60 ECTS credits

12 months

Online

MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE & BIG DATA

UCAM
UNIVERSIDAD
Católica de Murcia

Structuralia

SUMMARY

STRUCTURALIA

Structuralia is an online school specialized in graduate engineering, infrastructure, construction, energy, building, new technologies, and digital transformation programs and courses. We are dedicated to providing high-quality education for engineers, architects, and STEM (science, technology, engineering, and mathematics) professionals.

Since our creation in 2001, over 200,000 students from more than 90 countries have participated in our virtual classrooms as we disseminate knowledge and guide professionals toward success.

To this effect, we collaborate with leading international experts in each field, which enables our students to specialize under the guidance of active professionals. Our constant interaction with major companies in each sector, as their specialized training provider, enables us to tailor high-quality academic material to meet the current job requirements of our students.

Our master's programs are certified by our partner universities, such as the Universidad Católica San Antonio de Murcia, UDAVINCI, or Universidad Isabel I.

Every day we strive to provide the best training for engineers, architects, and STEM professionals with a clear goal: your professional success.

BRIEF SUMMARY

Big Data is defined as the process of collecting large heterogeneous amounts of data for analysis (sometimes in real time). This data set is so large and complex that traditional processing means are ineffective, hence, the new forms and computer applications capable of managing and processing all this amount of data must be developed. Big Data was born as a response to these challenges, and above all, so that through data analysis, we may be able to attract more customers, avoid losing them, and improve our operational processes.

This program aims at guiding students in their understanding of the technologies behind Big Data and Artificial Intelligence. As a matter of fact, Artificial Intelligence applied to the real world requires extraordinary vision, and this course intends to show the path to understanding the technology, its applications, and the execution of advanced AI project management models.

WHO IS IT INTENDED FOR?

Engineers from all sectors.

Businesspeople, directors and executives who wish to learn about the possibilities and implications of the new digital transformation.

Workers from public and private sectors interested in entrepreneurship.

College and university students and professors; chambers of commerce, etc.

All those who wish to delve into the concepts and applications of digital transformation in any sector (e.g., Blockchain).

JOB OPPORTUNITIES

A Big Data + AI expert is capable of managing areas such as marketing, as well as the data team, and the analytics team, in addition to being able to lead a data-based transformation of the company. The job opportunities can be classified within the following groups:

· Digital Marketing Specialist: In marketing, the application of Artificial Intelligence is key to analyzing markets and improving user experience, which leads to increased sales.

· Business Translator: An expert who makes strategic decisions and who also has analytical training suitable to serve as a link between data scientists and business development.

· Data Scientist: Special agent in the tasks of application and use of Machine Learning techniques.

· Model Integrator: It is part of the chain of professionals responsible for executing Artificial Intelligence and Machine Learning work in the organization. It is a computer scientist who knows how algorithms work and is in charge of applying predictive models, as well as automating the change of that model when the continuous learning process improves it.

GOALS

The overall objective of this program is to guide the student towards developing a new technological profile and acquiring the management and software project development skills necessary in this changing world. The global objective consist of the following specific objectives:

- Understand what Big Data is; why talk about Big Data; what it is for and the technological elements that support the concept.

- Understand intelligent systems capable of responding to current demands.

- Know and design the architecture behind Big Data and Artificial Intelligence

- Develop ideation and management methodologies for AI projects

- Identify the factors that convert an AI solution into a viable project.

