

# Hybrid Master's Degree Artificial Intelligence in Programming



## Hybrid Master's Degree Artificial Intelligence in Programming

Modality: Hybrid (Online + Internship)

Duration: 12 months

Certificate: TECH Global University

Accreditation: 60 + 4 ECTS

Website: [www.techtute.com/us/information-technology/hybrid-master-degree/hybrid-master-degree-artificial-intelligence-programming](http://www.techtute.com/us/information-technology/hybrid-master-degree/hybrid-master-degree-artificial-intelligence-programming)

# Index

01

Introduction

---

*p. 4*

02

Why Study this Hybrid Master's Degree?  
Objectives

---

*p. 8*

03

Objectives

---

*p. 12*

04

Skills

---

*p. 22*

05

Course Management

---

*p. 26*

06

Educational Plan

---

*p. 30*

07

Clinical Internship

---

*p. 48*

08

Where Can I Do the Internship?

---

*p. 54*

09

Methodology

---

*p. 58*

10

Certificate

---

*p. 66*

# 01

# Introduction

With continued advances in machine learning algorithms and neural networks, developers can now automate complex tasks, improve code efficiency and develop smarter, more adaptive applications. According to recent data, the use of Artificial Intelligence (AI) in programming has significantly reduced software development time and substantially improved error detection and resource optimization. Therefore, TECH has created this comprehensive program, divided into two essential parts. The first section is entirely theoretical and is taught entirely online, using the innovative learning methodology known as Relearning. The second part involves a 3-week practical internship in a company specialized in programming services using Artificial Intelligence.



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*Thanks to this TECH Hybrid Master's Degree, you will acquire a deep understanding of the essential fundamentals of Artificial Intelligence, such as algorithms, data mining and intelligent systems”*

According to recent data, the use of Artificial Intelligence (AI) in programming has made it possible to automate repetitive and complex tasks, reducing development times and increasing accuracy in error detection. Leading technology companies have integrated AI into their software development workflows, improving efficiency and facilitating the creation of more intelligent and adaptable applications.

In this way, this Hybrid Master's Degree was created, which will establish the fundamentals of Artificial Intelligence, providing computer scientists with a solid foundation in theory and key concepts. In addition, data types and their efficient management for AI applications will be analyzed, as well as the role of data in AI, including how it can be optimized and used effectively to improve results.

Professionals will also dive into cutting-edge technologies, such as TensorFlow, and specialized applications, such as natural language processing and recurrent neural networks. In this way, they will be prepared to face complex challenges in fields such as bio-inspired computing and productivity improvement. Likewise, the software architecture for QA Testing and the development of web and mobile applications will be explored.

Finally, the curriculum will focus on the implementation of AI to improve the quality of software testing, a comprehensive approach that will ensure that students are prepared to understand Artificial Intelligence in depth, applying it effectively in real-world projects.

In this context, TECH has developed a university program that integrates theory, completely online, with a practical stay of 3 weeks in the main companies of the sector. In this way, the first part of the academic itinerary will be adjusted to the graduate's work and personal schedule, who will only need an electronic device with Internet access. Additionally, it will be based on the revolutionary Relearning methodology, which emphasizes the review of key concepts for an effective and natural assimilation of the content.

This **Hybrid Master's Degree in Artificial Intelligence in Programming** contains the most complete and up-to-date program on the market. The most important features include:

- ♦ Development of more than 100 case studies presented by Artificial Intelligence professionals and university professors with extensive experience in its application in programming
- ♦ The graphic, schematic and eminently practical contents with which they are conceived, gather essential information on those procedures and tools essential for professional practice
- ♦ All of this will be complemented by 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
- ♦ Furthermore, you will be able to carry out an internship in one of the best companies



*It focuses you on practical applications of AI in different contexts, such as web projects, mobile applications and QA Testing, hand in hand with the best digital university in the world, according to Forbes: TECH*

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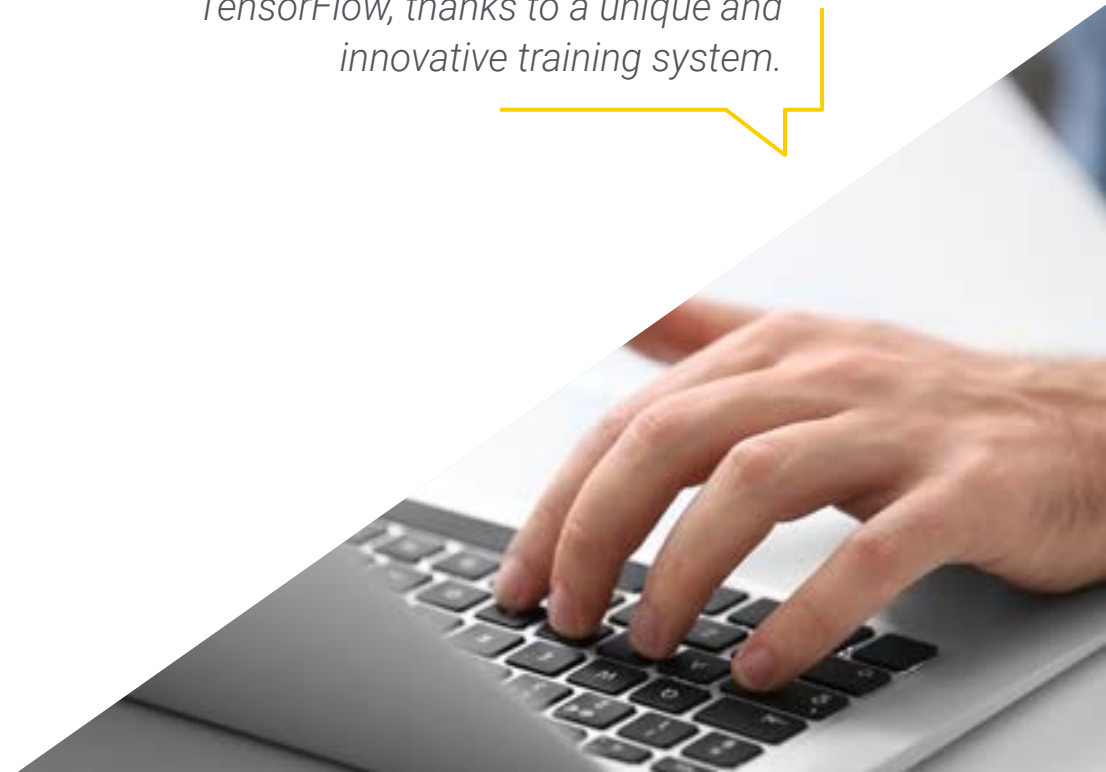
*You will analyze the types and life cycle of data, as well as its direct application in data mining, through the best teaching materials, at the forefront of technology and education”*

