



EUROPEAN HIGHER EDUCATION INSTITUTE

MASTER OF SCIENCE IN DATA SCIENCE AND ARTIFICIAL INTELLIGENCE



ABOUT US

The European Higher Education Institute is a high quality institution dedicated to preparing students for the careers of the global economy through the use of new technologies and advanced digital skills. The institution's mission is to foster academic excellence and student achievement in the field of business, computer science, innovation technologies and education. Our degree programmes provide students with a strong academic foundation and problem-solving skills to prepare them to become competent professionals and responsible citizens in a diverse, dynamic and global environment. All the master programmes are designed to take into account the emerging requirements of the job markets and to provide students with the skills and competencies needed to build a successful career at international level. The European Higher Education Institute is accredited by the Malta Further & Higher Education Authority and is affiliated to ENQA - *European Association for Quality Assurance in Higher Education*

ACCREDITED BY THE MALTA
FURTHER & HIGHER EDUCATION
AUTHORITY (MFHEA)



MASTER OF SCIENCE IN DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Computer science and technology will be our future and employment of IT experts is expected to grow by 12% from now until 2028. By considering the rapid rise of innovative tech as drivers of the global economy, the MSC in Data Science and Artificial Intelligence offers students a broad foundation in modern software and hardware systems and an in-depth knowledge of the new applications of IT. The master covers the latest technologies from Artificial Intelligence to Data Science and machine learning and their applications to the cloud and mobile apps and systems. Students will develop a comprehensive knowledge of the fundamentals of data management and an in-depth understanding of artificial intelligence principles and technologies and big data analytics. They will also develop a comprehensive knowledge of the main data-mining tasks such as data selection, data transformation, analysis and interpretation, with specific reference to unstructured text data, and with the issues related to analysis in the "big data" environment.



LEARNING OUTCOMES

Upon completion of the programme, students will acquire the skills to:

- be at the forefront of the AI-driven transformation in our economy and society
- organise, visualise, and analyse large, complex datasets using descriptive statistics and graphs to make decisions understand and analyse innovations like smart city, digital governance, smart mobility, smart manufacturing
- work with AI-based systems with intelligent assistants or decision-making mechanisms
- master the most popular modern machine-learning approaches to computer-vision tasks, in particular specialised deep-learning architectures
- write and implement Python scripts that carry out simple data analyses of large data sets
- write data transformation scripts using the Python API to the Apache Spark big data analytics engine
- analyse the implementation of AI strategies to comprehend the associated values, risks and opportunities

CURRICULUM

The master lasts 18 months and awards students 90 ECTS. The programme is structured in 3 semesters of 6 months and includes the following 9 modules and a final project work.

PYTHON – 6 ECTS

This course introduces computer programming using the Python programming language. In this course, students will analyse the different programming systems with particular attention to python programming language, which is today the most widely used for many types of applications, from networking, to the web, to animation up to machine learning. Emphasis is placed on common algorithms and programming principles utilising the standard library distributed with Python. Upon completion, students will be able to have a good knowledge of the python syntax and the most important mechanisms of object-oriented programming and should be able to design, code, test, and debug Python language programs.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Carry out activities and tasks using python programming language;
- Understand the main principles and functions of python;
- Ensure the correct use of variables and analyse them for efficient use;
- Understand the expressions used in python as well as the functions;
- Develop a good understanding of the libraries in python and the programming basics like creating loops and classes;
- Create a software application using the Python programming language;
- Debug a software application written in the Python programming language;
- Test a software application written in the Python programming language.

DATA SCIENCE – 8 ECTS

In this course, the goal is to give students an introduction to and hands-on experience with all phases of the data science process using real data and modern tools. Students will be introduced to real-world datasets using a statistical programming language for hands-on experience in data science. The main topics covered are: data formats, loading, and cleaning; statistical and exploratory data analysis using Python; basics of data visualisation; and some fundamental ethical issues in data science.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Understand issues relating to acquisition, cleaning and loading of data;
- Be able to perform exploratory data analysis using Python;
- Understand the basics of how data can be presented and visualised;
- Analyse the basic of NLP and computer vision;
- Become familiar with some very fundamental ethical issues in data science;
- Understand the implication of information security in data science;
- Practise some object-oriented programming and automation;
- Use effectively data aggregation and transformation;
- Understand the different ethics involved in data.

