Professional Master's Degree

Research and Innovation in Information and Communication Technology

tech technological university

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Professional Master's Degree
Research and Innovation in Information and Communication Technology

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

Website: **www.techtitute.com/us/engineering/professional-master-degree/master-research-innovation-information-communication-technology**

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01

Introduction

In a changing world where technology is transforming all areas of life, including the labor market, the direct application of acquired knowledge on Smart Cities, Blockchain, IoT, Digital Twins in AI (Artificial Intelligence) in real projects is an added professional value that very few experts specialized in Information and Communication Technologies can offer. This 100% online program is aimed at engineering professionals with proven experience in computing who wish to be skilled in the disruptive technologies that will be used in the global digitization process.

This program offers you immense possibilities for professional growth. Enroll today"

R+D+I is the basis of evolution in any area. In the field of Information and Communication Technologies, this program covers the newest technologies and areas of study, as well as the most disruptive and surprising practical applications that can be found. It is difficult to find a Professional Master's Degree that addresses the topic of Smart Cities and Digital Twins or Blockchain in the same program. This is precisely what makes this program one of a kind in the market, since engineers who take it will be unique professionals in their field.

Under the guidance of accredited professionals who use them on a daily basis, students will develop a highly specialized vision that will allow them to focus on advanced technological projects using the latest technologies in an appropriate manner. This will generate a differential added value for the good use and correct application of these technologies. Students will also have a global vision of the different technologies involved in global digitalization and will have the ability to successfully apply them.

Over the course of 12 months, students will gain an in-depth understanding of each technology's scope of application, understanding the competitive advantages they provide, positioning them at the technological forefront and enabling them to lead ambitious projects in the present and the future. Additionally, this program has the best 100% online study methodology, which eliminates the need to attend classes in person or have to comply with a predetermined schedule.

This **Professional Master's Degree in Research and Innovation in Information and Communication Technology** contains the most complete and up-to-date program on the market. The most important features include:

- The development of practical cases presented by experts in Research and Innovation in Information and Communication Technologies
- The graphic, schematic, and practical contents with which they are created, provide practical information on the disciplines that are essential for professional practice
- Practical exercises where self-assessment can be used to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

Companies are constantly looking for experts in disruptive technologies to drive their market and you could be the perfect candidate"

This specialization program will allow you to identify technology application cases and approach the different practical cases from a broad perspective"

Develop the ability to be innovative in the market and change people's lives as an active part of the real digital transformation.

Position yourself at the cutting edge of technology and lead ambitious present and future projects.

The program includes, in its teaching staff, professionals from the sector who bring to this program the experience of their work, in addition to recognized specialists from prestigious reference societies and universities.

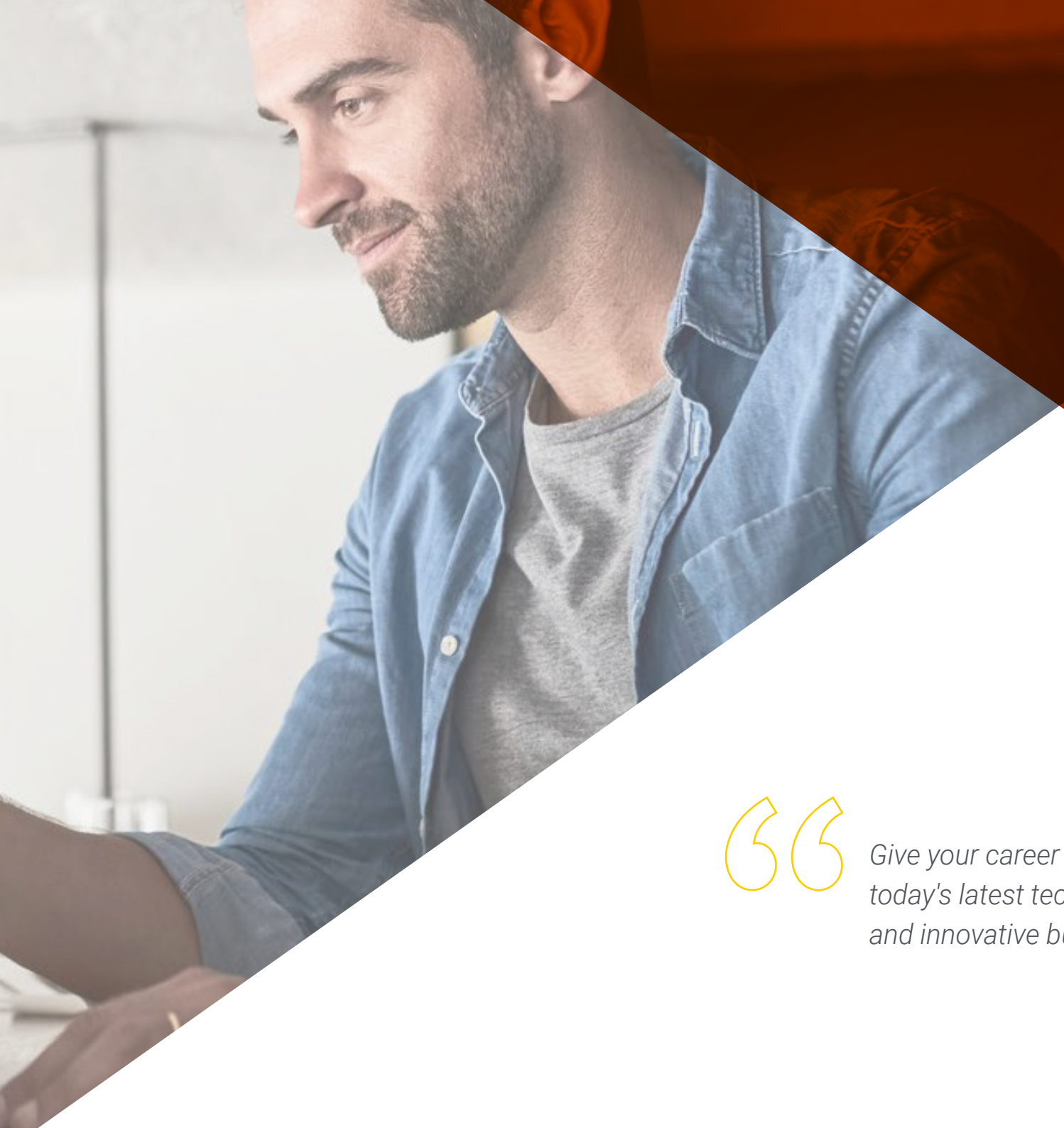
Its multimedia content, developed with the latest educational technology, will allow professionals to learn in professionals a situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to prepare in real situations.

The design of this program focuses on Problem-Based Learning, by means of which professionals must and develop to solve the different professional practice situations that arise during the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

Objectives

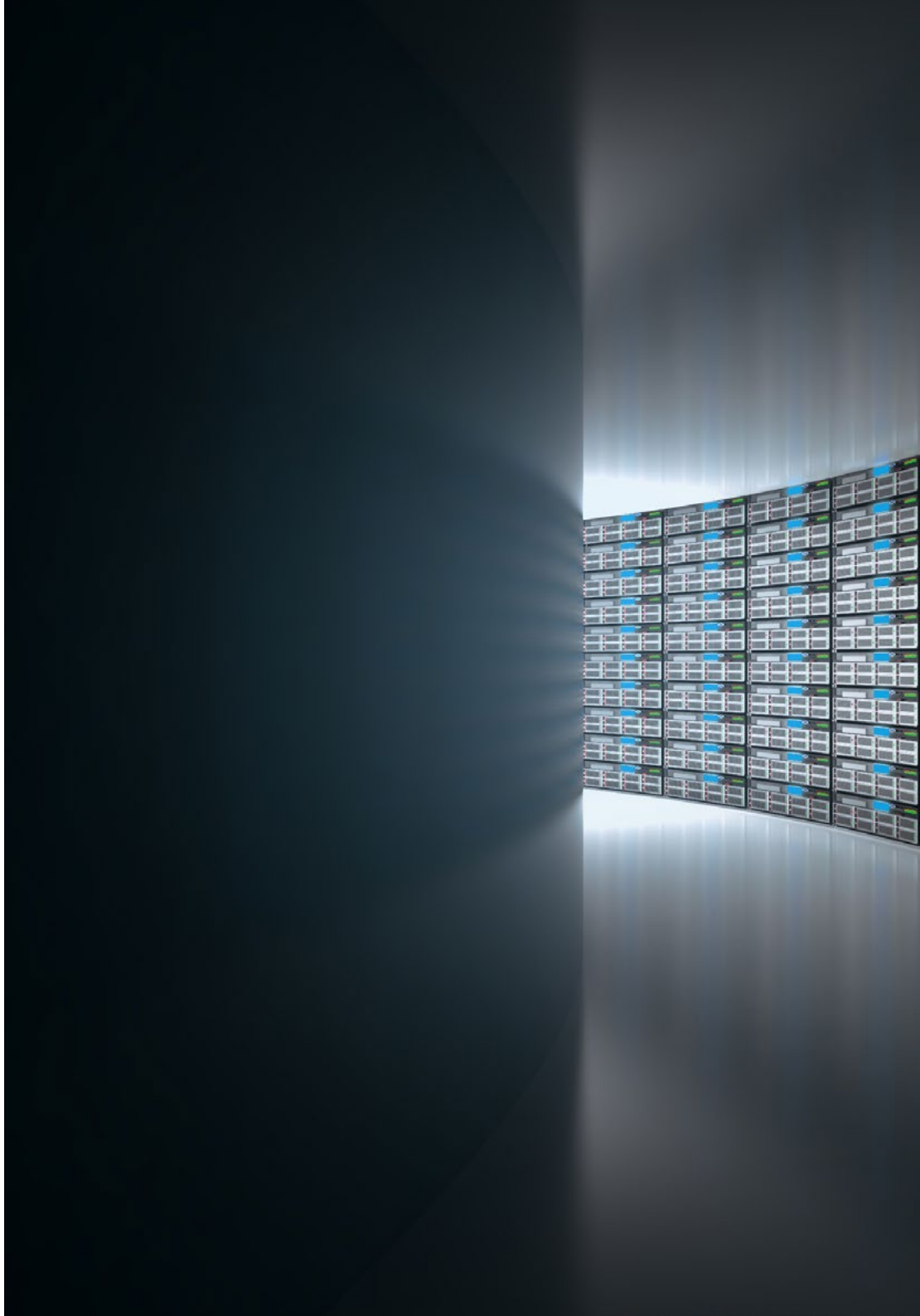
This program's main objective is for students to update their knowledge and specialize in the latest technologies and areas of study, as well as in the most disruptive practical applications. In this way, it covers topics ranging from cloud computing, the Internet of Things and Digital Twins, to smart cities, Blockchain and Artificial Intelligence. If there is something that differentiates this Professional Master's Degree from any other on the market, it would be, firstly, that it addresses the 6 most innovative technologies of today and, secondly, that it approaches them from a practical and innovative business perspective.



