Professional Master's Degree

Artificial Intelligence in Programming

tech technological university

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Professional Master's Degree
Artificial Intelligence in Programming

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/in/information-technology/professional-master-degree/master-artificial-intelligence-programming

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01

Introduction

Artificial Intelligence (AI) has emerged as a fundamental pillar in the world of programming, due to its ability to automate complex tasks, make data-driven decisions and learn from patterns. In fact, AI offers tools and techniques that enable the creation of smarter and more efficient systems. From machine learning algorithms, which improve the accuracy of programs, to the development of autonomous systems, capable of making decisions in real time, AI has radically transformed the way code is designed and executed. In this context, TECH has developed an educational program that will give graduates the opportunity to immerse themselves in the latest advances in this area, through the revolutionary *Relearning* methodology

This program in Artificial Intelligence in Programming will provide you with a holistic perspective on how AI impacts and improves every stage of software development"

The importance of Artificial Intelligence in Programming lies in its ability to empower and automate processes, optimizing software development and improving efficiency in solving complex problems. Its ability to analyze large volumes of data and find optimal solutions has led to significant advances in fields such as the optimization of algorithms, the creation of more intuitive interfaces and the resolution of complex problems in different areas

That is why TECH has developed this Professional Master's Degree, which emerges as a strategic solution to amplify the professional opportunities and career growth of computer scientists. It will address the improvement of productivity in software development through AI, exploring techniques and tools that automate processes, optimize code and accelerate the creation of intelligent applications

In addition, the program will focus on the crucial role of AI in the field of QA Testing, implementing AI algorithms and methods to improve test quality, accuracy and coverage, detecting and correcting errors more efficiently. It will also delve into the integration of machine learning and natural language processing capabilities in web development, creating intelligent sites that adapt and offer personalized experiences to users

Furthermore, it will delve into AI techniques to improve the usability, interaction and functionality of mobile applications, to create intelligent and predictive applications that adapt to user behavior. Likewise, software architecture with AI will be analyzed in depth, including the various models that will facilitate the integration of AI algorithms and their deployment in production environments

With the purpose of nurturing highly competent AI specialists, TECH has conceived a comprehensive program based on the unique *Relearning* methodology. This approach will allow students to consolidate their understanding through repetition of fundamental concepts

This **Professional Master's Degree in Artificial Intelligence in Programming** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- Development of practical cases presented by experts in Artificial Intelligence in Programming
- Graphic, schematic, and practical contents which provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

You will lead innovative projects adapted to the demands of a constantly evolving technology market" What are you waiting for to enroll?"

You will dive into the fundamentals of software architecture, including performance, scalability and maintainability, thanks to the most innovative multimedia resources"

Looking to specialize in Artificial Intelligence? With this program you will master deployment process optimization and AI integration in cloud computing.

You will delve into the integration of AI elements in Visual Studio Code and code optimization with ChatGPT, all through a comprehensive educational program.

The program's teaching staff includes professionals from the field who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn in real situations

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts

02

Objectives

The main objective of this program will be to provide professionals with access to the most cutting-edge knowledge in the field, with an approach that promotes their comprehensive education. As such, they will have the opportunity to participate in an exclusive and fully online educational pathway. Graduates will be equipped with useful cutting-edge skills, from AI-powered software development to the design and execution of web projects and mobile applications with intelligence and adaptability. With this program, the computer scientist will transcend the boundaries of conventional programming and become an active player in the technological revolution

You will tackle the testing life cycle, from the creation of test cases to the detection of bugs, thanks to TECH"

General Objectives

- Develop skills to configure and manage efficient development environments, ensuring a solid foundation for the implementation of AI projects
- Acquire skills in planning, executing and automating quality testing, incorporating AI tools for bug detection and correction
- Understand and apply performance, scalability and maintainability principles in the design of large-scale computing systems
- Become familiar with the most important design patterns and apply them effectively in software architecture

Specific Objectives

Module 1. Fundamentals of Artificial Intelligence

- Analyze the historical evolution of Artificial Intelligence, from its beginnings to its current state, identifying key milestones and developments
- Understand the functioning of neural networks and their application in learning models in Artificial Intelligence
- Study the principles and applications of genetic algorithms, analyzing their usefulness in solving complex problems
- Analyze the importance of thesauri, vocabularies and taxonomies in the structuring and processing of data for AI systems
- Explore the concept of the semantic web and its influence on the organization and understanding of information in digital environments

Module 2. Data Types and Data Life Cycle

- Understand the fundamental concepts of statistics and their application in data analysis
- Identify and classify the different types of statistical data, from quantitative to qualitative data
- Analyze the life cycle of data, from generation to disposal, identifying key stages
- Explore the initial stages of the data life cycle, highlighting the importance of data planning and structure
- Study data collection processes, including methodology, tools and collection channels
- Explore the *Datawarehouse* concept, with emphasis on the elements that comprise it and its design
- Analyze the regulatory aspects related to data management, complying with privacy and security regulations, as well as best practices

Module 3. Data in Artificial Intelligence

- Master the fundamentals of data science, covering tools, types and sources for information analysis
- Explore the process of transforming data into information using data mining and visualization techniques
- Study the structure and characteristics of *datasets*, understanding their importance in the preparation and use of data for Artificial Intelligence models
- Analyze supervised and unsupervised models, including methods and classification
- Use specific tools and best practices in data handling and processing, ensuring efficiency and quality in the implementation of Artificial Intelligence

Module 4. Data Mining. Selection, Pre-Processing and Transformation

- Master the techniques of statistical inference to understand and apply statistical methods in data mining
- Perform detailed exploratory analysis of data sets to identify relevant patterns, anomalies, and trends
- Develop skills for data preparation, including data cleaning, integration, and formatting for use in data mining
- Implement effective strategies for handling missing values in datasets, applying imputation or elimination methods according to context
- Identify and mitigate noise present in data, using filtering and smoothing techniques to improve the quality of the data set
- Address data preprocessing in *Big Data* environments

Module 5. Algorithm and Complexity in Artificial Intelligence

- Introduce algorithm design strategies, providing a solid understanding of fundamental approaches to problem solving
- Analyze the efficiency and complexity of algorithms, applying analysis techniques to evaluate performance in terms of time and space
- Study and apply sorting algorithms, understanding their performance and comparing their efficiency in different contexts
- Explore tree-based algorithms, understanding their structure and applications
- Investigate algorithms with *Heaps*, analyzing their implementation and usefulness in efficient data manipulation
- Analyze graph-based algorithms, exploring their application in the representation and solution of problems involving complex relationships
- Study *Greedy*algorithms, understanding their logic and applications in solving optimization problems
- Investigate and apply the *backtracking* technique for systematic problem solving, analyzing its effectiveness in various scenarios

Module 6. Intelligent Systems

- Explore agent theory, understanding the fundamental concepts of its operation and its application in Artificial Intelligence and software engineering
- Study the representation of knowledge, including the analysis of ontologies and their application in the organization of structured information
- Analyze the concept of the semantic web and its impact on the organization and retrieval of information in digital environments
- Evaluate and compare different knowledge representations, integrating these to improve the efficiency and accuracy of intelligent systems
- Study semantic reasoners, knowledge-based systems and expert systems, understanding their functionality and applications in intelligent decision making

Module 7: Machine Learning and Data Mining

- Introduce the processes of knowledge discovery and the fundamental concepts of machine learning
- Study decision trees as supervised learning models, understanding their structure and applications
- Evaluate classifiers using specific techniques to measure their performance and accuracy in data classification
- Study neural networks, understanding their operation and architecture to solve complex machine learning problems
- Explore Bayesian methods and their application in machine learning, including Bayesian networks and Bayesian classifiers
- Analyze regression and continuous response models for predicting numerical values from data
- Study *clustering* techniques to identify patterns and structures in unlabeled data sets
- Explore text mining and natural language processing (NLP), understanding how machine learning techniques are applied to analyze and understand text

Module 8. Neural Networks, the Basis of *Deep Learning*

- Master the fundamentals of Deep Learning, understanding its essential role in *Deep Learning*
- Explore the fundamental operations in neural networks and understand their application in model building
- Analyze the different layers used in neural networks and learn how to select them appropriately
- Understand the effective linking of layers and operations to design complex and efficient neural network architectures
- Use trainers and optimizers to tune and improve the performance of neural networks
- Explore the connection between biological and artificial neurons for a deeper understanding of model design
- Tune hyperparameters for *Fine Tuning* of neural networks, optimizing their performance on specific tasks

Module 9. Deep Neural Networks Training

- Solve gradient-related problems in deep neural network training
- Explore and apply different optimizers to improve the efficiency and convergence of models
- Program the learning rate to dynamically adjust the convergence speed of the model
- Understand and address overfitting through specific strategies during training
- Apply practical guidelines to ensure efficient and effective training of deep neural networks
- Implement *Transfer Learning* as an advanced technique to improve model performance on specific tasks
- Explore and apply *Data Augmentation* techniques to enrich datasets and improve model generalization
- Develop practical applications using *Transfer Learning* to solve real-world problems
- Understand and apply regularization techniques to improve generalization and avoid overfitting in deep neural networks

Module 10. Model Customization and Training with *TensorFlow*

- Master the fundamentals of *TensorFlow* and its integration with NumPy for efficient data management and calculations
- Customize models and training algorithms using the advanced capabilities of *TensorFlow*
- Explore the tfdata API to efficiently manage and manipulate datasets
- Implement the TFRecord format for storing and accessing large datasets in *TensorFlow*
- Use Keras preprocessing layers to facilitate the construction of custom models
- Explore the *TensorFlow Datasets* project to access predefined datasets and improve development efficiency
- Develop a *Deep Learning* application with *TensorFlow*, integrating the knowledge acquired in the module
- Apply in a practical way all the concepts learned in building and training custom models with *TensorFlow* in real-world situations

Module 11. Deep Computer Vision with Convolutional Neural Networks

- Understand the architecture of the visual cortex and its relevance in *Deep Computer Vision*
- Explore and apply convolutional layers to extract key features from images
- Implement clustering layers and their use in *Deep Computer Vision* models with Keras
- Analyze various Convolutional Neural Network (CNN) architectures and their applicability in different contexts
- Develop and implement a CNN ResNet using the Keras library to improve model efficiency and performance
- Use pre-trained Keras models to leverage transfer learning for specific tasks
- Apply classification and localization techniques in *Deep Computer Vision* environments
- Explore object detection and object tracking strategies using Convolutional Neural Networks
- Implement semantic segmentation techniques to understand and classify objects in images in a detailed manner

Module 12. Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention

- Developing skills in text generation using Recurrent Neural Networks (RNN)
- Apply RNNs in opinion classification for sentiment analysis in texts
- Understand and apply attentional mechanisms in natural language processing models
- Analyze and use *Transformers* models in specific NLP tasks
- Explore the application of *Transformers* models in the context of image processing and computer vision
- Become familiar with the *Hugging Face Transformers* library for efficient implementation of advanced models
- Compare different *Transformers* libraries to evaluate their suitability for specific tasks
- Develop a practical application of NLP that integrates RNN and attention mechanisms to solve real-world problems