DATA MANAGEMENT – 8 ECTS

In this course, students will provide students the fundamental theory and practical knowledge to use Database Management Systems to support MIS. It allows students to be introduced to main concepts of designing a relational database as well as map out the business requirements to the logical and physical design of Database Management Systems. In addition, OLAP tools to extract critical information to make business decisions will also be dealt with. The master also prepares students to deal with the concept of privacy issues and data breaches. Proper data management is presented as essential for all organisations that handle sensitive information and large volumes of data.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Deal with the business requirements to manage an information system to support operations in business and solve issues in data management;
- Create a schema for a database and learn how to build an MIS database;
- Introduce RDBMS and external MIS tools for the creation of reports for decision making in business;
- Delve into Online Analytical Processing to better understand business operations;
- Analyse effectively the business requirements and learn about the database management systems concepts;
- Use Structured Query Language to full effect in the design of databases;
- Effectively integrate databases and analyse information for reporting.

BIG DATA – 8 ECTS

In this course, students are introduced to data analysis to improve skills and understanding of how big data creates value in the business and public sector. The course also introduces data analysis lifecycle and the three types of data analytics: descriptive, predictive and prescriptive. Students will use Anaconda (Python with its libraries) extensively to create a data pipeline to acquire, analyse and visualise data. Students will identify the likelihood of future outcomes through the use of data, statistical algorithms and machine learning techniques based on historical data. The course prepares students to work effectively with heterogeneous, real-world data, training them to become experts in extracting useful insights for business. It provides a unique blend of information technology, mathematical, analytical, and managerial skills. Moreover, the course covers the concept of Big data privacy, the management of big data and the system and processes used to minimise risk and protect sensitive data.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Explain the challenges of big data analytics as related to the Internet of things;
- Learn methods for managing and analysing large datasets;
- Analyse data using basic statistical and data preparation techniques in Python with pandas;
- Develop algorithms for descriptive and predictive analysis of big data;
- Analyse data using machine learning models;
- Use fundamental principles adopted in predictive analysis;
- Understand the implication of protection and privacy in the use of big data
- Differentiate among the descriptive, predictive and inferential statistics;
- Analyse the principles for using big data in a secure way;
- Evaluate the data analysis lifecycle and understand the different types of data analysis;
- Create data-driven solutions that boost profits, reduce costs, and improve efficiency;
- Maintain compliance with data privacy regulations.

ARTIFICIAL INTELLIGENCE – 8 ECTS

In this course students will be introduced to the fundamental theories and applications of artificial intelligence. Accordingly, this course provides students with intensive knowledge in designing intelligent agents and observing their behaviours in connection to its surrounding environment. In addition, search algorithms for problem solving will be covered deeply in this course, supported with the appropriate applications, and examples. The main goal of these materials is to allow students to make use of them for solving problems with help of intelligent agents and their adopted algorithms. Moreover the concept of AI security will be introduced as well as the impact and implication of AI on cybersecurity.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Understand fully artificial intelligence and its application;
- Determine the type of environment for the intelligent agent such as robots in order to enhance its performance;
- Carry out problem solving activities on how to use artificial intelligence in the future;
- Carry out prototyping expert systems;
- Understand the concepts behind game playing and Natural Language Processing;
- Identify data breach;
- Understand the impact of security in AI;
- Distinguish among the different types of intelligent agents;
- Identify the relation between intelligent agents and its environment;
- Apply security measures for the use of AI
- Apply logic in problem solving and understand the limitations of logic;
- Understand the concepts of Natural Processing Language;