In this Hybrid Master's Degree proposal, of professionalizing character and blended learning modality, the program is aimed at updating professionals of Artificial Intelligence in Programming, who develop their functions in companies specialized in this field, and who require a high level of qualification. The contents are based on the latest scientific evidence, and oriented in a didactic way to integrate theoretical knowledge in computer science practice, and the theoretical-practical elements will facilitate the updating of knowledge and allow decision making.

Thanks to its multimedia content elaborated with the latest educational technology, they will allow the IT professional to learn in a contextual and situated way, that is to say, a simulated environment that will provide an immersive learning programmed to train in real situations. This program is designed around Problem-Based Learning, whereby the physician 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.

*You will carry out an intensive practical stay of 3 weeks in a prestigious company and will acquire all the knowledge to grow personally and professionally.*

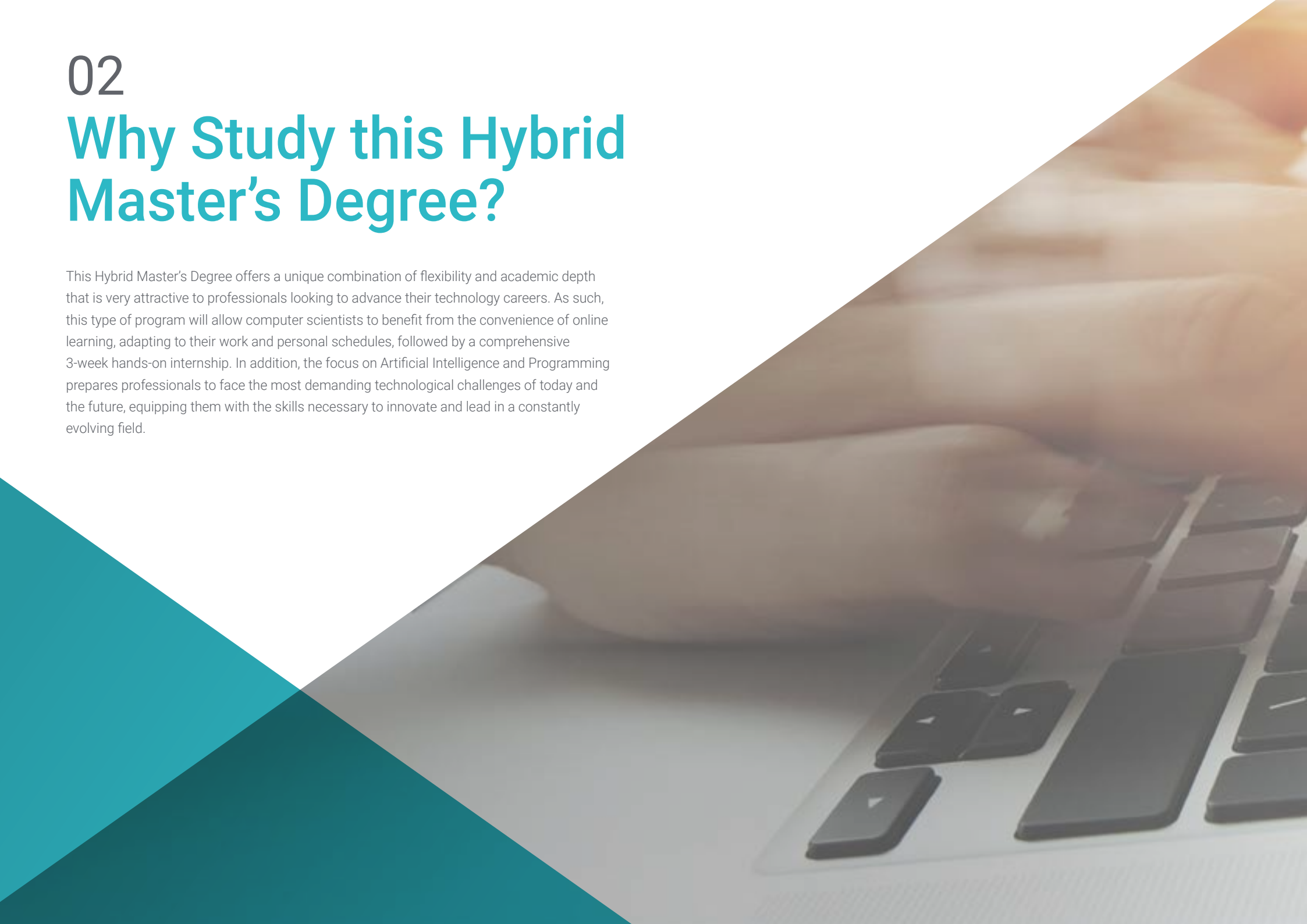
*You will be immersed in advanced topics, such as deep neural networks and their training using tools such as TensorFlow, thanks to a unique and innovative training system.*



# 02

## Why Study this Hybrid Master's Degree?

This Hybrid Master's Degree offers a unique combination of flexibility and academic depth that is very attractive to professionals looking to advance their technology careers. As such, this type of program will allow computer scientists to benefit from the convenience of online learning, adapting to their work and personal schedules, followed by a comprehensive 3-week hands-on internship. In addition, the focus on Artificial Intelligence and Programming prepares professionals to face the most demanding technological challenges of today and the future, equipping them with the skills necessary to innovate and lead in a constantly evolving field.