Give your career a boost by addressing today's latest technologies from a practical and innovative business perspective"

General Objectives

- Establish the basis for a correct foundation in the IoT, EIoT and IIoT field
- Acquire a global vision of the IoT project, as the project as a whole provides greater added value
- Analyze the current landscape of Digital Twins and associated technologies
- Generate specialized knowledge on Blockchain technology.
- Develop specialized knowledge of NLP and NLU
- Examine the operation of Word Embeddings
- Analyze the mechanism of Transformers
- Develop case studies where NLP can be applied
- Demonstrate the differences between quantum and classical computing by analyzing their mathematical foundations
- Develop and demonstrate the advantages of quantum computing in application solving examples (games, examples, programs)



Specific Objectives

Module 1. Communication Innovation with Cloud Computing

- Examine the different Cloud providers and Microsoft's specific offer with Azure
- Analyze the six ways in which MS Azure provides access to the administration and configuration of its services
- Examine the various computing services Azure has to offer
- Generate specialized knowledge on Azure web services platforms
- Develop the features and advantages of the "On Cloud Storage offered by Azure
- Determine which storage options are most beneficial in each case
- Delve into Azure IoT cloud services and MS Azure AI services
- Gain further understanding of Azure Security features and acquire advanced knowledge to ensure Data Security in the Cloud

Module 2. IoT. Service Applications from I 4.0 (4.0 Industries)

- Establish the appropriate criteria to start and manage a project in an IoT environment
- Analyze the most relevant IoT architecture techniques
- Develop thinking skills from start to finish Methodology (CRISP_DM)
- Examine, in-depth, the existing free software options
- Delve into all areas where technology can be added to connected objects
- Monitor projects through a Dashboard
- Acquire the ability to quantify not only the IoT value contribution to society, but also to quantify economically this type of technology

Module 3. Digital Twins. Innovative Solutions

- Acquire a detailed view of the influence of the Digital Twins on the future of product and service development
- Pinpoint the applications of the Digital Twins
- Demonstrate the utility of Digital Twins in the value chain
- Determine specific uses of Digital Twins
- Assess the feasibility of implementing a Digital Twin
- Identify concrete cases of application of the Digital Twins
- Justify uses and models of the Digital Twins
- Generate interest in the implementation of models

Module 4. Smart Cities as innovation tools

- Analyze the technological platform
- Determine what a City Digital Twin is (Virtual Model)
- Establish which are the monitoring layers: density, movement, consumptions, water, wind, solar radiation, etc
- Carry out a comparative analysis of the following variables
- Integrate the different sensor networks (IoT/M2M) as well as the behavioral parameters of the inhabitants of the city (treated as human sensors)
- Develop a detailed vision of how Smart Cities will influence the future of people
- Establish new uses of Smart Cities
- Generate interest in the implementation of smart city models

Module 5. R&D in Complex Software Systems. Blockchain. Public and Private Nodes

- Analyze requirements for solution definition
- Develop solutions based on Blockchain technologies (C#/Go)
- Optimize the performance of already implemented solutions
- Establish the basis for enabling the scalability of such solutions
- Fundamentalize the application of different tools, algorithms, Frameworks or platforms in the implementation of Blockchain solutions

Module 6. Data Operations in Blockchain. Innovation in Information Management

- Identify improvement points within existing architectures
- Evaluate the costs of applying the improvements to be implemented
- Fundamentalize the application of different tools in the implementation of Blockchain solutions

Module 7. R&D and AI NLP/NLU. Embeddings and Transformers

- Develop specialized knowledge of NLP (Natural Language Processing)
- Determine what is NLU Natural Languge Understanding
- Differentiate between NLP and NLU
- Understanding the use of Word Embedings and examples using Word2vec
- Analyze Transformers
- Examine examples of various Applied Transformers
- Delve into the NLP/NLU field through common Case Studies

Module 8. R&D and AI Computer Vision. Object Identification and Tracking

- Analyze what Computer Vision is
- Determine typical computer vision tasks
- Analyze, step by step, how convolution works and how Transfer Learning works
- Identify what mechanisms we have available to create modified images, from original to have more training data
- Compile typical tasks that can be performed with computer vision
- Examine commercial computer vision use cases

Module 9. Quantum Computing. A New Model of Computing

- Analyze the need for quantum computing and identify the different types of quantum computers currently available
- Specify the fundamentals of quantum computing and its characteristics
- Examine the applications of quantum computing, advantages and disadvantages
- Determine the basic fundamentals of quantum algorithms and their internal mathematics
- Examine Hilbert space of dimension 2n, n-Qubits, states, quantum gates and their reversibility
- Demonstrate Quantum Teleportation
- Analyze Deutsch's Algorithm, Shor's Algorithm and Grover's Algorithm
- Develop examples of applications with quantum algorithms

Module 10. Quantum Machine Learning. Future Artificial Intelligence

- Analyze quantum computing paradigms relevant to machine learning
- Examine the various ML algorithms available in quantum computing, both supervised and unsupervised
- Determine the different DL algorithms available in quantum computing
- Develop pure quantum algorithms for solving optimization problems
- Generate specialized knowledge on hybrid algorithms (quantum computation and classical computation) to solve learning problems
- Implement learning algorithms on quantum computers
- Establish the current status of QML and its immediate future

Immerse yourself in the most relevant technologies that will play a major role in the technological advances of the future”