Module 13. *Autoencoders, GANs* and Diffusion Models

- Develop efficient representations of data using *Autoencoders*, *GANs* and Diffusion Models
- Perform PCA using an incomplete linear autoencoder to optimize data representation
- Implement and understand the operation of stacked autoencoders
- Explore and apply convolutional autoencoders for efficient visual data representations
- Analyze and apply the effectiveness of sparse automatic encoders in data representation
- Generate fashion images from the MNIST dataset using *Autoencoders*
- Understand the concept of Generative Adversarial Networks (*GANs*) and Diffusion Models
- Implement and compare the performance of Diffusion Models and *GANs* in data generation

Module 14. Bio-Inspired Computing

- Introduce the fundamental concepts of bio-inspired computing
- Explore social adaptation algorithms as a key approach in bio-inspired computing
- Analyze space exploration-exploitation strategies in genetic algorithms
- Examine models of evolutionary computation in the context of optimization
- Continue detailed analysis of evolutionary computation models
- Apply evolutionary programming to specific learning problems
- Address the complexity of multi-objective problems in the framework of bio-inspired computing
- Explore the application of neural networks in the field of bio-inspired computing
- Delve into the implementation and usefulness of neural networks in bio-inspired computing

Module 15. Artificial Intelligence: Strategies and applications

- Develop strategies for the implementation of artificial intelligence in financial services
- Analyze the implications of artificial intelligence in the delivery of healthcare services
- Identify and assess the risks associated with the use of AI in the healthcare field
- Assess the potential risks associated with the use of AI in industry
- Apply artificial intelligence techniques in industry to improve productivity
- Design artificial intelligence solutions to optimize processes in public administration
- Evaluate the implementation of AI technologies in the education sector
- Apply artificial intelligence techniques in forestry and agriculture to improve productivity
- Optimize human resources processes through the strategic use of artificial intelligence

Module 16. Software Development Productivity Improvement with AI

- Delve into the implementation of must-have AI extensions in Visual Studio Code to improve productivity and facilitate software development
- Gain a solid understanding of basic AI concepts and their application in software development, including machine learning algorithms, natural language processing, neural networks, etc
- Master the configuration of optimized development environments, ensuring that students are able to create environments conducive to AI projects
- Apply specific techniques using ChatGPT for the automatic identification and correction of potential code improvements, encouraging more efficient programming practices
- Promote collaboration between professionals from different programmers (from programmers to data engineers to user experience designers) to develop effective and ethical AI software solutions

Module 17. Software Architecture for QA Testing

- Develop skills to design solid test plans, covering different types of testing and ensuring software quality
- Recognize and analyze different types of software frameworks, such as monolithic, microservices or service oriented
- Gain a comprehensive vision on the principles and techniques for designing computer systems that are scalable and capable of handling large volumes of data
- Apply advanced skills in the implementation of AI-powered data structures to optimize software performance and efficiency
- Develop secure development practices, with a focus on avoiding vulnerabilities to ensure software security at the architectural level

Module 18. Website Projects with AI

- Develop comprehensive skills for the implementation of web projects, from frontend design to backend optimization, with the inclusion of AI elements
- Optimize the process of deploying websites, incorporating techniques and tools to improve speed and efficiency
- Integrate AI into cloud computing, enabling students to create highly scalable and efficient web projects
- Acquire the ability to identify specific problems and opportunities in web projects where AI can be effectively applied, such as in text processing, personalization, content recommendation, etc
- Encourage students to keep abreast of the latest trends and advances in AI for its proper application in web projects

Module 19. Mobile Applications with AI

- Apply advanced concepts of clean architecture, datasources and repositories to ensure a robust and modular structure in AI-enabled mobile applications
- Develop skills to design interactive screens, icons and graphical resources using AI to enhance the user experience in mobile applications
- Delve into the configuration of the mobile app framework and use Github Copilot to streamline the development process
- Optimize mobile applications with AI for efficient performance, taking into account resource management and data usage
- Perform quality testing of AI mobile applications, enabling students to identify problems and debug bugs

Module 20. AI for QA Testing

- Master principles and techniques for designing computer systems that are scalable and capable of handling large volumes of data
- Apply advanced skills in the implementation of AI-powered data structures to optimize software performance and efficiency
- Understand and apply secure development practices, with a focus on avoiding vulnerabilities such as injection, to ensure software security at the architectural level
- Generate automated tests, especially in web and mobile environments, integrating AI tools to improve process efficiency
- Use advanced AI-powered QA tools for more efficient bug detection and continuous software improvement

You will master the technologies of the future with this exclusive 100% online university program. Only with TECH!"

03

Skills

This program will provide graduates with a significant advantage in the computer development industry by equipping them with specific and up-to-date skills in Artificial Intelligence (AI). Professionals will not only be able to design and develop advanced software, but also to implement AI solutions effectively in diverse applications, from web and mobile projects, to large-scale software architecture. In addition, addressing development productivity and QA Testing best practices will ensure that computer scientists are prepared to face real-world challenges and excel in an ever-evolving field

Thanks to this university program you will be able to implement AI algorithms in web projects and mobile applications"

General Skills

- Apply AI extensions in Visual Studio Code and no-code design techniques to increase efficiency in software development
- Use ChatGPT to optimize and improve code quality, applying advanced programming practices
- Implement web projects, from workspace creation to deployment, integrating AI on both the frontend and backend
- Develop AI-enabled mobile applications, from environment configuration to the creation of advanced features and management of graphical resources
- Apply advanced storage concepts and AI-powered data structures to improve system efficiency and scalability
- Include secure development practices, avoiding vulnerabilities such as injection, to ensure the integrity and security of developed software

You will be able to design personalized and intuitive user experiences through Artificial Intelligence. Enroll now!"

Specific Skills

- Apply AI techniques and strategies to improve efficiency in the *retail* sector
- Implement noise removal techniques using automatic encoders
- Effectively create training data sets for natural language processing (NLP) tasks
- Run grouping layers and their use in *Deep Computer Vision* models with Keras
- Use *TensorFlow* features and graphs to optimize the performance of custom models
- Optimize the development and application of *chatbots* and virtual assistants, understanding their operation and potential applications
- Master reuse of pre-workout layers to optimize and accelerate the training process
- Build the first neural network, applying the concepts learned in practice
- Activate Multilayer Perceptron (MLP) using the Keras library
- Apply data scanning and preprocessing techniques, identifying and preparing data for effective use in machine learning models
- Investigate languages and software for the creation of ontologies, using specific tools for the development of semantic models
- Develop data cleaning techniques to ensure the quality and accuracy of the information used in subsequent analyses
- Master the configuration of optimized development environments, ensuring that students are able to create environments conducive to AI projects
- Apply specific techniques, using ChatGPT for the automatic identification and correction of potential code improvements, encouraging more efficient programming practices
- Create automated tests, especially in web and mobile environments, integrating AI tools to improve process efficiency
- Use advanced AI-powered QA tools for more efficient bug detection and continuous software improvement
- Integrate AI into cloud computing, enabling to study create highly scalable and efficient web projects
- Delve into the configuration of the mobile app framework and use Github Copilot to streamline the development process

04

Course Management

In its commitment to elite teaching, TECH has carefully selected the teachers responsible for developing the syllabus for this program. Therefore, this educational program relies on an experienced faculty that has an outstanding background in the application of artificial intelligence in programming tasks. In this way, students of this Professional Master's Degree will have access to a first-class educational experience, with a unique combination of knowledge presented in various audiovisual media, for a more effective and dynamic integration of knowledge

Get up to date on the latest trends in Artificial Intelligence applied to Programming from the best experts in the field"

Management

Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometeus Global Solutions
- CTO at Korporate Technologies
- CTO at AI Shephers GmbH
- Consultant and Strategic Business Advisor at Alliance Medical
- Director of Design and Development at DocPath
- PhD. in Psychology from the University of Castilla - La Mancha
- PhD in Economics, Business and Finance from the Camilo José Cela University
- PhD in Psychology from University of Castilla – La Mancha
- Máster in Executive MBA por la Universidad Isabel I
- Master's Degree in Sales and Marketing Management, Isabel I University
- Expert Master's Degree in Big Data by Hadoop Training
- Master's Degree in Advanced Information Technologies from the University of Castilla - la Mancha
- Member of: SMILE Research Group

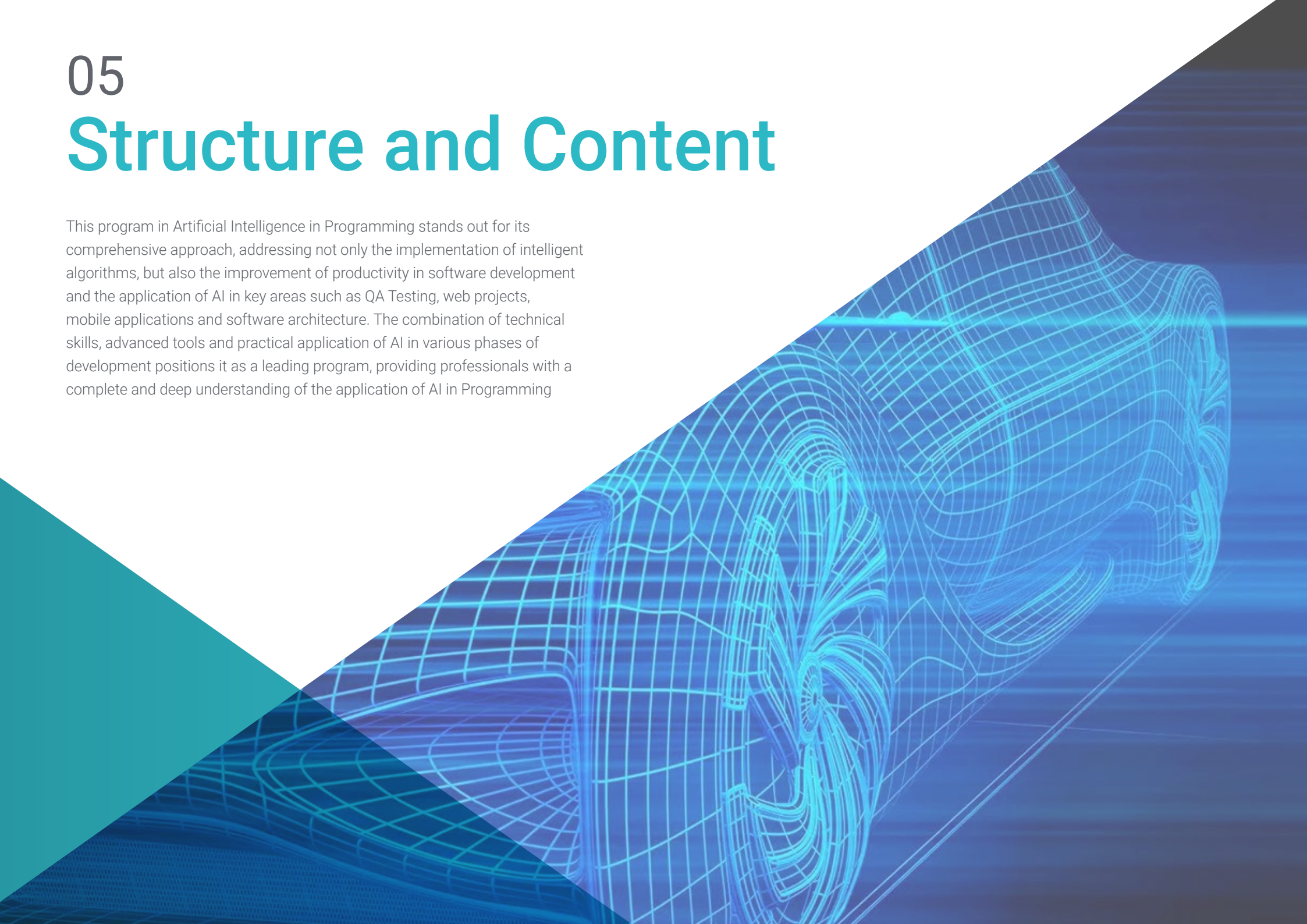
Mr. Castellanos Herreros Ricardo

- Chief Technology Officer en OWQLO
- Consultor Técnico Freelance
- Desarrollador de Aplicaciones Móviles para eDreams, Fnac, Air Europa, Bankia, Cetelem, Banco Santander, Santillana,
- Groupón y Grupo Planeta
- Desarrollador de Páginas Web para Openbank y Banco Santander
- Curso de Machine Learning Engineer en Udacity
- Ingeniero Técnico en Informática de Sistemas por la Universidad de Castilla la Mancha