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*The combination of rigorous theory and practical experience will facilitate the development of advanced skills and the ability to lead innovative projects in the field of technology”*

### 1. Updating from the latest technology available

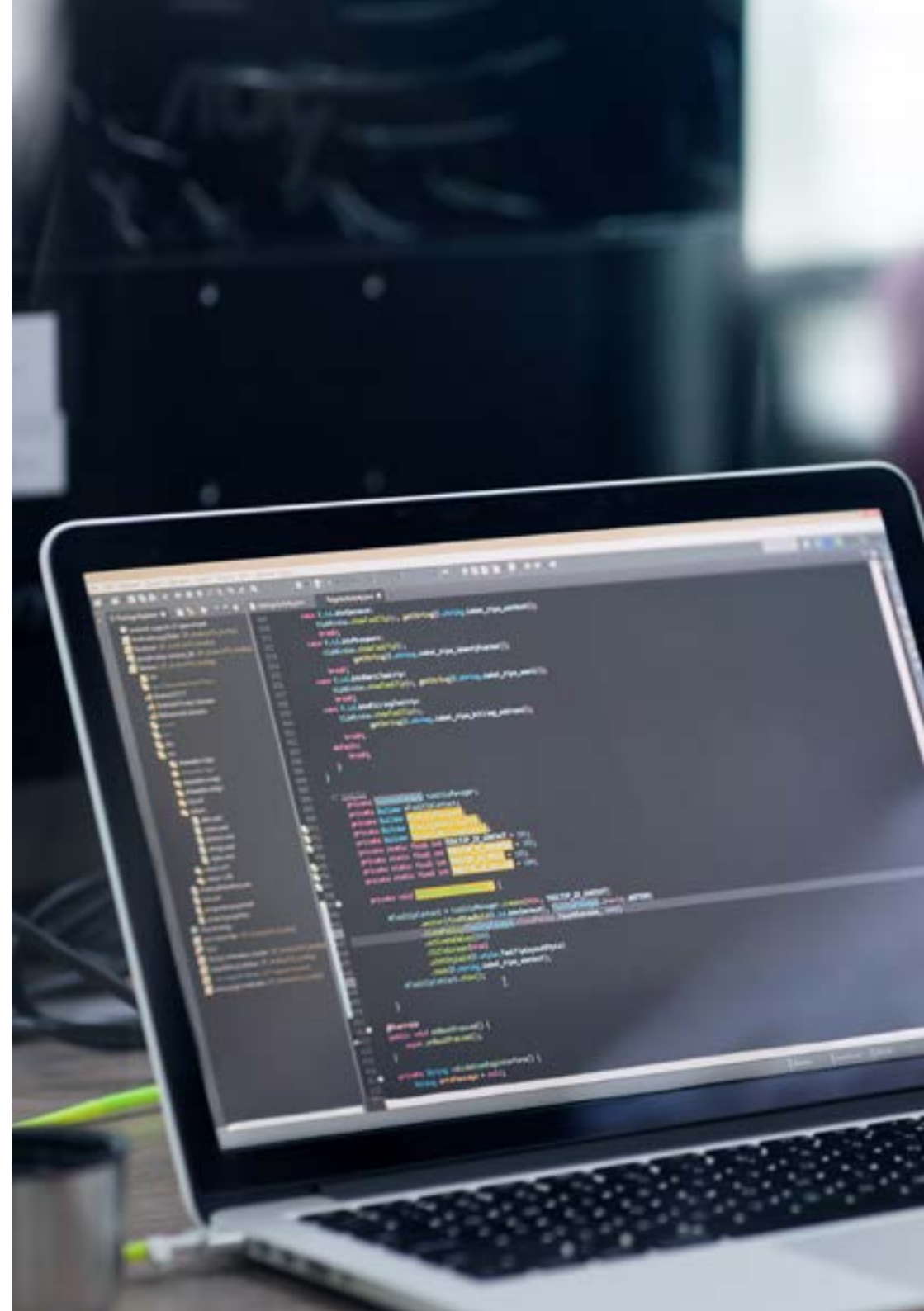
In this area, machine learning systems and deep neural networks have revolutionized the ability of machines to autonomously process and understand data. Tools such as TensorFlow and PyTorch have democratized the development of complex models, allowing researchers and developers to explore applications in areas such as natural language processing, computer vision and creative content generation.

### 2. Gaining in-depth knowledge from the experience of top specialists

The large team of professionals that will accompany the specialist throughout the practical period is a first-class and an unprecedented guarantee of updating. With a specifically designated tutor, the computer scientist will be able to work on real projects in a state-of-the-art environment, which will allow them to incorporate the latest Artificial Intelligence Programming procedures and tools into their daily practice.

### 3. Entering first-class professional environments

TECH carefully selects all available centers for Internship Programs. Thanks to this, the specialist will have guaranteed access to a prestigious technological environment in the area of Artificial Intelligence in Programming. In this way, they will be able to experience the day-to-day of a demanding, rigorous and exhaustive area of work, always applying the most innovative technological advances.



#### 4. Combining the best theory with state-of-the-art practice

The academic market is plagued by teaching programs that are poorly adapted to the daily work of the specialist and that require long teaching hours, often not very compatible with personal and professional life. TECH offers a new learning model, 100% practical, that allows you to get in front of state-of-the-art procedures in the field of Artificial Intelligence in Programming and, best of all, to put it into professional practice in just 3 weeks.

#### 5. Opening the door to new opportunities

With the ability to develop advanced machine-learning algorithms and intelligent systems, computer scientists can influence industries as diverse as healthcare, e-commerce, automotive and more. These technologies not only optimize existing processes, but also enable the creation of innovative products and services that improve quality of life and business efficiency.

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*You will have full practical immersion  
at the center of your choice"*

# 03 Objectives

This program will seek to train computer scientists to design and develop innovative solutions, using tools such as machine learning, deep neural networks and natural language processing. In addition, it will focus on preparing professionals to apply this knowledge in real-world contexts, both in industry and research, fostering critical skills such as data analysis, optimization of algorithms and complex problem solving. It will also foster the development of interpersonal and collaborative skills needed to work in multidisciplinary teams on advanced technology projects.



