

## **AI: CHATBOTS & RECOMMENDATION ENGINES**

**Grado en Computación e Inteligencia Artificial / Bachelor in  
Computer Science and Artificial Intelligence BCSAI SEP-2025  
AICRE-CSAI.3.M.A**

Area Computer Science

Number of sessions: 30

Academic year: 25-26

Degree course: THIRD

Number of credits: 6.0

Semester: 2º

Category: COMPULSORY

Language: English

Professor: **MIGUEL GONZÁLEZ-FIERRO**

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### **MIGUEL GONZÁLEZ-FIERRO PALACIOS**

Miguel González-Fierro is a Principal Data Science Manager at Microsoft Spain, where his job consists of helping customers leverage their processes using Big Data and Machine Learning. Previously, he was CEO and founder of Samsamia Technologies, a company that created a visual search engine for fashion items allowing users to find products using images instead of words, and founder of the Robotics Society of Universidad Carlos III, which developed different projects related to UAVs, mobile robots, small humanoids competitions, and 3D printers. Miguel also worked as a robotics scientist at Universidad Carlos III of Madrid (UC3M) and King's College London (KCL) and collaborated with other universities like Imperial College London and IE University in Madrid.

Miguel is an Electrical Engineer by UC3M, PhD in robotics by UC3M in collaboration with KCL, and graduated from MIT Sloan School of Management.

### **Office Hours**

Office hours will be on request. Please contact at:

[mgonzalezfierro@faculty.ie.edu](mailto:mgonzalezfierro@faculty.ie.edu)

## **SUBJECT DESCRIPTION**

Recommendation engines have changed a wide range of businesses by reducing costs and/or improving the user experience. With the variety of products, films, and music that exist today customers would not have any chance to find the right products without the existence of search & recommendation engines.

In addition, chatbots are a great way to interact with customers. With the development of LLMs like ChatGPT, Bing Chat or Bard, we have entered a new era of interactive search.

This course introduces students to the concept of recommender systems and chatbots, reviews several examples in detail, and helps them understand what are the recommendation systems and chatbots that are used in the industry today.

## LEARNING OBJECTIVES

In this course, the student learns to handle, apply and evaluate recommendation and chatbot methods and technologies. The course provides an understanding of the theoretical foundations, as well as applied and methodological skills.

At the end of the course, students will obtain a solid grasp of the theoretical and practical application of popular recommendation systems and will get an introduction to chatbots.

Students will learn to build an end-to-end recommendation solution using Python at the level that is required in a large company. They will also learn how to develop and implement a working chatbot.

## TEACHING METHODOLOGY

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	20.0 %	30.0 hours
Discussions	13.3 %	20.0 hours
Exercises in class, Asynchronous sessions, Field Work	13.3 %	20.0 hours
Group work	40.0 %	60.0 hours
Individual studying	13.3 %	20.0 hours
TOTAL	100.0 %	150.0 hours

## AI POLICY

In this course, the use of generative artificial intelligence (GenAI) is encouraged, with the goal of developing an informed critical perspective on potential uses and generated outputs.

However, be aware of the limits of GenAI in its current state of development:

-If you provide minimum effort prompts, you will get low quality results. You will need to refine your prompts to get good outcomes. This will take work.

-Don't take ChatGPT's or any GenAI's output at face value. Assume it is wrong unless you either know the answer or can cross-check it with another source. You are responsible for any errors or omissions. You will be able to validate the outputs of GenAI for topics you understand.

-AI is a tool, but one that you need to acknowledge using. Failure to do so is in violation of academic honesty policies. Acknowledging the use of AI will not impact your grade.

If you have chosen not to include any AI generated content in your assignment, the following disclosure is recommended:

No content generated by AI technologies has been used in this assignment.

## **PROGRAM**

### **SESSION 1 (LIVE IN-PERSON)**

Course logistics, organization and intro

### **SESSION 2 (LIVE IN-PERSON)**

Intro reco & chatbots

### **SESSION 3 (LIVE IN-PERSON)**

Data in recommendation systems

### **SESSION 4 (LIVE IN-PERSON)**

Recommendation systems algorithms overview

### **SESSION 5 (LIVE IN-PERSON)**

Evaluation, model selection and operationalization

### **SESSION 6 (LIVE IN-PERSON)**

Project discussion (presentation of projects)

### **SESSION 7 (LIVE IN-PERSON)**

Project discussion (presentation of projects)

### **SESSION 8 (LIVE IN-PERSON)**

Development practices for chatbots and recommendation systems (Set up project and GitHub)

### **SESSION 9 (LIVE IN-PERSON)**

Development practices for chatbots and recommendation systems (Python practices)