05

Structure and Content

This program in Artificial Intelligence in Programming stands out for its comprehensive approach, addressing not only the implementation of intelligent algorithms, but also the improvement of productivity in software development and the application of AI in key areas such as QA Testing, web projects, mobile applications and software architecture. The combination of technical skills, advanced tools and practical application of AI in various phases of development positions it as a leading program, providing professionals with a complete and deep understanding of the application of AI in Programming



You will delve into the practical application of AI in web projects, including both frontend and backend development"

Module 1. Fundamentals of Artificial Intelligence

1.1. History of Artificial Intelligence
- 1.1.1. When Do We Start Talking About Artificial Intelligence?
- 1.1.2. References in Film
- 1.1.3. Importance of Artificial Intelligence
- 1.1.4. Technologies that Enable and Support Artificial Intelligence

1.2. Artificial Intelligence in Games
- 1.2.1. Game Theory
- 1.2.2. *Minimax* and Alpha-Beta Pruning
- 1.2.3. Simulation: Monte Carlo

1.3. Neural Networks
- 1.3.1. Biological Fundamentals
- 1.3.2. Computational Model
- 1.3.3. Supervised and Unsupervised Neural Networks
- 1.3.4. Simple Perceptron
- 1.3.5. Multilayer Perceptron

1.4. Genetic Algorithms
- 1.4.1. History
- 1.4.2. Biological Basis
- 1.4.3. Problem Coding
- 1.4.4. Generation of the Initial Population
- 1.4.5. Main Algorithm and Genetic Operators
- 1.4.6. Evaluation of Individuals: Fitness

1.5. Thesauri, Vocabularies, Taxonomies
- 1.5.1. Vocabulary
- 1.5.2. Taxonomy
- 1.5.3. Thesauri
- 1.5.4. Ontologies
- 1.5.5. Knowledge Representation: Semantic Web

1.6. Semantic Web
- 1.6.1. Specifications RDF, RDFS and OWL
- 1.6.2. Inference/ Reasoning
- 1.6.3. *Linked Data*

1.7. Expert systems and DSS
- 1.7.1. Expert Systems
- 1.7.2. Decision Support Systems

1.8. *Chatbots* and Virtual Assistants
- 1.8.1. Types of Assistants: Voice and Text Assistants
- 1.8.2. Fundamental Parts for the Development of an Assistant: *Intents*, Entities and Dialog Flow
- 1.8.3. Integrations: Web, *Slack*, Whatsapp, Facebook
- 1.8.4. Assistant Development Tools: *Dialog Flow*, *Watson Assistant*

1.9. AI Implementation Strategy

1.10. Future of Artificial Intelligence
- 1.10.1. Understand How to Detect Emotions Using Algorithms
- 1.10.2. Creating a Personality: Language, Expressions and Content
- 1.10.3. Trends of Artificial Intelligence
- 1.10.4. Reflections

Module 2. Data Types and Data Life Cycle

2.1. Statistics
- 2.1.1. Statistics: Descriptive Statistics, Statistical Inferences
- 2.1.2. Population, Sample, Individual
- 2.1.3. Variables: Definition, Measurement Scales

2.2. Types of Data Statistics
- 2.2.1. According to Type
  - 2.2.1.1. Quantitative: Continuous Data and Discrete Data
  - 2.2.1.2. Qualitative: Binomial Data, Nominal Data and Ordinal Data
- 2.2.2. According to their Shape
  - 2.2.2.1. Numeric
  - 2.2.2.2. Text:
  - 2.2.2.3. Logical
- 2.2.3. According to its Source
  - 2.2.3.1. Primary
  - 2.2.3.2. Secondary

2.3. Life Cycle of Data
- 2.3.1. Stages of the Cycle
- 2.3.2. Milestones of the Cycle
- 2.3.3. FAIR Principles

2.4. Initial Stages of the Cycle
- 2.4.1. Definition of Goals
- 2.4.2. Determination of Resource Requirements
- 2.4.3. Gantt Chart
- 2.4.4. Data Structure

2.5. Data Collection
- 2.5.1. Methodology of Data Collection
- 2.5.2. Data Collection Tools
- 2.5.3. Data Collection Channels

2.6. Data Cleaning
- 2.6.1. Phases of Data Cleansing
- 2.6.2. Data Quality
- 2.6.3. Data Manipulation (with R)

2.7. Data Analysis, Interpretation and Evaluation of Results
- 2.7.1. Statistical Measures
- 2.7.2. Relationship Indexes
- 2.7.3. Data Mining

2.8. Data Warehouse (*Datawarehouse*)
- 2.8.1. Elements that Comprise it
- 2.8.2. Design
- 2.8.3. Aspects to Consider

2.9. Data Availability
- 2.9.1. Access
- 2.9.2. Uses
- 2.9.3. Security/Safety

2.10. Regulatory Aspects
- 2.10.1. Data Protection Law
- 2.10.2. Good Practices
- 2.10.3. Other Normative Aspects

Module 3. Data in Artificial Intelligence

3.1. Data Science
- 3.1.1. Data Science
- 3.1.2. Advanced Tools for Data Scientists

3.2. Data, Information and Knowledge
- 3.2.1. Data, Information and Knowledge
- 3.2.2. Types of Data
- 3.2.3. Data Sources

3.3. From Data to Information
- 3.3.1. Data Analysis
- 3.3.2. Types of Analysis
- 3.3.3. Extraction of Information from a *Dataset*

3.4. Extraction of Information Through Visualization
- 3.4.1. Visualization as an Analysis Tool
- 3.4.2. Visualization Methods
- 3.4.3. Visualization of a Data Set

3.5. Data Quality
- 3.5.1. Quality Data
- 3.5.2. Data Cleaning
- 3.5.3. Basic Data Pre-Processing

3.6. *Dataset*
- 3.6.1. *Dataset* Enrichment
- 3.6.2. The Curse of Dimensionality
- 3.6.3. Modification of Our Data Set

3.7. Unbalance
- 3.7.1. Classes of Unbalance
- 3.7.2. Unbalance Mitigation Techniques
- 3.7.3. Balancing a *Dataset*

3.8. Unsupervised Models
- 3.8.1. Unsupervised Model
- 3.8.2. Methods
- 3.8.3. Classification with Unsupervised Models

3.9. Supervised Models
- 3.9.1. Supervised Model
- 3.9.2. Methods
- 3.9.3. Classification with Supervised Models

3.10. Tools and Good Practices
- 3.10.1. Good Practices for Data Scientists
- 3.10.2. The Best Model
- 3.10.3. Useful Tools

Module 4. Data Mining: Selection, Pre-Processing and Transformation

4.1. Statistical Inference
- 4.1.1. Descriptive Statistics vs. Statistical Inference
- 4.1.2. Parametric Procedures
- 4.1.3. Non-Parametric Procedures

4.2. Exploratory Analysis
- 4.2.1. Descriptive Analysis
- 4.2.2. Visualization
- 4.2.3. Data Preparation

4.3. Data Preparation
- 4.3.1. Integration and Data Cleaning
- 4.3.2. Normalization of Data
- 4.3.3. Transforming Attributes

4.4. Missing Values
- 4.4.1. Treatment of Missing Values
- 4.4.2. Maximum Likelihood Imputation Methods
- 4.4.3. Missing Value Imputation Using Machine Learning

4.5. Noise in the Data
- 4.5.1. Noise Classes and Attributes
- 4.5.2. Noise Filtering
- 4.5.3. The Effect of Noise

4.6. The Curse of Dimensionality
- 4.6.1. *Oversampling*
- 4.6.2. *Undersampling*
- 4.6.3. Multidimensional Data Reduction

4.7. From Continuous to Discrete Attributes
- 4.7.1. Continuous Data Vs. Discreet Data
- 4.7.2. Discretization Process

4.8. The Data
- 4.8.1. Data Selection
- 4.8.2. Prospects and Selection Criteria
- 4.8.3. Selection Methods

4.9. Instance Selection
- 4.9.1. Methods for Instance Selection
- 4.9.2. Prototype Selection
- 4.9.3. Advanced Methods for Instance Selection

4.10. Data Pre-Processing in Big Data Environments

Module 5. Algorithm and Complexity in Artificial Intelligence

5.1. Introduction to Algorithm Design Strategies
- 5.1.1. Recursion
- 5.1.2. Divide and Conquer
- 5.1.3. Other Strategies

5.2. Efficiency and Analysis of Algorithms
- 5.2.1. Efficiency Measures
- 5.2.2. Measuring the Size of the Input
- 5.2.3. Measuring Execution Time
- 5.2.4. Worst, Best and Average Case
- 5.2.5. Asymptotic Notation
- 5.2.6. Mathematical Analysis Criteria for Non-Recursive Algorithms
- 5.2.7. Mathematical Analysis of Recursive Algorithms
- 5.2.8. Empirical Analysis of Algorithms

5.3. Sorting Algorithms
- 5.3.1. Concept of Sorting
- 5.3.2. Bubble Sorting
- 5.3.3. Sorting by Selection
- 5.3.4. Sorting by Insertion
- 5.3.5. *Merge Sort*
- 5.3.6. *Quick Sort*

5.4. Algorithms with Trees
- 5.4.1. Tree Concept
- 5.4.2. Binary Trees
- 5.4.3. Tree Paths
- 5.4.4. Representing Expressions
- 5.4.5. Ordered Binary Trees
- 5.4.6. Balanced Binary Trees

