

# Executive Master's Degree Artificial Intelligence and Knowledge Engineering

**M A I K E**



## Executive Master's Degree Artificial Intelligence and Knowledge Engineering

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

Website: [www.techtute.com/in/school-of-business/master/artificial-intelligence-knowledge-engineering](http://www.techtute.com/in/school-of-business/master/artificial-intelligence-knowledge-engineering)

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# 01 Welcome

Artificial intelligence makes it possible for machines to learn from experience, adjust to new inputs and perform tasks like human beings. Developments based on Artificial Intelligence and Knowledge Engineering have already reached numerous applications in business. Thanks to these, business and production processes can now be optimized at an unprecedented level. From the automation of numerous procedures to the improvement of process control itself. This means that professionals need to know and master the operation of these complex techniques. For this reason, TECH has created this program, where students will find the most relevant information of the moment, through a teaching and innovative syllabus that will be easy to understand and apply in daily practice.



Executive Master's Degree in Artificial Intelligence and Knowledge Engineering  
TECH Technological University



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*Specializing in Artificial Intelligence will give you the opportunity to improve your skills, as you will have greater control over everything that happens in your business”*

02

# Why Study at TECH?

TECH is the world's largest 100% online business school. It is an elite business school, with a model based on the highest academic standards. A world-class centre for intensive managerial skills training.



“

*TECH is a university at the forefront of technology, and puts all its resources at the student's disposal to help them achieve entrepreneurial success"*

## At TECH Technological University



### Innovation

The university offers an online learning model that combines the latest educational technology with the most rigorous teaching methods. A unique method with the highest international recognition that will provide students with the keys to develop in a rapidly-evolving world, where innovation must be every entrepreneur's focus.

"Microsoft Europe Success Story", for integrating the innovative, interactive multi-video system.



### The Highest Standards

Admissions criteria at TECH are not economic. Students don't need to make a large investment to study at this university. However, in order to obtain a qualification from TECH, the student's intelligence and ability will be tested to their limits. The institution's academic standards are exceptionally high...

**95%** | of TECH students successfully complete their studies



### Networking

Professionals from countries all over the world attend TECH, allowing students to establish a large network of contacts that may prove useful to them in the future.

**100,000+**  
executives trained each year

**200+**  
different nationalities



### Empowerment

Students will grow hand in hand with the best companies and highly regarded and influential professionals. TECH has developed strategic partnerships and a valuable network of contacts with major economic players in 7 continents.

**500+** | collaborative agreements with leading companies



### Talent

This program is a unique initiative to allow students to showcase their talent in the business world. An opportunity that will allow them to voice their concerns and share their business vision.

After completing this program, TECH helps students show the world their talent.



### Multicultural Context

While studying at TECH, students will enjoy a unique experience. Study in a multicultural context. In a program with a global vision, through which students can learn about the operating methods in different parts of the world, and gather the latest information that best adapts to their business idea.

TECH students represent more than 200 different nationalities.





TECH strives for excellence and, to this end, boasts a series of characteristics that make this university unique:



### Learn with the best

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In the classroom, TECH's teaching staff discuss how they have achieved success in their companies, working in a real, lively, and dynamic context. Teachers who are fully committed to offering a quality specialization that will allow students to advance in their career and stand out in the business world.

Teachers representing 20 different nationalities.



*At TECH, you will have access to the most rigorous and up-to-date case studies in the academic community"*



### Analysis

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TECH explores the student's critical side, their ability to question things, their problem-solving skills, as well as their interpersonal skills.



### Academic Excellence

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TECH offers students the best online learning methodology. The university combines the Relearning method (a postgraduate learning methodology with the highest international rating) with the Case Study. A complex balance between tradition and state-of-the-art, within the context of the most demanding academic itinerary.



### Economy of Scale

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TECH is the world's largest online university. It currently boasts a portfolio of more than 10,000 university postgraduate programs. And in today's new economy, **volume + technology = a groundbreaking price**. This way, TECH ensures that studying is not as expensive for students as it would be at another university.

03

# Why Our Program?

Studying this TECH program means increasing the chances of achieving professional success in senior business management.

It is a challenge that demands effort and dedication, but it opens the door to a promising future. Students will learn from the best teaching staff and with the most flexible and innovative educational methodology.



“

*We have highly qualified teachers and the most complete syllabus on the market, which allows us to offer you training of the highest academic level"*

This program will provide students with a multitude of professional and personal advantages, particularly the following:

**01**

### A significant career boost

By studying at TECH, students will be able to take control of their future and develop their full potential. By completing this program, students will acquire the skills required to make a positive change in their career in a short period of time.

*70% of participants achieve positive career development in less than 2 years.*

**02**

### Develop a strategic and global vision of companies

TECH offers an in-depth overview of general management to understand how each decision affects each of the company's different functional areas.

*Our global vision of companies will improve your strategic vision.*

**03**

### Consolidate the student's senior management skills

Studying at TECH means opening the doors to a wide range of professional opportunities for students to position themselves as senior executives, with a broad vision of the international environment.

*You will work on more than 100 real senior management cases.*

**04**

### Take on new responsibilities

The program will cover the latest trends, advances and strategies, so that students can carry out their professional work in a changing environment.

*45% of graduates are promoted internally.*

05

### Access to a powerful network of contacts

TECH connects its students to maximize opportunities. Students with the same concerns and desire to grow. Therefore, partnerships, customers or suppliers can be shared.

*You will find a network of contacts that will be instrumental for professional development.*

06

### Thoroughly develop business projects

Students will acquire a deep strategic vision that will help them develop their own project, taking into account the different areas in companies.

*20% of our students develop their own business idea.*

07

### Improve soft skills and management skills

TECH helps students apply and develop the knowledge they have acquired, while improving their interpersonal skills in order to become leaders who make a difference.

*Improve your communication and leadership skills and enhance your career.*

08

### Be part of an exclusive community

Students will be part of a community of elite executives, large companies, renowned institutions, and qualified professors from the most prestigious universities in the world: the TECH Technological University community.

*We give you the opportunity to train with a team of world renowned teachers.*

# 04 Objectives

This Professional Master's Degree from TECH Technological University is designed to strengthen the professional skills of business managers, who, in addition to being highly specialized in their field, will find in this program a unique opportunity to improve in a sector of great importance, since they will learn to prevent possible Internet threats that can cause serious damage to businesses. In this way, you will become a professional expert in different branches, so you will be able to control all areas of the company.



