Advanced Master's Degree

Computer Science, Cybersecurity and Data Analysis

tech technological university

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Advanced Master's Degree

Computer Science, Cybersecurity and Data Analysis

- Modality: **online**
- Duration: **2 years**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/in/information-technology/advanced-master-degree/advanced-master-degree-computer-science-cybersecurity-data-analysis

Index

01 Introduction p. 4

02 Objectives p. 8

03 Skills p. 20

04 Course Management p. 24

05 Structure and Content p. 32

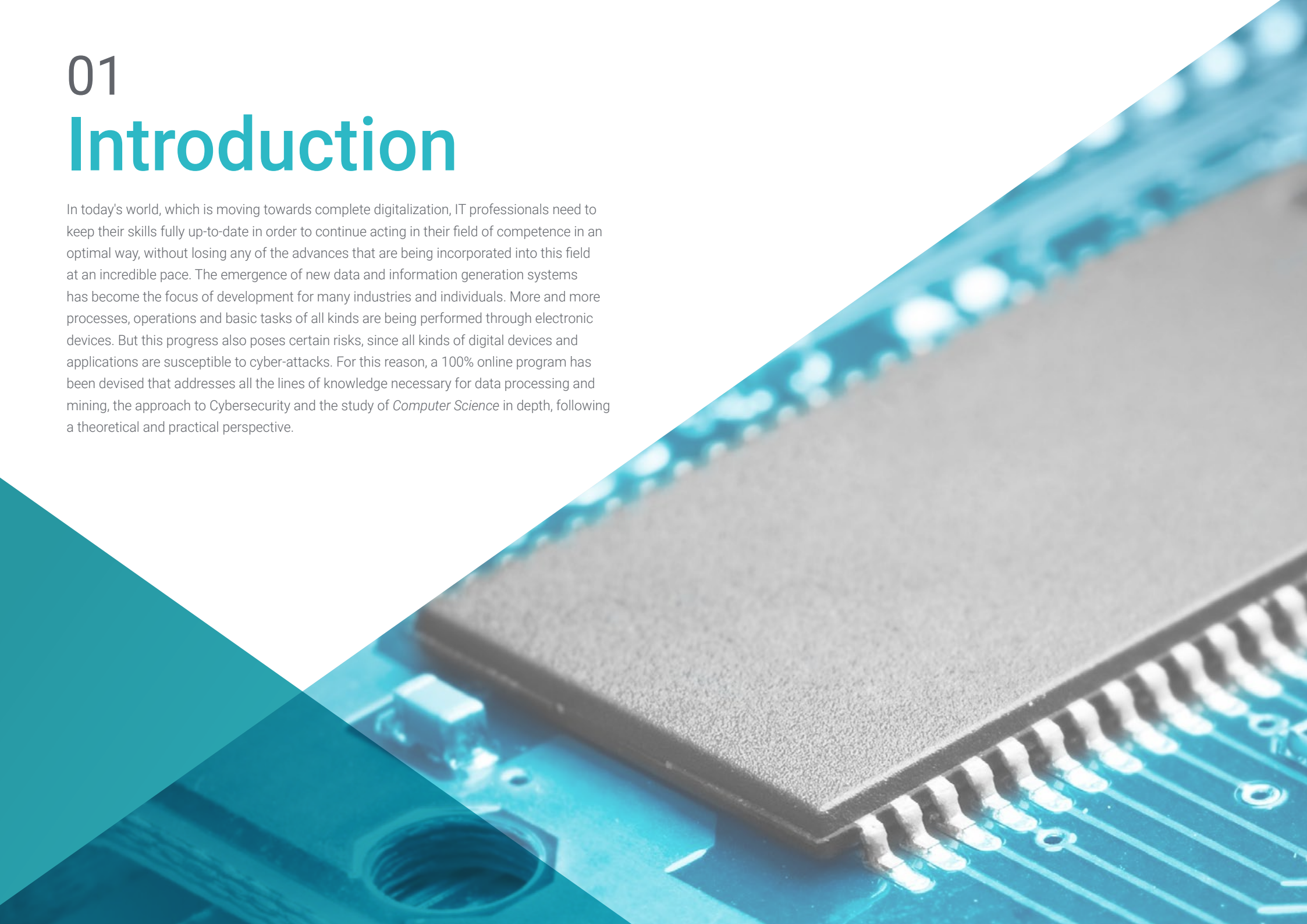
06 Methodology p. 60

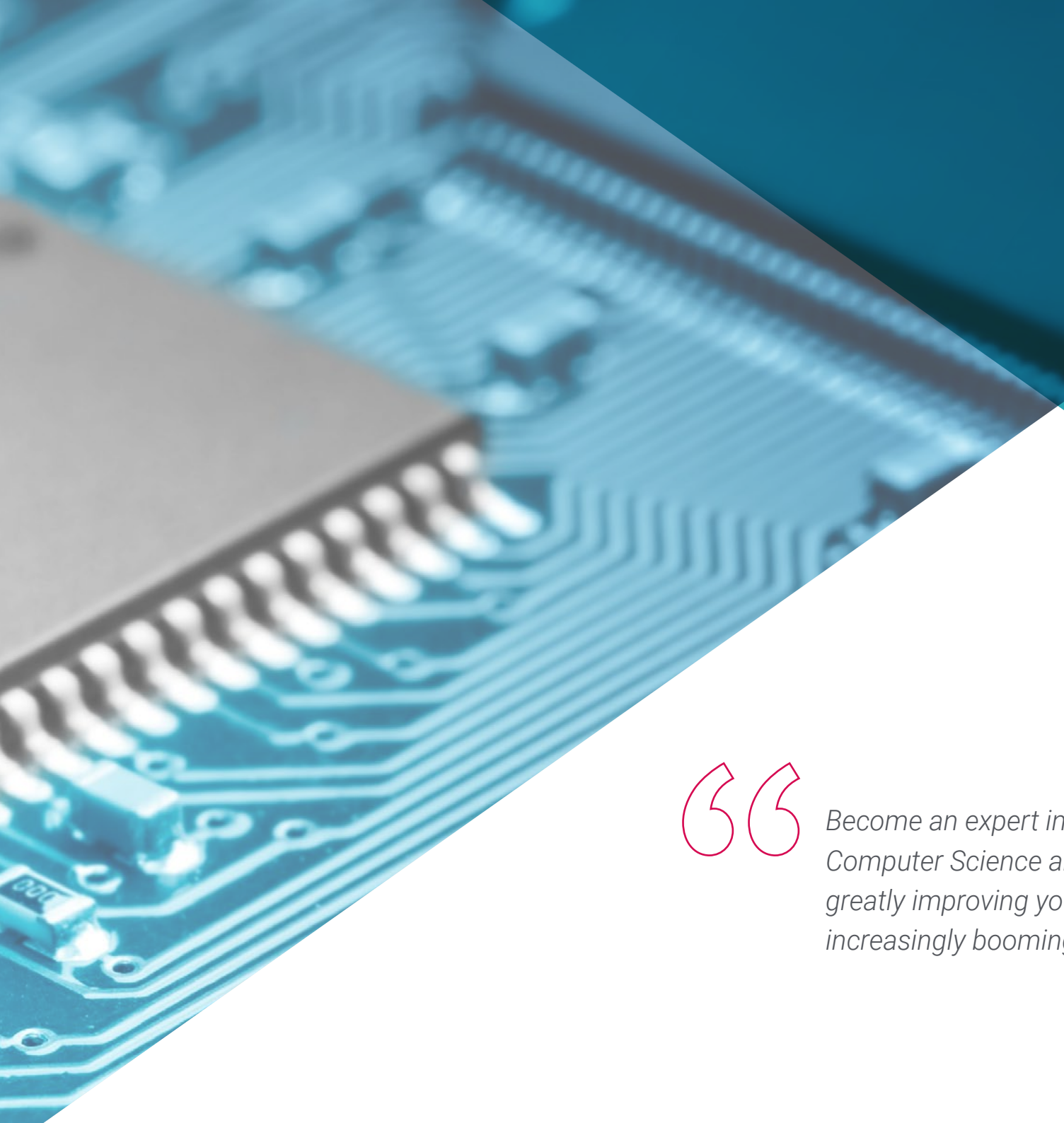
07 Certificate p. 68

01

Introduction

In today's world, which is moving towards complete digitalization, IT professionals need to keep their skills fully up-to-date in order to continue acting in their field of competence in an optimal way, without losing any of the advances that are being incorporated into this field at an incredible pace. The emergence of new data and information generation systems has become the focus of development for many industries and individuals. More and more processes, operations and basic tasks of all kinds are being performed through electronic devices. But this progress also poses certain risks, since all kinds of digital devices and applications are susceptible to cyber-attacks. For this reason, a 100% online program has been devised that addresses all the lines of knowledge necessary for data processing and mining, the approach to Cybersecurity and the study of *Computer Science* in depth, following a theoretical and practical perspective.





Become an expert in Cybersecurity by mastering Computer Science and Data Analysis, thereby greatly improving your employability in an increasingly booming sector"

Driven by the continuous advances in information technology, it is not only technology that has benefited from great improvements, but also the digital tools themselves with which many tasks are performed today. The other side of the coin is that these advances have also led to an increase in computer vulnerabilities. For this reason, more and more companies are looking for professionals specialized in Cybersecurity who can provide them with adequate protection against all types of cyber-attacks.