03

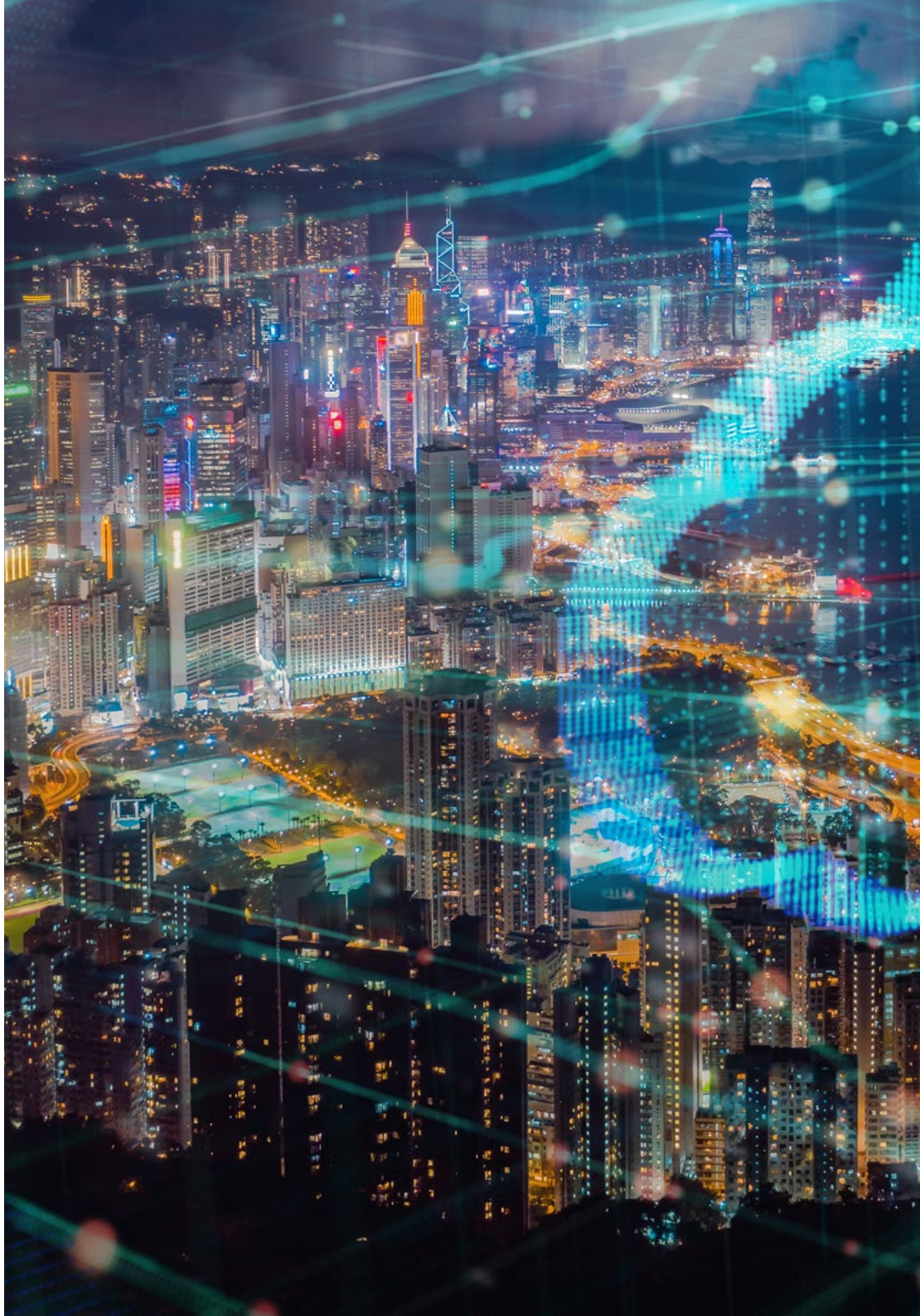
Skills

This Professional Master's Degree in Research and Innovation in Information and Communication Technology develops a highly specialized approach that will allow engineers to focus on advanced technological projects using the most innovative technologies in an appropriate way, generating a differential added value through their correct use and application. Students will delve into the application field of each one, understanding the competitive advantages they provide, and therefore positioning themselves at the technological forefront, being able to lead ambitious engineering projects in the present and in the future.

This program will open a whole new horizon of unimaginable professional growth from the beginning to the end of the program"

General Skills

- Propose different possibilities of IoT project development to evaluate each situation with the acquired knowledge so that students can choose, in each case, the most appropriate option
- Develop expertise in MS Azure, operate with it and secure its services
- Present the current panorama of the Smart City model in different countries and analyze the advantages of this hyperconnected model
- Examine the tools, algorithms, frameworks and platforms for their implementation, analyzing and specifying the different case studies and applications, in order to determine specific solutions
- Identify the main application advantages of Blockchain industry technology, examining the tools necessary for its implementation, analyzing different case studies and application, in order to develop specific solutions for such cases
- Determine how the Convolution layer and Transfer Learning works, identifying the different types of algorithms mainly used in computer vision



Specific Skills

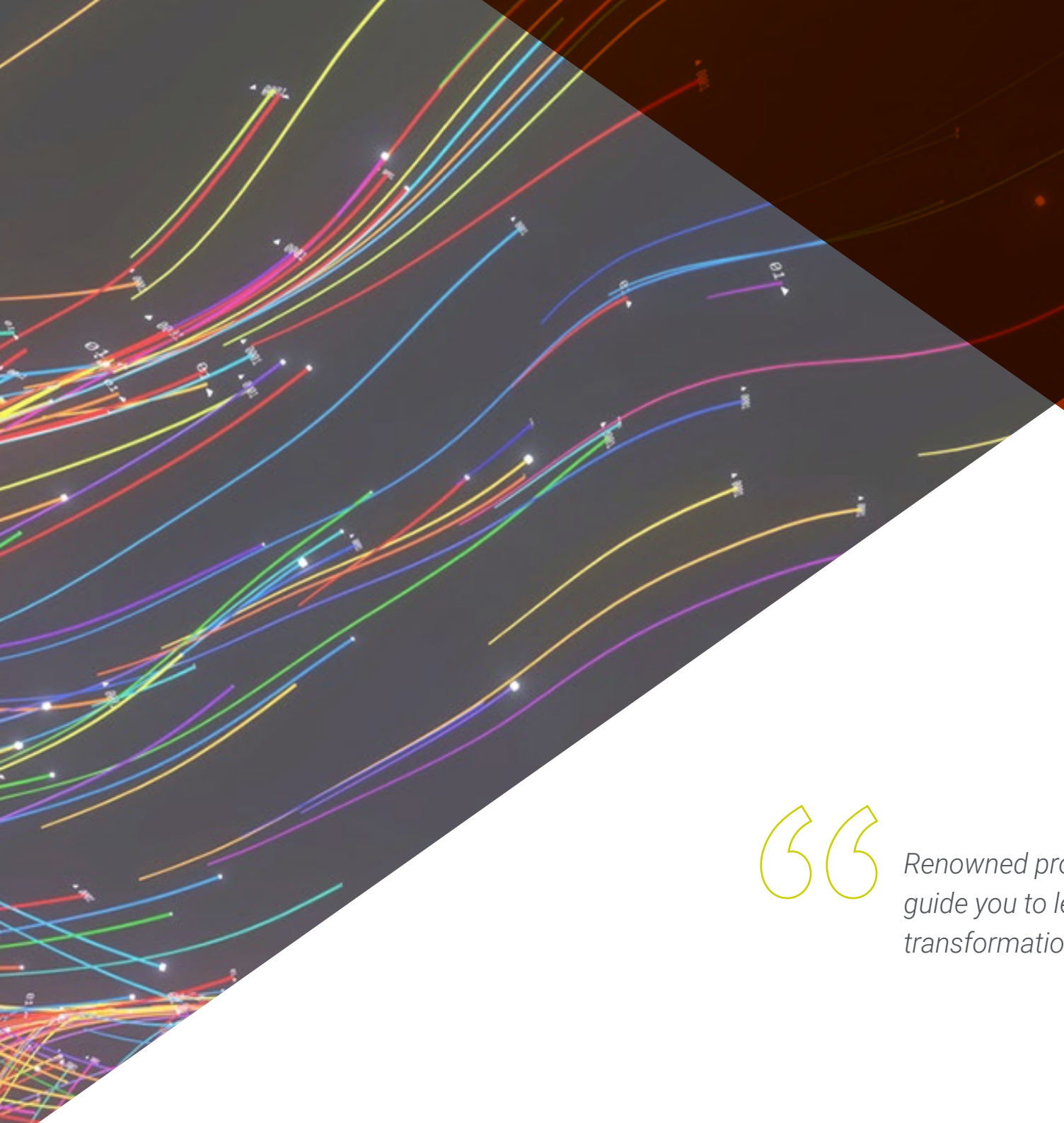
- Determine the main quantum operators and develop operational quantum circuits, through the analysis of the advantages of quantum computation in quantum "type" problem solving examples
- Demonstrate the different types of projects achievable with classical Machine Learning techniques and the state of the art in quantum computing
- Develop the key concepts of quantum states as a generalization of classical probability distributions, and thus to be , able to describe quantum systems of many states
- Determine the concept of "Kernel Methods" used in classic Machine Learning algorithms
- Develop and implement learning algorithms for classical ML models in quantum models, such as PCA, SVM, neural networks, etc
- Implement DL model learning algorithms on quantum models, such as GANs

Contemplate disruptive technologies from a practical perspective so that you can apply them directly to the end of your studies"

04

Course Management

Naturally, TECH has brought together the best professionals in information and communication technology. This Professional Master's Degree has high-level experts in the latest technologies and leading disciplines. In this way, the will acquire the necessary keys and tools in the most innovative areas of study and the most disruptive and surprising practical applications that can be found.