“

*Increase your skills and achieve your work objectives thanks to the advanced program offered by TECH Technological University with this Professional Master's Degree"*

Your goals are our goals.

We work together to help you achieve them.

The Executive Master's Degree in Artificial Intelligence and Knowledge Engineering will enable the student to:

01

Scientific and technological skills for computer engineering

04

Acquire the necessary knowledge in software engineering

02

Obtain comprehensive knowledge in the field of computer science

03

Obtain broad knowledge in the field of computer structure

05

Understand the basic structure of a computer, software and general-purpose programming languages





06

Learn how to design and interpret algorithms, which are the necessary basis for developing computer programs

08

Learn more about the advanced design of algorithms, analyzing recursive and divide and conquer algorithms, as well as performing amortized analysis



07

Understand the essential elements of a computer program, such as the different data types, operators, expressions, statements, I/O and control statements

09

Understand the concepts of dynamic programming and algorithms for NP problems

10

Learn the fundamentals of computational logic, what it is used for and its justification of use

11

Know the different strategies of formalization and deduction in propositional logic, including natural reasoning, axiomatic and natural deduction, as well as the primitive rules of propositional calculus

14

Learn all the concepts related to agent theory and agent architecture and its reasoning process

12

Lay the foundations of Artificial Intelligence and Knowledge Engineering, carrying out a brief recap of the history of Artificial Intelligence up to the present day

13

Understand the essential concepts of search in Artificial Intelligence, both informed and uninformed search

15

Assimilate the theory and practice behind the concepts of information and knowledge, as well as the different ways of representing knowledge



16

Introduce knowledge discovery processes and basic concepts of machine learning

18

Study the FIPA agent standard, considering agent communication, agent management and architecture, among other issues



19

Introduce the concept of bio-inspired computing, as well as to understand the functioning of the different types of social adaptation algorithms and genetic algorithms

17

Understand the basic and advanced concepts related to agents and multi-agent systems

20

Delve into the different models of evolutionary computation, knowing their strategies, programming, algorithms and models based on estimation of distributions

# 05 Skills

The Professional Master's Degree in Artificial Intelligence and Knowledge Engineering has been designed to improve the competitiveness of professionals in the business sector. Therefore, at the end of their studies, students will have acquired the necessary skills to develop a quality and up-to-date practice based on the most innovative teaching methodology. Undoubtedly, a program that will improve their qualifications and will allow them to be more competitive in their daily work, by unifying all the relevant aspects of IT Security that managers must know and put into practice.



A black and white photograph showing a hand pointing at a document. The document features a bar chart with three bars of increasing height. The background is a dark blue diagonal shape.

“

*Study artificial intelligence and improve your skills  
in a sector of the future"*

01

Develop programming in the field of artificial intelligence taking into account all the factors of artificial intelligence development

02

Know the data structure in C++ programming

03

Design basic and advanced algorithms

04

Understand computational logic and apply it in the design of projects

05

Know about Artificial Intelligence, its uses and its developments and how to implement in your own projects



06

Know what they are, how they work and how to work with intelligent systems

08

Knowledge of JADE, FIPA, computer vision and other multi-agent systems



07

Master the basic concepts of machine learning

09

Knowledge of bio-inspired computing algorithms and utilization strategies

10

Acquire the necessary skills for the professional practice of computer engineering with the knowledge of all the necessary factors to perform it with quality and solvency

06

# Structure and Content

This TECH Technological University program has been designed to meet the specialization needs of business professionals who wish to expand their knowledge of computer security, a fundamental field in order to be able to control potential threats that can pose a great risk to the company. Therefore, this Professional Master's Degree will allow them to acquire specific knowledge that they can apply to their work practice. And, to do so, they will use a totally online methodology so they can balance their studies with the rest of their daily obligations.





“

*This program will be essential to detect possible cyber-attacks in your company”*

## Syllabus

The Professional Master's Degree in Artificial Intelligence and Knowledge Engineering at TECH Technological University is an intensive program that prepares students to face challenges and business decisions in the field of information security. Its content is designed to promote the development of managerial skills that enable more rigorous decision-making in uncertain environments.

Throughout 1,500 hours of study, students will face a multitude of practical cases through individual work, which will allow the student to acquire the necessary skills to successfully carry out their daily practice. It is, therefore, an authentic immersion in real business situations.

This program deals in depth with different areas of the company and is designed for managers to understand Artificial Intelligence from a strategic, international and innovative perspective.

A program designed especially for students, focused on their professional development, which prepares them to achieve excellence in the field of information security management and administration. A program that understands your needs and those of your company through innovative content based on the latest trends, and supported by the best educational methodology and an exceptional faculty, which will provide you with the competencies to solve critical situations in a creative and efficient way.

This Professional Master's Degree takes place over 12 months and is divided into 10 modules:

<b>Module 1</b>	Programming Fundamentals
<b>Module 2</b>	Data Structure
<b>Module 3</b>	Algorithms and Complexity
<b>Module 4</b>	Advanced Algorithm Design
<b>Module 5</b>	Logic in Computer Science
<b>Module 6</b>	Artificial Intelligence and Knowledge Engineering
<b>Module 7</b>	Intelligent Systems
<b>Module 8</b>	Machine Learning and Data Mining
<b>Module 9</b>	Multiagent Systems and Computational Perception
<b>Module 10</b>	Bio-Inspired Computing



### Where, when and how is it taught?

TECH offers the possibility of developing this Executive Master's Degree in Artificial Intelligence and Knowledge Engineering completely online. Over the course of 12 months, you will be able to access all the contents of this program at any time, allowing you to self-manage your study time.