In this Advanced Master's Degree, computer scientists will be able to delve into aspects such as security in the development and design of systems, the best cryptographic techniques or security in Cloud Computing environments. In addition, this program focuses on programming fundamentals and data structure, algorithmics and complexity, as well as advanced algorithm design, advanced programming, language processors and computer graphics, among others. All this, with numerous multimedia teaching resources, taught by the most prestigious and specialized faculty in the field.

On the other hand, this educational program addresses data science from both a technical and business perspective, offering students all the skills they require to the knowledge hidden within said data. As such, computer scientists will be able to analyze the most current algorithms, platforms and tools for data exploration, visualization, manipulation, processing and analysis in great detail. All of the above is complemented by the executive business skills required to make key decisions in a company.

This program provides the professional with the specific tools and skills to successfully develop their professional activity in the broad environment of computing. Working on key competencies such as knowledge of the reality and daily practice in different IT fields and developing responsibility in the monitoring and supervision of their work, as well as specific skills within each field.

With this program, computer scientists will be able to specialize in Computer Science, Cybersecurity and Data Analysis, making it the perfect opportunity to enhance their professional career. All this will be tangible thanks to a 100% online program, which adapts to the daily needs of professionals, so that they only require a device with an Internet connection to start working toward developing a comprehensive professional profile with international projection.