Renowned professionals will guide you to lead the global digital transformation and evolution"

Management

Mr. Molina Molina, Jerónimo

- Head of the Artificial Intelligence Department at Ibermática
- IA Engineer & Software Architect at NASSAT - Internet Satellite in Motion
- Senior Consultant at Hexa Ingenieros. Introducer of Artificial Intelligence (ML and CV)
- Expert in Artificial Intelligence Based Solutions, in the fields of Computer Vision, ML/DL and NLP
- Expert in Business Creation and Development at Bancaixa - FUNDEUN Alicante
- Computer Engineer from the University of Alicante
- Master's Degree in Artificial Intelligence from the Catholic University of Avila
- Executive MBA (European Business Campus Forum)

Professors

Dr. Moreno Fernández de Leceta, Aitor

- Head of the Artificial Intelligence Department at Ibermática
- PeopleSoft Analyst at CEGASA INTERNACIONAL
- PhD in Artificial Intelligence from the University of the Basque Country
- Master's Degree in Advanced Artificial Intelligence by the National University of Distance Education
- Degree in Computer Engineering from the University of Deusto
- Certificate in Computational Neuroscience from the University of Washington
- Certificate in Quantum Computing, Simulation Theory and Programming from the University of Washington

Dr. Villalba García, Alfredo

- Industrial Engineer with specialization in Domotics and Inmotics
- Director of Fractalia Smart Projects
- CEO and Founding Partner of INMOMATICA
- Director of Technology and Operations at BBVA
- Industrial Systems Director at Alcatel
- Ph.D. in La Computer Science from the University of Fontainebleau
- Professional Master's Degree in Domotics and Industrial Automation, Polytechnic University of Madrid
- Member of the Board of Directors of Spanish Association of Home Automation

Mr. Mostajo Fernández, Iván

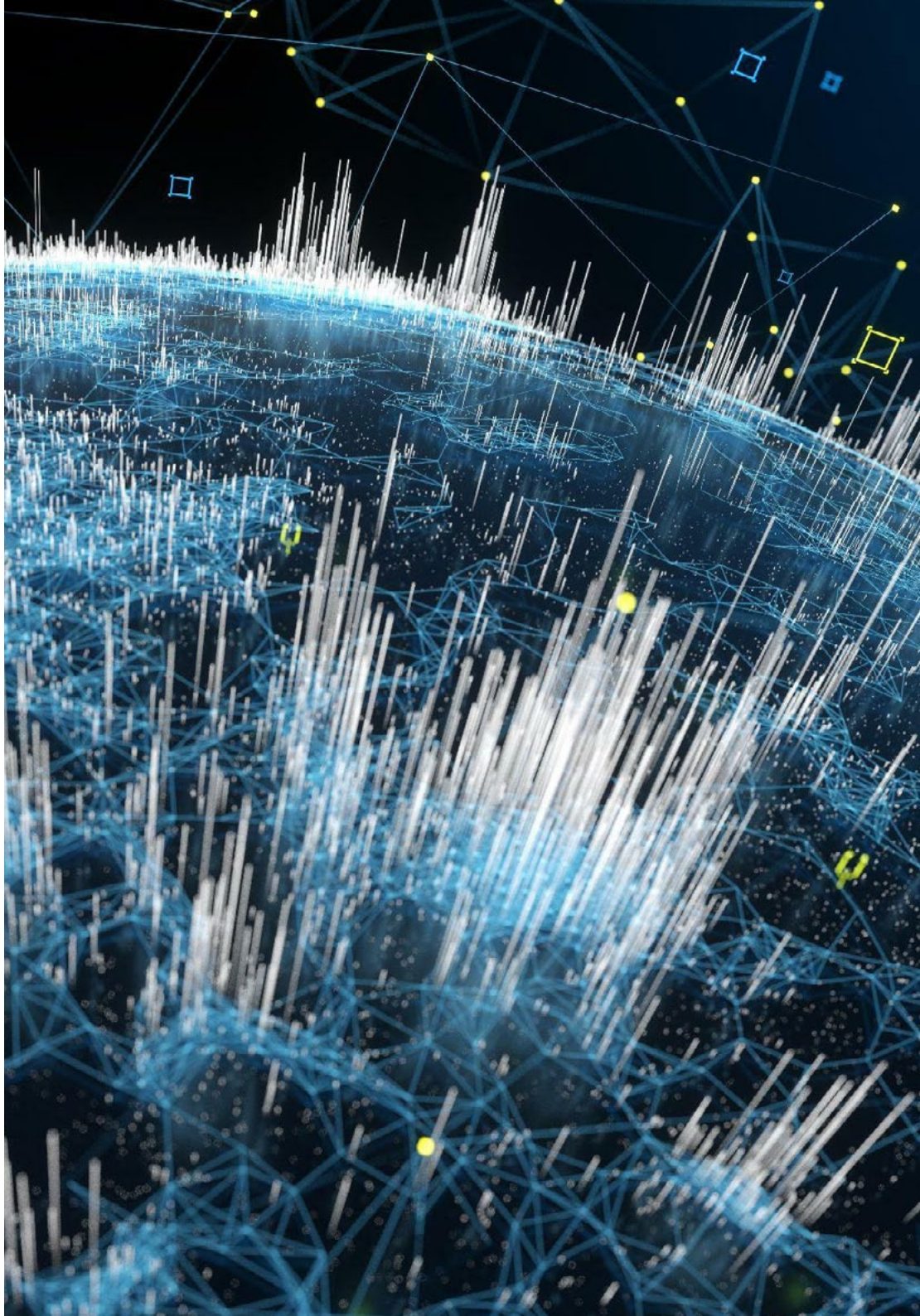
- Specialist in Project Management and Systems Computing
- ISBAN Consultant in Santander Consumer Finance Spain
- Technical Consultant at Signum Software and at Eutropraxis - Petrobass
- Technical Project Manager at Infortect Ingeniería
- Technical Engineer in Computer Systems from the Universidad Alcalá de Henares

Mr. Díaz Morales, Ángel

- Computer Engineer and Technology Consultant
- Founder and CTO of Wozala
- Technological Consultant at Técnicas Reunidas
- Project Manager at Cetelem, Gfi Spain and ISBAN
- Technology and Project Design Coordinator at Bankia and BBVA
- Programmer at Idom Consulting
- Computer Engineer at the University of Zaragoza

Mr. Domenech Espí, Plácido

- Software Architect specialized in Artificial Intelligence
- Founder and Managing Director of VISOPHY, MXND, MINDS HUB and ALICANTE.AI
- Consultant in Smart City projects and development team management
- Computer Management Engineer from the University of Alicante



Mr. Pi Morell, Oriol

- Functional Analyst at Fihoca
- Hosting and Mail Product Owner. CDMON
- Functional Analyst and Software Engineer at Atmira and CapGemini
- Teacher at CapGemini,Forms CapGemina and Atmira
- Professional Master's Degree in Technical Engineering in Computer Management from the Autonomous University of Barcelona
- Master's Degree in Artificial Intelligence from the Catholic University of Avila
- Professional Master's Degree in Business Administration and Management by IMF Smart Education
- Master's Degree in Information of Systems Management by IMF Smart Education
- Postgraduate Degree in Design Patterns, Catalunya Open University

Mr. Viguera Gallego, Ander

- Process Engineer at Integral Rings
- VSM Engineer in the Small Spans line for Safran ITP Aero Castings
- VSM Engineer in the structural rings line for PWA & RR ITPAero Castings
- Industry 4.0 & IIoT Focal Point at ITPAeroCastings (Sestao)
- Graduate in Industrial Organization Engineering from ETSI Bilbao
- Master's Degree in Industrial Organization Engineering by ETSI Bilbao
- Master's degree in Industrial Strategy and Organization, ESTIA Institute of technology, Bidart
- Master's Degree in Artificial Intelligence from the Catholic University of Avila

05

Structure and Content

This Professional Master's Degree in Research and Innovation in Information and Communication Technology consists of 10 modules. Each of them addresses leading technologies and disciplines, applied to real projects and direct case studies in the professional market. This program specializes its students in the use of the technologies of the future, but with real applications in the present, making them a professional catalyst of the technologies of the coming years starting today.

From a practical and innovative business perspective, you will specialize in the 6 most innovative technologies of today"

Module 1. Communication Innovation with Cloud Computing

1.1. Cloud Computing State of the Art Online Revolution
- 1.1.1. Cloud Computing
- 1.1.2. Suppliers
- 1.1.3. Microsoft Azure

1.2. Interaction Methods. Tool Configuration and Management. Cloud Services
- 1.2.1. Portal
- 1.2.2. App
- 1.2.3. Powershell
- 1.2.4. Azure CLI
- 1.2.5. Azure REST API
- 1.2.6. ARM Templates

1.3. Computing Available OnCloud Services
- 1.3.1. Virtual Machine
- 1.3.2. Containers
- 1.3.3. AKS / Kubernetes
- 1.3.4. Function (Serverless)

1.4. Computing Available OnCloud Services. Web Apps
- 1.4.1. Web
- 1.4.2. Web Apps
- 1.4.3. Rest API
- 1.4.4. API Management

1.5. Cloud Storage Systems. Security and Communications
- 1.5.1. Storage
- 1.5.2. Data Lake
- 1.5.3. Data Factory
- 1.5.4. Data Services
- 1.5.5. Backup Copies

1.6. OnCloud Databases. Structured OnCloud information. Unlimited Scalability
- 1.6.1. Azure SQL
- 1.6.2. PostgresSQL / MySQL
- 1.6.3. Azure Cosmos DB
- 1.6.4. Redis

1.7. IoT. OnCloud Device Data Management and Storage
  1.7.1. Stram Nalytics
  1.7.2. Digital Twins
1.8. OnCloud Artificial Intelligence
  1.8.1. Machine Learning
  1.8.2. Cognitive Services
  1.8.3. Quantum Computing
1.9. OnCloud Computing. Advanced Features
  1.9.1. Security/Safety
  1.9.2. Monitoring. DataDog
  1.9.3. Application Insights
1.10. OnCloud Computing Applications
  1.10.1. LOB Scenario: Customer Relationship Management (CRM)
  1.10.2. IoT Scenario: Smart City
  1.10.3. AI Scenario: Chat Bot