*A unique, key and decisive educational experience to boost your professional development and make the definitive leap.*

**Module 1. Programming Fundamentals**

**1.1. Introduction to Programming**

- 1.1.1. Basic Computer Structure
- 1.1.2. Software
- 1.1.3. Programming Languages
- 1.1.4. Computer Application Life Cycle

**1.2. Algorithm Design**

- 1.2.1. Problem Solving
- 1.2.2. Descriptive Techniques
- 1.2.3. Algorithm Elements and Structure

**1.3. Program Elements**

- 1.3.1. C++ Origin and Features
- 1.3.2. Development Environment
- 1.3.3. Concept of Program
- 1.3.4. Types of Fundamental Data
- 1.3.5. Operators
- 1.3.6. Expressions
- 1.3.7. Statements
- 1.3.8. Data Input and Output

**1.4. Control Sentences**

- 1.4.1. Statements
- 1.4.2. Branches
- 1.4.3. Loops

**1.5. Abstraction and Modularity: Function**

- 1.5.1. Modular Design
- 1.5.2. Concept of Function and Utility
- 1.5.3. Definition of Function
- 1.5.4. Execution Flow in a Function Call
- 1.5.5. Function Prototypes
- 1.5.6. Results Return
- 1.5.7. Calling Functions: Parameters
- 1.5.8. Parameter Passing According to Reference and Value
- 1.5.9. Scope Identifier

**1.6. Statistical Data Structures**

- 1.6.1. Arrays
- 1.6.2. Matrices: Polyhedra
- 1.6.3. Searching and Sorting
- 1.6.4. Chaining: I/O Functions for Chains
- 1.6.5. Structures: Unions
- 1.6.6. New Types of Data

**1.7. Dynamic Data Structures: Pointers**

- 1.7.1. Concept: Definition of Pointer
- 1.7.2. Pointer Operators and Operations
- 1.7.3. Pointer Arrays
- 1.7.4. Pointers and Arrays
- 1.7.5. Chain Pointers
- 1.7.6. Pointers to Structures
- 1.7.7. Multiple Indirectness
- 1.7.8. Function Pointers
- 1.7.9. Passing of Functions, Structures, and Arrays as Function Parameters

**1.8. Files**

- 1.8.1. Basic Concepts
- 1.8.2. File Operations
- 1.8.3. Types of Files
- 1.8.4. File Organization
- 1.8.5. Introduction to C++ Files
- 1.8.6. Managing Files

**1.9. Recursion**

- 1.9.1. Definition of Recursion
- 1.9.2. Types of Recursion
- 1.9.3. Advantages and Disadvantages
- 1.9.4. Considerations
- 1.9.5. Recursive-Iterative Conversion
- 1.9.6. Recursion Stack

**1.10. Testing and Documentation**

- 1.10.1. Program Testing
- 1.10.2. White Box Testing
- 1.10.3. Black Box Testing
- 1.10.4. Testing Tools
- 1.10.5. Program Documentation

**Module 2. Data Structure****2.1. Introduction to C++ Programming**

- 2.1.1. Classes, Constructors, Methods and Attributes
- 2.1.2. Variables
- 2.1.3. Conditional Expressions and Loops
- 2.1.4. Objects

**2.2. Abstract Data Types (ADT)**

- 2.2.1. Types of Data
- 2.2.2. Basic Structures and ADT
- 2.2.3. Vectors and Arrays

**2.3. Lineal Data Structures**

- 2.3.1. ADT List: Definition
- 2.3.2. Linked and Double-Linked Lists
- 2.3.3. Ordered Lists
- 2.3.4. C++ Lists
- 2.3.5. ADT Stack
- 2.3.6. ADT Queue
- 2.3.7. Stack and Queue in C++

**2.4. Hierarchical Data Structures**

- 2.4.1. ADT Tree
- 2.4.2. Tours
- 2.4.3. N-ary Trees
- 2.4.4. Binary Trees
- 2.4.5. Binary Search Trees

**2.5. Hierarchical Data Structures: Complex Trees**

- 2.5.1. Perfectly Balanced Trees or Trees of Minimum Height
- 2.5.2. Multi-Path Trees
- 2.5.3. Bibliographical References

**2.6. Priority Mounds and Queue**

- 2.6.1. ADT Heaps
- 2.6.2. ADT Priority Queue

**2.7. Hash Tables**

- 2.7.1. ADT Hash Table
- 2.7.2. Hash Functions
- 2.7.3. Hash Function in Hash Tables
- 2.7.4. Redispersion
- 2.7.5. Open Hash Tables

**2.8. Graphs**

- 2.8.1. ADT Graph
- 2.8.2. Types of Graphs
- 2.8.3. Graphical Representation and Basic Operations
- 2.8.4. Graph Design

**2.9. Algorithms and Advanced Graph Concepts**

- 2.9.1. Problems about Graphs
- 2.9.2. Road Algorithms
- 2.9.3. Search Algorithms or Paths
- 2.9.4. Other Algorithms

**2.10. Other Data Structure**

- 2.10.1. Sets
- 2.10.2. Parallel Arrays
- 2.10.3. Symbol Tables
- 2.10.4. Tries

Module 3. Algorithms and Complexity

**3.1. Introduction to Algorithm Design Strategies**

- 3.1.1. Recursion
- 3.1.2. Divide and Conquer
- 3.1.3. Other Strategies

**3.2. Algorithm Efficiency and Analysis**

- 3.2.1. Efficiency Measures
- 3.2.2. Measuring Entry Size
- 3.2.3. Measuring Execution Time
- 3.2.4. Worst, Best and Average Case
- 3.2.5. Asymptotic Notation
- 3.2.6. Mathematical Analysis Criteria for Non-Recursive Algorithms
- 3.2.7. Mathematical Analysis for Recursive Algorithms
- 3.2.8. Empirical Analysis for Algorithms

**3.3. Sorting Algorithms**

- 3.3.1. Concept of Sorting
- 3.3.2. Bubble Sorting
- 3.3.3. Selection Sorting
- 3.3.4. Insertion Sorting
- 3.3.5. Merge Sort
- 3.3.6. Quick Sort

**3.4. Tree Algorithms**

- 3.4.1. Concept of Tree
- 3.4.2. Binary Trees
- 3.4.3. Tree Range
- 3.4.4. Representing Expressions
- 3.4.5. Sorted Binary Trees
- 3.4.6. Balanced Binary Trees

**3.5. Algorithms Using Heaps**

- 3.5.1. Heaps
- 3.5.2. The Heapsort Algorithm
- 3.5.3. Priority Queues

**3.6. Graph Algorithms**

- 3.6.1. Representation
- 3.6.2. Width Range
- 3.6.3. Depth Range
- 3.6.4. Topological Sorting