PROGRAM

1. ARTIFICIAL INTELLIGENCE

Unit 1. Introduction to Artificial Intelligence

- State of the art of artificial intelligence
- Philosophy of artificial intelligence
- Future of artificial intelligence
- Project development process with artificial intelligence
- Data, your greatest asset

Unit 2. Types of artificial intelligence

- Machine learning
- Deep learning
- Transformers
- Generation of synthetic data
- Hyperparameters in artificial intelligence models

Unit 3. Introduction to Machine Learning Algorithms

- Linear regression
- Non-linear regression and support vector machines (SVM)
- Decision trees, random forests
- Fuse logic and gradient down
- Recommendation systems

Unit 4. Artificial Intelligence Turnkey Project

- Preparation of the working environment: Anaconda, Visual Studio Code and Python
- Input dataset and data preprocessing
- TensorHub, TensorFlow and Keras
- Image processing

- Generation of artificial intelligence models

2. DATA MINING, MACHINE LEARNING AND DEEP LEARNING

Unit 1: Supervised learning (I)

- Introduction
- Simple, multiple, and logistic linear regression (I)
- Simple, multiple, and logistic linear regression (II)
- Support vector machines (svm)
- Decision trees

Unit 2: Supervised learning (II)

- knn (k-nearest neighbors)
- Naive bayes
- Evaluation of supervised models
- Example exercise
- Proposed exercise

Unit 3: Unsupervised learning

- Introduction to clustering: purconsider and metrics
- K-means clustering
- Hierarchical clustering, other techniques, and examples
- Principal component analysis (PCA)
- PCA example exercise

Unit 4: Deep learning

- Artificial Neural Networks (ANN) (I)
- Artificial Neural Networks (ANN) (II)
- Artificial Neural Networks (ANN) (III)
- Example exercise
- Proposed exercise

3. ADVANCED DEEP LEARNING

Unit 1. Supervised Deep Learning (I)

- Introduction
- Review: Artificial Neural Networks (Ann)
- Review: Ann Exercises
- Convolutional Neural Networks (Cnn)
- Cnn Exercises

Unit 2. Supervised Deep Learning (II)

- Natural Language Processing (I)
- Recurrent Neural Networks (Rnn) (I)
- Recurrent Neural Networks (Rnn) (II)
- Natural Language Processing (II)
- Rnn Exercise

Unit 3. Unsupervised Deep Learning (I)

- Boltzmann Machines (Bm)
- Restricted Boltzmann Machines (Rbm)
- Recommender Systems
- Recommender Systems: Metrics
- Rbm Exercise

Unit 4. Unsupervised Deep Learning (II)

- Self-Organizing Maps (Som)
- Som Exercices
- Autoencoders (Ae)
- Ae Exercises
- Proposed Exercise

4. TECHNOLOGY ECOSYSTEMS

Unit 1. Introduction to technology ecosystems

- The fourth industrial revolution
- Digital transformation in companies
- Fundamentals and key points
- Benefits
- Enabling technologies

Unit 2. Enabling technologies I

- Big data
- Cloud computing
- Blockchain
- Artificial intelligence
- Augmented and virtual reality

Unit 3. Enabling technologies II

- BIM
- Collaborative robots
- Additive manufacturing
- Hyperconnectivity
- IoT

Unit 4 enabling technologies III

- Manufacturing execution system (MES)
- Process integration and efficiency
- Use cases
- New methodologies: agile, lean startup or design thinking
- Business change management

5. IDEATION METHODOLOGIES AND TECHNIQUES AND AI PROJECT MANAGEMENT

Unit 1. Introduction

- Introduction
- Key elements in AI project management
- AI project characteristics
- Introduction to the main agile and ideation methodologies
- Methodology integration

Unit 2. Design Thinking

- Introduction
- Phase I: Empathize
- Phase II: Define
- Phase III: Devise
- Phase IV: Prototype

Unit 3. Lean start-up and Scrum

- Lean start-up. Basic concepts
- Lean start-up. Tools
- Scrum. Introduction
- Scrum. Roles
- Scrum. Ceremonies and artifacts

Unit 4. Application to AI projects

- Introduction
- Project ideation
- Project implementation
- Advice on implementing methodologies
- Summary and conclusions

6. THE IMPACT OF AI ON BUSINESS

Unit 1. AI applied to different sectors

- Financial sector
- Retail sector
- Industrial sector
- Agricultural sector
- Health sector