5.5. Algorithms Using *Heaps*
- 5.5.1. *Heaps*
- 5.5.2. The *Heapsort* Algorithm
- 5.5.3. Priority Queues

5.6. Graph Algorithms
- 5.6.1. Representation
- 5.6.2. Traversal in Width
- 5.6.3. Depth Travel
- 5.6.4. Topological Sorting

5.7. *Greedy* Algorithms
- 5.7.1. *Greedy* Strategy
- 5.7.2. Elements of the *Greedy* Strategy
- 5.7.3. Currency Exchange
- 5.7.4. Traveler's Problem
- 5.7.5. Backpack Problem

5.8. Minimal Path Finding
- 5.8.1. The Minimum Path Problem
- 5.8.2. Negative Arcs and Cycles
- 5.8.3. Dijkstra's Algorithm

5.9. *Greedy* Algorithms on Graphs
- 5.9.1. The Minimum Covering Tree
- 5.9.2. Prim's Algorithm
- 5.9.3. Kruskal's Algorithm
- 5.9.4. Complexity Analysis

5.10. *Backtracking*
- 5.10.1. *Backtracking*
- 5.10.2. Alternative Techniques

Module 6. Intelligent Systems

6.1. Agent Theory
- 6.1.1. Concept History
- 6.1.2. Agent Definition
- 6.1.3. Agents in Artificial Intelligence
- 6.1.4. Agents in Software Engineering

6.2. Agent Architectures
- 6.2.1. The Reasoning Process of an Agent
- 6.2.2. Reactive Agents
- 6.2.3. Deductive Agents
- 6.2.4. Hybrid Agents
- 6.2.5. Comparison

6.3. Information and Knowledge
- 6.3.1. Difference between Data, Information and Knowledge
- 6.3.2. Data Quality Assessment
- 6.3.3. Data Collection Methods
- 6.3.4. Information Acquisition Methods
- 6.3.5. Knowledge Acquisition Methods

6.4. Knowledge Representation
- 6.4.1. The Importance of Knowledge Representation
- 6.4.2. Definition of Knowledge Representation According to Roles
- 6.4.3. Knowledge Representation Features

6.5. Ontologies
- 6.5.1. Introduction to Metadata
- 6.5.2. Philosophical Concept of Ontology
- 6.5.3. Computing Concept of Ontology
- 6.5.4. Domain Ontologies and Higher-Level Ontologies
- 6.5.5. How to Build an Ontology?

6.6. Ontology Languages and Ontology Creation Software
- 6.6.1. Triple RDF, *Turtle* and N
- 6.6.2. RDF *Schema*
- 6.6.3. OWL
- 6.6.4. SPARQL
- 6.6.5. Introduction to Ontology Creation Tools
- 6.6.6. Installing and Using *Protégé*

6.7. Semantic Web
- 6.7.1. Current and Future Status of the Semantic Web
- 6.7.2. Semantic Web Applications

6.8. Other Knowledge Representation Models
- 6.8.1. Vocabulary
- 6.8.2. Global Vision
- 6.8.3. Taxonomy
- 6.8.4. Thesauri
- 6.8.5. Folksonomy
- 6.8.6. Comparison
- 6.8.7. Mind Maps

6.9. Knowledge Representation Assessment and Integration
- 6.9.1. Zero-Order Logic
- 6.9.2. First-Order Logic
- 6.9.3. Descriptive Logic
- 6.9.4. Relationship between Different Types of Logic
- 6.9.5. *Prolog*: Programming Based on First-Order Logic

6.10. Semantic Reasoners, Knowledge-Based Systems and Expert Systems
- 6.10.1. Concept of Reasoner
- 6.10.2. Reasoner Applications
- 6.10.3. Knowledge-Based Systems
- 6.10.4. MYCIN: History of Expert Systems
- 6.10.5. Expert Systems Elements and Architecture
- 6.10.6. Creating Expert Systems

Module 7. Machine Learning and Data Mining

7.1. Introduction to Knowledge Discovery Processes and Basic Concepts of Machine Learning
- 7.1.1. Key Concepts of Knowledge Discovery Processes
- 7.1.2. Historical Perspective of Knowledge Discovery Processes
- 7.1.3. Stages of the Knowledge Discovery Processes
- 7.1.4. Techniques Used in Knowledge Discovery Processes
- 7.1.5. Characteristics of Good Machine Learning Models
- 7.1.6. Types of Machine Learning Information
- 7.1.7. Basic Learning Concepts
- 7.1.8. Basic Concepts of Unsupervised Learning

7.2. Data Exploration and Pre-processing
- 7.2.1. Data Processing
- 7.2.2. Data Processing in the Data Analysis Flow
- 7.2.3. Types of Data
- 7.2.4. Data Transformations
- 7.2.5. Visualization and Exploration of Continuous Variables
- 7.2.6. Visualization and Exploration of Categorical Variables
- 7.2.7. Correlation Measures
- 7.2.8. Most Common Graphic Representations
- 7.2.9. Introduction to Multivariate Analysis and Dimensionality Reduction

7.3. Decision Trees
- 7.3.1. ID Algorithm
- 7.3.2. Algorithm C
- 7.3.3. Overtraining and Pruning
- 7.3.4. Analysis of Results

7.4. Evaluation of Classifiers
- 7.4.1. Confusion Matrixes
- 7.4.2. Numerical Evaluation Matrixes
- 7.4.3. Kappa Statistic
- 7.4.4. ROC Curves

7.5. Classification Rules
- 7.5.1. Rule Evaluation Measures
- 7.5.2. Introduction to Graphic Representation
- 7.5.3. Sequential Overlay Algorithm

7.6. Neural Networks
- 7.6.1. Basic Concepts
- 7.6.2. Simple Neural Networks
- 7.6.3. *Backpropagation* Algorithm
- 7.6.4. Introduction to Recurrent Neural Networks

7.7. Bayesian Methods
- 7.7.1. Basic Probability Concepts
- 7.7.2. Bayes' Theorem
- 7.7.3. Naive Bayes
- 7.7.4. Introduction to Bayesian Networks

7.8. Regression and Continuous Response Models
- 7.8.1. Simple Linear Regression
- 7.8.2. Multiple Linear Regression
- 7.8.3. Logistic Regression
- 7.8.4. Regression Trees
- 7.8.5. Introduction to Support Vector Machines (SVM)
- 7.8.6. Goodness-of-Fit Measures

7.9. *Clustering*
- 7.9.1. Basic Concepts
- 7.9.2. Hierarchical *Clustering*
- 7.9.3. Probabilistic Methods
- 7.9.4. EM Algorithm
- 7.9.5. *B-Cubed* Method
- 7.9.6. Implicit Methods

7.10. Text Mining and Natural Language Processing (NLP)
- 7.10.1. Basic Concepts
- 7.10.2. Corpus Creation
- 7.10.3. Descriptive Analysis
- 7.10.4. Introduction to Feelings Analysis

Module 8. Neural Networks, the Basis of *Deep Learning*

8.1. Deep Learning
- 8.1.1. Types of Deep Learning
- 8.1.2. Applications of Deep Learning
- 8.1.3. Advantages and Disadvantages of Deep Learning

8.2. Surgery
- 8.2.1. Sum
- 8.2.2. Product
- 8.2.3. Transfer

8.3. Layers
- 8.3.1. Input layer
- 8.3.2. Cloak
- 8.3.3. Output layer

8.4. Union of Layers and Operations
- 8.4.1. Architecture Design
- 8.4.2. Connection between layers
- 8.4.3. Forward propagation

8.5. Construction of the first neural network
- 8.5.1. Network Design
- 8.5.2. Establish the weights
- 8.5.3. Network Training

8.6. Trainer and Optimizer
- 8.6.1. Optimizer Selection
- 8.6.2. Establishment of a Loss Function
- 8.6.3. Establishing a Metric

8.7. Application of the Principles of Neural Networks
- 8.7.1. Activation Functions
- 8.7.2. Backward Propagation
- 8.7.3. Parameter Adjustment

8.8. From Biological to Artificial Neurons
- 8.8.1. Functioning of a Biological Neuron
- 8.8.2. Transfer of Knowledge to Artificial Neurons
- 8.8.3. Establish Relations Between the Two

8.9. Implementation of MLP (Multilayer Perceptron) with Keras
- 8.9.1. Definition of the Network Structure
- 8.9.2. Model Compilation
- 8.9.3. Model Training

8.10. *Fine Tuning* Hyperparameters of Neural Networks
- 8.10.1. Selection of the Activation Function
- 8.10.2. Set the *Learning* Rate
- 8.10.3. Adjustment of Weights

Module 9. Deep Neural Networks Training

9.1. Gradient Problems
- 9.1.1. Gradient Optimization Techniques
- 9.1.2. Stochastic Gradients
- 9.1.3. Weight Initialization Techniques

9.2. Reuse of Pre-Trained Layers
- 9.2.1. Learning Transfer Training
- 9.2.2. Feature Extraction
- 9.2.3. Deep Learning

9.3. Optimizers
- 9.3.1. Stochastic Gradient Descent Optimizers
- 9.3.2. Optimizers Adam and *RMSprop*
- 9.3.3. Moment Optimizers

9.4. Learning Rate Programming
- 9.4.1. Automatic Learning Rate Control
- 9.4.2. Learning Cycles
- 9.4.3. Smoothing Terms

9.5. Overfitting
- 9.5.1. Cross Validation
- 9.5.2. Regularization
- 9.5.3. Evaluation Metrics

9.6. Practical Guidelines
- 9.6.1. Model Design
- 9.6.2. Selection of Metrics and Evaluation Parameters
- 9.6.3. Hypothesis Testing

9.7. *Transfer Learning*
- 9.7.1. Learning Transfer Training
- 9.7.2. Feature Extraction
- 9.7.3. Deep Learning

9.8. *Data Augmentation*
- 9.8.1. Image Transformations
- 9.8.2. Synthetic Data Generation
- 9.8.3. Text Transformation

9.9. Practical Application of Transfer Learning
- 9.9.1. Learning Transfer Training
- 9.9.2. Feature Extraction
- 9.9.3. Deep Learning

9.10. Regularization
- 9.10.1. L and L
- 9.10.2. Regularization by Maximum Entropy
- 9.10.3. *Dropout*

Module 10. Model Customization and Training with *TensorFlow*

10.1. *TensorFlow*
- 10.1.1. Use of the *TensorFlow* Library
- 10.1.2. Model Training with *TensorFlow*
- 10.1.3. Operations with Graphs in *TensorFlow*

10.2. *TensorFlow* and NumPy
- 10.2.1. NumPy Computing Environment for *TensorFlow*
- 10.2.2. Using NumPy Arrays with *TensorFlow*
- 10.2.3. NumPy Operations for *TensorFlow* Graphs

10.3. Model Customization and Training Algorithms
- 10.3.1. Building Custom Models with *TensorFlow*
- 10.3.2. Management of Training Parameters
- 10.3.3. Use of Optimization Techniques for Training