**3.7. Greedy Algorithms**

- 3.7.1. Greedy Strategy
- 3.7.2. Greedy Strategy Elements
- 3.7.3. Currency Exchange
- 3.7.4. Traveler's Problem
- 3.7.5. The Backpack Problem

**3.8. Search for Minimum Paths**

- 3.8.1. Problem of the Minimum Path
- 3.8.2. Negative Arcs and Cycles
- 3.8.3. Dijkstra's Algorithm

**3.9. Greedy Algorithms on Graphs**

- 3.9.1. The Minimum Overlapping Tree
- 3.9.2. Prim's Algorithm
- 3.9.3. Kruskal's Algorithm
- 3.9.4. Complexity Analysis

**3.10. Backtracking**

- 3.10.1. Backtracking
- 3.10.2. Alternative Techniques

**Module 4. Advanced Algorithm Design****4.1. Analysis of Recursive and Divide and Conquer Algorithms**

- 4.1.1. Posing and Solving Homogeneous and Non-Homogeneous Recurrence Equations
- 4.1.2. Divide and Conquer Strategy Overview

**4.2. Amortized Analysis**

- 4.2.1. Aggregate Analysis
- 4.2.2. The Accounting Method
- 4.2.3. The Potential Method

**4.3. Dynamic Programming and Algorithms for NP Problems**

- 4.3.1. Dynamic Programming Features
- 4.3.2. Backtracking
- 4.3.3. Branching and Pruning

**4.4. Combinatorial Optimization**

- 4.4.1. Representation of Problems
- 4.4.2. Optimization in 1D

**4.5. Randomization Algorithms**

- 4.5.1. Examples of Randomization Algorithms
- 4.5.2. The Buffon Theorem
- 4.5.3. Monte Carlo Algorithm
- 4.5.4. Las Vegas Algorithm

**4.6. Local and Candidate Search**

- 4.6.1. Gradient Ascent
- 4.6.2. Hill Climbing
- 4.6.3. Simulated Annealing
- 4.6.4. Tabu Search
- 4.6.5. Candidate Search

**4.7. Formal Program Verification**

- 4.7.1. Specification of Functional Abstractions
- 4.7.2. The Language of First-Order Logic
- 4.7.3. Hoare's Formal System

**4.8. Iterative Program Verification**

- 4.8.1. Rules of Hoare's Formal System
- 4.8.2. Concept of Invariant Iterations

**4.9. Numerical Methods**

- 4.9.1. The Bisection Method
- 4.9.2. The Newton Raphson Method
- 4.9.3. The Secant Method

**4.10. Parallel Algorithms**

- 4.10.1. Parallel Binary Operations
- 4.10.2. Parallel Operations with Graphs
- 4.10.3. Parallelism in Divide and Conquer
- 4.10.4. Parallelism in Dynamic Programming

Module 5. Logic in Computer Science

**5.1. Justification of the Logic**

- 5.1.1. Object of Logic Study
- 5.1.2. What Is Logic for?
- 5.1.3. Components and Types of Reasoning
- 5.1.4. Components of a Logic Calculation
- 5.1.5. Semantics
- 5.1.6. Justification of the Existence of a Logic
- 5.1.7. How to Check that a Logic is Adequate

**5.2. Calculation of Natural Deduction from Statements**

- 5.2.1. Formal Language
- 5.2.2. Deductive Mechanism

**5.3. Formalization and Deduction Strategies for Propositional Logic**

- 5.3.1. Formalization Strategies
- 5.3.2. Natural Reasoning
- 5.3.3. Laws and Rules
- 5.3.4. Axiomatic Deduction and Natural Deduction
- 5.3.5. Calculating Natural Deduction
- 5.3.6. Primitive Rules of Propositional Calculus

**5.4. Semantics of Propositional Logic**

- 5.4.1. Truth Tables
- 5.4.2. Equivalence
- 5.4.3. Tautologies and Contradictions
- 5.4.4. Validation of Propositional Sentences
- 5.4.5. Validation by Means of Truth Tables
- 5.4.6. Validation Using Semantic Trees
- 5.4.7. Validation by Refutation

**5.5. Applications of Propositional Logic: Logic Circuits**

- 5.5.1. Basic Gates
- 5.5.2. Circuits
- 5.5.3. Mathematical Models of the Circuits
- 5.5.4. Minimization
- 5.5.5. The Second Canonical Form and the Minimum Form in Product of Additions
- 5.5.6. Other Gates

**5.6. Natural Predicate Deduction Calculus**

- 5.6.1. Formal Language
- 5.6.2. Deductive Mechanism

**5.7. Formalization Strategies for Predicate Logic**

- 5.7.1. Introduction to Formalization in Predicate Logic
- 5.7.2. Formalization Strategies with Quantifiers

**5.8. Deduction Strategies for Predicate Logic**

- 5.8.1. Reason for Omission
- 5.8.2. Presentation of the New Rules
- 5.8.3. Predicate Logic as a Natural Deduction Calculus

**5.9. Applications of Predicate Logic: Introduction to Logic Programming**

- 5.9.1. Informal Presentation
- 5.9.2. Prolog Elements
- 5.9.3. Re-Evaluation and Cut-Off

**5.10. Set Theory, Predicate Logic and Its Semantics**

- 5.10.1. Intuitive Set Theory
- 5.10.2. Introduction to Predicate Semantics



**Module 6. Artificial Intelligence and Knowledge Engineering****6.1. Introduction to Artificial Intelligence and Knowledge Engineering**

- 6.1.1. Brief History of Artificial Intelligence
- 6.1.2. Artificial Intelligence Today
- 6.1.3. Knowledge Engineering

**6.2. Searching**

- 6.2.1. Common Search Concepts
- 6.2.2. Uninformed Search
- 6.2.3. Informed Search

**6.3. Boolean Satisfiability, Constraint Satisfiability and Automatic Planning**

- 6.3.1. Boolean Satisfiability
- 6.3.2. Constraint Satisfaction Problems
- 6.3.3. Automatic Planning and PDDL
- 6.3.4. Planning as a Heuristic Search
- 6.3.5. Planning with SAT

**6.4. Artificial Intelligence in Games**

- 6.4.1. Game Theory
- 6.4.2. Minimax and Alpha-Beta Pruning
- 6.4.3. Simulation: Monte Carlo