Module 2. IoT. Service Applications from I 4.0 (4.0 Industries)

2.1. IoT. Internet of Things
  2.1.1. IoT
  2.1.2. Internet 0 & IoT
  2.1.3. Privacy and Object Control
2.2. Applications of IoT
  2.2.1. IoT Applications Consumption
  2.2.2. EIoT & IIoT
  2.2.3. IoT Administration
2.3. IoT & IIoT. Differences
  2.3.1. IIoT. IoT Differences
  2.3.2. IIot. Application
  2.3.3. Industries
2.4. Industry 4.0, Big Data & Business Analytics
  2.4.1. Industry 4.0, Big Data & Business Analytics
  2.4.2. Industry 4.0, Big Data & Business Analytics. Contextualization
  2.4.3. CRISP-DM Decisions and Methodology

2.5. Predictive Maintenance
- 2.5.1. Predictive Maintenance. Application
- 2.5.2. Predictive Maintenance. Model Development Approach

2.6. IoTeclipse.org I. IoT from Solutions Implementation Tool
- 2.6.1. Ethos Micro NPU
- 2.6.2. End-to-End Products
- 2.6.3. IoTeclipse. Examples of Use

2.7. IoTeclipse.org II. Advanced
- 2.7.1. Architecture
- 2.7.2. End-to-End
- 2.7.3. Environment Analytics

2.8. IIoT Arquitecture
- 2.8.1. Sensors and Actuators
- 2.8.2. Internet Ports and Data Acquisition Systems
- 2.8.3. Data Pre-Processing
- 2.8.4. Cloud Data Analysis and Modeling

2.9. End-to-End Open and Modular Arquitecture
- 2.9.1. End-to-End Open and Modular Arquitecture
- 2.9.2. Modular Architecture. Key Components
- 2.9.3. Modular Architecture. Benefits

2.10. Machine Learning at the Core and Edge
- 2.10.1. PoC
- 2.10.2. Data Pipeline
- 2.10.3. Edge to Core & Demo

Module 3. Digital Twins. Innovative Solutions

3.1. Digital Twins
- 3.1.1. Digital Twins
- 3.1.2. Digital Twins. Technological Evolution
- 3.1.3. Digital Twins Typology

3.2. Digital Twins. Applicable Technologies
- 3.2.1. Digital Twins Platforms
- 3.2.2. Digital Twins Interfaces
- 3.2.3. Digital Twins Typology

3.3. Digital Twins. Applications. Sectors and Examples of Use
- 3.3.1. Digital Twins. Techniques and Uses
- 3.3.2. Industries
- 3.3.3. Architecture and Cities

3.4. Industry 4.0. Digital Twin Applications
- 3.4.1. Industry 4.0
- 3.4.2. Environment
- 3.4.3. Digital Twin Applications in Industry 4.0

3.5. Smart Cities based on Digital Twins
- 3.5.1. Models
- 3.5.2. Categories
- 3.5.3. Future of Smart Cities based on Digital Twins

3.6. IoT Applied to Digital Twins
- 3.6.1. IoT. Link with Digital Twins
- 3.6.2. IoT. Relationship with Digital Twins
- 3.6.3. IoT. Problems and Possible Solutions

3.7. Digital Twin Environment
- 3.7.1. Companies
- 3.7.2. Organisation
- 3.7.3. Implications

3.8. Digital Twin Market
- 3.8.1. Platforms
- 3.8.2. Suppliers
- 3.8.3. Associated Services

3.9. Future of Digital Twins
- 3.9.1. Immersiveness
- 3.9.2. Augmented Reality
- 3.9.3. Biointerfaces

3.10. Digital Twins Present and future results
- 3.10.1. Platform
- 3.10.2. Technologies
- 3.10.3. Sectors

Module 4. Smart Cities as Innovation Tools

4.1. From Cities to Smart Cities
- 4.1.1. From Cities to Smart Cities
- 4.1.2. Cities Over Time and Cultures in Cities
- 4.1.3. Evolution of City Models

4.2. Technologies
- 4.2.1. Technological Application Platforms
- 4.2.2. Services/Citizen Interfaces
- 4.2.3. Technological Typologies

4.3. City as a Complex System
- 4.3.1. Components of a City
- 4.3.2. Interactions between Components
- 4.3.3. Applications: Products and Services in the City

4.4. Intelligent Safety Management
- 4.4.1. Current State
- 4.4.2. Technological Management Environments in the City
- 4.4.3. Future: Smart Cities in the Future

4.5. Intelligent Cleaning Management
- 4.5.1. Application Models in Intelligent Cleaning Services
- 4.5.2. Systems: Application of Intelligent Cleaning Services
- 4.5.3. Future of Intelligent Cleaning Services

4.6. Intelligent Traffic Management
- 4.6.1. Traffic Evolution: Complexity and Factors Hindering Traffic Management
- 4.6.2. Problems
- 4.6.2. E-Mobility
- 4.6.3. Solutions

4.7. Sustainable City
- 4.7.1. Energy
- 4.7.2. The Water Cycle
- 4.7.3. Management Platform

4.8. Intelligent Leisure Management
- 4.8.1. Business Models
- 4.8.2. Urban Leisure Evolution
- 4.8.3. Associated Services

4.9. Large Social Event Management
- 4.9.1. Movement
- 4.9.2. Capacities
- 4.9.3. Health

4.10. Conclusions on the Present and Future of Smart Cities
- 4.10.1. Technology Platforms and Problems
- 4.10.2. Technologies, Integration in Heterogeneous Environments
- 4.10.3. Practical Applications in Different City Models

Module 5. R&D in Complex Software Systems. Blockchain. Public and Private Nodes

5.1. Blockchain and Distributed Data
- 5.1.1. Information Communications. New Paradigm
- 5.1.2. Privacy and Transparency
- 5.1.3. Information Exchange. New Models

5.2. Blockchain
- 5.2.1. Blockchain
- 5.2.2. Blockchain. Technological Base
- 5.2.3. Blockchain. Components and Elements

5.3. Blockchain. Public Nodes
- 5.3.1. Blockchain. Public Nodes
- 5.3.2. Working Algorithms in Public Nodes
  - 5.3.2.1. Proof of Work
  - 5.3.2.2. Proof of Stake
  - 5.3.2.3. Proof of Authority
- 5.3.3. Use Cases and Application
  - 5.3.3.1. Smart Contracts
  - 5.3.3.2. Dapps

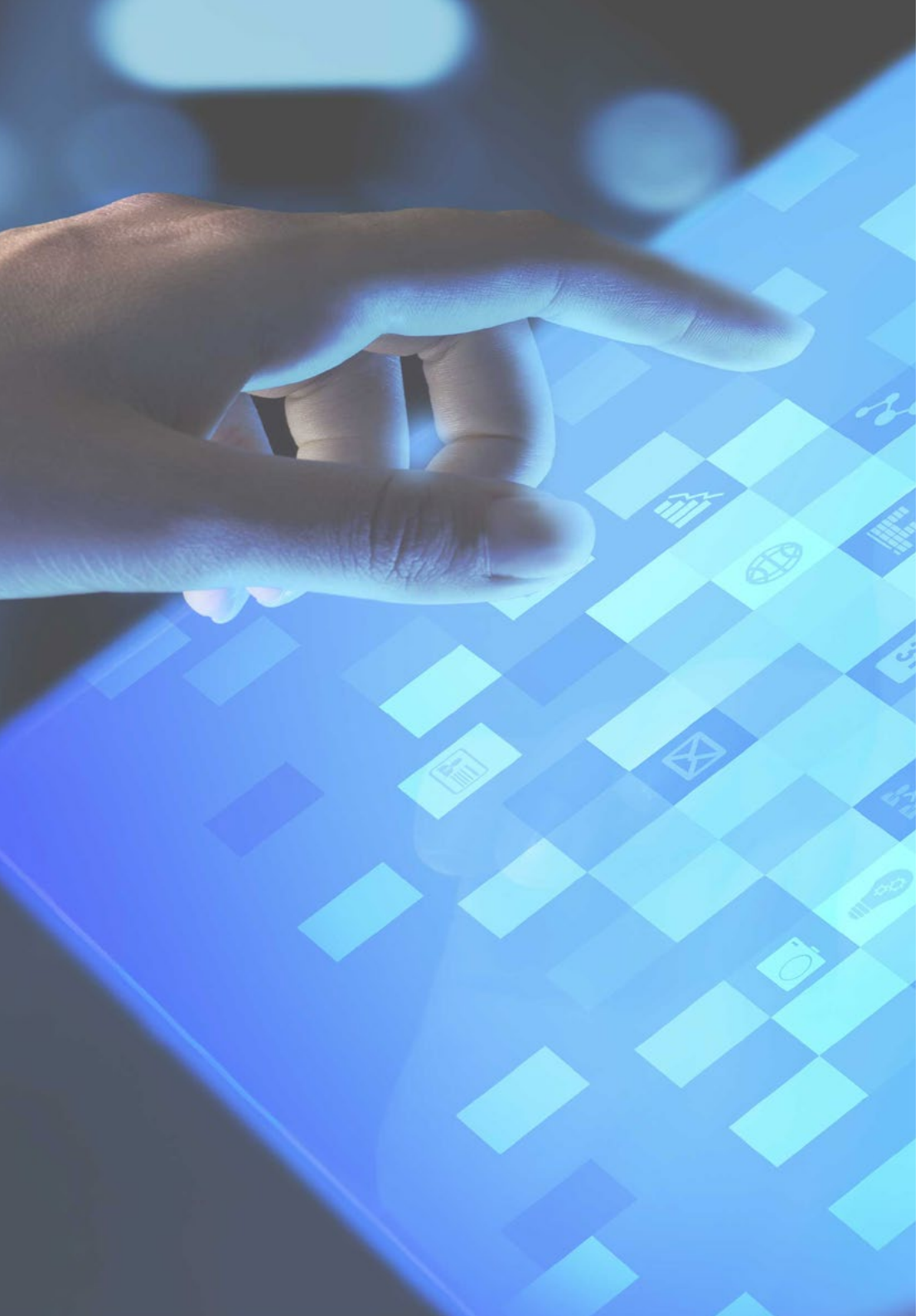
5.4. Blockchain. Private Nodes
- 5.4.1. Blockchain. Private Nodes
- 5.4.2. Working Algorithms in Private Nodes
  - 5.4.2.1. Proof of Work
  - 5.4.2.2. Proof of Stake
  - 5.4.2.3. Proof of Authority
- 5.4.3. Use Cases and Application
  - 5.4.3.1. Crypto Economy
  - 5.4.3.2. Game Theory
  - 5.4.3.3. Market Modeling