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*The main objectives of the Hybrid Master's Degree are to provide computer scientists with a deep and updated knowledge in the most advanced techniques and applications of Artificial Intelligence”*



## General Objective

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- ♦ The overall objective of the Hybrid Master's Degree in Artificial Intelligence in Programming is to equip computer scientists with advanced skills and fundamental practices to master efficient development environments. This will include the configuration and management of essential tools for the implementation of AI projects, ensuring a robust foundation for practical applications. In addition, the program will seek to improve productivity by integrating AI extensions into Visual Studio Code and no-code design techniques, optimizing the software development process



*You will strengthen your skills in advanced QA Testing, including the planning, execution and automation of quality tests, with the support of Artificial Intelligence tools"*





## Specific Objectives

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### 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 task
- ♦ 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 with AI

- ♦ 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

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*Delve into the most relevant theory in this field, subsequently applying it in a real work environment”*

# 04 Skills

The skills acquired in this university program will cover a wide range of technical and practical skills that will prepare computer scientists to face complex challenges in software development. In this way, they will develop the ability to configure and manage efficient development environments, integrating Artificial Intelligence extensions in tools such as Visual Studio Code, to increase productivity. They will also use ChatGPT to optimize and improve code quality, applying advanced programming practices. In the field of QA Testing, you will acquire skills in planning, executing and automating quality tests.

```
...ings.js  
...js  
.js command.js  
.js editor.js  
.js FileManager.js  
.js main.js  
= readme.rst  
.js sequences.js
```

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self  
input.on  
//escap  
if (e.  
// th  
self  
retur  
}  
if (e.  
e.st  
e.pr  
self  
self  
retur  
}  
//up/d  
if (e.  
e.pr  
e.st  
if (  
//  
if
```

```
searchHistory;  
= this;  
("keydown", function(e) {  
  if (e.keyCode == 27) {  
    this is a new line  
    .deactivate(true);  
    return; // this is a modified line
```