**6.5. Supervised and Unsupervised Learning**

- 6.5.1. Introduction to Machine Learning
- 6.5.2. Classification
- 6.5.3. Regression
- 6.5.4. Validation of Results
- 6.5.5. Clustering

**6.6. Neural Networks**

- 6.6.1. Biological Fundamentals
- 6.6.2. Computational Model
- 6.6.3. Supervised and Unsupervised Neural Networks
- 6.6.4. Simple Perceptron
- 6.6.5. Multilayer Perceptron

**6.7. Genetic Algorithms**

- 6.7.1. History
- 6.7.2. Biological Basis
- 6.7.3. Problem Coding
- 6.7.4. Generation of the Initial Population
- 6.7.5. Main Algorithm and Genetic Operators
- 6.7.6. Evaluation of Individuals: *Fitness*

**6.8. Thesauri, Vocabularies, Taxonomies**

- 6.8.1. Vocabulary
- 6.8.2. Taxonomy
- 6.8.3. Thesauri
- 6.8.4. Ontologies

**6.9. Knowledge Representation: Semantic Web**

- 6.9.1. Semantic Web
- 6.9.2. Specifications: RDF, RDFS and OWL
- 6.9.3. Inference/Reasoning
- 6.9.4. Linked Data

**6.10. Expert Systems and DSS**

- 6.10.1. Expert Systems
- 6.10.2. Decision Support Systems

Module 7. Intelligent Systems

**7.1. Agent Theory**

- 7.1.1. Concept History
- 7.1.2. Agent Definition
- 7.1.3. Agents in Artificial Intelligence
- 7.1.4. Agents in Software Engineering

**7.2. Agent Architectures**

- 7.2.1. The Reasoning Process of an Agent
- 7.2.2. Reactive Agents
- 7.2.3. Deductive Agents
- 7.2.4. Hybrid Agents
- 7.2.5. Comparison

**7.3. Information and Knowledge**

- 7.3.1. Difference between Data, Information and Knowledge
- 7.3.2. Data Quality Assessment
- 7.3.3. Data Collection Methods
- 7.3.4. Information Acquisition Methods
- 7.3.5. Knowledge Acquisition Methods

**7.4. Knowledge Representation**

- 7.4.1. The Importance of Knowledge Representation
- 7.4.2. Definition of Knowledge Representation According to Roles
- 7.4.3. Knowledge Representation Features

**7.5. Ontologies**

- 7.5.1. Introduction to Metadata
- 7.5.2. Philosophical Concept of Ontology
- 7.5.3. Computing Concept of Ontology
- 7.5.4. Domain Ontologies and Higher-Level Ontologies
- 7.5.5. Building an Ontology

**7.6. Ontology Languages and Ontology Creation Software**

- 7.6.1. Triple RDF, Turtle and N3
- 7.6.2. RDF Schema
- 7.6.3. OWL
- 7.6.4. SPARQL
- 7.6.5. Introduction to Ontology Creation Tools
- 7.6.6. Installing and Using Protégé

**7.7. Semantic Web**

- 7.7.1. Current and Future Status of the Semantic Web
- 7.7.2. Semantic Web Applications

**7.8. Other Knowledge Representation Models**

- 7.8.1. Vocabulary
- 7.8.2. Global Vision
- 7.8.3. Taxonomy
- 7.8.4. Thesauri
- 7.8.5. Folksonomy
- 7.8.6. Comparison
- 7.8.7. Mind Maps

**7.9. Knowledge Representation Assessment and Integration**

- 7.9.1. Zero-Order Logic
- 7.9.2. First-Order Logic
- 7.9.3. Descriptive Logic
- 7.9.4. Relationship between Different Types of Logic
- 7.9.5. Prolog: Programming Based on First-Order Logic

**7.10. Semantic Reasoners, Knowledge-Based Systems and Expert Systems**

- 7.10.1. Concept of Reasoner
- 7.10.2. Reasoner Applications
- 7.10.3. Knowledge-Based Systems
- 7.10.4. MYCIN: History of Expert Systems
- 7.10.5. Expert Systems Elements and Architecture
- 7.10.6. Creating Expert Systems

**Module 8. Machine Learning and Data Mining**
**8.1. Introduction to Knowledge Discovery Processes and Basic Concepts of Machine Learning**

- 8.1.1. Key Concepts of Knowledge Discovery Processes
- 8.1.2. Historical Perspective of Knowledge Discovery Processes
- 8.1.3. Stages of the Knowledge Discovery Processes

- 8.1.4. Techniques Used in Knowledge Discovery Processes
- 8.1.5. Characteristics of Good Machine Learning Models
- 8.1.6. Types of Machine Learning Information
- 8.1.7. Basic Learning Concepts
- 8.1.8. Basic Concepts of Unsupervised Learning

**8.2. Data Exploration and Pre-processing**

- 8.2.1. Data Processing
- 8.2.2. Data Processing in the Data Analysis Flow
- 8.2.3. Types of Data
- 8.2.4. Data Transformations
- 8.2.5. Visualization and Exploration of Continuous Variables

- 8.2.6. Visualization and Exploration of Categorical Variables
- 8.2.7. Correlation Measures
- 8.2.8. Most Common Graphic Representations
- 8.2.9. Introduction to Multivariate Analysis and Dimensionality Reduction

**8.3. Decision Trees**

- 8.3.1. ID3 Algorithm
- 8.3.2. C4.5 Algorithm
- 8.3.3. Overtraining and Pruning
- 8.3.4. Analysis of Results

**8.4. Evaluation of Classifiers**

- 8.4.1. Confusion Matrixes
- 8.4.2. Numerical Evaluation Matrixes
- 8.4.3. Kappa Statistic
- 8.4.4. ROC Curves

**8.5. Classification Rules**

- 8.5.1. Rule Evaluation Measures
- 8.5.2. Introduction to Graphic Representation
- 8.5.3. Sequential Overlay Algorithm

**8.6. Neural Networks**

- 8.6.1. Basic Concepts
- 8.6.2. Simple Neural Networks
- 8.6.3. Backpropagation Algorithm
- 8.6.4. Introduction to Recurrent Neural Networks

**8.7. Bayesian Methods**

- 8.7.1. Basic Probability Concepts
- 8.7.2. Bayes' Theorem
- 8.7.3. Naive Bayes
- 8.7.4. Introduction to Bayesian Networks

