230717 - AHLT - Advanced Human Language Technologies

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications
Academic year: 2019
Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: English

Teaching staff
Coordinator: Marta Ruiz Costa-jussà

Opening hours
Timetable: During the course the hour after the class

Prior skills
Introductory concepts and methods of Natural Language Processing.
Introductory concepts and methods of Machine Learning.
Programming.

Requirements
Student will benefit from experience in programming in Python

Degree competences to which the subject contributes
Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology
-Lectures
-Programming/Laboratory
-Problems

Learning objectives of the subject
Can a machine learn to correct the grammaticality of text? Can a machine learn to answer questions we make in plain English? Can a machine learn to translate languages, using Wikipedia as a training set?
This course offers an in depth coverage of methods for Natural Language Processing. We will present fundamental models and tools to approach a variety of Natural Language Processing tasks, ranging from syntactic processing, to semantic processing, to final applications such as information extraction, human-machine dialogue systems, and machine translation. The flow of the course is along two main axis: (1) computational formalisms to describe natural language processes, and (2) statistical and machine learning methods to acquire linguistic models from large data collections.

1. Learn to apply statistical methods for NLP in a practical application
2. Understand statistical and machine learning techniques applied to NLP
3. Develop the ability to solve technical problems related to statistical and algorithmic problems in NLP
4. Understand fundamental methods of Natural Language Processing from a computational perspective

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 26h</th>
<th>20.80%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group: 13h</td>
<td>10.40%</td>
</tr>
<tr>
<td></td>
<td>Self study: 86h</td>
<td>68.80%</td>
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</tbody>
</table>
Advanced Human Language Technology

Content

**Advanced Human Language Technology**

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>2h 05m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>0h 26m</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>0h 13m</td>
</tr>
<tr>
<td>Self study:</td>
<td>1h 26m</td>
</tr>
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**Description:**

1. Course Introduction (1h Theory)
2. Syntactic Parsing (5h Theory)
Three lectures of the course will be devoted to syntactic parsing:

1.- Statistical parsing. The core are SCFG. Learning (supervised from treebanks or unsupervised using the inside/outside algorithm), parsing (Viterbi). Pros & Cons of SCFG. Other probabilistic approaches.


3. Distances and Similarities (3h Theory)

4. Semantic Role Labelling (2h Theory)
5. Semantic Parsing (6h Theory)

6. Distributional models (2h Theory)

7. Linguistic Inference (2h Theory)
Detecting inference between linguistic units. Recognizing Textual Entailment. The case of paraphrasing.

8. Deep Learning for NLP (6h Theory)
Three lectures will be devoted to Deep Learning for NLP

1.- Linear models. Feed Forward NN. Simple Perceptron. Multilayer Perceptron (MLP).

2.- Neural language modeling and Word embeddings. Use of words embeddings


9. Laboratory assignment (13h)
Qualification system

Final grade = 0.5*FE + 0.5*LP

where

FE is the grade of the final exam

LP is the grade of the lab project

Bibliography

Basic:

