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**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/artificial-intelligence/professional-master-degree/master-artificial-intelligence-programing**

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01

Introduction

In an era characterized by technological advances, Artificial Intelligence (AI) has emerged as a primary tool for programming experts. Its importance lies in its ability to mechanize arduous activities, make decisions based on accurate data and learn from patterns. In this way, Machine Learning offers valuable techniques for computer scientists to design more intelligent systems. These range from algorithms to provide programs with greater thoroughness to the development of autonomous systems, useful for changing the way code is executed. For this reason, TECH is launching an academic program that will provide students with the latest advances in this field. All under a 100% online methodology, adapted to the agenda of busy professionals.

You will be able to design customized and intuitive user experiences through this 100% online university degree"

Computational Intelligence serves institutions to improve productivity in software development. Its tools have the ability to handle unstructured data, learn from past experiences and adapt to changes in dynamic environments. In addition, AI can predict potential application problems before they happen, allowing professionals to take preventative measures to avoid costly problems in the future. In this context, the most prestigious international IT companies are looking to actively incorporate Software Architecture specialists for QA Testing.

For this reason, TECH implements an innovative program for programmers to get the most out of optimization and performance management in AI tools. Designed by world-class experts, the curriculum will delve into programming algorithms to develop products with intelligent systems. The syllabus will also delve into the essential extensions for Visual Studio Code, today's most widely used source code editor. Moreover, the teaching materials will address the integration of AI in database management to detect possible failures and create unittests This is a university degree that has a diversity of audiovisual content in multiple formats and a network of real simulations to bring the development of the program closer to the reality of IT practice.

In order to achieve the proposed learning objectives, this program is taught through an online teaching methodology. In this way, professionals will be able to perfectly combine their work with their studies. In addition, you will enjoy a first-class teaching staff and multimedia academic materials of great pedagogical rigor such as master classes, interactive summaries or practical exercises. The only requirement for accessing the Virtual Campus is that students have an electronic device with Internet access, and can even use their cell phone.

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

- The development of practical cases presented by experts in Artificial Intelligence in programming
- The graphic, schematic, and practical contents with which they are created, 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 gain a holistic perspective on how Machine Learning impacts and improves every stage of software development"

Are you looking to apply Transformational Models for natural language processing to your practice? Achieve it thanks to this innovative program"

You will delve into the testing lifecycle, from the creation of test cases to the detection of bugs.

Relearning will enable you to learn with less effort and more performance, involving you more in your professional specialization.

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 academic year For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

Objectives

This program will turn computer scientists into experts in AI applied to programming. Graduates will acquire a comprehensive vision that combines the most updated knowledge with practical skills that will improve their decision making. At the same time, professionals will master the most modern tools for the development of software powered by Machine Learning. In this way, students will design proposals for both webs and mobile applications with adaptability. They will be highly specialized to meet the current demands of the industry.

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

General Objectives

- Develop skills to set up and manage efficient development environments, ensuring a solid foundation for the implementation of AI projects
- Acquire skills in planning, executing and automating quality tests, incorporating AI tools for bug detection and remediation
- 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 Greedyalgorithms, 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 the course
- Apply practical guidelines to ensure efficient and effective learning 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 Natural Recurrent Networks (NRN) and Attention

- Develop 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. Improving Software Development Productivity 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 setup of optimized development environments, ensuring that students are able to create environments conducive to AI projects
- Apply specific techniques using ChatGPT for automatic identification and correction of potential code improvements, encouraging more efficient programming practices
- Promote collaboration between different programming professionals (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 testingand ensuring software quality
- Recognize and analyze different types of software frameworks, such as monolithic, microservices or service-oriented
- Gain a comprehensive view 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. Web Projects with AI

- Develop comprehensive skills for the implementation of web projects, from frontend design tobackendoptimization, 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. AI-enabled Mobile Applications

- 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 mobile app framework configuration and employ 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 bugdetection and continuous software improvement

You will delve into the integration of Visual Studio Code elements and code optimization with ChatGPT, through a comprehensive academic program"

03

Skills

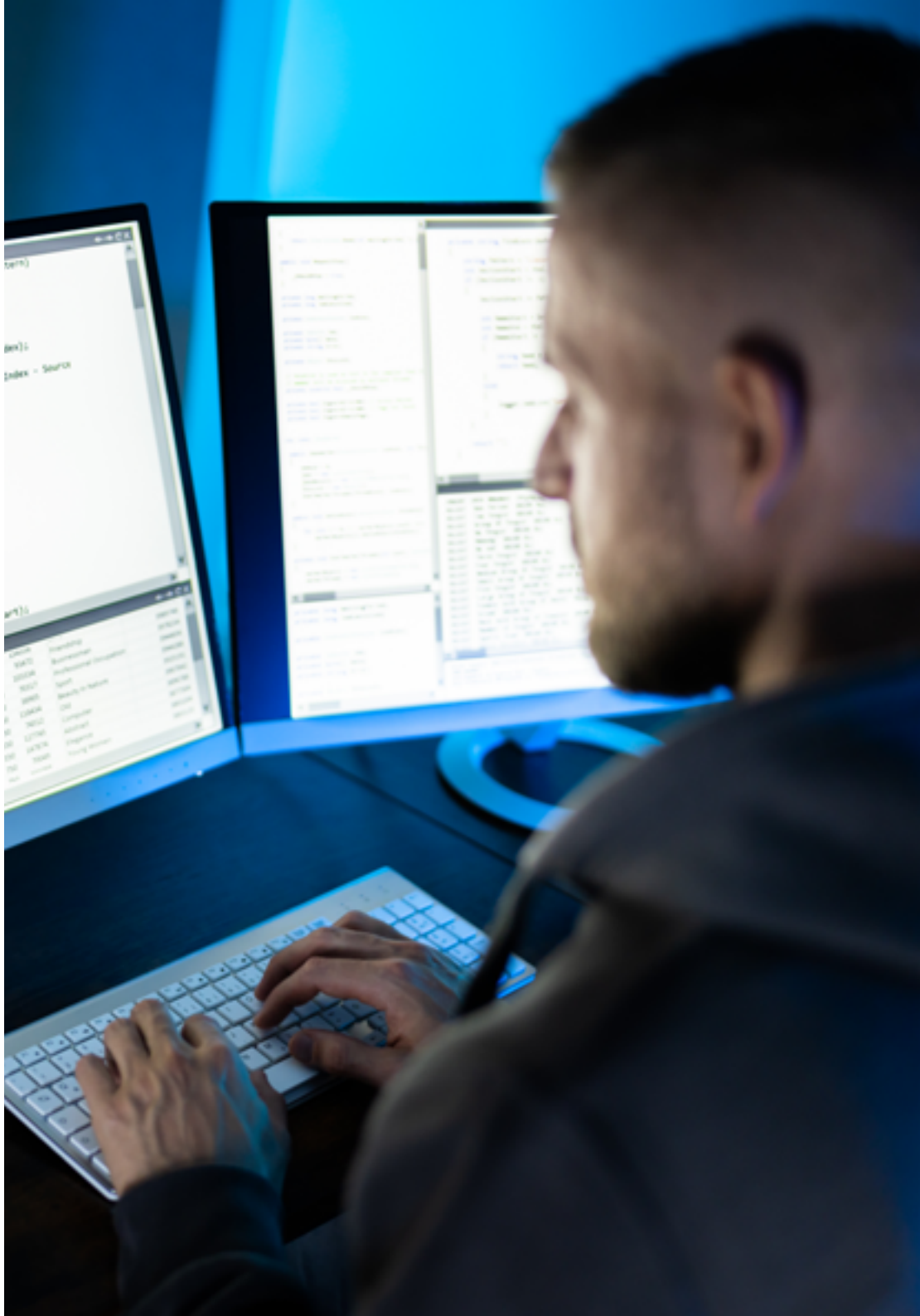
Through 12 months of learning, graduates will have a set of skills that will raise their professional horizons in the IT industry. Therefore, experts will be able to create and implement advanced software and design large-scale AI proposals. Related to this, professionals will address productivity in development, awhile performing QA Testing best practices. This university degree ensures that computer scientists are specialized to successfully overcome real-world challenges and excel significantly in an area that is advancing by leaps and bounds.

You will be highly qualified to implement Machine Learning algorithms in your 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 frontendand backend
- Develop AI-powered mobile applications, from environment configuration to the creation of advanced features and management of graphical resources
- Apply advanced AI-powered storage concepts and data structures to improve system efficiency and scalability
- Include secure development practices, avoiding vulnerabilities such as injection, to ensure the integrity and security of the developed software

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



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 graphics 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 learning 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 setup of optimized development environments, ensuring that students are able to create environments conducive to AI projects
- Apply specific techniques, using ChatGPT for 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 students to create highly scalable and efficient web projects
- Configure the framework for mobile apps and use Github Copilot to streamline the development process

04

Course Management

Loyal to its commitment to offer the highest quality education, TECH has a teaching staff of the highest level. Therefore, the experts who make up this university degree stand out for their deep knowledge of AI in Programming, while they have years of professional experience behind them. Thanks to these aspects, this academic pathway provides students with the best technological tools and strategies not only to broaden their understanding, but also to gain skills to perfect their computer procedures. Therefore, students have the guarantees they need to specialize in a digital sector that offers numerous opportunities.

The leading experts in Machine Learning in Programming have come together to share with you all their knowledge in this sector"

Management

Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometeus Global Solutions
- CTO at Korporate Technologies
- CTO at AI Shepherds GmbH
- Consultant and Strategic Business Advisor at Alliance Medical
- Director of Design and Development at DocPath
- Ph.D. in Psychology from the University of Castilla - La Mancha
- Ph.D. in Economics, Business and Finance from the Camilo José Cela University
- Ph.D. in Psychology from the University of Castilla – La Mancha
- Master's 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 at OWQLO
- Freelance Technical Consultant
- Mobile Applications Developer for eDreams, Fnac, Air Europa, Bankia, Cetelem, Banco Santander, Santillana, Groupón and Grupo Planeta
- Web Developer for Openbank and Banco Santander
- Machine Learning Engineer course at Udacity
- Technical Engineer in Computer Systems from the University of Castilla la Mancha

05

Structure and Content

This Professional Master's Degree will provide graduates with a holistic approach, which will give them a significant advantage in IT development by equipping them with specific skills. To achieve this, the course will range from development environment preparation to *software* optimization and AI implementation in real projects. The syllabus will delve into aspects such as *no-code* design of interfaces, use of ChatGPT to optimize code or the application of Machine Learning in QA *Testing*. In this way, the graduates will implement innovative solutions in an effective way in various applications such as web and mobile projects.

Update your knowledge about Artificial Intelligence in Programming through innovative multimedia content"

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 Indices
- 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 Graphics 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 TensorFlowGraphics

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 Graphics
- 10.4.1. Functions with TensorFlow
- 10.4.2. Use of Graphs for Model Training
- 10.4.3. Graphics Optimization with TensorFlowOperations

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 TensorFlowTools for Data Manipulation

10.6. The API tfdata
- 10.6.1. Using the tfdataAPI for Data Processing
- 10.6.2. Construction of Data Streams with tfdata
- 10.6.3. Using thetfdata API for Model Training

10.7. The TFRecord Format
- 10.7.1. Using the TFRecordAPI 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 Natural Recurrent Networks (NRN) 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 TransformerModels for Natural Language Processing
- 12.6.2. Application of Transformer Models for Vision
- 12.6.3. Advantages of Transformer Models

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

12.8. Hugging Face's TransformersLibrary
- 12.8.1. Using the Hugging Face's TransformersLibrary
- 12.8.2. Hugging Face's TransformersLibrary App
- 12.8.3. Advantages of Hugging Face's Transformers Library

12.9. Other Transformers Libraries. Comparison
- 12.9.1. Comparison between different TransformersLibraries
- 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. Application of Filters
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. Improving Software Development Productivity with AI

16.1. Prepare a Suitable Development Environment
- 16.1.1. Selection of Essential Tools for AI Development
- 16.1.2. Configuration of the Chosen 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. Integration of Static and Dynamic Analysis Tools in the SDI
- 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 the Visual Design of Interfaces
- 16.3.3. Tools and Platforms for 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. Identifying Duplicate Code
- 16.4.2. Refactor
- 16.4.3. Create Readable Code
- 16.4.4. Understanding What Code Does
- 16.4.5. Improving Variable and Function Names
- 16.4.6. Automatic Documentation Creation

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. Improved Organization and Categorization of Repositories using AI

16.6. Integration of AI in Database Management
- 16.6.1. Query and Performance Optimization 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. Monitoring and Proactive Detection of Potential Problems in Databases

16.7. Fault Finding 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 with AI

16.8. Pair Programming with GitHub Copilot
- 16.8.1. Integration and Effective Use of GitHub Copilot in Pair ProgrammingSessions
- 16.8.2. Integration Improvements in Communication and Collaboration between Developers with GitHub Copilot
- 16.8.3. Integration Strategies for Making the Most of Code Hints Generated by GitHub Copilot
- 16.8.4. Integration Case Studies and Best Practices in AI-assisted Pair Programming

16.9. Automatic Translation between Programming Languages
- 16.9.1. Programming Language Specific Machine Translation Tools and Services
- 16.9.2. Adapting Machine Translation Algorithms to Development Contexts
- 16.9.3. Improving Interoperability between Different Languages by Machine Translation
- 16.9.4. Assessing and Mitigating Potential Challenges and Limitations of 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. Evaluating and Selecting Tools Based on Context and Project 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. Design of Scalable Architectures for AI Applications
- 17.2.2. Implementation of Partitioning and Load Distribution Techniques
- 17.2.3. Workflow and Workload Management for 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 AI Projects
- 17.3.2. Specific Documentation Strategies for AI Models and Algorithms
- 17.3.3. Implementation of Unit and Integration Tests to Facilitate Maintenance
- 17.3.4. Methods for Refactoring and Continuous Improvement in Systems with AI Components

17.4. Design of Large-Scale Systems
- 17.4.1. Architectural Principles for the Design of Large-Scale Systems
- 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 Warehousing Technologies
- 17.5.2. Designing Database Schemas for Efficient Management 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 AI
- 17.6.1. Adaptation of Classical Data Structures for Use in AI Algorithms
- 17.6.2. Designing and Optimizing 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 Artificial Intelligence Systems
- 17.7.4. Evaluation and Comparison of Performance between Different Algorithms in AI Development Contexts

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. Pattern Implementation Strategies for Improving 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 AI Software Development

17.10. Secure Software Development in Web Applications with AI
- 17.10.1. Principles of Security in Software Development with AI Components
- 17.10.2. Identifying and Mitigating 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. Web Projects with AI

18.1. Preparation of the Working Environment 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 AI Web Development
- 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 Interface with Artificial Intelligence Components
- 18.3.2. Development of Specific Patterns to Improve User Experience in Web Projects with AI
- 18.3.3. Integration of Design Patterns in the Overall Architecture of AI Web Projects
- 18.3.4. Evaluation and Selection of Adequate Design Patterns according to the Project Context

18.4. Frontend Development with AI
- 18.4.1. Integration of AI Models into 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 the Frontend
- 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 the 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 Backend Business Logic
- 18.6.2. Development of Specific APIs and Endpoints for Communication between the Frontend 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 the Backend Development of Web Projects with AI

18.7. Optimizing Your Web Deployment Process
- 18.7.1. Automating 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. Creating an 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 Complementing the Traditional LAMP Architecture
- 18.9.4. Strategies for Optimization and Maintenance in Web Projects with AI in LAMP Environments

18.10. Creating an AI-enabled Project for MEVN Environments
- 18.10.1. Integration of MEVN Stack Technologies and Tools with AI 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 Imrpoving Performance and Security Enhancement of AI-enabled Web Applications in MEVN Environments

Module 19. AI-enabled Mobile Applications

19.1. Preparation of Working Environment 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. Creating 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 Functionalities
- 19.3.3. Use of Firebase Services as a 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 a Focus on Clean Architecture
- 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 AI
- 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 on the Authentication Screen

19.6. Dashboardand Navigation Creation
- 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 AI-enabled Mobile Application Listing Displays
- 19.7.2. Integration of Recommendation and Filtering Algorithms in the Listing Screen
- 19.7.3. Use of Design Patterns for Effective Data Presentation in the Listing Screen
- 19.7.4. Strategies for Efficient Real-Time Data Loading in the Listing Screen

19.8. Creating Detail Screen
- 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 Detail Screen
- 19.8.3. Implementation of Interactions and Animations in the Detail Screen
- 19.8.4. Strategies for Performance Optimization in Loading and Detail Display in AI-enabled Mobile Applications

19.9. Creating Settings Screen
- 19.9.1. Development of User Interfaces for Configuration and Settings in AI-enabled Mobile Applications
- 19.9.2. Integration of Custom Settings Related to AI Components
- 19.9.3. Implementing Customization Options and Preferences in the Configuration Screen
- 19.9.4. Strategies for Usability and Clarity in the Presentation of Options in the Settings Screen

19.10. Creating Icons, Splash and Graphic Resources for Your App with AI
- 19.10.1. Designing and Creating Attractive Icons to Represent Your AI Mobile Application
- 19.10.2. Developing Splash Screens with Impressive Visual Elements
- 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 AI Application Graphics Elements

Module 20. AI for QA *Testing*

20.1. 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 for 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 QA Testing Context
- 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 Domain
- 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. Creating a Test Plan
- 20.4.1. Designing and Structuring a Comprehensive Test Plan
- 20.4.2. Identifying 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 Test 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 in Search of Possible Errors
- 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 API Verification 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 Artificial Intelligence Projects

20.8. AI Tools for Web Testing
- 20.8.1. Exploring 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 Artificial Intelligence Components
- 20.9.2. Integration of Specific Testing Tools for AI-based Mobile Platforms
- 20.9.3. Use of Machine Learning Algorithms for the Detection of Performance Problems in Mobile Apps
- 20.9.4. Strategies for the Validation of Specific Mobile Application Interfaces and Functions using AI

20.10. QA Tools with AI
- 20.10.1. Exploration of QA Tools and Platforms that Incorporate Artificial Intelligence Functionalities
- 20.10.2. Evaluation of Tools for Efficient Test Management and 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 Capabilities

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

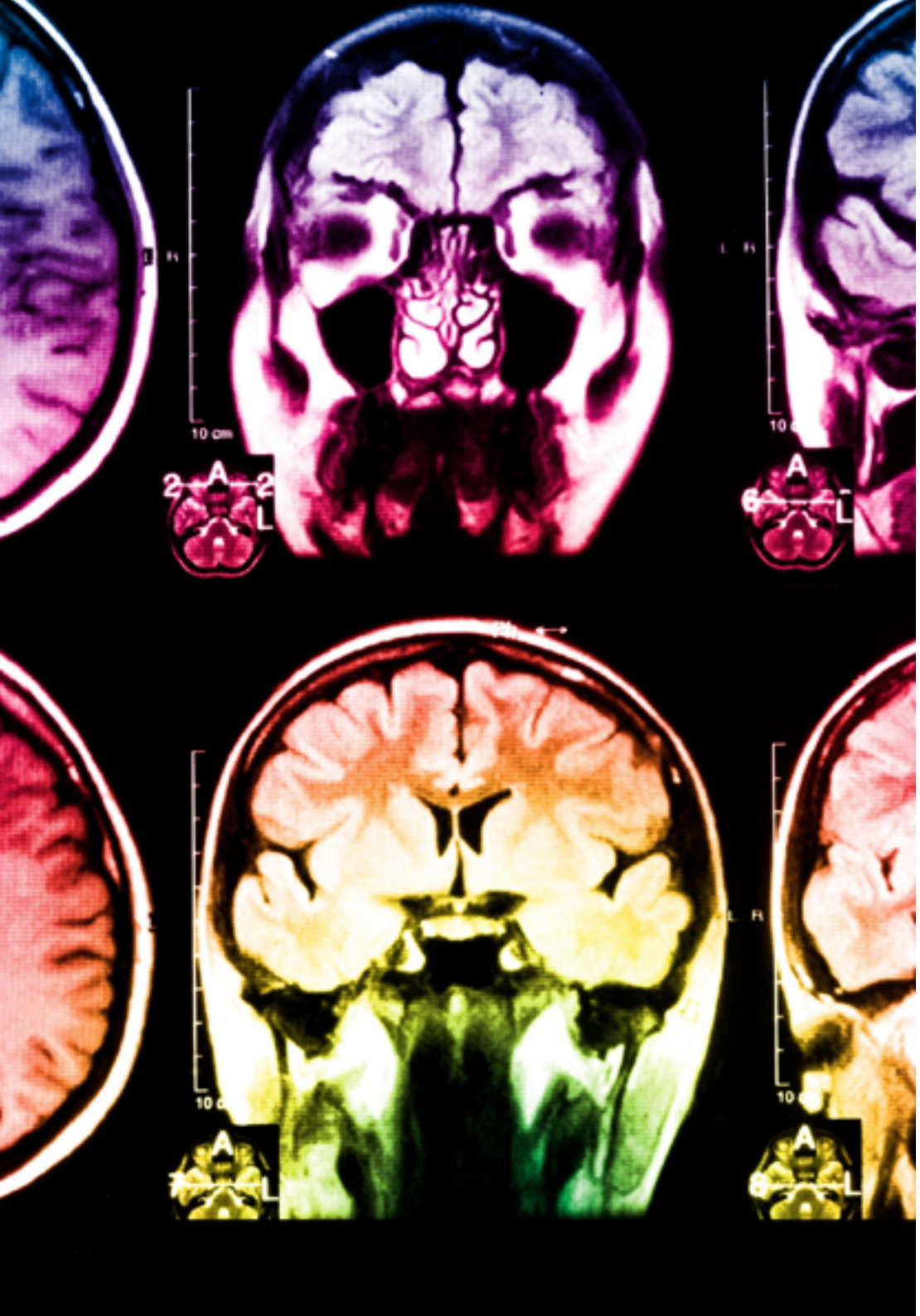
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