**8.8. Regression and Continuous Response Models**

- 8.8.1. Simple Linear Regression
- 8.8.2. Multiple Linear Regression
- 8.8.3. Logistic Regression
- 8.8.4. Regression Trees
- 8.8.5. Introduction to Support Vector Machines (SVM)
- 8.8.6. Goodness-of-Fit Measures

**8.9. Clustering**

- 8.9.1. Basic Concepts
- 8.9.2. Hierarchical Clustering
- 8.9.3. Probabilistic Methods
- 8.9.4. EM Algorithm
- 8.9.5. B-Cubed Method
- 8.9.6. Implicit Methods

**8.10. Text Mining and Natural Language Processing (NLP)**

- 8.10.1. Basic Concepts
- 8.10.2. Corpus Creation
- 8.10.3. Descriptive Analysis
- 8.10.4. Introduction to Feelings Analysis

**Module 9. Multiagent Systems and Computational Perception**

**9.1. Agents and Multiagent Systems**

- 9.1.1. Concept of Agent
- 9.1.2. Architecture
- 9.1.3. Communication and Coordination
- 9.1.4. Programming Languages and Tools
- 9.1.5. Applications of the Agents
- 9.1.6. The FIPA

**9.2. The Standard for Agents: FIPA**

- 9.2.1. Communication between Agents
- 9.2.2. Agent Management
- 9.2.3. Abstract Architecture
- 9.2.4. Other Specifications

**9.3. The JADE Platform**

- 9.3.1. Software Agents According to JADE
- 9.3.2. Architecture
- 9.3.3. Installation and Execution
- 9.3.4. JADE Packages

**9.4. Basic Programming with JADE**

- 9.4.1. The Management Console
- 9.4.2. Basic Creation of Agents

**9.5. Advanced Programming with JADE**

- 9.5.1. Advanced Creation of Agents
- 9.5.2. Communication between Agents
- 9.5.3. Discovering Agents

**9.6. Artificial Vision**

- 9.6.1. Processing and Digital Analysis of Images
- 9.6.2. Image Analysis and Artificial Vision
- 9.6.3. Image Processing and Human Vision
- 9.6.4. Image Capturing System
- 9.6.5. Image Formation and Perception

**9.7. Digital Image Analysis**

- 9.7.1. Stages of the Image Analysis Process
- 9.7.2. Pre-Processing
- 9.7.3. Basic Operations
- 9.7.4. Spatial Filtering

**9.8. Digital Image Transformation and Image Segmentation**

- 9.8.1. Fourier Transform
- 9.8.2. Frequency Filtering
- 9.8.3. Basic Concepts
- 9.8.4. Thresholding
- 9.8.5. Contour Detection

**9.9. Shape Recognition**

- 9.9.1. Feature Extraction
- 9.9.2. Classification Algorithms

**9.10. Natural Language Processing**

- 9.10.1. Automatic Speech Recognition
- 9.10.2. Computational Linguistics

**Module 10. Bio-Inspired Computing**

**10.1. Introduction to Bio-Inspired Computing**

10.1.1. Introduction to Bio-Inspired Computing

**10.2. Social Adaptation Algorithms**

10.2.1. Bio-Inspired Computing Based on Ant Colonies  
 10.2.2. Variants of Ant Colony Algorithms  
 10.2.3. Particle Cloud Computing

**10.3. Genetic Algorithms**

10.3.1. General Structure  
 10.3.2. Implementations of the Main Operators

**10.4. Space Exploration-Exploitation Strategies for Genetic Algorithms**

10.4.1. CHC Algorithm  
 10.4.2. Multimodal Problems

**10.5. Models of Evolutionary Computing (I)**

10.5.1. Evolutionary Strategies  
 10.5.2. Evolutionary Programming  
 10.5.3. Algorithms Based on Differential Evolution

**10.6. Models of Evolutionary Computing (II)**

10.6.1. Evolution Models Based on Estimation of Distributions (EDA)  
 10.6.2. Genetic Programming

**10.7. Developmental Programming Applied to Learning Disabilities**

10.7.1. Rules-Based Learning  
 10.7.2. Evolutionary Methods in Instance Selection Problems

**10.8. Multi-Objective Problems**

10.8.1. Concept of Dominance  
 10.8.2. Application of Evolutionary Algorithms to Multi-objective Problems

**10.9. Neural Networks (I)**

10.9.1. Introduction to Neural Networks  
 10.9.2. Practical Example with Neural Networks

**10.10. Neural Networks (II)**

10.10.1 Use Cases of Neural Networks in Medical Research  
 10.10.2 Use Cases of Neural Networks in Economy  
 10.10.3 Use Cases of Neural Networks in Computer Vision



*This program will open doors to a new professional world"*

07

# 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"*

## TECH Business School uses the 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”*



*This program prepares you to face business challenges in uncertain environments and achieve business success.*





## A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch to present executives with challenges and business decisions at the highest level, whether at the national or international level. 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 business reality is taken into account.

“

*You will learn, through collaborative activities and real cases, how to solve complex situations in real business environments”*

The case method has been the most widely used learning system among the world's leading business 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 we face in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They must integrate all their knowledge, research, argue and defend their ideas and decisions.

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

## 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.

*Our online system will allow you to organize your time and learning pace, adapting it to your schedule. You will be able to access the contents from any device with an internet connection.*

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 online business school is the only one in the world licensed to incorporate 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.

With this methodology we have 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, markets, and financial 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 specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to 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.