This **Advanced Master's Degree in Computer Science, Cybersecurity and Data Analysis** contains the most complete and up-to-date educational program on the market. The most important features include:

- The development of case studies presented by IT experts
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where self-assessment can be used to improve learning
- Its special emphasis on innovative methodologies for Cybersecurity and Data Analysis
- 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

In a comfortable and simple way, acquire the necessary knowledge in Computer Science, Cybersecurity and Data Analysis to perform quality computer programming"

TECH puts at your service a wide and clear educational material, which incorporates all the current topics of interest, so that you can continue to advance in computing"

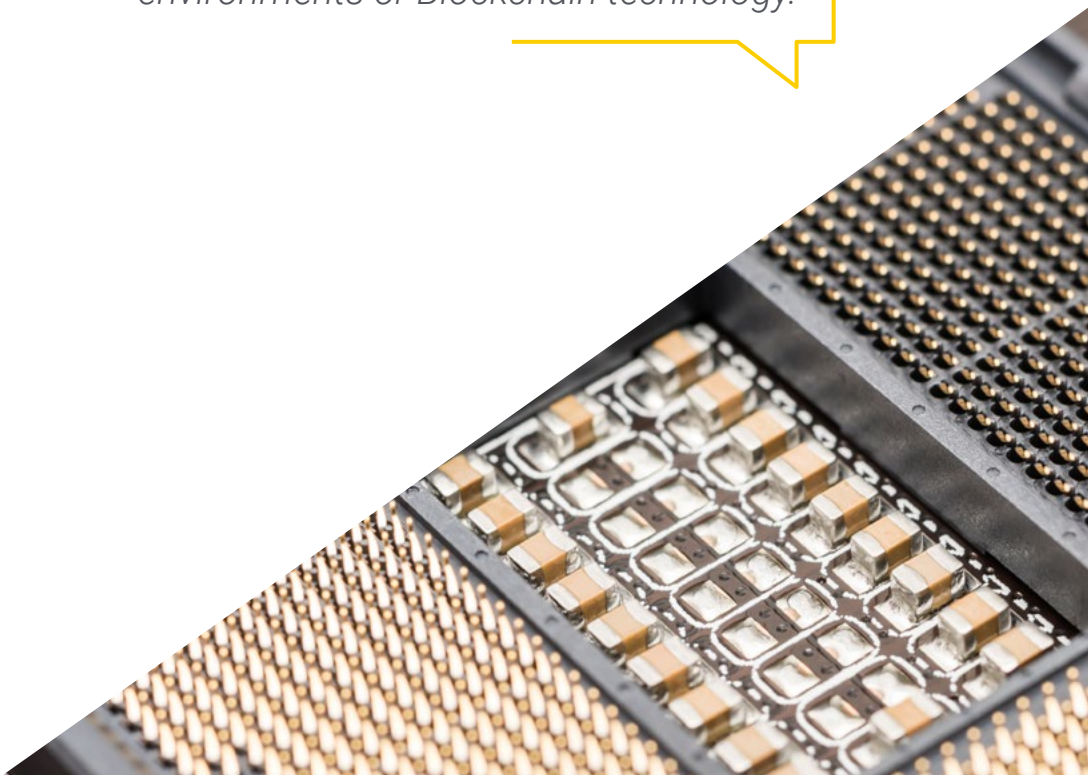
Empower your career by determining the creation of dashboards and KPIs according to the department in which you work.

Learn, first hand, the best security techniques applied to Cloud Computing environments or Blockchain technology.

Its teaching staff includes professionals from the field of Computer Science, who contribute their work experience to this program, as well as renowned specialists from prestigious universities and leading societies.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide an immersive learning experience designed to prepare for real-life situations.