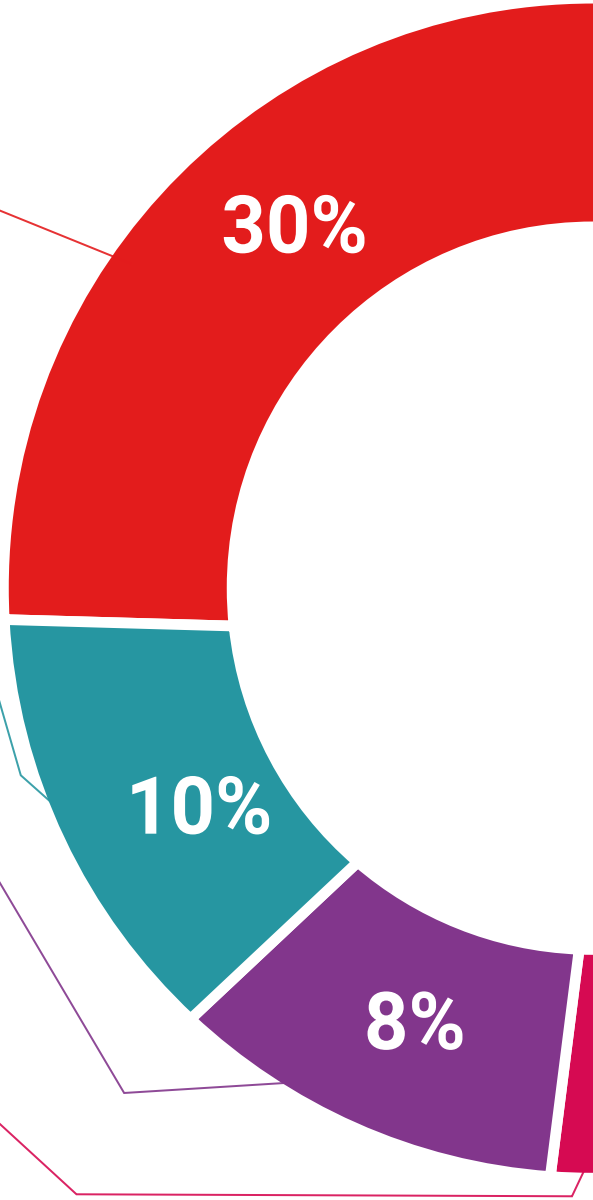
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

