ESCI upf.
School of International Business

Academic Year: 2024/25

80245 - Artificial Intelligence and Machine Learning in Business Management

Teaching Guide Information

Subject: Elective
Teaching language:
Plenary session: Group 1: English

Number of credits: 6.0
Term: Second quarter

1. Basic description

Academic center: Escola Superior de Comerç Internacional
Degree/Course: International Business Programme
Contact hours: 45
Total number of hours committed: 150
Lecturer: Manel Guerris (manuel.guerris@prof.esci.upf.edu)
Timetable: SIGMA schedule
Office hour: on-demand basis

2. Presentation of the course

In the digital age, the landscape of business management is undergoing a seismic shift driven by the integration of Artificial Intelligence (AI) and Machine Learning (ML). This comprehensive course is designed to explore these transformative technologies and their application within various business contexts. As companies across industries increasingly harness the power of AI and ML to optimize operations, enhance customer experiences, and drive strategic decision-making, the demand for professionals skilled in these areas has surged. This course aims to bridge the gap between theoretical knowledge and practical application, empowering students to implement AI and ML solutions in their organizations effectively.

Students will embark on a journey that starts with foundational concepts in Big Data, Data Science, and Analytics, providing a robust base to understand the intricate workings of AI and ML. The course will delve into the technologies that define Industry 4.0, supervised and unsupervised machine learning techniques, offering hands-on experience with real-world datasets to reinforce learning, advanced topics such as Deep Learning and Generative, Large Language Models (LLMs) and prompt engineering, highlighting their potential in automating and enhancing various business processes and understanding the role of cloud computing in AI project development and deployment to scale their AI initiatives.

This course will equip students with the frameworks and tools to identify and prioritize high-value projects aligning with organizational goals. Ethical considerations and project management techniques specific to AI will be discussed, ensuring students are prepared to navigate the complexities of bias, fairness, and transparency in AI implementations.

Learning Objectives:

1. Understand the foundational concepts of Big Data, Data Science, and Analytics.
2. Gain proficiency in AI and ML principles, including supervised and unsupervised learning.
3. Delve into advanced topics such as Deep Learning and Generative AI.
4. Develop skills in LLMs and prompt engineering.

5. Understand the role of cloud computing in developing and implementing AI projects.
6. Learn how to prioritize AI projects strategically and ethically within an organization.

3. Educational and learning process outcomes

GENERAL COMPETENCES	SPECIFIC COMPETENCES
Instrumental competences	**Professional competences**
G.I.1. Ability to search, analyse, assess and summarise information. G.I.3. Ability to organise and plan. G.I.4. Ability to tackle and solve problems. G.I.5. Ability to take decisions in complex and changing environments. G.I.6. Ability to develop, present and defend arguments	E.P.2. Ability to analyse economic and market indicators when taking decisions within the organisation. E.P.21. Ability to search and use various information sources. E.P.22. Ability to contrast knowledge obtained in the learning process and adapt it to real situations.
Generic systematic competences	
G.S.5. Ability to learn on one's own. G.S.6. Proactivity, ability to suggest, develop and implement initiatives and changes within the organisation	
Competences for applicability	
G.A.2. Ability to use quantitative criteria and qualitative insights when taking decisions. G.A.3. Ability to search and exploit new information sources.	

The above competences reflect the basic competences set out in Royal Decree 1393/2007, namely:
a. Competence to **comprehend knowledge, on the basis of general secondary education.**
b. Competence to **apply knowledge** to day-to-day work in international management or marketing, in particular the ability to develop and defend arguments and to solve problems.
c. Competence to **gather and interpret** relevant **data**, enabling the development of critical judgements on the economic and social reality.
d. Competence to **communicate and transmit information** (ideas, problems, solutions) to a specialist and non-specialist audience.
e. Competence to **develop learning activities** in a relatively autonomous manner.

The competences worked on in the course are divided into two groups: those seen as a development or specification of a basic competence; and those that hone graduates' professional profile with respect to general and specific competences.