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



02

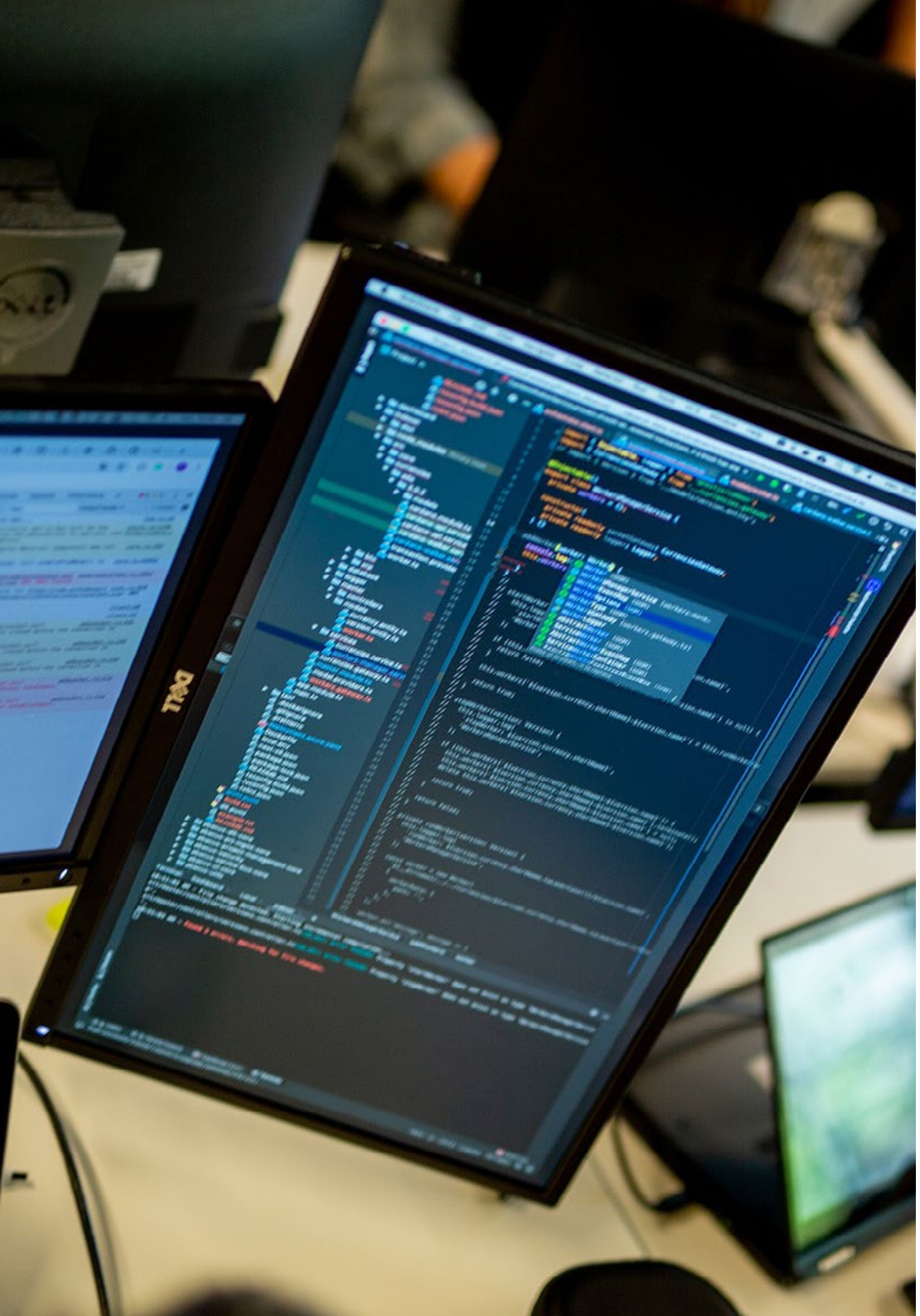
Objectives

The Advanced Master's Degree in Computer Science, Cybersecurity and Data Analysis has been created specifically for the computer scientist looking to advance in this field quickly and with real quality. For this reason, a program has been organized based on realistic and high-value objectives that will propel you to another level of work in this field. The professional will focus on the study of the different techniques, technologies and phases necessary for computing, from a disruptive, complete and up to date perspective.

TECH puts a high-quality program at your service, one that will allow you to intervene with solvency in computing, guaranteeing the security of your company"

General Objectives

- Being up to date scientifically and technologically, as well as to prepare for the professional practice of computing and languages in a transversal and versatile way adapted to new technologies and innovations in this field
- Generate specialized knowledge about an information system, types and security aspects that must be taken into account
- Identify the vulnerabilities of an information system
- Develop the legal regulation and typification of the crime attacking an information system
- Evaluate the different models of security architecture to establish the most suitable model for the organization
- Identify the regulatory frameworks of application and their regulatory bases
- Analyze the organizational and functional structure of an information security area (the CISO's office)
- Analyze and develop the concept of risk, uncertainty within the environment in which we live
- Examine the risk management model based on Iso 31.000
- Examine the science of cryptology and the relationship to its branches: cryptography, cryptanalysis, steganography and stegoanalysis
- Analyze the types of cryptography according to the type of algorithm and according to its use
- Examine digital certificates
- Examining the Public Key Infrastructure (PKI)
- Develop the concept of identity management
- Identify authentication methods
- Generate specialized knowledge of the IT security ecosystem
- Evaluate the knowledge in terms of Cybersecurity
- Identify the areas of Cloud security
- Analyze the services and tools in each of the security areas
- Develop the security specifications of each LPWAN technology
- Analyze comparatively the security of LPWAN technologies
- Analyze the benefits of applying data analysis techniques in each department of the company
- Develop the basis for understanding the needs and applications of each department
- Generate specialized knowledge to select the right tool
- Propose techniques and objectives in order to be as productive as possible according to the department



Specific Objectives

Module 1. Programming Fundamentals

- Understand the basic structure of a computer, software and general purpose programming languages
- Learn to design and interpret algorithms, which are the necessary basis for developing computer programs
- Understand the essential elements of a computer program, such as the different types of data, operators, expressions, statements, I/O and control statements
- Understand the different data structures available in general purpose programming languages, both static and dynamic, and to acquire the essential knowledge for file handling
- Know the different testing techniques in computer programs and the importance of generating good documentation together with good source code
- Learn the basic concepts of the C++ programming language, one of the most widely used languages in the world

Module 2. Data Structure

- Learn the basics of programming in the C++ language, including classes, variables, conditional expressions and objects
- Understand abstract data types, linear data structure types, simple and complex hierarchical data structures, as well as their implementation in C++
- Understand the operation of advanced data structures other than the usual ones
- Know the theory and practice related to the use of priority heaps and queues
- Learn the operation of Hash tables, such as abstract data types and functions
- Understand Graph theory, as well as advanced Graph algorithms and concepts

Module 3. Algorithm and Complexity

- Learn the main strategies for algorithm design, as well as the different methods and measures for algorithm computation
- Know the main sorting algorithms used in software development
- Understand the operation of the different algorithms with trees, Heaps and Graphs
- Understand the operation of Greedy algorithms, their strategy and examples of their use in the main known problems. We will also learn about the use of Greedy algorithms on graphs
- We will learn the main strategies of minimum path search, with the approach of essential problems of the field and algorithms for their resolution
- Understand the Backtracking technique and its main uses, as well as other alternative techniques