Unit 2. AI applied to different business areas

- Logistics and operations
- Marketing
- Sales and customer service
- Finance and control
- People analytics

Unit 3. AI and entrepreneurship

- Current scenario of a booming sector
- Financing
- Featured startups
- Future of the AI ecosystem
- Starting an AI company

Unit 4. Ethics. Business and society

- Ethics. General remarks
- Bias examples
- Global initiatives
- Public Institutions and regulations
- AI in the SDGs

7.INTRODUCTION TO BIG DATA

Unit 1: Data in business

- Data, information, knowledge, and wisdom
- Data Management I
- Data Management II
- Corporate Performance Management
- Databases

Unit 2: From business intelligence to Big Data

- Business intelligence
- Data Warehousing
- Big data
- Hadoop
- Spark

Unit 3: Big Data technological architecture

- Hadoop ecosystem I
- Hadoop ecosystem II
- Hadoop ecosystem III
- Spark ecosystem
- Big Data architecture. Installation and settings

Unit 4: Big Data Analytics

- Analytics
- Main algorithms I
- Main algorithms II
- Machine Learning and Deep Learning
- Internet of Things

8. RELATIONAL DATABASE: SQL. DATA WAREHOUSE

Unit 1: First steps into SQL

- Introduction to SQL
- Database management
- Data types
- Normalization
- SQL tables

Unit 2: SQL commands

- SQL table management
- Consulting SQL tables
- Combining SQL tables
- Combining tables and views
- Other SQL commands

Unit 3: SQL Functions

- Functions for strings and numerical operations (I)
- Numerical functions (II)
- Date and time
- Other functions
- Loops, conditionals and triggers in SQL

Unit 4: Data warehouse design

- Introduction to data warehousing
- Data warehouse database. Stage
- Data warehouse. ODS (I)
- Data in a data warehouse. ods (II)
- Data warehouse database. DDS

9. NOSQL AND HDFS DATABASES

Unit 1. Introduction to NOSQL database

- Introduction
- Multilingual persistence
- The Acid model
- New trends
- Comparison between SQL and NoSQL

Unit 2. NOSQL data models

- Data models
- Aggregation models
- Key-value aggregation models
- Document-oriented data models
- Column-oriented aggregation models
- Graph data models

Unit 3. Distributed databases

- Distributed databases
- Strategies for the design of distributed databases
- NOSQL database design
- Hadoop distributed file system (HDFS)

Unit 4. Examples of NOSQL databases

- NOSQL aggregation database
- RIak. Example of a key-value database
- Mongodb. Example of a document-oriented database
- Neo4j. Example of a NOSQL graph database

- Hbase. Example of a column-oriented database

MODULE X: MASTER´S FINAL PROJECT

The program is subject to possible variations / updates of the contents to improve their quality

AUTHOR PROFILE

DIRECTOR: MIGUEL ÁNGEL VERA MELLADO

Miguel Ángel is a Computer Science engineer, ACP, PMP, MBA and ITIL expert specialized in project management and in Big Data and Blockchain technology. In addition to his professional experience in working with clients, businesses and software factories, Vera Mellado has 10 years of capacity building experience with multiple companies, business and technical schools, as well as public administration agencies. Miguel Angel has extensive and solid experience in project management and bid coordination, as well as in people management in multidisciplinary teams. He strongly believes in goal-oriented work and in building the necessary capacities to overcome challenges.

Sandra Navarro

Sandra holds a bachelor 's degree in Business & Marketing Intelligence, Big Data & Digital Transformation, as well as specialized training in Advanced Analytics. She is also a specialist in the creation and maintenance of data infrastructure, in addition to the generation of dashboards, ad-hoc reports, and the implementation of tasks related to information quality. Sandra's professional experience has focused on information systems as business management catalysts.

