65339 - Natural Language Processing using Computers (NLP)

Spring Semester, 2020-2021

Lecturers: Dr. Nava Shaked
Lab Instructor: Yuri Yurchenko

Weekly hours: 4
Credits: 3
Teaching methos: Lectures + Practice

Prerequisites: At least 3 of the courses
61307 -תכנות מונחה עצמים - Object Oriented Programming
הסתברות וסטטיסטיקה - 20019
תכנון וניתוח אלגוריתמים - 61210
61303 - מערכת בסיסי נתונים Data Base Systems

Course goals:

NLP is a key component required today in all artificial intelligence applications dealing with the human-machine-based interface. Natural language processing is a field that aims to allow the computer to analyze written or spoken natural language (text or speech) in a way similar to the human brain, hence the launch into the field of artificial intelligence (AI). Personal assistants such as Siri, Alexa, Cortana as well as bots-applications of various kinds require such a module to perform a dialog and complete tasks.

Learning outcomes:

The course is designed to introduce students to the complexities of modeling human languages, as well as impart practical knowledge that will help them solve tasks in the field of natural language processing, from sorting tools to automatic translation. In the course, students will be exposed to the various scientific theories and schools in the field in different periods
The laboratory will present up-to-date methods and tools used for language processing and practice processing and establishing databases, language models and solving ambiguous problems. For all the theories, algorithms and tools we will bring real examples of products and technologies developed in the field and linked to real projects in the industry.
The course is structured as a seminar, where students will explore different areas of language modeling and will be able to concentrate on one topic, an interesting challenge that they will explore. The student's research in the course will deal with algorithmic aspects, linguistic issues and the demonstration of tools that perform analyzes on natural language data. The student will build a direct connection between theories and applications and link research to industrial applications while studying cases and examples of projects at the forefront of the high-tech industry and research.

הפקולטה למדעים
המחלקה למדעי המחשב
Faculty of Sciences
Department of Computer Science

גולומב 52, ת.ד 305, חולון 58102
טלפון 5026528‏-03, פקס׳ 5026733‏-03
52 Golomb St., Holon 58102 Israel
w w w . h i t . a c . i l Tel. 972-3-502-6528, Fax. 972-3-502-6733

Throughout the course will build a project for the student to choose research or NLP applications that express the challenges he or she has researched. Students will work in pairs and will be asked to present a class presentation of the project.

Course topics (Weekly schedule):

Week	Topic(s)
1	**NLP** • Definition and basic terms. • Importance usage & goals. NLP - Roots and history:Turing test, Eliza
2	**Language Processing** • Linguistics levels of NLP- general. • Ambiguity (problem, resolution, exercise) • Languages processing Mind vs. Machine
3	**Relevant Linguistic issues:** • Acoustic phonetics • Phonology and prosody • Morphology • Lexicon
4	**Relevant Linguistic issues (cont.):** • Syntax • Pragmatics • Discourse analysis
5	**Arranging knowledge into models** • Schools of NLP • Symbolic • Statistical
6	**Arranging knowledge into models (cont.)** • Connectionist • Hybrid
7	**NLP Tools** • Introduction to main tools according to language categories. • Demonstration and usage principles of the tools. • Trends and vision.
8	**Midterm presentations**
9	**Tools and algorithms** • Platforms for implementing NLP systems
10	**Tools and algorithms (cont.)** • Platforms for implementing NLP systems
11	**Integration Tools and algorithms** • Challenges in language processing • Using the tools to solve NL processing • Examples for usage in real projects
12	**VUI Voice User Interface**

גולומב 52, ת.ד 305, חולון 58102
טלפון 03–5026528, פקס' 03–5026733
52 Golomb St., Holon 58102 Israel
w w w . h i t . a c . i l Tel. 972-3-502-6528, Fax. 972-3-502-6733

הפקולטה למדעים
המחלקה למדעי המחשב
Faculty of Sciences
Department of Computer Science

	• **Definition and basic terms** • **Designing and executing.** • **Usability tools**
13	**Project Presentation**

Bibliography:

- List of current Articles – will be published.

- Daniel Jurafsky and James H. Martin, *Speech and Language Processing: an introduction to natural language processing, computational linguistics, and speech recognition*, Prentice Hall 2009.

- Oviatt, S., Cohen, P. "The Paradigm Shift to Multimodality in Contemporary Computer Interfaces" Morgan & Claypool Publishers 2015

- Manning, Christopher D., and Hinrich Schütze. *Foundations of Statistical Natural Language Processing*. Cambridge, MA: MIT   1999

- Ido Dagan, Dan Roth, Mark Sammons and Fabio Massimo Zanzotto. *Recognizing Textual Entailment: Models and Application*s. Morgan & Claypool Publishers. 220 pages. 2013

- Daniël de Kok, Harm Brouwer ***Natural Language Processing for the Working Programmer*** , 2011   http://nlpwp.org/book/ book download

- John E. Kelly III , Steve Hamm. *Smart Machines: IBM's Watson and the Era of Cognitive Computing.* Columbia Business School Publishing. 2013.

Final grade:

Task	**Homework and class assignments**	**Final Project**	**Presentation**
	20%	50%	30%

Attendance. 80%
Attendance at Class presentations & exercises is mandatory

Reception hours: By appointment only

Course site: In Moodle