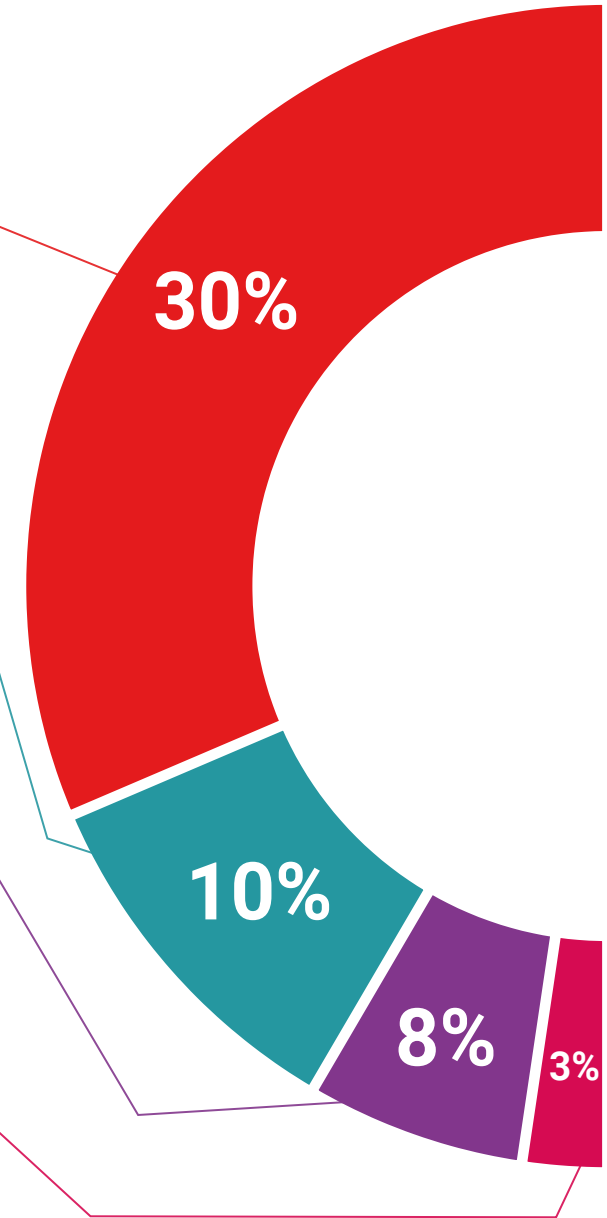
### Management Skills Exercises

They will carry out activities to develop specific executive competencies in each thematic area. Practices and dynamics to acquire and develop the skills and abilities that a high-level manager needs to develop in the context of the globalization we live in.



### 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 senior management 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.



08

# Our Students' Profiles

The Professional Master's Degree in Artificial Intelligence and Knowledge Engineering is a program aimed at professionals who wish to improve their qualifications with quality education. Students who want to broaden their knowledge in another business-related field such as Artificial Intelligence or Knowledge Engineering. A program aimed at professionals with experience, but who believe in higher specialization as a way of improving on a personal and professional level.





“

*TECH Technological University students are professionals with extensive experience who are looking for a better job"*

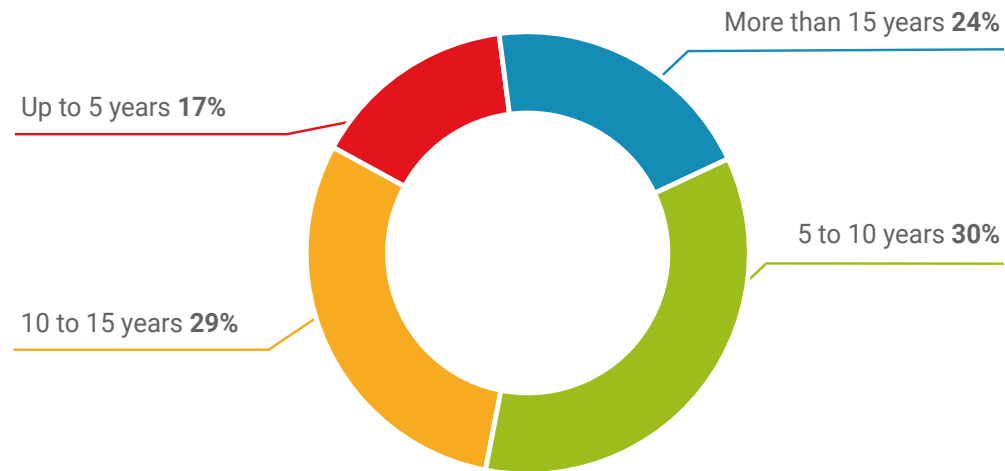
### Average Age

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Between **35** and **45** years old

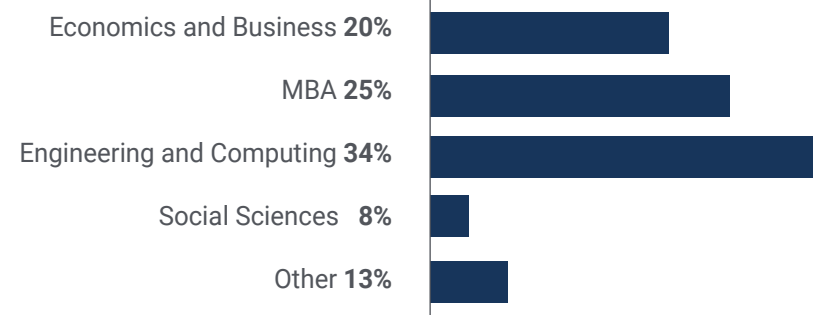
### Years of Experience

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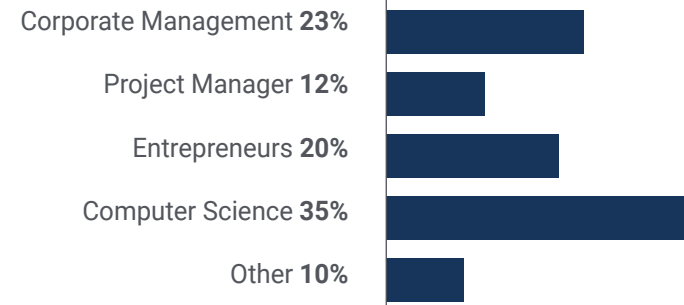
### Training

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### Academic Profile

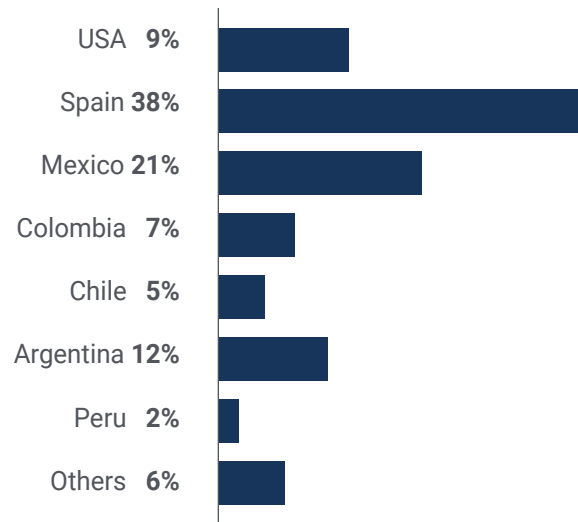
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## Geographical Distribution