5.5. Blockchain. Work Frameworks
- 5.5.1. Blockchain. Work Frameworks
- 5.5.2. Types
  - 5.5.2.1. Ethereum
  - 5.5.2.2. Hyperledger Fabric
- 5.5.3. Application Examples (Ethereum)
  - 5.5.3.1. C#
  - 5.5.3.2. Go

5.6. Blockchain in Finance
- 5.6.1. The Impact of Blockchain on the Financial World
- 5.6.2. Advanced Technologies
- 5.6.3. Use Cases and Application
  - 5.6.3.1. Information Assurance
  - 5.6.3.2. Follow-Up and Monitoring
  - 5.6.3.3. Certified Transmissions
  - 5.6.3.4. Examples within the Financial Sector

5.7. Blockchain in the Industrial Environment
- 5.7.1. Blockchain and Logistics
- 5.7.2. Advanced Technologies
- 5.7.3. Use Cases and Application
  - 5.7.3.1. Smart Contracts between Suppliers and Customers
  - 5.7.3.2. Support in Automation Processes
  - 5.7.3.3. Real-Time Product Traceability
  - 5.7.3.4. Examples within the Industrial Sector

5.8. Blockchain. Transaction Tokenization
- 5.8.1. “Tokenizing” the World
- 5.8.2. Smart Contracts Platforms (Smart Contracts)
  - 5.8.2.1. Bitcoin
  - 5.8.2.2. Ethereum
  - 5.8.2.3. Other Emerging Platforms



5.8.3. Communication: The Oracle Problem
5.8.4. Uniqueness: NFTs
5.8.5. "Tokenization": STOs
5.9. Blockchain. Examples of Use
5.9.1. Use Case Description
5.9.2. Practical Implementation (C#/Go)
5.10. Distributed Data. Blockchain applications, Present and Future
5.10.1. Distributed Data. Present and Future Applications of Blockchain
5.10.2. The Future of Communication
5.10.3. Next Steps

Module 6. Data Operations in Blockchain. Innovation in Information Management

6.1. Information Management
6.1.1. Information Management
6.1.2. Management Applied to Knowledge
6.2. Blockchain in Information Management
6.2.1. Blockchain in Information Management
6.2.1.1. Data Security
6.2.1.2. Data Quality
6.2.1.3. Traceability of Information
6.2.1.4. Other Additional Benefits
6.2.2. Additional Considerations
6.3. Data Security
6.3.1. Data Security
6.3.2. Security and Privacy
6.3.3. Use Cases and Application
6.4. Data Quality
6.4.1. Data Quality
6.4.2. Reliability and Consensus
6.4.3. Use Cases and Application

6.5. Traceability of Information
- 6.5.1. Data Traceability
- 6.5.2. Blockchain in Data Traceability
- 6.5.3. Use Cases and Application

6.6. Analysis of Information
- 6.6.1. Big Data
- 6.6.2. Blockchain and Big Data
- 6.6.3. Real-Time Data Accessibility
- 6.6.4. Use Cases and Application

6.7. Application of BC (I). Information Security
- 6.7.1. Information Security
- 6.7.2. Use Case
- 6.7.3. Practical Implementation

6.8. Application of BC (II). Information Quality
- 6.8.1. Information Quality
- 6.8.2. Use Case
- 6.8.3. Practical Implementation

6.9. Application of BC (III). Traceability of Information
- 6.9.1. Traceability of Information
- 6.9.2. Use Case
- 6.9.3. Practical Implementation

6.10. Blockchain. Practical Applications
- 6.10.1. Blockchain in Practice
  - 6.10.1.1. Data Centers
  - 6.10.1.2. Sectorial
  - 6.10.1.3. Multisectorial
  - 6.10.1.4. Geographical

Module 7. R&D and AI NLP/NLU. Embeddings and Transformers

7.1. Natural Language Processing (NLP)
- 7.1.1. Natural Language Processing. Uses of NLP
- 7.1.2. Nautral Language Processing (NLP). Libraries
- 7.1.3. Stoppers in NLP Application

7.2. Natural Language Understanding/Natural Language Generation. (NLU/NLG)
- 7.2.1. NLG. I.A. NLP/NLU. Embeddings and transformers
- 7.2.2. NLU/NLG. Uses
- 7.2.3. NLP/NLG. Differences

7.3. Word Embeddings
- 7.3.1. Word Embeddings
- 7.3.2. Word Embeddings Uses
- 7.3.3. Word2vec. Libraries

7.4. Embeddings. Practical Applications
- 7.4.1. Word2vec Code
- 7.4.2. Word2vec. Real Cases
- 7.4.3. Corpus for Word2vec Use. Examples:

7.5. Transformers
- 7.5.1. Transformers
- 7.5.2. Models Created with Transformers
- 7.5.3. Pros and Cons of Transformers

7.6. Sentiment Analysis
- 7.6.1. Sentiment Analysis
- 7.6.2. Practical Application of Sentiment Analysis
- 7.6.3. Uses of Sentiment Analysis

7.7. GPT Open AI
- 7.7.1. GPT Open AI
- 7.7.2. GPT 2. Free Disposal Model
- 7.7.3. GPT 3. Payment Model

7.8. Hugging Face Community
- 7.8.1. Hugging Face Community
- 7.8.2. Hugging Face Community Possibilities
- 7.8.3. Hugging Face Community Examples:

7.9. Barcelona Super Computing Case
- 7.9.1. BSC Case
- 7.9.2. MARIA Model
- 7.9.3. Existing Corpus
- 7.9.4. Importance of Having a Large Spanish Language Corpus

7.10. Practical Applications
- 7.10.1. Automatic Summary
- 7.10.2. Text Translation
- 7.10.3. Sentiment Analysis
- 7.10.4. Speech Recognition

Module 8. R&D and AI Computer Vision. Object Identification and Tracking

8.1. Computer Vision
- 8.1.1. Computer Vision
- 8.1.2. Computational Vision
- 8.1.3. Interpretation of the Machines in an Image

8.2. Activation Functions
- 8.2.1. Activation Functions
- 8.2.2. Sigmoid
- 8.2.3. RELU
- 8.2.4. Hyperbolic Tangent
- 8.2.5. Softmax

8.3. Construction of Convolutional Neural Networks
- 8.3.1. Convolution Operation
- 8.3.2. ReLU Layer
- 8.3.3. Pooling
- 8.3.4. Flattering
- 8.3.5. Full Connection

8.4. Convolution Process
- 8.4.1. Operation of a Convolution
- 8.4.2. Convolution Code
- 8.4.3. Convolution. Application

8.5. Transformations with Images
- 8.5.1. Transformations with Images
- 8.5.2. Advanced Transformations
- 8.5.3. Transformations with Images. Application
- 8.5.4. Transformations with Images. Use Case

8.6. Transfer Learning
- 8.6.1. Transfer Learning
- 8.6.2. Transfer Learning. Typology
- 8.6.3. Deep Networks to Apply Transfer Learning

8.7. Computer Vision Use Case
- 8.7.1. Image Classification
- 8.7.2. Object Detection
- 8.7.3. Object Identification
- 8.7.4. Object Segmentation

