

## **RECOMMENDATION ENGINES**

**Bachelor in Data and Business Analytics BDBA SEP-2023  
RE-DBA.3.M.A**

Area Others

Number of sessions: 30

Academic year: 23-24

Degree course: THIRD

Number of credits: 6.0

Semester: 1º

Category: COMPULSORY

Language: English

Professor: **ALVARO ROMERO MIRALLES**

E-mail: [aromerom@faculty.ie.edu](mailto:aromerom@faculty.ie.edu)

### **ALVARO ROMERO MIRALLES**

Álvaro Romero is Data Science Technical Director in the group of Energy Predictive Analytics of Instituto de Ingeniería del Conocimiento (IIC). He holds a Master's Degree in Computer Engineering, a Master's Degree in ICT Research and Innovation in Computational Intelligence and an EMBA from IE. His thesis on prediction of electricity prices in Spain has been published in the International Journal of Interactive Multimedia and Artificial Intelligence. He graduated in Mathematics and Computer Engineering from Universidad Autónoma de Madrid. He has experience in fraud detection, predictive maintenance, optimization problems, forecasting of demand and renewable energy production, etc. He also collaborates as a professor in different Masters and Bachelors of Data Science, BI and Big Data in business schools such as MBIT School and ENAE Business School or IE.

[aromerom@faculty.ie.edu](mailto:aromerom@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, music that exist today consumers would not have any chance to find the right products without the existence of search & recommendation engines.

This course introduces students to the concept of recommender systems, reviews several examples in detail, and leads students through non-personalized recommendation, content-based and collaborative filtering recommendations. In addition, students will learn how to evaluate recommender systems using several families of metrics, including ones to measure prediction accuracy, rank accuracy, decision-support, and other factors such as diversity, product coverage, and serendipity.

## LEARNING OBJECTIVES

In this course the student learns to handle, apply and evaluate search engines 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 supervised machine learning algorithms. Through Python or R coding students will be able to:

- Gather the appropriate data
- Build non-personalised recommenders
- Build filter-based recommenders
- Build content-based recommenders
- Standard evaluations on recommendation systems to aid in the decision making process.

## 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	26.67 %	40.0 hours
Discussions	13.33 %	20.0 hours
Exercises in class, Asynchronous sessions, Field Work	13.33 %	20.0 hours
Group work	33.33 %	50.0 hours
Individual studying	13.33 %	20.0 hours
TOTAL	100.0 %	150.0 hours

## PROGRAM

### SESSION 1 (LIVE IN-PERSON)

In this session we will review the course logistics and organization together with an introduction to recommender systems

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

In this session we will hold a live discussion on how recommendation engines can improve almost any business by analysing Netflix case.

*Practical Case: Netflix in 2011 (HBS 615007-PDF-ENG)*

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

Review of R programming & Discussion on what are the different uses of recommendation systems

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

Review of R programming & Reading of "Great Digital Companies Build Great Recommendation Engines"

*Article: Great Digital Companies Build Great Recommendation Engines (HBS H03SI8-PDF-ENG)*

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

Approaches for building a recommender system

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

Gathering data for recommendation engines: what is the important data we need when building a recommender?

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

Advanced topics on gathering data: ratings

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

Coordinated discussion on how the big companies collect the necessary data.

Working with Recommenderlab

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

Accuracy metrics for recommendation engines

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

Practical exercises in class about metrics

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

Presentation of individual work

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

Presentation of individual work

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

Further topics on metrics

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

Offline evaluation vs online evaluation

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

Theory on stereotype-based & demographic recommendations

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

Building a non-personalized recommender

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

Splitting the data & using the evaluation methods to evaluate your own recommender

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

Building your own recommender

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

Theory about collaborative filtering methods

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

Factorization Methods

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

Building a collaborative filtering recommender

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

Building your own recommender

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

Introduction to content based recommenders

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

Building a content-based recommender

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

Building your own recommender

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

Work group presentation

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

Work group presentation

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

Advanced topics on recommender systems

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

Revision session and class discussion

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

Final exam

## **EVALUATION CRITERIA**

<b>criteria</b>	<b>percentage</b>	<b>Learning Objectives</b>	<b>Comments</b>
Final Exam	20 %		
Individual Work	25 %		
Workgroups	40 %		
Class Participation	15 %		

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

### **BIBLIOGRAPHY**

#### **Recommended**

- Suresh K. Gorakala, Michelle Usuelli. *Building a Recommendation Engine*. ISBN 9781783554492 (Digital)
- Aggarwal, C. C. *Recommender Systems: The Textbook*. Springer. ISBN 3319296574 (Digital)
- KIM FALK. *Practical Recommender Systems*. Manning. ISBN 9781617292705 (Digital)

## **BEHAVIOR RULES**

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

## **ATTENDANCE POLICY**

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## **ETHICAL POLICY**

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