Module 4. Advanced Algorithm Design

- Delve into advanced algorithm design, analyzing recursive and divide-and-conquer algorithms, as well as performing amortized analysis
- Understand dynamic programming concepts and algorithms for NP problems
- Understand the operation of combinatorial optimization, as well as the different randomization algorithms and parallel algorithms
- Know and understand the operation of the different local and candidate search methods
- Learn the mechanisms of formal verification of programs and iterative programs, including first-order logic and Hoare's formal system
- Learn the operation of some of the main numerical methods such as the bisection method, the Newton-Raphson method and the secant method

Module 5. Advanced Programming

- In-depth knowledge of programming, especially as it relates to object-oriented programming, and the different types of relationships between existing classes
- Know the different design patterns for object-oriented problems
- Learn about event-driven programming and the development of user interfaces with Qt
- Acquire the essential knowledge of Concurrent Programming, processes and threads
- Learn how to manage the use of threads and synchronization, as well as the resolution of common problems within Concurrent Programming
- Understand the importance of documentation and testing in software development

Module 6. Theoretical Computer Science

- Understand the essential theoretical mathematical concepts behind Computer Science, such as propositional logic, set theory and numerable and non-numerable sets
- Understand the concepts of formal languages and grammars, as well as Turing machines in their different variants
- Learn about the different types of undecidable problems and intractable problems, including the different variants of them and their approaches
- Understand the operation of different kinds of randomization-based languages and other kinds of classes and grammars
- Learn about other advanced computing systems such as membrane computing, DNA computing and quantum computing

Module 7. Automata Theory and Formal Languages

- Understand the theory of automata and formal languages, learning the concepts of alphabets, strings and languages, as well as how to perform formal demonstrations
- Delve into the different types of finite automata, both deterministic and non-deterministic
- Learn the basic and advanced concepts related to regular languages and regular expressions, as well as the application of the pumping lemma and the closure of regular languages
- Understand context-independent grammars, as well as the operation of stack automata
- Delve into normal forms, the pumping lemma of context-independent grammars and properties of context-independent languages

Module 8. Language Processors

- Introduce the concepts related to the compilation process and the different types of analysis: lexical, syntactic and semantic
- Learn how a lexical analyzer works, its implementation and error recovery
- Delve into the knowledge of syntactic analysis, both top-down and bottom-up, but with special emphasis on the different types of bottom-up syntactic parsers
- Understand the functioning of semantic parsers, the syntax-driven tradition, the symbol table and the different types
- Learn the various mechanisms for code generation, both in runtime environments and for intermediate code generation
- Lay the groundwork for code optimization, including expression reordering and loop optimization

Module 9. Computer Graphics and Visualization

- Introduce the essential concepts of computer graphics and computer visualization, such as color theory and its models and the properties of light
- Understand the functioning of output primitives and their algorithms, both for line drawing and for drawing circles and fills
- Delve into the study of the different transformations, both 2D and 3D, and their coordinate systems and computer visualization
- Learn how to make projections and cuts in 3D, as well as the elimination of hidden surfaces
- Learn the theory related to interpolation and parametric curves, as well as Bézier Curves and B-Splines

Module 10. Bio-Inspired Computing

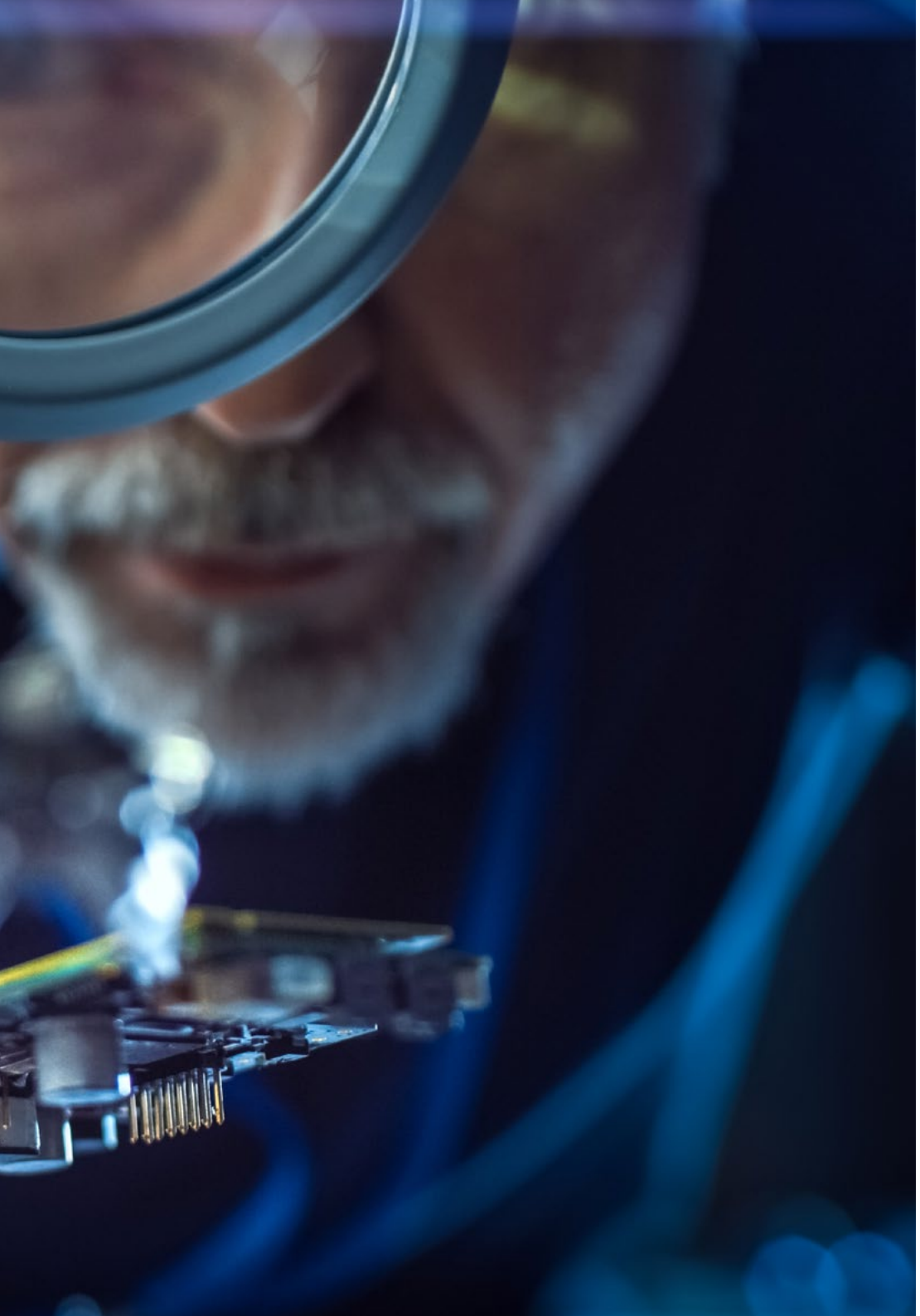
- Introduce the concept of bio-inspired computing, as well as to understand the functioning of the different types of social adaptation algorithms and genetic algorithms
- Study of the different models of evolutionary computation, knowing their strategies, programming, algorithms and models based on estimation of distributions
- Understand the main space exploration-exploitation strategies for genetic algorithms
- Understand the operation of evolutionary programming applied to learning problems and multi-objective problems
- Learn the essential concepts related to neural networks and understand the operation of real use cases applied to fields as diverse as medical research, economics and artificial vision

Module 11. Security in System Design and Development

- Assess the security of an information system in all its components and layers
- Identify current security threat types and trends
- Establish security guidelines by defining security and contingency policies and plans
- Analyze strategies and tools to ensure the integrity and security of information systems
- Apply specific techniques and tools for each type of attack or security vulnerability
- Protect sensitive information stored in the information system
- Have the legal framework and typification of the crime, completing the vision with the typification of the offender and his victim

Module 12. Information Security Architectures and Models

- Align the Safety Master Plan with the organization's strategic objectives
- Establish a continuous risk management framework as an integral part of the Master Security Plan
- Determine appropriate indicators for monitoring ISMS implementation
- Establish a policy-based security strategy
- Analyze the objectives and procedures associated with the employee, supplier and partner awareness plan
- Identify, within the regulatory framework, the regulations, certifications and laws applicable to each organization
- Develop the fundamental elements required by the ISO 27001:2013 standard
- Implement a privacy management model in line with the European GDPR/RGPD regulation



Module 13. IT Security Management

- Identify the different structures that an information security area can have
- Develop a security model based on three lines of defense
- Present the different periodic and extraordinary committees in which the Cybersecurity area intervenes
- Specify the technological tools that support the main functions of the security operations team (SOC)
- Evaluate vulnerability control measures appropriate to each scenario
- Develop the security operations framework based on the NIST CSF
- Specify the scope of the different types of audits (RedTeam, Pentesting, Bug Bounty, etc.)
- Propose the activities to be carried out after a security incident
- Set up an information security command center encompassing all relevant actors (authorities, customers, suppliers, etc.)

Module 14. Risk Analysis and IT Security Environment

- Examine, with a holistic view, the environment in which we operate
- Identify the main risks and opportunities that may affect the achievement of our objectives
- Analyze the risks based on the best practices at our disposal
- Evaluate the potential impact of these risks and opportunities
- Develop techniques that will enable us to address risks and opportunities in a way that maximizes our value contribution
- Examine in depth the different techniques for transferring risk and value
- Generate value from the design of proprietary models for agile risk management
- Examine the results to propose continuous improvements in project and process management based on Risk-Driven management models
- Innovate and transform general data into relevant information for risk-based decision making

Module 15. Cryptography in IT

- Compile the fundamental operations (XOR, large numbers, substitution and transposition) and the various components (One-Way functions, Hash, random number generators)
- Analyze cryptographic techniques
- Develop the different cryptographic algorithms
- Demonstrate the use of digital signatures and their application in digital certificates
- Evaluate key management systems and the importance of cryptographic key lengths
- Examine key derivation algorithms
- Analyze key life cycle
- Evaluate block cipher and stream cipher modes
- Determine pseudorandom number generators
- Develop real-world cryptography application cases, such as Kerberos, PGP or smart cards
- Examine related associations and organizations, such as ISO, NIST or NCSC
- Determine the challenges in quantum computing cryptography

Module 16. Identity and Access Management in IT security

- Develop the concept of digital identity
- Evaluating physical access control to information
- Fundamentals of biometric authentication and MFA authentication
- Evaluate attacks related to information confidentiality
- Analyze identity federation
- Establish network access control

Module 17. Security in Communications and Software Operation

- Develop expertise in physical and logical security
- Demonstrate knowledge of communications and networks
- Identify major malicious attacks
- Establish a secure development framework
- Demonstrate knowledge of key information security management system regulations
- Demonstrate the operation of a cybersecurity operations center
- Demonstrate the importance of having cybersecurity practices for organizational disasters

