 2: 20%, due Week 7.
- Assignment 3: 15%, due Week 12.
- Exam: 60%, online, during the examination period.

Final Assessment

- Your final mark and grade are entirely determined by the sum of marks of the individual assessment tasks.
- To pass the unit, the sum of marks must be at least 50% of the total assessment marks.
- This unit does not have hurdle assessments.

Practical Assignments

1. Simple Document Processing (5%, due Week 3)
   - Use of pre-packaged tools.
   - Can be used as a diagnostic test (before census date).
2. Document Processing (20%, due Week 7)
   - Use of techniques used in commercial and research applications.
   - Use of real (messy) text data.
3. Semantic Web (15%, due Week 12)
   - Integration of Semantic Web technologies.

Submitting your Assignment

- *Read the assignment specifications.*
- Submit in iLearn.
- Hard deadlines:
  - 10% of the **maximum** mark off per day of delay (or part thereof).

Plagiarism

- You may discuss but not write together.
- Read the Academic Honesty Policy. `https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/academic-honesty`

Tentative Lecture Schedule — Diego

1. Python for Text Processing (NLTK Ch 1)
2. Information Retrieval (Manning et al.)
3. Text Classification (NLTK Ch 6)
4. Deep Learning for Text (Chollet, Ch. 2 & 3)
5. Text Sequences (Chollet, Ch. 6)
6. Advanced Deep Learning for Text (lecture notes)

   (recess) - use this time for working on the assignment

Lecture Schedule — Rolf

7. Semantic Technologies (A Review of the Semantic Web Field)
8. RDF, RDF Schema and SPARQL (RDF Primer, SPARQL at W3C)
9. DBPedia and Wikidata (Wikipedia and DBPedia: a Comparative Study)
10. Ontologies (OWL Primer)
11. Rule Languages (Applications of Answer Set Programming)
12. Recent Trends in Semantic Technologies (lecture notes)
13. Revision

Important Things To Do

- Print out the lecture notes *before* attending the lecture.
- Read the practical exercises *before* attending the session.
  - time in the sessions is gold.
- Read the online Unit Outline; this is your "contract".
- Schedule an average of 10 hours per week for working on this unit:
  - As in every 10-credit-point unit.
  - This includes the mid-semester break.

What's Next

Week 1

- Python for Text Processing
- Workshop: Python and Text Processing

Reading

- NLTK Chapter 1
- `http://docs.python.org/tut/tut.html`