## **SESSION 10 (LIVE IN-PERSON)**

Invited guest: product management

## **SESSION 11 (LIVE IN-PERSON)**

Similarity-based methods

## **SESSION 12 (LIVE IN-PERSON)**

Matrix factorization & Factorization machines

## **SESSION 13 (LIVE IN-PERSON)**

Application of general machine learning to recommendation systems

## **SESSION 14 (LIVE IN-PERSON)**

MLOps for reco and chatbots

## **SESSION 15 (LIVE IN-PERSON)**

Mid-term project presentation

## **SESSION 16 (LIVE IN-PERSON)**

Mid-term project presentation

## **SESSION 17 (LIVE IN-PERSON)**

Deep learning models in recommendation systems

## **SESSION 18 (LIVE IN-PERSON)**

Sequential Recommendation Systems

## **SESSION 19 (LIVE IN-PERSON)**

Graph Recommendation Systems

## **SESSION 20 (LIVE IN-PERSON)**

Introduction to chatbots

## **SESSION 21 (LIVE IN-PERSON)**

Q&A modern methodologies: autoencoders and autoregressive algorithms

## **SESSION 22 (LIVE IN-PERSON)**

Fundamentals of LLMs

### **SESSION 23 (LIVE IN-PERSON)**

Operationalization of chatbots

### **SESSION 24 (LIVE IN-PERSON)**

Final project presentation

### **SESSION 25 (LIVE IN-PERSON)**

Final project presentation

### **SESSION 26 (LIVE IN-PERSON)**

Advanced methods for building chatbot applications

### **SESSION 27 (LIVE IN-PERSON)**

Advanced methods for building chatbot applications

### **SESSION 28 (LIVE IN-PERSON)**

Invited guest: Data Science

### **SESSION 29 (LIVE IN-PERSON)**

Group discussion about ethical AI and course wrap up

### **SESSION 30 (LIVE IN-PERSON)**

Final exam

### **EVALUATION CRITERIA**

<b>criteria</b>	<b>percentage</b>	<b>Learning Objectives</b>	<b>Comments</b>
Final Exam	30 %		
Group project	35 %		
Individual contributions	25 %		
Individual participation	10 %		

### **RE-SIT / RE-TAKE POLICY**

Each student has four chances to pass any given course distributed over two consecutive academic years: ordinary call exams and extraordinary call exams (re-sits) in June/July.

Students who do not comply with the 80% attendance rule during the semester will fail both calls for this Academic Year (ordinary and extraordinary) and have to re-take the course (i.e., re-enroll) in the next Academic Year.

Evaluation criteria:

- Students failing the course in the ordinary call (during the semester) will have to re-sit the exam

in June / July (except those not complying with the attendance rule, who will not have that opportunity and must directly re-enroll in the course on the next Academic Year).

- The extraordinary call exams in June / July (re-sits) require your physical presence at the campus you are enrolled in (Segovia or Madrid). There is no possibility to change the date, location or format of any exam, under any circumstances. Dates and location of the June / July re-sit exams will be posted in advance. Please take this into consideration when planning your summer.
- The June / July re-sit exam will consist of a comprehensive exam. Your final grade for the course will depend on the performance in this exam only; continuous evaluation over the semester will not be taken into consideration. Students will have to achieve the minimum passing grade of 5 and can obtain a maximum grade of 8.0 (out of 10.0) – i.e., “notable” in the re-sit exam.
- Retakers: Students who failed the subject on a previous Academic Year and are now re-enrolled as re-takers in a course will be needed to check the syllabus of the assigned professor, as well as contact the professor individually, regarding the specific evaluation criteria for them as retakers in the course during that semester (ordinary call of that Academic Year).

The maximum grade that may be obtained in the retake exam (3rd call) is 10.0.

After ordinary and extraordinary call exams are graded by the professor, you will have a possibility to attend a review session for that exam and course grade. Please be available to attend the session in order to clarify any concerns you might have regarding your exam. Your professor will inform you about the time and place of the review session. Any grade appeals require that the student attended the review session prior to appealing.

- Students failing more than 18 ECTS credits in the academic year after the June-July re-sits will be asked to leave the Program. Please, make sure to prepare yourself well for the exams in order to pass your failed subjects.
- In case you decide to skip the opportunity to re-sit for an exam during the June / July extraordinary call, you will need to enroll in that course again for the next Academic Year as a re-taker and pay the corresponding extra cost. As you know, students have a total of four allowed calls to pass a given subject or course, in order to remain in the program.

## **BIBLIOGRAPHY**

### **Recommended**

- Valentina Alto. *Building LLM Powered Applications: Create intelligent apps and agents with large language models*. Packt. ISBN 1835462316 (Printed)
- D. Li, J. Lian, L. Zhang, K. Ren, D. Lu, T. Wu, X. Xie. *Recommender Systems: Frontiers and Practices*. Springer. ISBN 9819989639 (Printed)
- Charu C. Aggarwal. (2016). *Recommender Systems: The Textbook*. Springer. ISBN 3319296574 (Printed)

## **BEHAVIOR RULES**

Please, check the University's Code of Conduct [here](#). The Program Director may provide further indications.

## **ATTENDANCE POLICY**

Please, check the University's Attendance Policy [here](#). The Program Director may provide further indications.

## **ETHICAL POLICY**

Please, check the University's Ethics Code [here](#). The Program Director may provide further indications.