8.8. Object Detection
- 8.8.1. Convolution-Based Detection
- 8.8.2. R-CNN, Selective Search
- 8.8.3. Rapid Detection with YOLO
- 8.8.4. Other Possible Solutions

8.9. GAN. Generative Adversarial Networks
- 8.9.1. Generative Adversarial Networks
- 8.9.2. Code for a GAN
- 8.9.3. GAN. Application

8.10. Application of Computer Vision Models
- 8.10.1. Content Organization
- 8.10.2. Visual Search Engines
- 8.10.3. Facial Recognition
- 8.10.4. Augmented Reality
- 8.10.5. Autonomous Driving
- 8.10.6. Fault Identification in Each Assembly
- 8.10.7. Pest Identification
- 8.10.8. Health

Module 9. Quantum Computing. A New Model of Computing

9.1. Quantum Computing
- 9.1.1. Differences with Classical Computing
- 9.1.2. Need for Quantum Computing
- 9.1.3. Quantum Computers Available: Nature and Technology

9.2. Applications of Quantum Computing
- 9.2.1. Quantum Computing vs. Classical Computing Applications
- 9.2.2. Contexts of Use
- 9.2.3. Application in Real Cases

9.3. Mathematical Foundations of Quantum Computing
- 9.3.1. Computational Complexity
- 9.3.2. Double Slit Experiment. Particles and Waves
- 9.3.3. Intertwining

9.4. Geometric Foundations of Quantum Computing
- 9.4.1. Qubit and Complex Two-Dimensional Hilbert Space
- 9.4.2. Dirac's General Formalism
- 9.4.3. N-Qubits States and Hilbert Space of Dimension 2n

9.5. Mathematical Foundations of Linear Algebra
- 9.5.1. The Domestic Product
- 9.5.2. Hermitian Operators
- 9.5.3. Eigenvalues and Eigenvectors

9.6. Quantum Circuits
- 9.6.1. Bell States and Pauli Matrices
- 9.6.2. Quantum Logic Gates
- 9.6.3. Quantum Control Gates

9.7. Quantum Algorithms
- 9.7.1. Reversible Quantum Gates
- 9.7.2. Quantum Fourier Transform
- 9.7.3. Quantum Teleportation

9.8. Algorithms Demonstrating Quantum Supremacy
- 9.8.1. Deutsch´s Algorithm
- 9.8.2. Shor´s Algorithm
- 9.8.3. Grover´s Algorithm

9.9. Quantum Computer Programming
- 9.9.1. My First Program on Qiskit (IBM)
- 9.9.2. My First Program on Ocean (Dwave)
- 9.9.3. My First Program on Cirq (Google)

9.10. Application on Quantum Computers
- 9.10.1. Creation of Logical Gates
  - 9.10.1.1. Creation of a Quantum Digital “Adder”
- 9.10.2. Creation of Quantum Games
- 9.10.3. Secret Key Communication between Bob and Alice

Module 10. Quantum Machine Learning. Future Artificial Intelligence

10.1. Classical Machine Learning Algorithms
- 10.1.1. Descriptive, Predictive, Proactive and Prescriptive Models
- 10.1.2. Supervised and Unsupervised Models
- 10.1.3. Feature Reduction, PCA, Covariance Matrix, SVM, Neural Networks
- 10.1.4. ML Optimization: Gradient Descent

10.2. Classical Deep Learning Algorithms
- 10.2.1. Boltzmann Networks. The Machine Learning Revolution
- 10.2.2. Deep Learning Models. CNN, LSTM, GANs
- 10.2.3. Encoder-Decoder Models
- 10.2.4. Signal Analysis Models. Fourier Analysis

10.3. Quantum Classifiers
- 10.3.1. Quantum Classifier Generation
- 10.3.2. Amplitude Coding of Data in Quantum States
- 10.3.3. Encoding of Data in Quantum States by Phase/Angle
- 10.3.4. High-Level Coding

10.4. Optimization Algorithms
- 10.4.1. Quantum Approximate Optimization Algorithm (QAOA)
- 10.4.2. Variational Quantum Eigensolvers (VQE)
- 10.4.3. Quadratic Unconstrained Binary Optimization (QUBO)

10.5. Optimization Algorithms Examples:
- 10.5.1. PCA with Quantum Circuits
- 10.5.2. Optimization of Stock Packages
- 10.5.3. Optimization of logistics routes

10.6. Quantum Kernels Machine Learning
- 10.6.1. Variational Quantum Classifiers. QKA
- 10.6.2. Quantum Kernels Machine Learning
- 10.6.3. Classification Based on Quantum Kernel
- 10.6.4. Clustering Based on Quantum Kernel

10.7. Quantum Neural Networks
- 10.7.1. Classical Neural Networks and "Perceptron"
- 10.7.2. Quantum Neural Networks and "Perceptron"
- 10.7.3. Quantum Convolutional Neural Networks

10.8. Advanced Deep Learning (DL) Algorithms
- 10.8.1. Quantum Boltzmann Machines
- 10.8.2. General Adversarial Networks
- 10.8.3. Quantum Fourier Transformation, Quantum Phase Estimation and Quantum Matrix

10.9. Machine Learning. Use Case
- 10.9.1. Experimentation with VQC (Variational Quantum Classifier)
- 10.9.2. Experimentation with Quantum Neural Networks
- 10.9.3. Experimentation with qGANS

10.10. Quantum Computing and Artificial Intelligence
- 10.10.1. Quantum Capacity in ML Models
- 10.10.2. Quantum Knowledge Graphs
- 10.10.3. The Future of Quantum Artificial Intelligence

"Specialize as an engineer in applying the technologies of the future, but using real applications in the present"

06

Methodology

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

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

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

Case Study to contextualize all content

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

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

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

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

A learning method that is different and innovative

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

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

The case method is the most widely used learning system in the best faculties in the world. 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 program, the studies 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

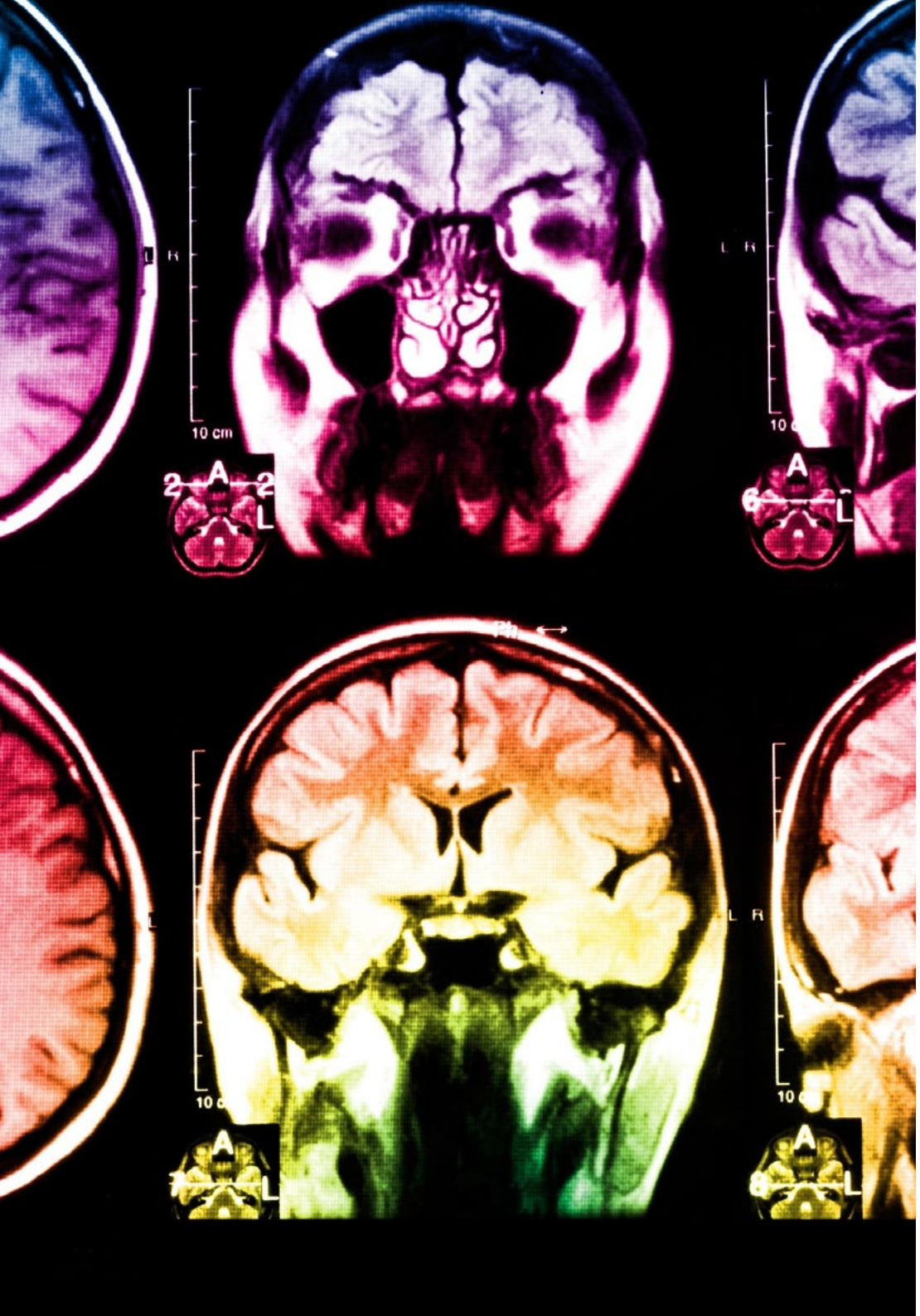
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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