MACHINE LEARNING – 8 ECTS

This module introduces students to the basics of machine learning and data analytics in the current age of big data. After an initial part on numbers and concepts related to big data and on motivation for a new type of analytics based on machine learning, algorithms for both supervised and unsupervised learning are presented both in theory and practice via hands-on labs, to prepare students for research or industry application of machine learning techniques.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Understand the limitations and drawbacks of conventional programming in the age of big data;
- Develop an appreciation of how machines learn models from data;
- Assess the pros and cons of data-driven models;
- Understand a variety of supervised and unsupervised learning algorithms;
- Understand how to evaluate machine learning models for different problems;
- Analyse the application of machine learning (ML) technique in cyber- security;
- Identify automatic model building starting from conventional programming to machine learning;
- Learn about supervised and unsupervised model learning;
- Understand and comprehend the topic of clustering and dimensionality reduction;
- Analyse the relationship between machine learning and cybersecurity;
- Apply non parametric algorithms such as decision trees and random forests to lab work;
- Apply and understand the use of machine learning to respond to active cyber-attacks in real time;
- Comprehend the clustering models and algorithms such as k-Means, hierarchical and density based;
- Understand the limitations of traditional machine learning such as the curse of dimensionality, local priors and so on

DEEP LEARNING – 8 ECTS

Deep learning is machine learning driven by deep artificial neural networks. Assuming a general knowledge of the basic concepts introduced in machine learning, the course digs deeper into why and how artificial neural networks go beyond the generalised linear models and provide a universal function approximation by learning non-linear multi-dimensional spaces as output. After a broad discussion on general deep and wide feed forward neural networks (aka multilayer perceptron), two specialised deep learning solutions, namely convolutional neural networks and recurrent neural networks are introduced and thoroughly described to show how to effectively learn and process grid-shaped data and sequential data respectively. Finally, deep unsupervised neural networks are described as powerful solutions to learn unlabelled data by fine tuning the reconstruction error of the input. Various types of auto encoders are covered.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Understand the limitations and drawbacks of generalised linear models;
- Develop an appreciation of how deep and wide artificial neural networks work and learn powerful models from data and how they can be fine-tuned;
- Be able to re-train and tune hyperparameters of several classes of deep learning methods, in particular CNNs, RNNs, and GANs, on real-world datasets;
- Apply deep learning techniques to practical problems;
- Critically evaluate model performance and interpret results;
- Analyse NLP tasks that can be performed with deep learning, such as language translation, chatbots, speech recognition, text classification, and question-answering;
- Demonstrate the deep neural networks, layers, matrices, approximation and performance;
- Apply hyper parameters such as filter size, filter count, stride and padding;
- Apply advanced techniques for analysing complex data using neural networks, machine learning algorithms and NL
- Solve NLP problems using deep learning models to understand human languages and build better system
- Practice computer vision applications based on deep learning
- Use advanced deep learning techniques for CV and NLP

ARTIFICIAL INTELLIGENCE APPLICATIONS – 8 ECTS

The course builds on a relational understanding of Artificial Intelligence (AI) and focuses on opportunities, limitations, and challenges related to organisational use of AI for value creation. The course introduces different types of AI technologies and how they have emerged. Through theories of how the relationship and dynamics between organisations and technology can be understood, the course highlights how AI triggers new organisational and societal challenges. Against this backdrop, the course explores how, on operational and strategic levels, businesses can work with understanding, managing and creating value using AI.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Describe different types of AI technologies and account for their evolution;
- Account for and explain the role of AI in organisational value creation;
- Motivate different ethical challenges and issues raised by the use of AI in businesses;
- Analyse organisational challenges related to the management of AI in business;
- Design, construct, and evaluate intelligent software agents;
- Demonstrate theoretical and practical skills in developing intelligent software agents based on data-driven and logic-based methods.

NEURAL NETWORKS – 8 ECTS

Neural networks provide a model of computation drastically different from traditional computers. Typically, neural networks are not explicitly programmed to perform a given task; rather, they learn to do the task from examples of desired input/output behavior. This course will cover basic neural network architectures and learning algorithms, for applications in pattern recognition, image processing, and computer vision. Three forms of learning will be introduced (i.e., supervised, unsupervised and reinforcement learning) and applications of these will be discussed. The students will have a chance to try out several of these models on practical problems. Through the course, students will also examine the history of neural networks and state-of-the-art approaches to deep learning. They will learn to design neural network architectures and training procedures via hands-on assignments. Current research articles to appreciate state-of-the-art approaches will be presented.