10.4. *TensorFlow* Features and Graphs
- 10.4.1. Functions with *TensorFlow*
- 10.4.2. Use of Graphs for Model Training
- 10.4.3. Grap Optimization with *TensorFlow* Operations

10.5. Loading and Preprocessing Data with *TensorFlow*
- 10.5.1. Loading Data Sets with *TensorFlow*
- 10.5.2. Preprocessing Data with *TensorFlow*
- 10.5.3. Using TensorFlow Tools for Data Manipulation

10.6. The *tf.data* API
- 10.6.1. Using the *tf.data*API for Data Processing
- 10.6.2. Construction of Data Streams with tf.data
- 10.6.3. Using the tf.data API for Model Training

10.7. The *TFRecord* Format
- 10.7.1. Using the TFRecord API for Data Serialization
- 10.7.2. *TFRecord* File Upload with *TensorFlow*
- 10.7.3. Using *TFRecord* files for Model Training

10.8. Keras Preprocessing Layers
- 10.8.1. Using the Keras Preprocessing API
- 10.8.2. Preprocessing *Pipelined* Construction with Keras
- 10.8.3. Using the Keras Preprocessing API for Model Training

10.9. The *TensorFlow Datasets* Project
- 10.9.1. Using *TensorFlow Datasets* for Data Loading
- 10.9.2. Preprocessing Data with *TensorFlow Datasets*
- 10.9.3. Using *TensorFlow Datasets* for Model Training

10.10. Building a Deep *Learning* App with *TensorFlow*
- 10.10.1. Practical Application
- 10.10.2. Building a Deep *Learning* App with *TensorFlow*
- 10.10.3. Model Training with *TensorFlow*
- 10.10.4. Use of the Application for the Prediction of Results

Module 11. *Deep Computer Vision* with Convolutional Neural Networks

11.1. The *Visual Cortex* Architecture
- 11.1.1. Functions of the Visual Cortex
- 11.1.2. Theories of Computational Vision
- 11.1.3. Models of Image Processing

11.2. Convolutional Layers
- 11.2.1. Reuse of Weights in Convolution
- 11.2.2. Convolution D
- 11.2.3. Activation Functions

11.3. Grouping Layers and Implementation of Grouping Layers with Keras
- 11.3.1. Pooling and Striding
- 11.3.2. *Flattening*
- 11.3.3. Types of Pooling

11.4. CNN Architecture
- 11.4.1. VGG Architecture
- 11.4.2. *AlexNet* Architecture
- 11.4.3. Architecture *ResNet*

11.5. Implementing a CNN ResNet- using Keras
- 11.5.1. Weight Initialization
- 11.5.2. Input Layer Definition
- 11.5.3. Output Definition

11.6. Use of Pre-trained Keras Models
- 11.6.1. Characteristics of Pre-trained Models
- 11.6.2. Uses of Pre-trained Models
- 11.6.3. Advantages of Pre-trained Models

11.7. Pre-trained Models for Transfer Learning
- 11.7.1. Transfer Learning
- 11.7.2. Transfer Learning Process
- 11.7.3. Advantages of Transfer Learning

11.8. *Deep Computer Vision* Classification and Localization
- 11.8.1. Image Classification
- 11.8.2. Localization of Objects in Images
- 11.8.3. Object Detection

11.9. Object Detection and Object Tracking
- 11.9.1. Object Detection Methods
- 11.9.2. Object Tracking Algorithms
- 11.9.3. Tracking and Localization Techniques

11.10. Semantic Segmentation
- 11.10.1. Deep Learning for Semantic Segmentation
- 11.10.2. Edge Detection
- 11.10.3. Rule-based Segmentation Methods

Module 12. Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention

12.1. Text Generation using RNN
- 12.1.1. Training an RNN for Text Generation
- 12.1.2. Natural Language Generation with RNN
- 12.1.3. Text Generation Applications with RNN

12.2. Training Data Set Creation
- 12.2.1. Preparation of the Data for Training an RNN
- 12.2.2. Storage of the Training Dataset
- 12.2.3. Data Cleaning and Transformation
- 12.2.4. Sentiment Analysis

12.3. Classification of Opinions with RNN
- 12.3.1. Detection of Themes in Comments
- 12.3.2. Sentiment Analysis with Deep Learning Algorithms

12.4. Encoder-Decoder Network for Neural Machine Translation
- 12.4.1. Training an RNN for Machine Translation
- 12.4.2. Use of an Encoder-Decoder Network for Machine Translation
- 12.4.3. Improving the Accuracy of Machine Translation with RNNs

12.5. Attention Mechanisms
- 12.5.1. Application of Care Mechanisms in RNN
- 12.5.2. Use of Care Mechanisms to Improve the Accuracy of the Models
- 12.5.3. Advantages of Attention Mechanisms in Neural Networks

12.6. Transformer Models
- 12.6.1. Using *Transformers*Models for Natural Language Processing
- 12.6.2. Application of *Transformers* Models for Vision
- 12.6.3. Advantages of *Transformers* Models

12.7. *Transformers* for Vision
- 12.7.1. Use of *Transformers* Models for Vision
- 12.7.2. Image Data Preprocessing
- 12.7.3. Training a Transformers Model for Vision

12.8. *Hugging Face's Transformers*Bookstore
- 12.8.1. Using the *Hugging Face's Transformers* Library
- 12.8.2. *Hugging Face´s Transformers* Library Application
- 12.8.3. Advantages of *Hugging Face´s Transformers* Library

12.9. Other *Transformers* Libraries. Comparison
- 12.9.1. Comparison Between Different *Transformers* Libraries
- 12.9.2. Use of the Other *Transformers* Libraries
- 12.9.3. Advantages of the Other *Transformers* Libraries

12.10. Development of an NLP Application with RNN and Attention. Practical Application
- 12.10.1. Development of a Natural Language Processing Application with RNN and Attention
- 12.10.2. Use of RNN, Attention Mechanisms and Transformers Models in the Application
- 12.10.3. Evaluation of the Practical Application

Module 13. *Autoencoders*, *GANs*, and Diffusion Models

13.1. Representation of Efficient Data
- 13.1.1. Dimensionality Reduction
- 13.1.2. Deep Learning
- 13.1.3. Compact Representations

13.2. PCA Realization with an Incomplete Linear Automatic Encoder
- 13.2.1. Training Process
- 13.2.2. Implementation in Python
- 13.2.3. Use of Test Data

13.3. Stacked Automatic Encoders
- 13.3.1. Deep Neural Networks
- 13.3.2. Construction of Coding Architectures
- 13.3.3. Use of Regularization

13.4. Convolutional Autoencoders
- 13.4.1. Design of Convolutional Models
- 13.4.2. Convolutional Model Training
- 13.4.3. Results Evaluation

13.5. Automatic Encoder Denoising
- 13.5.1. Filter Application
- 13.5.2. Design of Coding Models
- 13.5.3. Use of Regularization Techniques

13.6. Sparse Automatic Encoders
- 13.6.1. Increasing Coding Efficiency
- 13.6.2. Minimizing the Number of Parameters
- 13.6.3. Using Regularization Techniques

13.7. Variational Automatic Encoders
- 13.7.1. Use of Variational Optimization
- 13.7.2. Unsupervised Deep Learning
- 13.7.3. Deep Latent Representations

13.8. Generation of Fashion MNIST Images
- 13.8.1. Pattern Recognition
- 13.8.2. Image Generation
- 13.8.3. Deep Neural Networks Training

13.9. Generative Adversarial Networks and Diffusion Models
- 13.9.1. Content Generation from Images
- 13.9.2. Modeling of Data Distributions
- 13.9.3. Use of Adversarial Networks

13.10. Implementation of the Models
- 13.10.1. Practical Application
- 13.10.2. Implementation of the Models
- 13.10.3. Use of Real Data
- 13.10.4. Results Evaluation

Module 14. Bio-Inspired Computing

14.1. Introduction to Bio-Inspired Computing
- 14.1.1. Introduction to Bio-Inspired Computing

14.2. Social Adaptation Algorithms
- 14.2.1. Bio-Inspired Computation Based on Ant Colonies
- 14.2.2. Variants of Ant Colony Algorithms
- 14.2.3. Particle Cloud Computing

14.3. Genetic Algorithms
- 14.3.1. General Structure
- 14.3.2. Implementations of the Major Operators

14.4. Space Exploration-Exploitation Strategies for Genetic Algorithms
- 14.4.1. CHC Algorithm
- 14.4.2. Multimodal Problems

14.5. Evolutionary Computing Models (I)
- 14.5.1. Evolutionary Strategies
- 14.5.2. Evolutionary Programming
- 14.5.3. Algorithms Based on Differential Evolution

14.6. Evolutionary Computation Models (II)
- 14.6.1. Evolutionary Models Based on Estimation of Distributions (EDA)
- 14.6.2. Genetic Programming

14.7. Evolutionary Programming Applied to Learning Problems
- 14.7.1. Rules-Based Learning
- 14.7.2. Evolutionary Methods in Instance Selection Problems

14.8. Multi-Objective Problems
- 14.8.1. Concept of Dominance
- 14.8.2. Application of Evolutionary Algorithms to Multi-Objective Problems

14.9. Neural Networks (I)
- 14.9.1. Introduction to Neural Networks
- 14.9.2. Practical Example with Neural Networks

14.10. Neural Networks (II)
- 14.10.1. Use Cases of Neural Networks in Medical Research
- 14.10.2. Use Cases of Neural Networks in Economics
- 14.10.3. Use Cases of Neural Networks in Artificial Vision

Module 15. Artificial Intelligence: Strategies and applications

15.1. Financial Services
- 15.1.1. The Implications of Artificial Intelligence (AI) in Financial Services. Opportunities and Challenges
- 15.1.2. Case Uses
- 15.1.3. Potential Risks Related to the Use of AI
- 15.1.4. Potential Future Developments/uses of AI

15.2. Implications of Artificial Intelligence in the Healthcare Service
- 15.2.1. Implications of AI in the Healthcare Sector. Opportunities and Challenges
- 15.2.2. Case Uses

15.3. Risks Related to the Use of AI in the Health Service
- 15.3.1. Potential Risks Related to the Use of AI
- 15.3.2. Potential Future Developments/uses of AI

15.4. *Retail*
- 15.4.1. Implications of AI in *Retail*. Opportunities and Challenges
- 15.4.2. Case Uses
- 15.4.3. Potential Risks Related to the Use of AI
- 15.4.4. Potential Future Developments/uses of AI

15.5. Industry
- 15.5.1. Implications of AI in Industry. Opportunities and Challenges
- 15.5.2. Case Uses

15.6. Potential risks related to the use of AI in industry
- 15.6.1. Case Uses
- 15.6.2. Potential Risks Related to the Use of AI
- 15.6.3. Potential Future Developments/uses of AI

15.7. Public Administration
- 15.7.1. AI implications for public administration. Opportunities and Challenges
- 15.7.2. Case Uses
- 15.7.3. Potential Risks Related to the Use of AI
- 15.7.4. Potential Future Developments/uses of AI