```
keyCode == 13) {  
  stopImmediatePropagation();  
  eventDefault();  
  .search();  
  .deactivate();  
  return;
```

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down  
keyCode == 38 || e.  
eventDefault();  
stopImmediatePr  
e.keyCode  
show  
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```

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*You will master end-to-end web development and the creation of AI-powered mobile applications, ensuring the performance, scalability and security of systems”*



## General Skills

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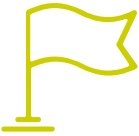
- ♦ Apply AI extensions in Visual Studio Code and no-code design techniques to increase efficiency in software development
- ♦ Use ChatGPT to optimize and improve code quality, applying advanced programming practices
- ♦ Implement web projects, from workspace creation to deployment, integrating AI on 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

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*You will apply design patterns and secure development practices, ensuring the integrity and protection of the developed software. What are you waiting for to enroll?"*







## Specific Skills

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- ♦ 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 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

# 05

# Course Management

The faculty behind this Hybrid Master's Degree in Artificial Intelligence in Programming are highly qualified and recognized experts in the field of AI and software development. Coming from leading technology companies, these professionals combine solid academic training with vast practical experience in innovative and high-impact projects. In addition, their pedagogical approach is based on the application of advanced teaching methodologies, including the integration of emerging tools and technologies, to provide an enriching and up-to-date learning experience.



“

*Teachers will provide in-depth and practical knowledge on machine learning, code optimization, secure development and implementation of AI in web and mobile applications”*

## Management



### Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometheus 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 at OWQLO
- Specialist in Computer Systems Engineering and Machine Learning Engineer
- 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
- Technical Engineer in Computer Systems from the University of Castilla la Mancha

# 06

## Educational Plan

The academic program will offer a comprehensive and updated curriculum that will address both the theoretical foundations and practical applications of Artificial Intelligence. Among the program contents, essential modules such as "Fundamentals of Artificial Intelligence" and "Types and life cycle of data" have been included, which will lay the foundations for understanding the handling and processing of large volumes of information. Other outstanding modules are "Data Mining: Selection, Preprocessing and Transformation", 'Algorithm and Complexity in Artificial Intelligence' and 'Intelligent Systems', which will delve into advanced techniques and algorithms crucial for AI development.



“

*You will cover specialized areas, such as machine learning, data mining, neural networks and Deep Learning, as well as natural language processing (NLP)”*

## 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
  - 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 BORRAR
  - 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. Discret 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. Graphic 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 Attention Mechanisms in RNN
  - 12.5.2. Use of Attention 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 Library
  - 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 Computing 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. Education
  - 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 ChatGPT
  - 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 ChatGPT
  - 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 with the help of ChatGPT
  - 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 Using ChatGPT
  - 17.2.1. Scalable 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 Using ChatGPT
  - 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 AI Using ChatGPT