Specific knowledge, skills and competencies:

At the end of the module/unit the learner will have acquired the responsibility and autonomy to:

- Define the common Evolutionary Computation methods;
- Describe evolutionary robotics;
- Identify the different learning techniques within the Artificial Neural Networks;
- Arrange learning in Artificial Neural Networks and differentiate between supervised, unsupervised, reinforcement and deep learning;
- Show the performance of the different artificial neural networks.

PROJECT WORK – 20 ECTS

The Master's Project work provides a means for both practical applications of the knowledge and skills obtained through classwork and extended, in-depth work on a focused project. Through the project, students have opportunities to gain experience in specific areas of interest or career development. Students are required to think about possible topics for the project-work at the end of the second semester or at the beginning of the third semester. Each student will be assigned a faculty member who will be the project advisor Project Advisor. The project advisor provides primary research guidance and mentorship to the students. The student, in consultation with his/her Project Advisor, is responsible for selecting an appropriate project topic, an overall plan of work, and a time schedule for completion. Students are required to present to the project advisor a proposal which must contain an introduction to the problem, a statement of the problem, significance and impact, the aims of the project, a description of the methods, and a realistic project timeline. The master project work is generally 40 pages, corresponding to 20000 words single-spaced or 10000 words double-spaced, not including the bibliography. However, the length will vary according to the topic and the method of analysis, so the appropriate length will be determined by the student and the project advisor. Once the project is completed and approved by the project advisor, the student has to present it by video-conference to the master committee. The master committee will be in charge of evaluating the project results and grading it.

CAREER BENEFITS OF THE MASTER

With technology changing quickly, Data science and AI are among the fastest growing and most in-demand careers today. A practical grounding in artificial intelligence (AI), data science and its business applications, equip with the knowledge and skills required to transform organisation into innovative, efficient, and sustainable companies of the future. The master offers an invaluable skill set essential to enter the workforce, succeed in this quickly-expanding field and contribute to contemporary advances in the field.

MOST IN DEMAND Data Science and AI careers:

- Computer programmer;
- Computer systems analyst;
- Software applications developer;
- Software architect;
- Software engineer;
- Data scientist;
- Engineering manager;
- Artificial Intelligence and machine learning engineer;
- machine learning scientist
- data engineer
- business intelligence (BI) developer
- data analyst

THE ONLINE EDUCATION THAT FITS YOUR NEEDS

Our online education model gives you the freedom to complete classes on your schedule and create a learning experience that your needs, with access to faculty and advisors who will support you throughout the master. All the modules will be taught online through an interactive Virtual Learning Environment where you can access synchronous and asynchronous lectures and project based and lab activities. Live interactive sessions and webinars will be organised by the professor to deepen relevant topics, present case studies and organise practical activities. The module also includes different discussion forums that allows students to create and process information, practice critical thinking and collaborate and interact simultaneously or asynchronously in the online learning environment.

Customised assistance by faculty and academic advisors will be provided to the students throughout the academic journey to improve academic success and results.

100%
ONLINE

**FULL TIME AND
PART-TIME**
SCHEDULE

90 ECTS / 2.250
HOURS OF INSTRUCTION

LEVEL 7 EQF
EUROPEAN QUALIFICATION
FRAMEWORK

LANGUAGE
ENGLISH

TUITION COSTS
€ 3.500

ENTRY REQUIREMENTS

The master is addressed to:

- Professionals wishing to enhance their technological skills to increase competitiveness in the global market;
- Professionals from the IT sector who wish to develop new skills in AI and Data science;
- Professionals and graduates interested in understanding the foundations and implications of Artificial Intelligence and Deep Learning in Business, Art, and Society

A bachelor degree of 3 or 4 year minimum 180 ECTS is required to be admitted to the Master.

START YOUR APPLICATION PROCESS THANKS TO THE SUPPORT OF OUR ADMISSIONS ADVISORS!

Complete the Online [APPLICATION FORM](#) to begin your application