15.8. Educational
- 15.8.1. AI implications for education. Opportunities and Challenges
- 15.8.2. Case Uses
- 15.8.3. Potential Risks Related to the Use of AI
- 15.8.4. Potential Future Developments/uses of AI

15.9. Forestry and Agriculture
- 15.9.1. Implications of AI in Forestry and Agriculture. Opportunities and Challenges
- 15.9.2. Case Uses
- 15.9.3. Potential Risks Related to the Use of AI
- 15.9.4. Potential Future Developments/uses of AI

15.10 Human Resources
- 15.10.1. Implications of AI for Human Resources Opportunities and Challenges
- 15.10.2. Case Uses
- 15.10.3. Potential Risks Related to the Use of AI
- 15.10.4. Potential Future Developments/uses of AI

Module 16. Software Development Productivity Improvement with AI

16.1. Preparing a Suitable Development Environment
- 16.1.1. Essential Tools selection for AI Development
- 16.1.2. Configuration of the Selected Tools
- 16.1.3. Implementation of CI/CD Pipelines Adapted to AI Projects
- 16.1.4. Efficient Management of Dependencies and Versions in Development Environments

16.2. Essential AI Extensions for Visual Studio Code
- 16.2.1. Exploring and Selecting AI Extensions for Visual Studio Code
- 16.2.2. Integrating Static and Dynamic Analysis Tools into the Integrated Development Environment (IDE)
- 16.2.3. Automation of Repetitive Tasks with Specific Extensions
- 16.2.4. Customization of the Development Environment to Improve Efficiency

16.3. No-Code Design of User Interfaces with AI Elements
- 16.3.1. No-Code Design Principles and their Application to User Interfaces
- 16.3.2. Incorporation of AI Elements in Visual Interface Design
- 16.3.3. Tools and Platforms for the No-Code Creation of Intelligent Interfaces
- 16.3.4. Evaluation and Continuous Improvement of No-code Interfaces with AI

16.4. Code Optimization Using ChatGPT
- 16.4.1. Duplicate Code Detection
- 16.4.2. Refactor
- 16.4.3. Create Readable Code
- 16.4.4. Understanding What Code Does
- 16.4.5. Improving Variable and Function Naming
- 16.4.6. Creating Automatic Documentation

16.5. Repository Management with AI
- 16.5.1. Automation of Version Control Processes with AI Techniques
- 16.5.2. Conflict Detection and Automatic Resolution in Collaborative Environments
- 16.5.3. Predictive Analysis of Changes and Trends in Code Repositories
- 16.5.4. Improvements in the Organization and Categorization of Repositories using AI

16.6. Integration of AI in Database Management
- 16.6.1. Optimization of Queries and Performance Using AI Techniques
- 16.6.2. Predictive Analysis of Database Access Patterns
- 16.6.3. Implementation of Recommender Systems to Optimize Database Structure
- 16.6.4. Proactive Monitoring and Detection of Potential Database Problems

16.7. Fault Detection and Creation of Unit Tests with AI
- 16.7.1. Automatic Generation of Test Cases using AI Techniques
- 16.7.2. Early Detection of Vulnerabilities and Bugs using Static Analysis with AI
- 16.7.3. Improving Test Coverage by Identifying Critical Areas by AI

16.8. Pair Programming with GitHub Copilot
- 16.8.1. Integration and Effective Use of GitHub Copilot in Pair Programming Sessions
- 16.8.2. Integration Improvements in Communication and Collaboration among Developers with GitHub Copilot
- 16.8.3. Integration Strategies to Maximize the Use of GitHub Copilot-Generated Code suggestions
- 16.8.4. Integration Case Studies and Best Practices in AI-Assisted Pair Programming

16.9. Automatic Translation between Programming Languages
- 16.9.1. Specific Machine Translation Tools and Services for Programming Languages
- 16.9.2. Adaptation of Machine Translation Algorithms to Development Contexts
- 16.9.3. Improvement of Interoperability between Different Languages by Machine Translation
- 16.9.4. Assessment and Mitigation of Potential Challenges and Limitations in Machine Translation

16.10. Recommended AI Tools to Improve Productivity
- 16.10.1. Comparative Analysis of AI Tools for Software Development
- 16.10.2. Integration of AI Tools in Workflows
- 16.10.3. Automation of Routine Tasks with AI Tools
- 16.10.4. Evaluation and Selection of Tools Based on Project Context and Requirements

Module 17. Software Architecture with AI

17.1. Optimization and Performance Management in AI Tools
- 17.1.1. Performance Analysis and Profiling in AI tools
- 17.1.2. Algorithm Optimization Strategies and AI Models
- 17.1.3. Implementation of Caching and Parallelization Techniques to Improve Performance
- 17.1.4. Tools and Methodologies for Continuous Real-Time Performance Monitoring

17.2. Scalability in AI Applications
- 17.2.1. calable Architectures Design for AI Applications
- 17.2.2. Implementation of Partitioning and Load Sharing Techniques
- 17.2.3. Workflow and Workload Management in Scalable Systems
- 17.2.4. Strategies for Horizontal and Vertical Expansion in Variable Demand Environments

17.3. Maintainability of AI Applications
- 17.3.1. Design Principles to Facilitate Maintainability in IA Projects
- 17.3.2. Specific Documentation Strategies for AI Models and Algorithms
- 17.3.3. Implementation of Unit and Integration Tests to Facilitate Maintainability
- 17.3.4. Methods for Refactoring and Continuous Improvement in Systems with AI Components

17.4. Large-Scale System Design
- 17.4.1. Architectural Principles for Large-Scale System Design
- 17.4.2. Decomposition of Complex Systems into Microservices
- 17.4.3. Implementation of Specific Design Patterns for Distributed Systems
- 17.4.4. Strategies for Complexity Management in Large-Scale Architectures with AI Components

17.5. Large-Scale Data Warehousing for AI Tools
- 17.5.1. Selection of Scalable Data Storage Technologies
- 17.5.2. Design of Database Schemas for Efficient Handling of Large Data Volumes
- 17.5.3. Partitioning and Replication Strategies in Massive Data Storage Environments
- 17.5.4. Implementation of Data Management Systems to Ensure Integrity and Availability in AI Projects

17.6. Data structures with IA
- 17.6.1. Adaptation of Classical Data Structures for Use with AI Algorithms
- 17.6.2. Design and Optimization of Specific Data Structures for Machine Learning Models
- 17.6.3. Integration of Efficient Data Structures in Data Intensive Systems
- 17.6.4. Strategies for Real-Time Data Manipulation and Storage in AI Data Structures

17.7. Programming Algorithms for AI Products
- 17.7.1. Development and Implementation of Application-Specific Algorithms for AI Applications
- 17.7.2. Algorithm Selection Strategies according to Problem Type and Product Requirements
- 17.7.3. Adaptation of Classical Algorithms for Integration into AI Systems
- 17.7.4. Evaluation and Performance Comparison between Different Algorithms in Development Contexts with AI

17.8. Design Patterns for AI Development
- 17.8.1. Identification and Application of Common Design Patterns in Projects with AI Components
- 17.8.2. Development of Specific Patterns for the Integration of Models and Algorithms into Existing Systems
- 17.8.3. Strategies for the Implementation of Patterns to Improve Reusability and Maintainability in AI Projects
- 17.8.4. Case Studies and Best Practices in the Application of Design Patterns in AI Architectures

17.9. Implementation of Clean Architecture
- 17.9.1. Fundamental Principles and Concepts of Clean Architecture
- 17.9.2. Adaptation of Clean Architecture to Projects with AI Components
- 17.9.3. Implementation of Layers and Dependencies in Systems with Clean Architecture
- 17.9.4. Benefits and Challenges of Implementing Clean Architecture in Software Development with AI

17.10. Secure Software Development in Web Applications with AI
- 17.10.1. Principles of Security in the Development of Software with AI Components
- 17.10.2. Identification and Mitigation of Potential Vulnerabilities in AI Models and Algorithms
- 17.10.3. Implementation of Secure Development Practices in Web Applications with Artificial Intelligence Functionalities
- 17.10.4. Strategies for the Protection of Sensitive Data and Prevention of Attacks in AI projects

Module 18. Website Projects with AI

18.1. Working Environment Preparation for Web Development with AI
- 18.1.1. Configuration of Web Development Environments for Projects with Artificial Intelligence
- 18.1.2. Selection and Preparation of Essential Tools for Web Development with AI
- 18.1.3. Integration of Specific Libraries and Frameworks for Web Projects with Artificial Intelligence
- 18.1.4. Implementation of Best Practices in the Configuration of Collaborative Development Environments

18.2. Workspace Creation for AI Projects
- 18.2.1. Effective Design and Organization of Workspaces for Web Projects with Artificial Intelligence Components
- 18.2.2. Use of Project Management and Version Control Tools in the Workspace
- 18.2.3. Strategies for Efficient Collaboration and Communication in the Development Team
- 18.2.4. Adaptation of the Workspace to the Specific Needs of AI Web Projects

18.3. Design Patterns in AI Products
- 18.3.1. Identification and Application of Common Design Patterns in User Interfaces with Artificial Intelligence Elements
- 18.3.2. Development of Specific Patterns to Improve the User Experience in AI Web Projects
- 18.3.3. Integration of Design Patterns in the Overall Architecture of Web Projects with Artificial Intelligence
- 18.3.4. Evaluation and Selection of Appropriate Design Patterns According to the Project's Context

18.4. Frontend Development with AI
- 18.4.1. Integration of AI Models in the Presentation Layer of Web Projects
- 18.4.2. Development of Adaptive User Interfaces with Artificial Intelligence Elements
- 18.4.3. Implementation of Natural Language Processing (NLP) Functionalities in Frontend Development
- 18.4.4. Strategies for Performance Optimization in Frontend Development with AI

18.5. Database Creation
- 18.5.1. Selection of Database Technologies for Web Projects with Artificial Intelligence
- 18.5.2. Design of Database Schemas for Storing and Managing AI-Related Data
- 18.5.3. Implementation of Efficient Storage Systems for Large Volumes of Data Generated by AI Models
- 18.5.4. Strategies for Security and Protection of Sensitive Data in AI Web Project Databases

18.6. Back-End Development with AI
- 18.6.1. Integration of AI Services and Models in the Back-End Business Logic
- 18.6.2. Development of Specific APIs and Endpoints for Communication between Front-End and AI Components
- 18.6.3. Implementation of Data Processing and Decision-Making Logic in the Backend with Artificial Intelligence
- 18.6.4. Strategies for Scalability and Performance in Back-End Development of Web Projects with AI

18.7. Optimization of the Deployment Process of Your Website
- 18.7.1. Automation of Web Project Build and Deployment Processes with AI
- 18.7.2. Implementing CI/CD Pipelines Tailored to Web Applications with Artificial Intelligence Components
- 18.7.3. Strategies for Efficient Release and Upgrade Management in Continuous Deployments
- 18.7.4. Post-Deployment Monitoring and Analysis for Continuous Process Improvement