  - 17.6.1. Adaptation of Classical Data Structures for Use with AI Algorithms
  - 17.6.2. Design and Optimization of Specific Data Structures with ChatGPT
  - 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 using ChatGPT
  - 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 DeepCode
  - 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 with GitHub Copilot
  - 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 Github Copilot 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 GitHub Copilot
  - 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 using GitHub Copilot
    - 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 GitHub Copilot
    - 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 ChatGPT
    - 18.7.2. Implementing CI/CD Pipelines Tailored to Web Applications with Github Copilot
    - 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 Project for LAMP Environments with the Help of ChatGPT
    - 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. Creating an AI Project for MEVN Environments Using ChatGPT
    - 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 with GitHub Copilot
    - 19.4.3. Design and Structuring of Components in Mobile Projects with Github Copilot
    - 19.4.4. Benefits and Challenges of Implementing Clean Architecture in Mobile Applications with AI
  - 19.5. Creating Authentication Screen with GitHub Copilot
    - 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. Creating Dashboard and Navigation with GitHub Copilot
    - 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. Listing Screen Creation using GitHub Copilot
    - 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. Creating Details Screen with GitHub Copilot
    - 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. Creating a Settings Screen with GitHub Copilot
    - 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 with the Help of ChatGPT
    - 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 Projects with ChatGPT
  - 20.3.4. Adaptation of Conventional Testing Types to Projects with ChatGPT
- 20.4. Creation of a Testing Plan Using ChatGPT
  - 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 ChatGPT for Dynamic Code Analysis to Search for Possible Bugs
  - 20.5.3. Strategies for Automatic Generation of Detailed Reports on Bugs Detected Using ChatGPT
  - 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 Using ChatGPT
  - 20.6.2. Integration of AI-Based Test Automation Tools
  - 20.6.3. Using ChatGPT 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 Using ChatGPT
  - 20.7.3. Strategies for Data and Results Validation in API Testing with ChatGPT
  - 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 ChatGPT
  - 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 ChatGPT 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. Using ChatGPT for the Generation and Optimization of Test Cases
  - 20.10.4. Strategies for Effective Selection and Adoption of QA Tools with AI Capabilities

07

# Clinical Internship

After passing the online theoretical period, the program includes a period of practical training in a reference company, specialized in the use of Artificial Intelligence in Programming. In this way, the computer scientist will have at his disposal the support of a tutor who will accompany him throughout the process, both in the preparation and in the development of the practical stay.







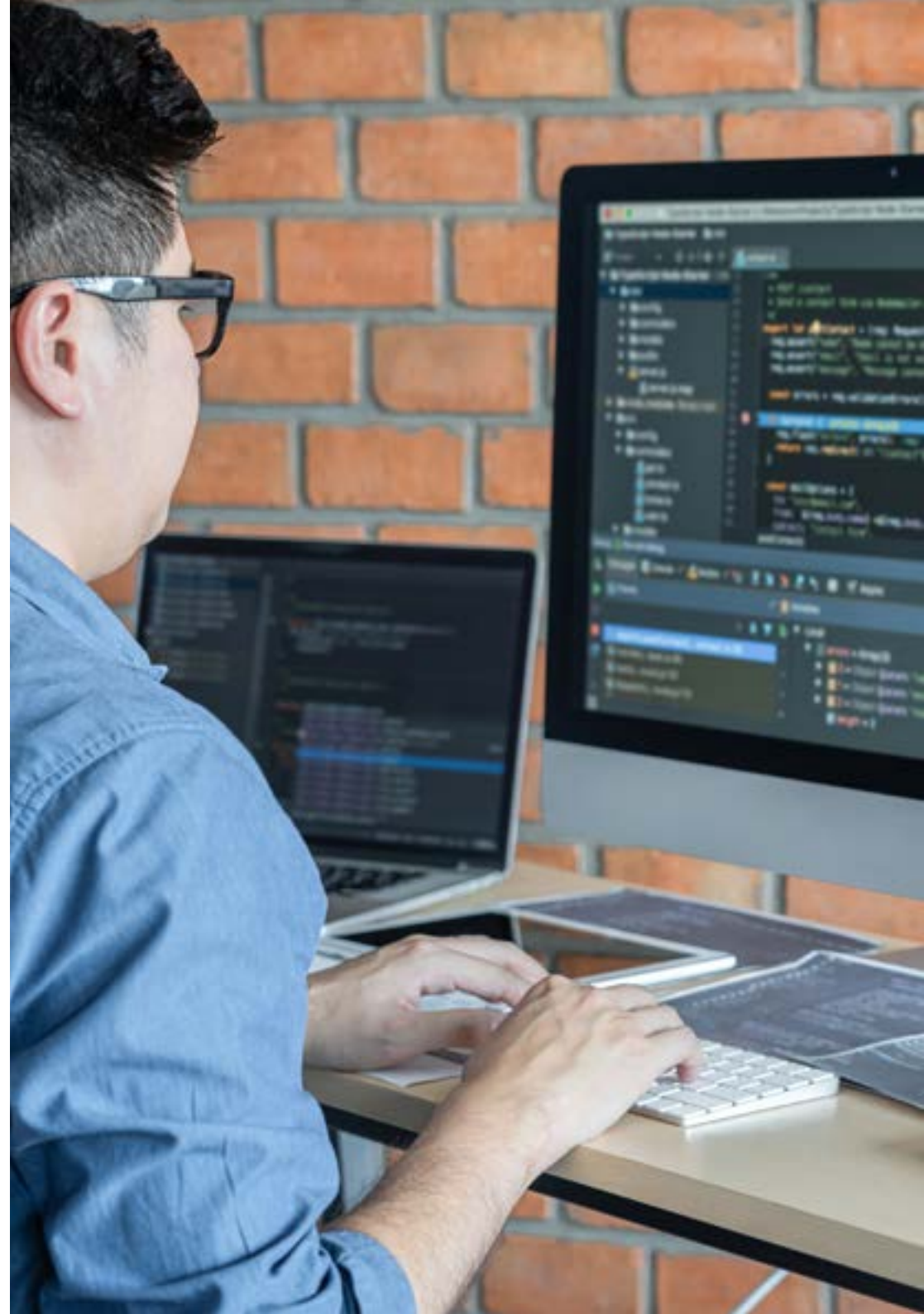
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*You will carry out the practical stay in leading companies in the technology sector, specialized in the use of Artificial Intelligence for software development”*

The Internship Program of this Artificial Intelligence in Programming program consists of a practical internship in a prestigious company specialized in Artificial Intelligence in Programming, lasting 3 weeks, from Monday to Friday, with 8 consecutive hours of practical training, with a specialist in the field. This internship will allow the computer scientist to develop real AI projects, alongside a team of experts of reference in this field, applying the most innovative procedures and tools, implementing the latest technology.

In this training proposal, of a completely practical nature, the activities are aimed at developing and perfecting the skills necessary for the use of Artificial Intelligence in programming work, in areas and conditions that require a high level of qualification, and which are oriented towards specific training for the exercise of the activity. This is undoubtedly a unique opportunity to learn by working.