Module 18. Security in *Cloud* Environments

- Identify risks of a public cloud infrastructure deployment
- Define security requirements
- Developing a security plan for a cloud deployment
- Identify the cloud services to be deployed for the execution of a security plan
- Determine the operations necessary for the prevention mechanisms
- Establish guidelines for a Logging and monitoring system
- Propose incident response actions

Module 19. Security in IoT Device Communications

- Introduce the simplified IoT architecture
- Explain the differences between generalist connectivity technologies and connectivity technologies for the IoT
- Establish the concept of the iron triangle of IoT connectivity
- Analyze the security specifications of LoRaWAN technology, NB-IoT technology and WiSUN technology
- Justify the choice of the appropriate IoT technology for each project

Module 20. Business Continuity Plan Associated with Security

- Present the key elements of each phase and analyze the characteristics of the business continuity plan (BCP)
- Justify the need for a Business Continuity Plan
- Determine the success and risk maps for each phase of the business continuity plan
- Specify how to establish an action plan for implementation
- Evaluating the completeness of a Business Continuity Plan (BCP)
- Develop the plan for the successful implementation of a business continuity plan for our business

Module 21. Data Analysis in a Business Organization

- Develop analytical skills in order to make quality decisions
- Examine effective marketing and communication campaigns
- Determine the creation of scorecards and kpi's according to the department
- Generate specialized knowledge to develop predictive analytics
- Propose business and loyalty plans based on market research
- Develop the ability to listen to the customer
- Apply statistical, quantitative and technical knowledge in real situations

Module 22. Data and Information Management and Manipulation for Data Science

- Perform Data Analysis
- Unify diverse data: Achieving consistency of information
- Producing relevant, effective information for decision making
- Determine the best practices for data management according to its typology and uses
- Establish data access and reuse policies
- Ensure security and availability: information availability, integrity and confidentiality
- Examine data management tools using programming languages

Module 23. Devices and IoT platforms as a Foundation for Data Science

- Define what is meant by IoT (Internet of Things) and IIoT (Industrial Internet of Things)
- Examining the Industrial Internet Consortium
- Analyze what is the IoT reference architecture
- Address IoT sensors and devices and their classification
- Identify communications protocols and technologies used in IoT
- Examine the different Cloud platforms in IoT: general purpose, industrial, open source
- Develop data exchange mechanisms
- Establish security requirements and strategies
- Present the different IoT and IIoT application fields

Module 24. Graphical Representation of Data Analysis

- Generate specialized knowledge in data analysis and representation
- Examine the different types of grouped data
- Establish the most-used graphic representations in different fields
- Determine the design principles in data visualization
- Introduce graphic narrative as a tool
- Analyze the different software tools for graphing and exploratory data analysis

Module 25. Data Science Tools

- Develop the skills to convert data into information from which knowledge can be extracted
- Determine the main features of a dataset, its structure, components and the implications of its distribution in the modeling
- Supporting decision making by performing comprehensive data analysis in advance
- Develop skills to solve practical cases using data science techniques
- Establish the most appropriate general tools and methods for modeling each Dataset based on the preprocessing performed
- Evaluate the results in an analytical way, understanding the impact of the chosen strategy on the various metrics
- Demonstrate critical analysis of the results obtained after applying preprocessing or modeling methods

Module 26. Data Mining: Selection, Pre-Processing and Transformation

- Generate specialized knowledge about the statistical prerequisites for any data analysis and evaluation
- Develop the necessary skills for data identification, preparation and transformation
- Evaluate the various methodologies presented and identify advantages and drawbacks
- Examine the problems in high dimensional data environments
- Implement algorithms used for data preprocessing
- Demonstrate the ability to interpret data visualization for descriptive analysis
- Develop advanced knowledge of the different existing data preparation techniques for data cleaning, normalization and transformation

Module 27. Predictability and Analysis of Stochastic Phenomena

- Analyze time series
- Develop the formulation and basic properties of univariate time series models
- Examine the methodology of modeling and prediction of real time series
- Assess univariate models including outliers
- Apply dynamic regression models and apply the methodology for the construction of such models from observed series
- Address the spectral analysis of univariate time series, as well as the fundamentals related to periodogram-based inference and interpretation
- Estimate the probability and trend in time series for a given time horizon

Module 28. Design and Development of Intelligent Systems

- Analyze the step from information to knowledge
- Develop the different types of machine learning
- Examine metrics and scores to quantify model quality
- Implement the different machine learning algorithms
- Identify probabilistic reasoning models
- Lay the foundations for deep learning
- Demonstrate the skills acquired to understand the various machine learning algorithms

Module 29. Architecture and Systems for Intensive Use of Data

- Determine the requirements for mass data usage systems
- Examine different data models and analyze databases
- Analyze the key functionalities for distributed systems and their importance in different types of systems
- Evaluate which widely used applications use the fundamentals of distributed systems to design their systems
- Analyze the way in which databases store and retrieve information
- Understand the different replication models and associated issues
- Develop partitioning and distributed transactions
- Assess batch systems and (near) real time systems

Module 30. Practical Application of Data Science in Business Sectors

- Analyze the state of the art of Artificial Intelligence (AI) and data analysis
- Develop specialized knowledge of the most widely used technologies
- Generate a better understanding of the technology through use cases
- Analyze the chosen strategies to select the best technologies to implement
- Determine the fields of application
- Examine the actual and potential risks of the technology used
- Propose benefits derived from the use
- Identify future trends in specific fields