18.8. AI in Cloud Computing
- 18.8.1. Integration of Artificial Intelligence Services in Cloud Computing Platforms
- 18.8.2. Development of Scalable and Distributed Solutions using Cloud Services with AI Capabilities
- 18.8.3. Strategies for Efficient Resource and Cost Management in Cloud Environments with AI-enabled Web Applications
- 18.8.4. Evaluation and Comparison of Cloud Service Providers for AI-enabled Web Projects

18.9. Creation of AI-enabled Project for LAMP Environments
- 18.9.1. Adaptation of Web Projects Based on the LAMP Stack to Include Artificial Intelligence Components
- 18.9.2. Integration of AI-specific Libraries and Frameworks in LAMP Environments
- 18.9.3. Development of AI Functionalities that Complement the Traditional LAMP Architecture
- 18.9.4. Strategies for Optimization and Maintenance in Web Projects with AI in LAMP Environments

18.10. Creation of AI-enabled Project for MEVN Environments
- 18.10.1. Integration of MEVN Stack Technologies and Tools with Artificial Intelligence Components
- 18.10.2. Development of Modern and Scalable Web Applications in MEVN Environments with AI Capabilities
- 18.10.3. Implementation of Data Processing and Machine Learning functionalities in MEVN Projects
- 18.10.4. Strategies for Performance and Security Enhancement of AI-enabled Web Applications in MEVN Environments

Module 19. Mobile Applications with AI

19.1. Working Environment Preparation for mobile Development with AI
- 19.1.1. Configuration of Mobile Development Environments for Projects with Artificial Intelligence
- 19.1.2. Selection and Preparation of Specific Tools for Mobile Application Development with AI
- 19.1.3. Integration of AI-Libraries and Frameworks in Mobile Development Environments
- 19.1.4. Configuration of Emulators and Real Devices for Testing Mobile Applications with AI Components

19.2. Creation of a Workspace with GitHub Copilot
- 19.2.1. Integration of GitHub Copilot in Mobile Development Environments
- 19.2.2. Effective Use of GitHub Copilot for Code Generation in AI Projects
- 19.2.3. Strategies for Developer Collaboration when Using GitHub Copilot in the Workspace
- 19.2.4. Best Practices and Limitations in the Use of GitHub Copilot in Mobile Application Development with AI

19.3. Firebase Configuration
- 19.3.1. Initial Configuration of a Firebase Project for Mobile Development
- 19.3.2. Firebase Integration in Mobile Applications with Artificial Intelligence Functionality
- 19.3.3. Use of Firebase Services as Database, Authentication, and Notifications in AI projects
- 19.3.4. Strategies for Real-Time Data and Event Management in Firebase-enabled Mobile Applications

19.4. Concepts of Clean Architecture, DataSources, Repositories
- 19.4.1. Fundamental Principles of Clean Architecture in Mobile Development with AI
- 19.4.2. Implementation of DataSources and Repositories Layers in Clean Architectures
- 19.4.3. Design and Structuring of Components in Mobile Projects with Clean Architecture Approach
- 19.4.4. Benefits and Challenges of Implementing Clean Architecture in Mobile Applications with AI

19.5. Authentication Screen Creation
- 19.5.1. Design and Development of User Interfaces for Authentication Screens in Mobile Applications with IA
- 19.5.2. Integration of Authentication Services with Firebase in the Login Screen
- 19.5.3. Use of Security and Data Protection Techniques in the Authentication Screen
- 19.5.4. Personalization and Customization of the User Experience in the Authentication Screen

19.6. Creation of Dashboard and Navigation
- 19.6.1. Dashboard Design and Development with Artificial Intelligence Elements
- 19.6.2. Implementation of Efficient Navigation Systems in Mobile Applications with AI
- 19.6.3. Integration of AI Functionalities in the Dashboard to Improve User Experience

19.7. Creation of Listing Screen
- 19.7.1. Development of User Interfaces for Listing Screens in AI-enabled Mobile Applications
- 19.7.2. Integration of Recommendation and Filtering Algorithms into the Listing Screen
- 19.7.3. Use of Design Patterns for Effective Presentation of Data in the Listing Screen
- 19.7.4. Strategies for Efficient Loading of Real-Time Data into the Listing Screen

19.8. Details Screen Creation
- 19.8.1. Design and Development of Detailed User Interfaces for the Presentation of Specific Information
- 19.8.2. Integration of AI Functionalities to Enrich the Detailed Screen
- 19.8.3. Implementation of Interactions and Animations in the Detailed Screen
- 19.8.4. Strategies for Performance Optimization in Loading and Detail Display in AI-enabled Mobile Applications

19.9. Creation of Settings Screen
- 19.9.1. Development of User Interfaces for Configuration and Settings in AI-enabled Mobile Applications
- 19.9.2. Integration of Customized Settings Related to Artificial Intelligence Components
- 19.9.3. Implementation of Customized Options and Preferences in the Settings Screen
- 19.9.4. Strategies for Usability and Clarity in the Presentation of Options in the Settings Screen

19.10. Creation of Icons, Splash and Graphic Resources for Your App with AI
- 19.10.1. Design and Creation of Attractive Icons to Represent the AI Mobile Application
- 19.10.2. Development of Splash Screens with Impactful Visuals
- 19.10.3. Selection and Adaptation of Graphic Resources to Enhance the Aesthetics of the Mobile Application
- 19.10.4. Strategies for Consistency and Visual Branding in the Graphic Elements of the Application with AI

Module 20. AI for QA Testing

20.1. Software Testing Life Cycle
- 20.1.1. Description and Understanding of the Testing Life Cycle in Software Development
- 20.1.2. Phases of the Testing Life Cycle and its Importance in Quality Assurance
- 20.1.3. Integration of Artificial Intelligence in Different Stages of the Testing Life Cycle
- 20.1.4. Strategies for Continuous Improvement of the Testing Life Cycle using AI

20.2. Test Cases and Bug Detection
- 20.2.1. Effective Test Case Design and Writing in the Context of QA Testing
- 20.2.2. Identification of Bugs and Errors during Test Case Execution
- 20.2.3. Application of Early Bug Detection Techniques using Static Analysis
- 20.2.4. Use of Artificial Intelligence Tools for the Automatic Identification of Bugs in Test Cases

20.3. Types of Testing
- 20.3.1. Exploration of Different Types of Testing in the QA Environment
- 20.3.2. Unit, Integration, Functional, and Acceptance Testing: Characteristics and Applications
- 20.3.3. Strategies for the Selection and Appropriate Combination of Testing Types in AI Projects
- 20.3.4. Adaptation of Conventional Testing Types to Projects with Artificial Intelligence Components

20.4. Creation of a Testing Plan
- 20.4.1. Design and Structure of a Comprehensive Testing Plan
- 20.4.2. Identification of Requirements and Test Scenarios in AI Projects
- 20.4.3. Strategies for Manual and Automated Test Planning
- 20.4.4. Continuous Evaluation and Adjustment of the Testing Plan as the Project Develops

20.5. AI Bug Detection and Reporting
- 20.5.1. Implementation of Automatic Bug Detection Techniques using Machine Learning Algorithms
- 20.5.2. Use of Artificial Intelligence Tools for Dynamic Code Analysis to Search for Possible Bugs
- 20.5.3. Strategies for Automatic Generation of Detailed Reports on AI-Detected Bugs
- 20.5.4. Effective Collaboration between Development and QA Teams in the Management of AI-Detected Bugs

20.6. Creation of Automated Testing with AI
- 20.6.1. Development of Automated Test Scripts for Projects with AI Components
- 20.6.2. Integration of AI-Based Test Automation Tools
- 20.6.3. Use of Machine Learning Algorithms for Dynamic Generation of Automated Test Cases
- 20.6.4. Strategies for Efficient Execution and Maintenance of Automated Test Cases in AI Projects

20.7. API Testing
- 20.7.1. Fundamental Concepts of API Testing and its Importance in QA
- 20.7.2. Development of Tests for the Verification of APIs in Environments with Artificial Intelligence Components
- 20.7.3. Strategies for Data and Results Validation in API Testing with AI
- 20.7.4. Use of Specific Tools for API Testing in Projects with Artificial Intelligence

20.8. AI Tools for Web Testing
- 20.8.1. Exploration of Artificial Intelligence Tools for Test Automation in Web Environments
- 20.8.2. Integration of Element Recognition and Visual Analysis Technologies in Web Testing
- 20.8.3. Strategies for Automatic Detection of Changes and Performance Problems in Web Applications Using AI
- 20.8.4. Evaluation of Specific Tools for Improving Efficiency in Web Testing with AI

20.9. Mobile Testing Using AI
- 20.9.1. Development of Testing Strategies for Mobile Applications with AI Components
- 20.9.2. Integration of Specific Testing Tools for AI-Based Mobile Platforms
- 20.9.3. Use of Machine Learning Algorithms for Detecting Performance Problems in Mobile Applications
- 20.9.4. Strategies for the Validation of Interfaces and Specific Functions of Mobile Applications by AI

20.10. QA Tools with AI
- 20.10.1. Exploration of QA Tools and Platforms that Incorporate Artificial Intelligence Functionality
- 20.10.2. Evaluation of Tools for Efficient Test Management and Test Execution in AI Projects
- 20.10.3. Use of Machine Learning Algorithms for Test Case Generation and Optimization
- 20.10.4. Strategies for Effective Selection and Adoption of QA Tools with AI Capabilitie

Position yourself in the labor market with a 100% online program that adapts to your needs and allows you an immersive and solid learning"

06

Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world"

You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.

The student will learn to solve complex situations in real business environments through collaborative activities and real cases.