The practical part will be carried out with the active participation of the student performing the activities and procedures of each area of competence (learning to learn and learning to do), with the accompaniment and guidance of teachers and other training partners that facilitate teamwork and multidisciplinary integration as transversal competencies for the practice of Artificial Intelligence in Programming (learning to be and learning to relate).



The procedures described below will be the basis of the practical part of the program, and their implementation will be subject to the center’s own availability and workload, the proposed activities being the following:

Module	Practical Activity
<b>Development of Machine Learning Models</b>	Train neural network models
	Optimize machine learning algorithms
	Implement regularization and optimization techniques
	Evaluate and compare the accuracy of different models
<b>Natural Language Processing (NLP)</b>	Develop algorithms for sentiment analysis
	Create Named Entity Recognition (NER) systems
	Implement machine translation models
	Design spam filters using PLN techniques
<b>Computer Vision</b>	Develop algorithms for face recognition
	Implement object detection systems in images
	Optimize image segmentation algorithms
	Evaluate accuracy of computer vision models
<b>Recommendation Systems</b>	Implement collaborative filtering-based recommendation engines
	Develop hybrid recommender systems
	Optimize real-time recommendation algorithms
	Evaluate the effectiveness of recommender systems using appropriate metrics

Module	Practical Activity
<b>Practical Applications of AI</b>	Develop chatbots using natural language processing techniques
	Implement speech recognition systems for mobile applications
	Design predictive analytics models for business
	Create automatic content generation systems
<b>Ethics and Security in AI</b>	Assess bias in machine learning models
	Implement privacy techniques in AI algorithms
	Develop ethics policies in the deployment of AI systems
	Audit AI systems to identify vulnerabilities and risks
<b>Research and Development</b>	Research new deep learning techniques
	Develop prototypes of innovative systems using AI
	Publish papers in conferences and journals
	Collaborate with multidisciplinary teams on applied research projects

## Civil Liability Insurance

This institution's main concern is to guarantee the safety of the students and other collaborating agents involved in the internship process at the company. Among the measures dedicated to achieve this is the response to any incident that may occur during the entire teaching-learning process.

To this end, this entity commits to purchasing a civil liability insurance policy to cover any eventuality that may arise during the course of the internship at the center.

This liability policy for interns will have broad coverage and will be taken out prior to the start of the practical training period. That way professionals will not have to worry in case of having to face an unexpected situation and will be covered until the end of the internship program at the center.



## General Conditions of the Internship Program

The general terms and conditions of the internship agreement for the program are as follows:

**1. TUTOR:** During the Hybrid Master's Degree, students will be assigned with two tutors who will accompany them throughout the process, answering any doubts and questions that may arise. On the one hand, there will be a professional tutor belonging to the internship center who will have the purpose of guiding and supporting the student at all times. On the other hand, they will also be assigned with an academic tutor whose mission will be to coordinate and help the students during the whole process, solving doubts and facilitating everything they may need. In this way, the student will be accompanied and will be able to discuss any doubts that may arise, both clinical and academic.

**2. DURATION:** The internship program will have a duration of three continuous weeks, in 8-hour days, 5 days a week. The days of attendance and the schedule will be the responsibility of the center and the professional will be informed well in advance so that they can make the appropriate arrangements.