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## Francisco Jiménez

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**Manager at a multinational company**

*"Today, any company, whether large- or medium-sized, handles a huge volume of information and relevant data that requires an automation process for management and control. I had been thinking about expanding my knowledge in Artificial Intelligence for quite some time, with the aim of improving procedures and incorporating new developments in the sector in my company. It has certainly been a huge success, as I have been able to boost staff productivity"*

09

# Impact on Your Career

The completion of this Professional Master's Degree in Artificial Intelligence and Knowledge Engineering will enhance the qualifications of business professionals, by offering all that knowledge that, although it may seem totally distant from their daily work, can be very useful to control those business processes. For this reason, higher specialization in this field proves essential, both at a personal and professional level for students, but also for the companies where they work.



“

*TECH puts all of its academic resources at the disposal of its students so they acquire the necessary skills that will lead them to success”*

### Are you ready to take the leap? Excellent professional development awaits you

With this program, the student will be able to advance drastically in their profession, although there is no doubt that, in order to do so, the student will have to make an investment in various areas, such as economic, professional and personal.

However, the goal is to improve in your professional life and, to do so, it is necessary to fight.

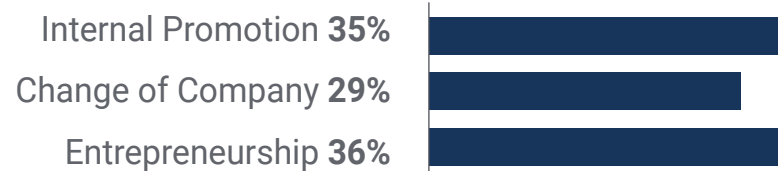
*Thanks to this program, you will receive a large number of job offers with which you will be able to start your professional growth.*

*The best way to achieve professional change is to increase your skills. So don't stop studying at TECH.*

#### When the change occurs



#### Type of change



## Salary increase

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This program represents a salary increase of more than **25.22%** for our students.



10

# Benefits for Your Company

The Professional Master's Degree in Artificial Intelligence and Knowledge Engineering contributes to raise the organization's talent to its maximum potential through the specialization of high-level leaders. This way, business professionals will be able to bring added quality to their company by having the necessary skills to control the Artificial Intelligence processes themselves. A program that adapts to students so they acquire the necessary tools that, later on, they will be able to apply in their daily practice, achieving great benefits for their company.





“

*A must-have program for business professionals who want to monitor and manage potential Artificial Intelligence issues”*

Developing and retaining talent in companies is the best long-term investment.

01

### **Intellectual Capital and Talent Growth**

The professional will introduce the company to new concepts, strategies, and perspectives that can bring about significant changes in the organization.

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02

### **Retaining high-potential executives to avoid losing talent**

This program strengthens the link between the company and the professional and opens new avenues for professional growth within the company.

03

### **Building agents of change**

You will be able to make decisions in times of uncertainty and crisis, helping the organization overcome obstacles.

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04

### **Increased international expansion possibilities**

Thanks to this program, the company will come into contact with the main markets in the world economy.





05

### **Project Development**

The professional can work on a current project or develop new projects in the field of R&D or Business Development within their company.

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06

### **Increased Competitiveness**

This Executive Master's Degree will equip students with the skills to take on new challenges and drive the organization forward.

11

# Certificate

The Executive Master's Degree in Artificial Intelligence and Knowledge Engineering guarantees students, in addition to the most rigorous and up-to-date education, access to a qualification issued by TECH Technological University.



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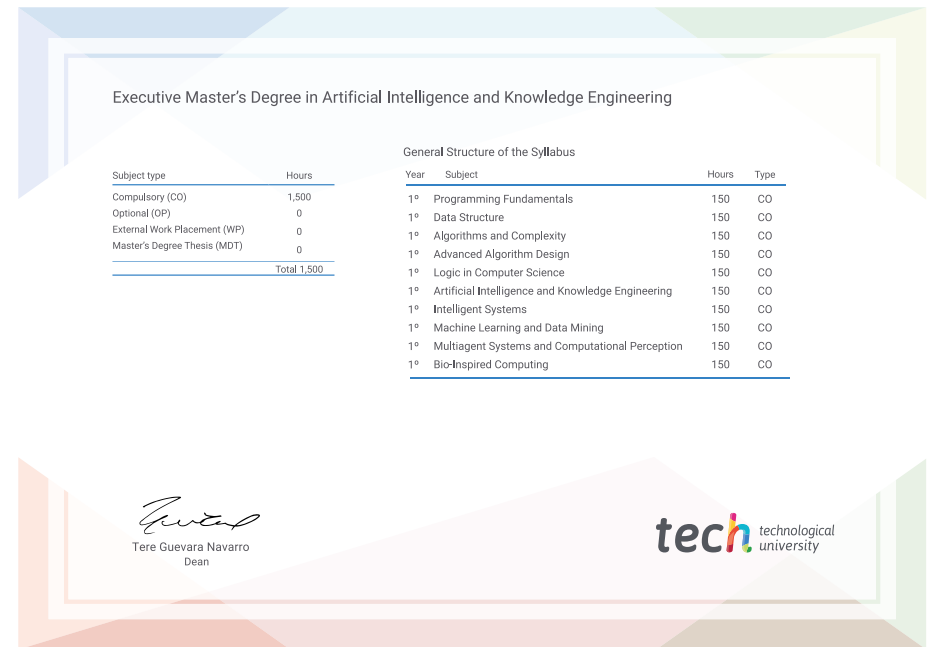
*Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"*

This **Executive Master's Degree in Artificial Intelligence and Knowledge Engineering**, contains the most complete and up-to-date program on the market.

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

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

Title: **Executive Master's Degree in Artificial Intelligence and Knowledge Engineering**  
 Official N° of Hours: **1,500 h.**



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



## Executive Master's Degree Artificial Intelligence and Knowledge Engineering

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

# Executive Master's Degree Artificial Intelligence and Knowledge Engineering