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

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

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



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

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

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

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

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

Study Material

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

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

Classes

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

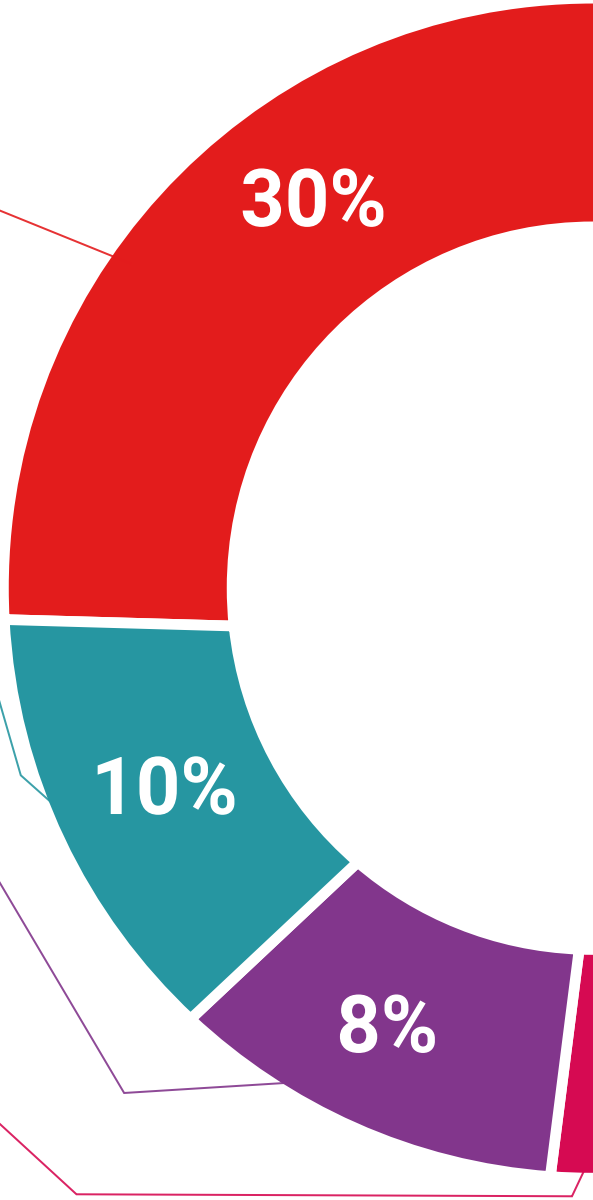
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

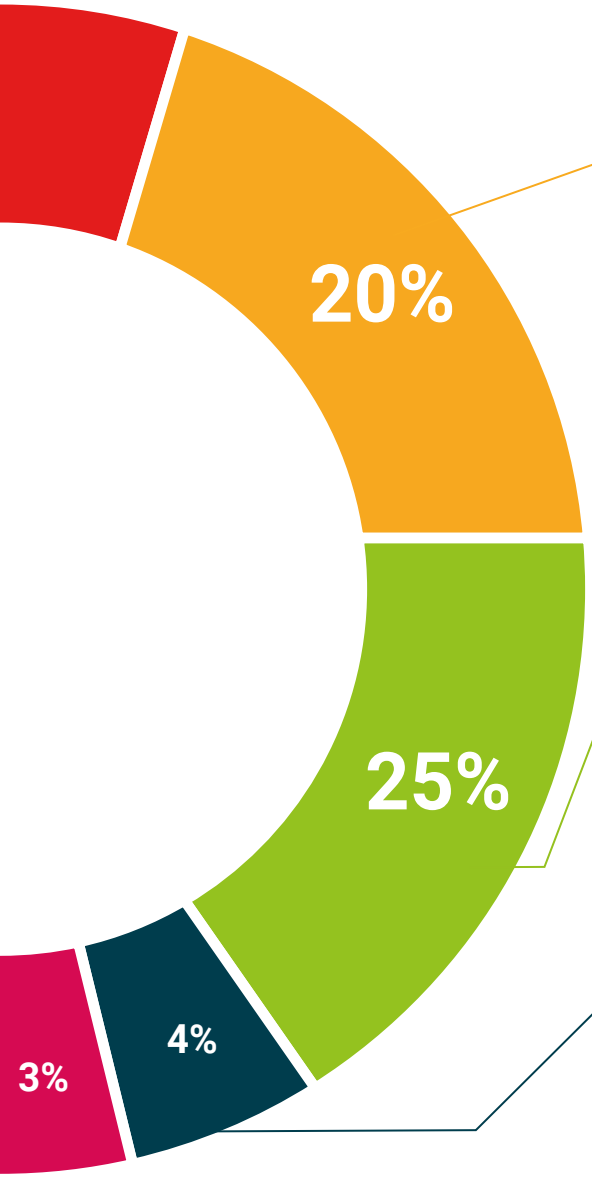
Practising Skills and Abilities

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

Additional Reading

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





Case Studies

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

Interactive Summaries

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

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

Testing & Retesting

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

07

Certificate

The Professional Master's Degree in Research and Innovation in Information and Communication Technology guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree diploma issued by TECH Technological University.

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

This **Professional Master's Degree in Research and Innovation in Information and Communication Technology** contains the most complete and up-to-date program on the market.

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

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

Title: **Professional Master's Degree in Research and Innovation in Information and Communication Technology**

Official Nº of Hours: **1,500 h.**


tech technological university

Awards the following

DIPLOMA

to

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

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Research and Innovation in Information and Communication Technology

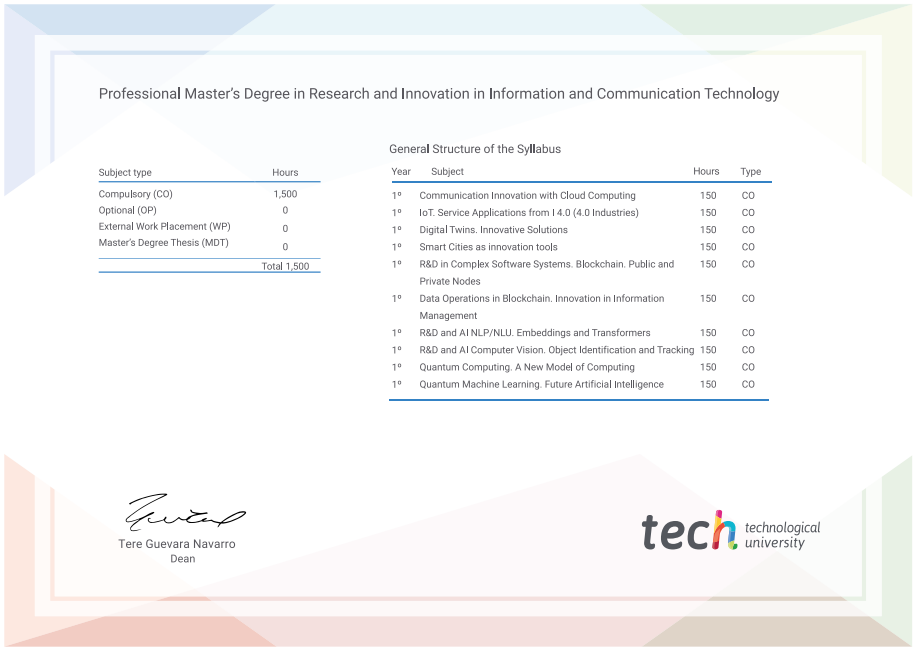
This is a qualification awarded by this University, equivalent to 1,500 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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

June 17, 2020

Tere Guevara Navarro
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Research and Innovation in Information and Communication Technology

Subject type	Hours
Compulsory (CO)	1,500
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 1,500

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Communication Innovation with Cloud Computing	150	CO
1º	IoT. Service Applications from I 4.0 (4.0 Industries)	150	CO
1º	Digital Twins. Innovative Solutions	150	CO
1º	Smart Cities as innovation tools	150	CO
1º	R&D in Complex Software Systems. Blockchain. Public and Private Nodes	150	CO
1º	Data Operations in Blockchain. Innovation in Information Management	150	CO
1º	R&D and AI NLP/NLU. Embeddings and Transformers	150	CO
1º	R&D and AI Computer Vision. Object Identification and Tracking	150	CO
1º	Quantum Computing. A New Model of Computing	150	CO
1º	Quantum Machine Learning. Future Artificial Intelligence	150	CO

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Dean

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

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Professional Master's Degree
Research and Innovation in Information and Communication Technology

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

Professional Master's Degree

Research and Innovation in Information and Communication Technology

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