Sergio Torres

Sergio is a Computer science Engineer, with a double master's degree in Big Data Architecture, Business Analytics and Big Data. He has also been officially certified by Hyperledger Fabric through The Linux Foundation. Sergio is a professor of blockchain technology in different universities and business schools.

Vanessa Sánchez Martín

Vanessa holds a Bachelor's degree in Economics, and her professional career has been greatly influenced by Law 10/2010 of April 28 on the Prevention of Money Laundering. She has worked in the field of Prevention of money laundering and financing of terrorism for large companies from different countries and sectors such as real estate, insurance, finance, gaming, jewelry, and most recently, cryptoasset and wallet custody providers.

The main responsibilities she has had in this field are:

- Operations analysis with Technical Unit

- Reporting and communications with SEPBLAC

- PBC technician in policy-making and procedure development; implementation of procedures with efficiency control mechanisms, creation of alerts and manuals.

- Consultant for different regulated entities in matters of money laundering.

Vanessa is an external expert officially registered in the *Executive Service of the Commission for the Prevention of Money Laundering and Monetary Offense (*SEPBLAC*)* as qualified to issue technical reports on the subject of money laundering, and the development and execution of action plans. She is also a certified Corporate Compliance expert, with experience in compliance procedures, risk management, crime prevention, internal audits, and regulatory compliance consulting.

Vanessa is passionate about training and capacity building, hence her years of teaching experience in the subjects of AML, Compliance, Blockchain regulations, crypto assets, and other risk analysis and management topics.

The following are some of her most relevant training:

- Bachelor's degree in Economics (Complutense University of Madrid).

- Master's degree in Financial Management and Stock Market (EFEM).

- Master's degree in SAP FI/BPC Consultant (official SAP BPC Certification) at IDE-CESEM.

- Master's degree in Compliance Officer and DPO (CUMPLEN certificate) at UNIR.

- Expert Course in Prevention of Money Laundering (Thomson Reuters).

- Blockchain and cryptoassets (University of Salamanca and Cyberwall).

METHODOLOGY

At Structuralia, we apply a modern methodology adapted to the process of change we live in today. Our educational environment is based on an online learning system, that is, learning by observing, reflecting, and practicing with an organized and carefully programmed study pace, which comes along with the constant support from our team. Our learning solution is designed to facilitate learning at the student's own pace, with a uniform structure that includes continuous evaluations and practical exercises to reinforce knowledge.

Our program's calendar consists of 9 monthly modules, which are divided into 4 weekly teaching units. In addition, there are 3 months for the Master's Final Project (MFP). This structure may be adjusted depending on the innate complexities of the program.

Each of these units contain introductory videos on concepts, syllabus prepared by our experts (which can be viewed online or downloaded in PDF), and self-assessments. Some units may even have practical exercises or examples, if required by the expert. At the end of each module, there will be a compulsory exam in order to complete the module.

The Director will ask all students to complete a Master's project, in which they will apply everything they have learnt in the previous modules, to practical cases. Students will have 3 months to complete and submit the project, during which they will receive the support from the program's team.

Finally, you will receive the status reports from our team through regular follow-ups throughout the program.

EVALUATION

The assessment will be ongoing throughout the training program and will take into account not only the acquisition of knowledge, but also the development of skills and attitudes.

At the end of each monthly module, the student must answer a test-type exam on the online training platform, in addition to pose a variety of practical cases along the topics and optional unit test so as to achieve the maximum consolidation of technical concepts.

To obtain the degree it will be necessary to pass the assessable modules of the program.

DEGREE

Students who have visualized all the lessons, successfully passed the self-assessments and exams, and submitted the master's final project, will receive Structuralia's certificate and the title of Master of Professional Development by the Universidad Católica San Antonio de Murcia (UCAM), in digital format.

Likewise, the student can request a certificate of completion of his/her master's degree, or a certificate of completion from Structuralia.

The student may also request a the Hague Apostille on his/her certificate of completion from the university an additional fee.

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