Fakultät für Ingenieurwesen

Facoltà di Ingegneria

Faculty of Engineering

COURSE DESCRIPTION – ACADEMIC YEAR 2024/2025

Course title	**Natural Language Processing and Recommender Systems**
Course code	73071
Scientific sector	INF/01
Degree	Master in Computing for Data Science (LM-18)
Semester	2
Year	1
Credits	6
Modular	No

Total lecturing hours	40
Total lab hours	20
Attendance	Attending lectures is not compulsory but highly recommended. Final marks will be awarded on the basis of the outcome of the final exam and assignments (project and seminar). Students who are not attending the lectures must contact the lecturer to receive their mandatory assignments.
Prerequisites	Some knowledge of Linear algebra, probability, basic machine learning concepts is required; some basic knowledge of logic will be useful but it is not mandatory.
Course page	https://ole.unibz.it/

Specific educational objectives	The course belongs to the type "caratterizzanti – discipline informatiche" in the curricula "Data Analytics".
	The main objective of the course is to a) reach an overview of NLP and RS; and to familiarize with a variety of b) NLP and RS approaches and c) evaluation methods for NLP and Recommender Systems.
	Hence, the student will learn on the one hand how to design, implement, and evaluate Recommender Systems in concrete application scenarios; on the other, the student will familiarize with today's NLP models situating them in the broader and long-standing context of the field.

Lecturer	Attaullah Buriro and Raffaella Bernardi
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Scientific sector of lecturer	INF/01
Teaching language	English
Office hours	Book beforehand via e-mail.
Lecturing Assistant	--
Contact LA	--
Office hours LA	--

List of topics	● Symbolic, statistical and neural networks approaches for Natural Language Processing ● Collaborative Filtering and Content-Based Filtering ● Group Recommender Systems ● Context-aware systems ● Conversational Systems ● Decision Making
Teaching format	Frontal lectures, exercises, labs, projects, seminars.

Learning outcomes	Applying knowledge and understanding: ● D1.2 - Understanding of the skills, tools and techniques required for an effective use of data science ● D1.7 - Knowledge of artificial intelligence techniques and methods for the implementation of intelligent systems Applying knowledge and understanding: ● D2.1 - Practical application and evaluation of tools and techniques in the field of data science ● D2.2 - Ability to address and solve a problem using scientific methods ● D2.6 - Ability to apply innovative techniques of data mining and machine learning to extract knowledge from complex and heterogeneous data Making judgments ● D3.2 - Ability to autonomously select the documentation (in the form of books, web, magazines, etc.) needed to keep up to date in a given sector Communication skills ● D4.1 - Ability to use English at an advanced level with particular reference to disciplinary terminology ● D4.3 - Ability to structure and draft scientific and technical documentation Learning skills ● D5.2 - Ability to autonomously keep oneself up to date with the developments of the most important areas of data science ● D5.3 - Ability to deal with problems in a systematic and creative way and to appropriate problem solving techniques.

Assessment	● Final exam, written, 40 % of mark ● Project in a small team (2 students), 40% ● Seminars, 20% The project will consist of the design of a recommender system in a specific application domain selected by the student or on the proposal for the evaluation of an NLP model against a specific task. The project domain, the attacked problem, the techniques and the obtained results, if any, must be described in a report (~ 5.000 words). System prototype implementation for the RS is optional; an actual evaluation of the NLP model is recommended. The project is aimed at assessing to what extent the student has achieved the above-mentioned

	learning outcomes related to: applying knowledge and understanding, making judgments, and communication skills.
	The student will be required, during the lecture period, to give one seminar to present a scientific paper on NLP or to illustrate a tool/technique useful for implementing RSs. The seminar is aimed at assessing to what extent the student has achieved the above-mentioned learning outcomes related to: applying knowledge and understanding, making judgments, communication and learning skills.
	The written exam is based on verification questions and exercises, and it will assess to what extent the student has achieved the above-mentioned learning outcomes related to: knowledge and understanding, applying knowledge and understanding, and learning skills.
Assessment language	English
Assessment Typology	Collegial
Evaluation criteria and criteria for awarding marks	The seminar will be evaluated at the end of the semester and it is a prerequisite for attending the written exam. The project report must be submitted one week before the written exam. The student must pass each single component of the exam (project, seminar and written exam), by obtaining at least 50% of the mark.
	Project evaluation criteria: clarity of the presentation, novelty of the problem and the solution, appropriateness of the methods, significance of the solution and capability to refer to the methods and techniques discussed in the course.
	Seminar evaluation: clarity of the presentation and capability to reply to clarification questions of the teacher.
	Written exam: correctness and clarity of the replies to the posed questions.

Required readings	The suggested book for recommender systems topics is:
	● Ricci, F.; Rokach, L.; Shapira, B. (Eds.). Recommender Systems Handbook. Berlin: Springer, 2022. ● Speech and Language Processing (3rd ed. draft) Dan Jurafsky and James H. Martin
	All the required reading material will be provided during the course and will be available in electronic format. Copy of the slides will be available as well.
	Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
Supplementary readings	Scientific papers and additional books will be specified on each course topic during lectures.
Software used	Python and Java.