A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

> *Our program prepares you to face new challenges in uncertain environments and achieve success in your career"*

The case method has been the most widely used learning system among the world's leading Information Technology schools for as long as they have existed. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the course, students will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

Relearning Methodology

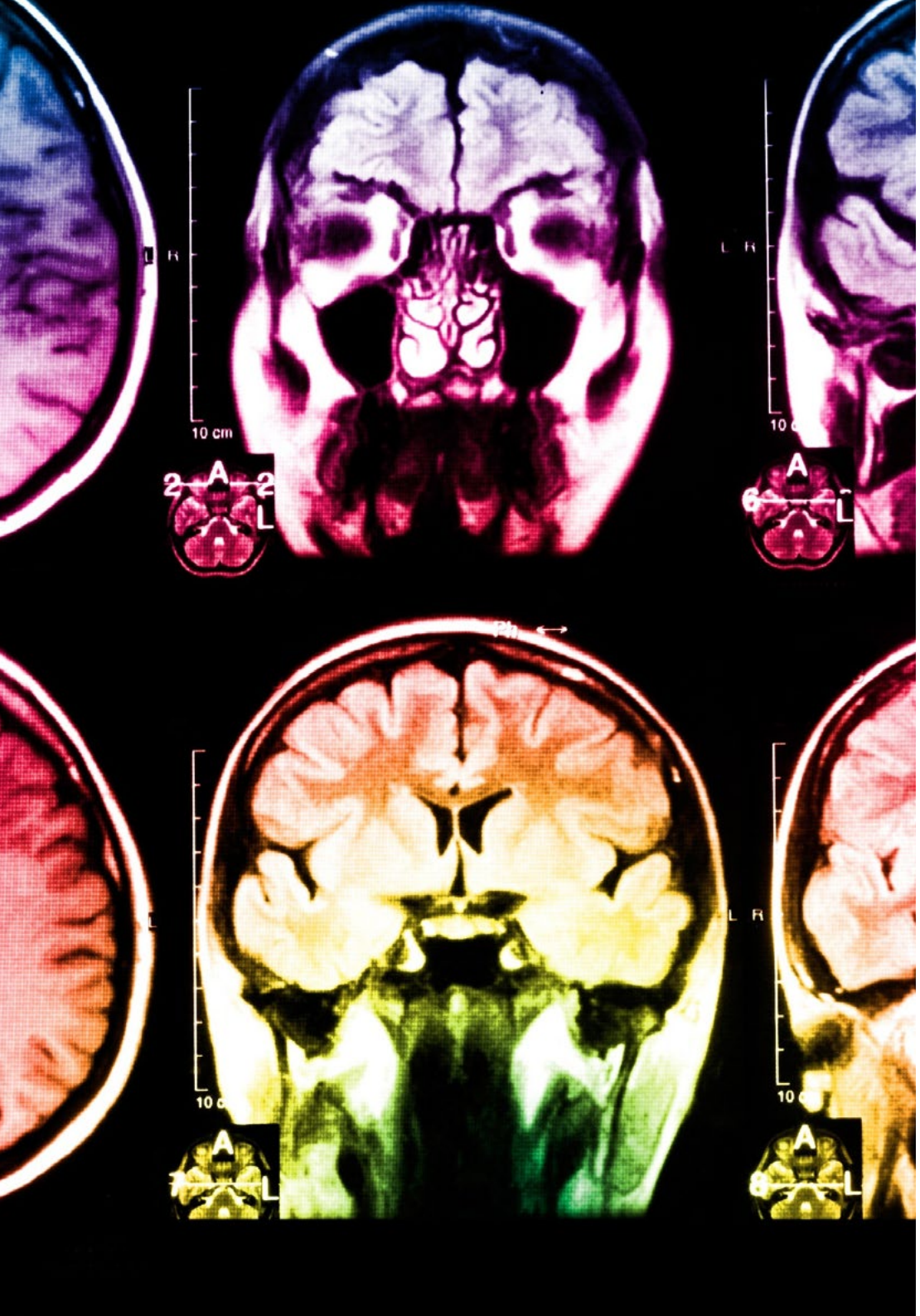
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

In 2019, we obtained the best learning results of all online universities in the world.

At TECH you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

This program offers the best educational material, prepared with professionals in mind:

Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

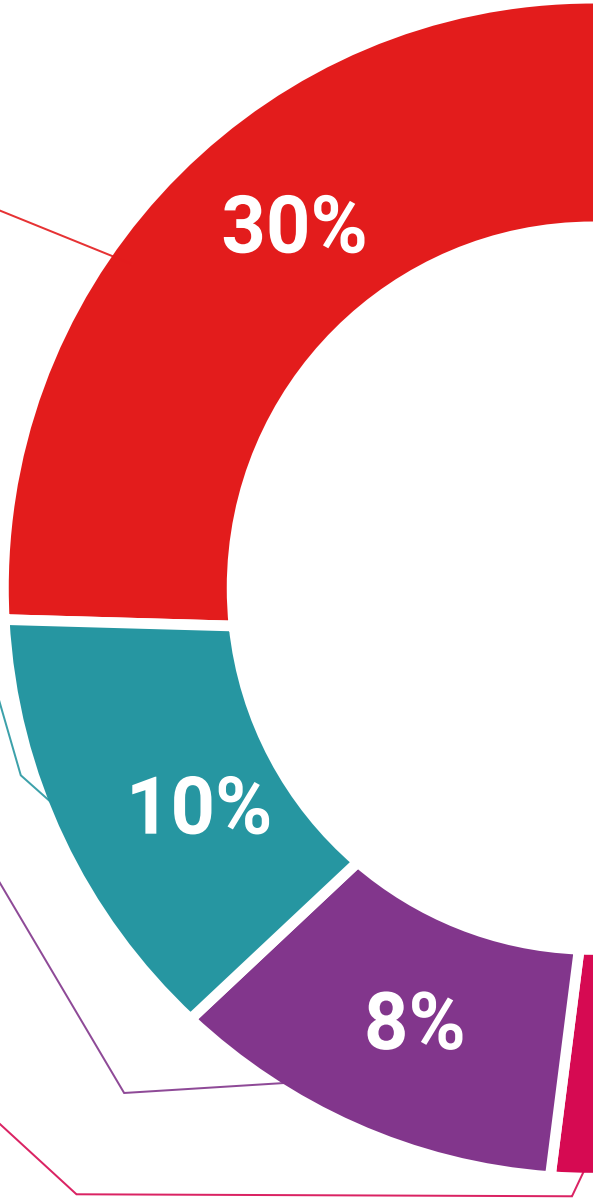
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

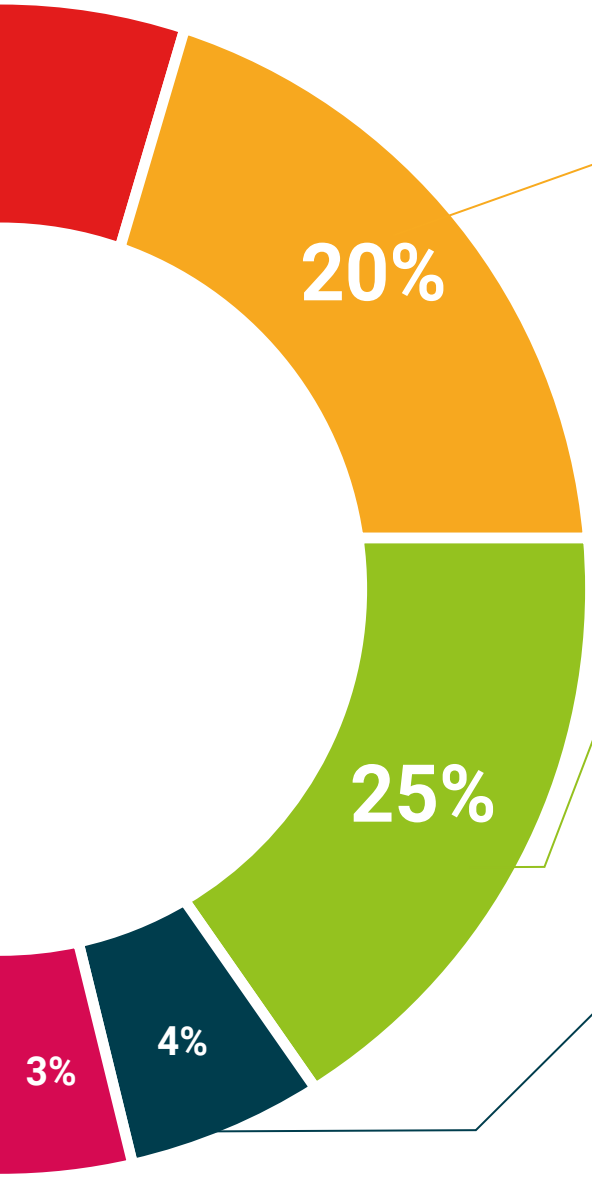
Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.

Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.

Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

07

Certificate

The Professional Master's Degree in Artificial Intelligence in Programming guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This **Professional Master's Degree in Artificial Intelligence in Programming** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Professional Master's Degree** issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Diploma, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Professional Master's Degree in Artificial Intelligence in Programming**

Official Nº of Hours: **2,250 hours**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Artificial Intelligence in Programming

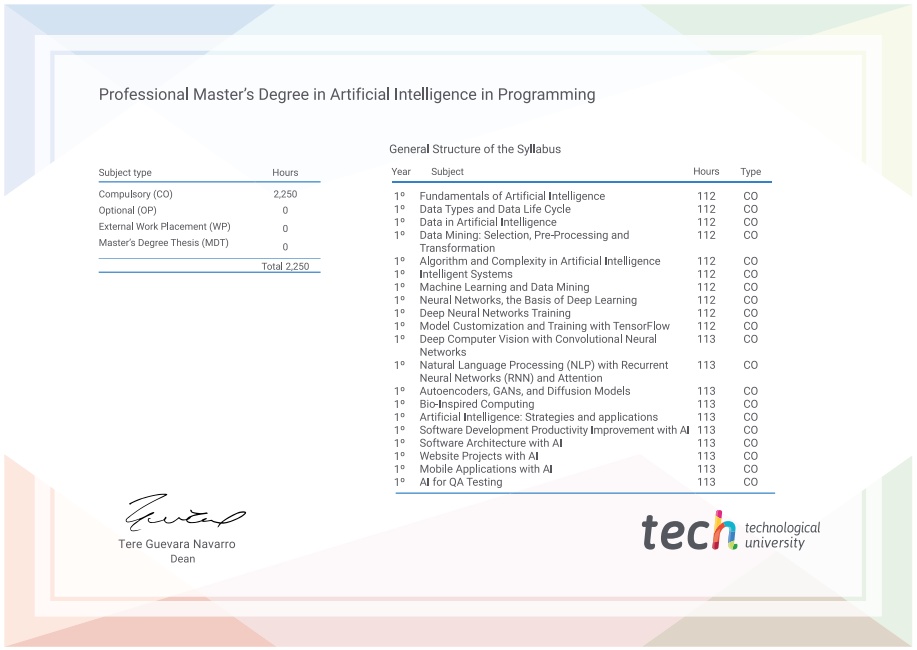
This is a qualification awarded by this University, equivalent to 2,250 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro
Dean

Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Artificial Intelligence in Programming

Subject type	Hours
Compulsory (CO)	2,250
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 2,250

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Fundamentals of Artificial Intelligence	112	CO
1º	Data Types and Data Life Cycle	112	CO
1º	Data in Artificial Intelligence	112	CO
1º	Data Mining: Selection, Pre-Processing and Transformation	112	CO
1º	Algorithm and Complexity in Artificial Intelligence	112	CO
1º	Intelligent Systems	112	CO
1º	Machine Learning and Data Mining	112	CO
1º	Neural Networks, the Basis of Deep Learning	112	CO
1º	Deep Neural Networks Training	112	CO
1º	Model Customization and Training with TensorFlow	112	CO
1º	Deep Computer Vision with Convolutional Neural Networks	113	CO
1º	Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention	113	CO
1º	Autoencoders, GANs, and Diffusion Models	113	CO
1º	Bio-Inspired Computing	113	CO
1º	Artificial Intelligence: Strategies and applications	113	CO
1º	Software Development Productivity Improvement with AI	113	CO
1º	Software Architecture with AI	113	CO
1º	Website Projects with AI	113	CO
1º	Mobile Applications with AI	113	CO
1º	AI for QA Testing	113	CO

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*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

tech technological university

Professional Master's Degree
Artificial Intelligence in Programming

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

Artificial Intelligence in Programming

tech technological university