**3. ABSENCE:** If the students does not show up on the start date of the Hybrid Master's Degree, they will lose the right to it, without the possibility of reimbursement or change of dates. Absence for more than two days from the internship, without justification or a medical reason, will result in the professional's withdrawal from the internship, therefore, automatic termination of the internship. Any problems that may arise during the course of the internship must be urgently reported to the academic tutor.

**4. CERTIFICATION:** Professionals who pass the Hybrid Master's Degree will receive a certificate accrediting their stay at the center.

**5. EMPLOYMENT RELATIONSHIP:** the Hybrid Master's Degree shall not constitute an employment relationship of any kind.

**6. PRIOR EDUCATION:** Some centers may require a certificate of prior education for the Hybrid Master's Degree. In these cases, it will be necessary to submit it to the TECH internship department so that the assignment of the chosen center can be confirmed.

**7. DOES NOT INCLUDE:** The Hybrid Master's Degree will not include any element not described in the present conditions. Therefore, it does not include accommodation, transportation to the city where the internship takes place, visas or any other items not listed.

However, students may consult with their academic tutor for any questions or recommendations in this regard. The academic tutor will provide the student with all the necessary information to facilitate the procedures in any case.

# 08

## Where Can I Do the Internship?

This Hybrid Master's Degree program includes in its itinerary a practical stay in a prestigious company, where the graduate will put into practice everything they have learned about Artificial Intelligence in Programming. In this sense, and to bring this degree to more professionals, TECH will offer the student the opportunity to take it in different institutions around the country. In this way, strengthens its commitment to quality and affordable education for all.



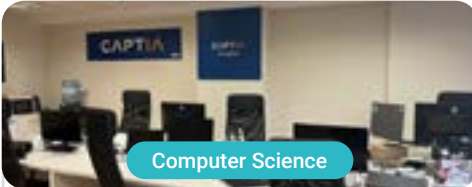
“

*You will face concrete challenges, developing practical solutions and collaborating in teams, which will enhance your technical skills and your ability to solve complex problems”*

## tech 56 | Where Can I Do the Internship?



The student will be able to complete the practical part of this Hybrid Master's Degree at the following centers:



Computer Science

### Captia Ingeniería

Country	City
Spain	Madrid

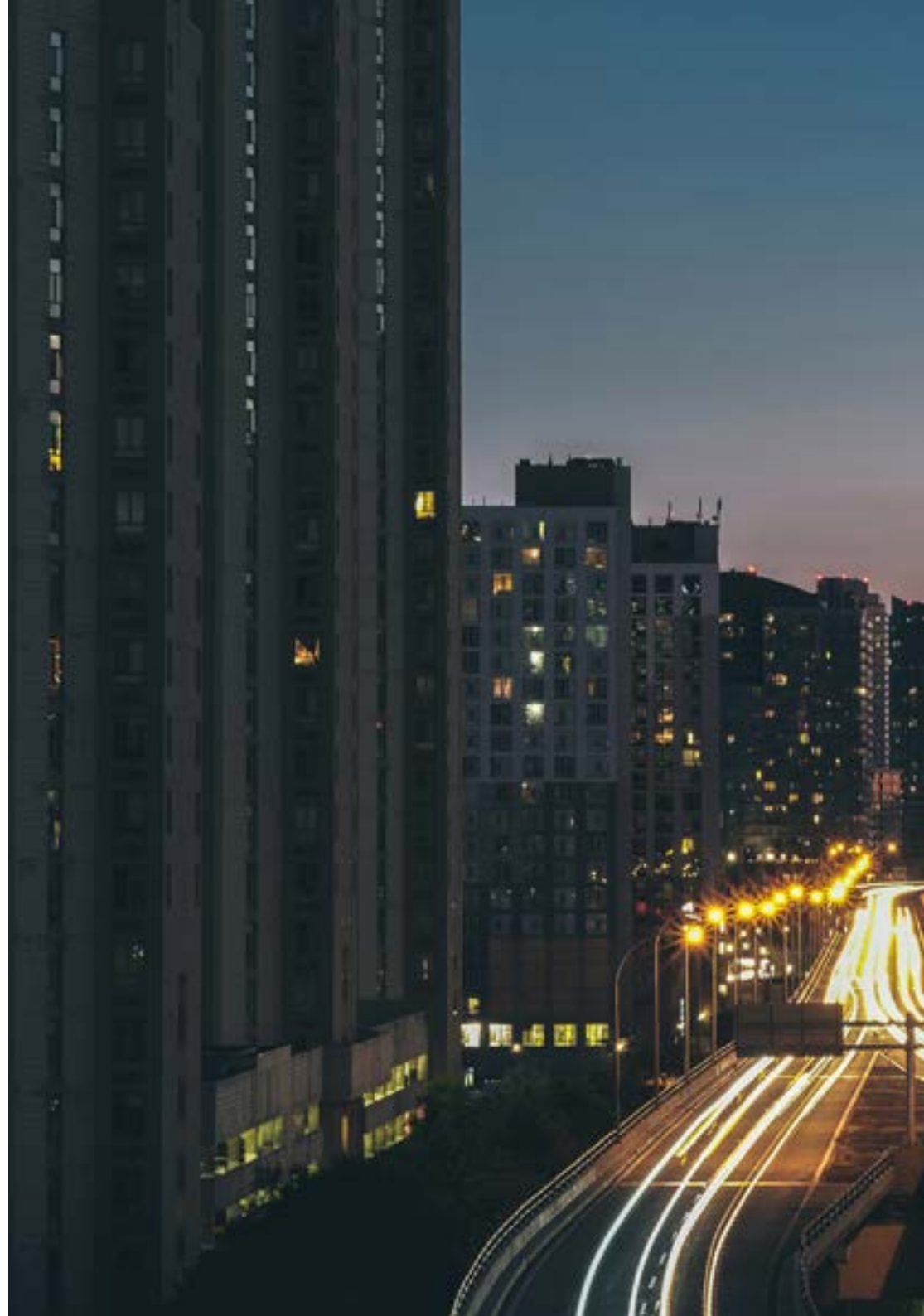
Address: Av. de las Nieves, 37, Bloque A Planta 1  
Oficina E, 28935, Móstoles, Madrid

IT company dedicated to providing advanced technological solutions to industries.

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**Related internship programs:**

- Visual Analytics and Big Data
- Software Development







“

*Boost your career path with holistic teaching, allowing you to advance both theoretically and practically”*

09

# 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.



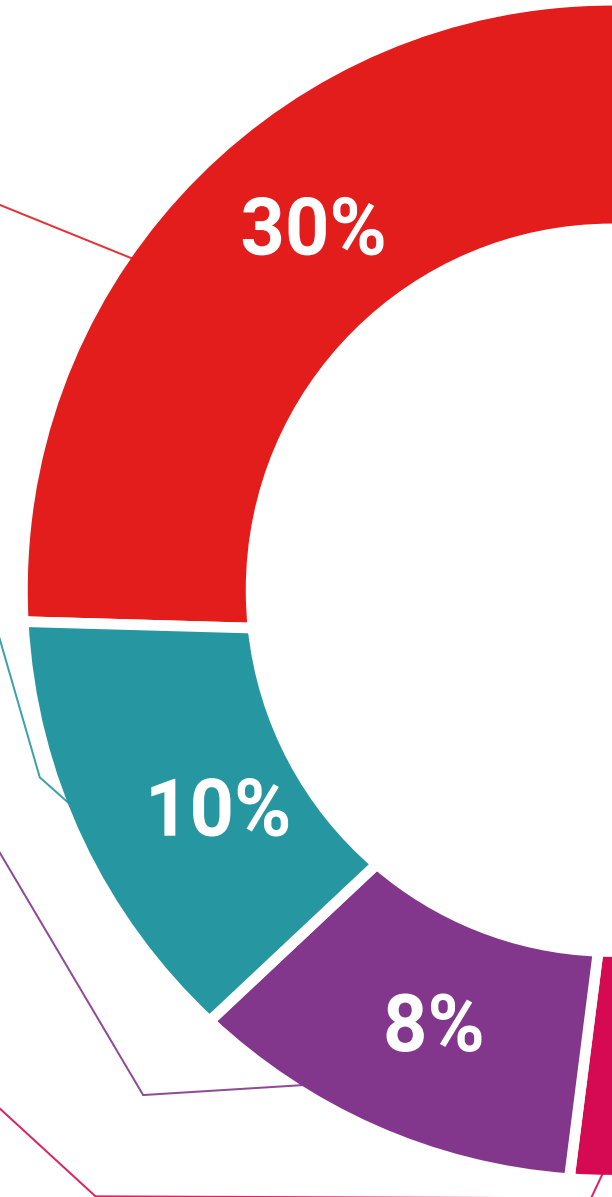
#### Practising Skills and Abilities

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.

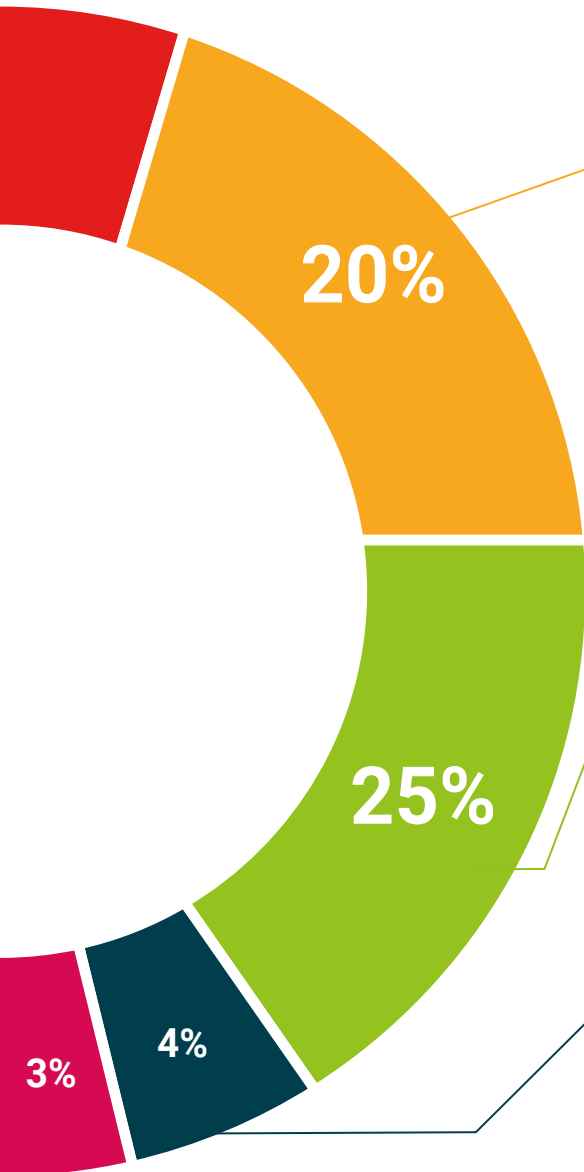


#### Additional Reading

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.



# 10 Certificate

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



“

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

This private qualification will allow you to obtain a **Hybrid Master's Degree in Artificial Intelligence in Programming** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra ([official bulletin](#)). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

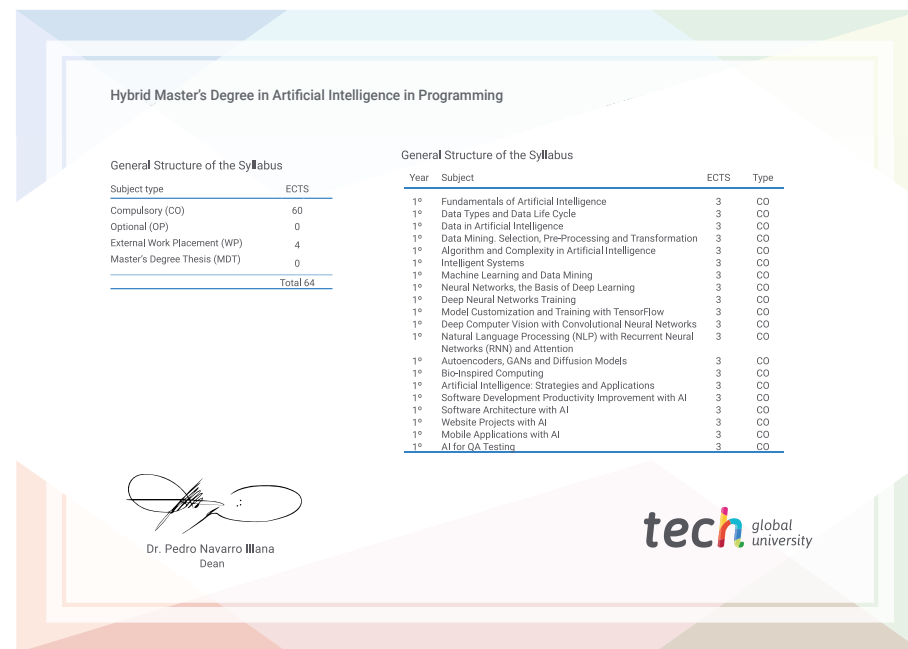
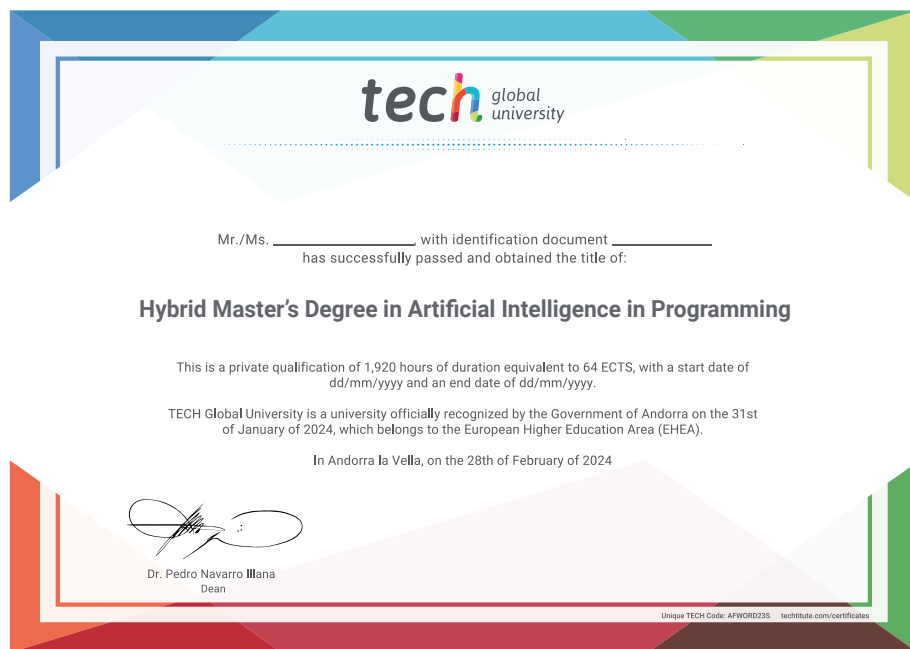
This **TECH Global University** private qualification is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

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

Modality: **Hybrid (Online + Internship)**

Duration: **12 months**

Accreditation: **60 + 4 ECTS**



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

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment



## Hybrid Master's Degree Artificial Intelligence in Programming

Modality: Hybrid (Online + Internship)

Duration: 12 months

Certificate: TECH Global University

Accreditation: 60 + 4 ECTS

# Hybrid Master's Degree Artificial Intelligence in Programming