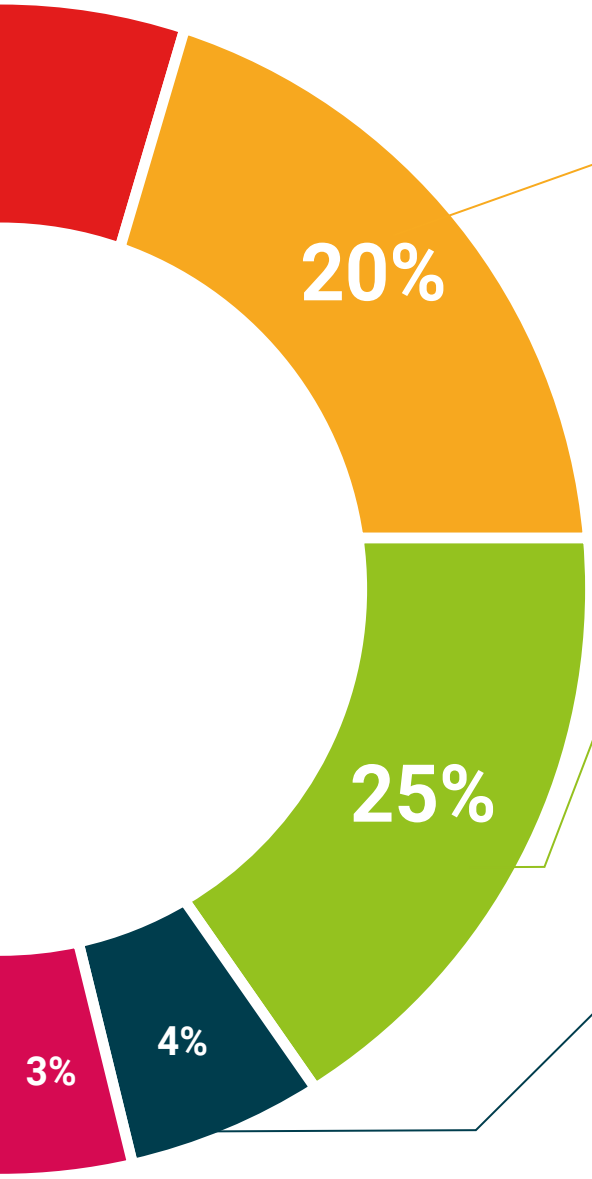
Practising Skills and Abilities

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 Professional Master's Degree 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 diploma issued by **TECH Technological University** will reflect the qualification obtained in the Professional Master's Degree, 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 h.**


tech technological university

Awards the following

DIPLOMA

to

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

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Artificial Intelligence in Programming

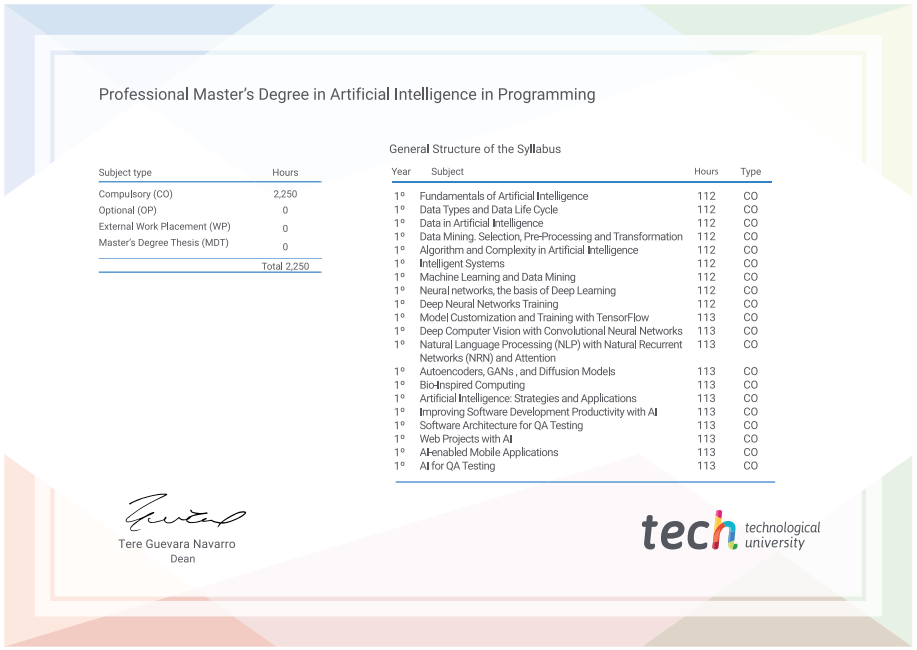
This is a qualification awarded by this University, equivalent to 2,250 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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	113	CO
1º	Deep Computer Vision with Convolutional Neural Networks	113	CO
1º	Natural Language Processing (NLP) with Natural Recurrent Networks (NRN) 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	Improving Software Development Productivity with AI	113	CO
1º	Software Architecture for QA Testing	113	CO
1º	Web Projects with AI	113	CO
1º	AI-enabled Mobile Applications	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 diploma 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**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

Artificial Intelligence in Programming

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