Basic competence: **understanding of knowledge**
General competences. G.I.3, G.A.2

Basic competence: **gather and interpret data**
General competences. G.I.1, G.A.3
Specific competences. E.P.2

Basic competence: **communicate and transmit information**
General competences. G.I.6, G.S.6

Basic competence: **develop learning activities**
General competences. G.I.3, G.I.4, G.S.5
Specific competences. G.P.21, G.P.22

Competences that hone graduates' professional profile which are not included under basic competences
In general, these competences combine the following key elements for honing students' professional profile in the area of international business and marketing:

- Provide students with the capacity to adapt to dynamic teams and environments.
- Provide students with the capacity to create their own integral vision of the operation of a business or inte
- Provide students with the capacity to take complex decisions and carry out negotiation processes.

General competences. G.I.4, G.I.5

LEARNING OUTCOMES: Implement artificial intelligence and machine learning developments for their practical application in the business field. Learn and practice most important machine learning and optimization analytics.

The competences, the learning outcomes, the assessment elements and the quality of the learning process included in this Teaching Guide will not be affected if during the academic trimester the teaching model has to switch either to an hybrid model (combination of face-to-face and on-line sessions) or to a complete on-line model.

4. Contents

Keywords: artificial intelligence, machine learning, deep learning, LLMs, optimization, cloud computing, project management, ai ethics

Introduction to Big Data, Data Science, and Analytics

- Overview of Big Data
- Key concepts in Data Science
- Data Analytics: Tools and Techniques
- Case studies on data-driven decision-making

Industry 4.0: Technologies & Applications

- Introduction to Industry 4.0
- Key technologies: IoT, Cyber-Physical Systems, Robotics
- Applications and impact on various industries
- Case studies and industry examples

Artificial Intelligence & Machine Learning

- Introduction to AI and ML
- Historical development and key milestones
- Current trends and future directions
- Real-world applications in business

Supervised Machine Learning

- Concept and methodology

- Regression and classification techniques
- Model evaluation and performance metrics
- Hands-on exercises with real datasets

Unsupervised Machine Learning

- Concept and methodology
- Clustering and association techniques
- Dimensionality reduction
- Hands-on exercises with real datasets

Optimization in AI

- Optimization techniques: Linear, Non-linear, Integer
- Applications in AI and business
- Case studies and problem-solving exercises

Deep Learning & Generative AI

- Introduction to Deep Learning
- Neural networks and architectures
- Generative AI: GANs and other models
- Practical applications and case studies

LLMs and Prompt Engineering

- Introduction to Large Language Models (LLMs)
- Techniques in prompt engineering
- Applications in business and marketing
- Hands-on exercises with LLMs

Cloud Computing for AI Projects

- Introduction to cloud computing
- Tools and platforms: AWS, Google Cloud, Azure
- Developing and deploying AI projects on the cloud
- Case studies and hands-on projects

Strategic Prioritization of AI Projects

- Identifying and prioritizing AI projects
- Strategic alignment with business goals
- ROI and impact assessment
- Frameworks and tools for prioritization

Ethics and AI Project Management

- Ethical considerations in AI
- Bias, fairness, and transparency

- AI project management techniques
- Case studies on ethical dilemmas in AI

5. Assessment

Assessment elements	Time period	Type of assessment		Assessment agent			Type of activity	Assessment		Grouping		W(
		Comp	Opt	Lecturer	Self-assess	Co-assess		Continuous	Synthesis	Indiv	Group (#)	
Class participation	Time of course	X		X			Synthesis and application based	C		X		1
ses	Periodically	X		X			Application based	C			X	3
ect plan	Last day	X		X			Application based	C			X	3
xam	Exams week	X		X			Synthesis based	S		X		3

Taking the final exam is a necessary condition to pass the subject. In case of not attending the final exam, the student will obtain the “not presented” qualification.

Total or partial copy and/or plagiarism will imply a failure in the subject with a final grade of zero points and no access to the make-up exam. According to the academic regulations specified in the Disciplinary rules for students of Universitat Pompeu Fabra, other additional sanctions may apply depending on the seriousness of the offence.

In case of divergence between the evaluation criteria established in the Learning Plan and the Teaching Guide, those established in the Learning Plan will prevail.

6. Sustainable Development Goals

SDG 9: Industry, innovation and infrastructure

SDG 11: Sustainable cities and communities

SDG 12: Responsible consumption and production