Achieve excellence by completing a program that will enable you to generate specialized knowledge in Computer Science, Cybersecurity and Data Analysis"

03

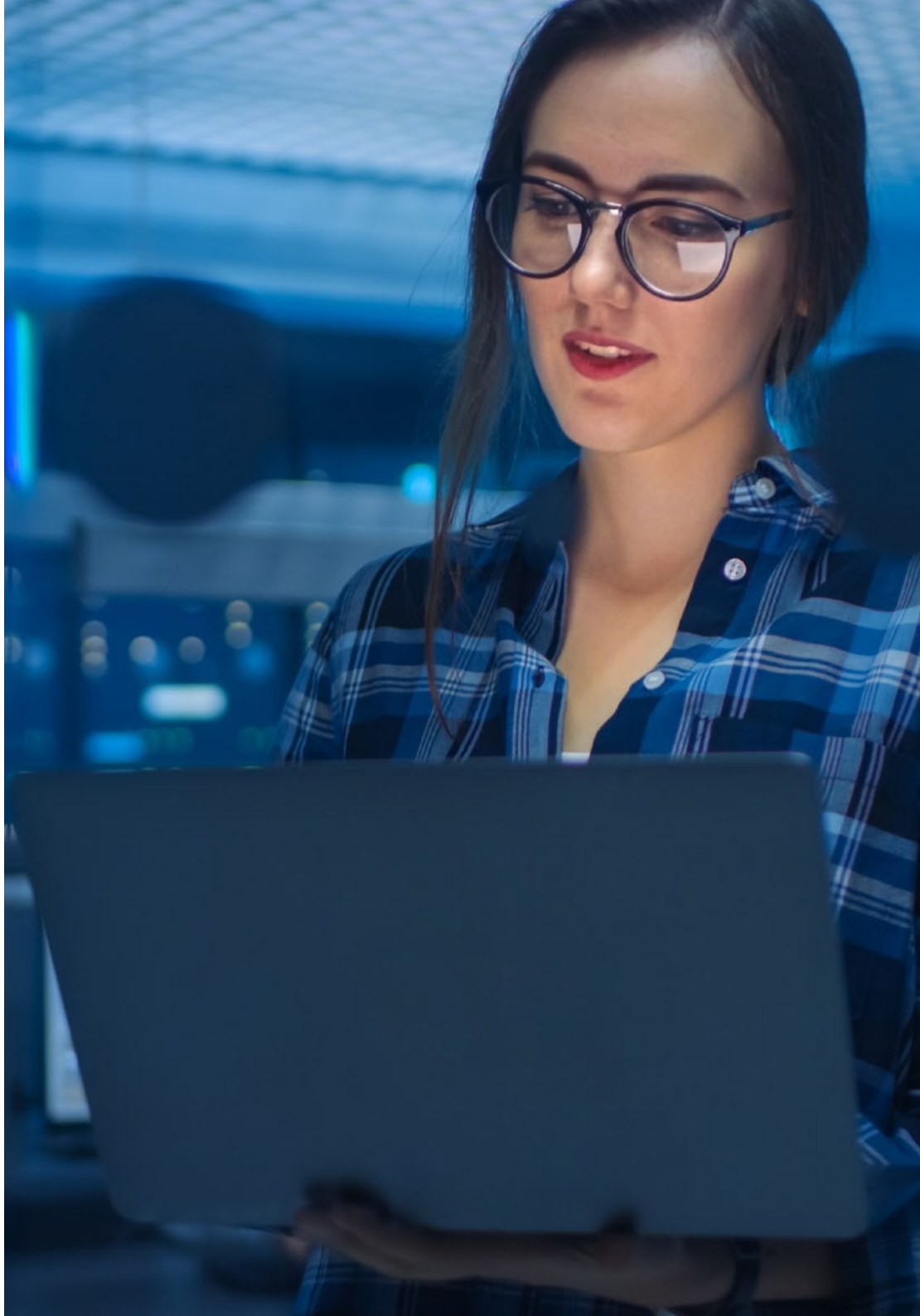
Skills

After passing the assessments of this program, the computer scientist will have acquired the skills required to know the fundamental principles of computing with the ability to work with programming languages and data. This will allow you to be able to aspire to an improvement in your daily work in this field of specialization, which becomes an opportunity to offer valuable knowledge when making decisions that affect the operation of the departments of a company.

Acquire the skills required to take your profession to the highest level, thanks to this Advanced Master's Degree that will allow you to update and adapt to the new IT environment"

General Skills

- Correctly perform tasks related to computing and computer language
- Apply the most appropriate security measures depending on the threats
- Determine a company's information system security policy and plan, completing the design and implementation of the contingency plan
- Establish an audit program that meets the organization's self-assessment needs in terms of cybersecurity
- Develop a vulnerability scanning and monitoring program and a cybersecurity incident response plan
- Maximize the opportunities presented and eliminate exposure to all potential risks from the design stage itself
- Compile key management systems
- Evaluate a company's information security
- Analyze information access systems
- Develop best practices in secure development
- Present the risks involved for companies in not having a secure IT environment
- Develop a technical and business perspective of data analysis
- Understand the most current algorithms, platforms and tools for data exploration, visualization, manipulation, processing, and analysis
- Implementing a business vision necessary for valorization as a key element for decision-making
- Be able to address problems specific to data analysis



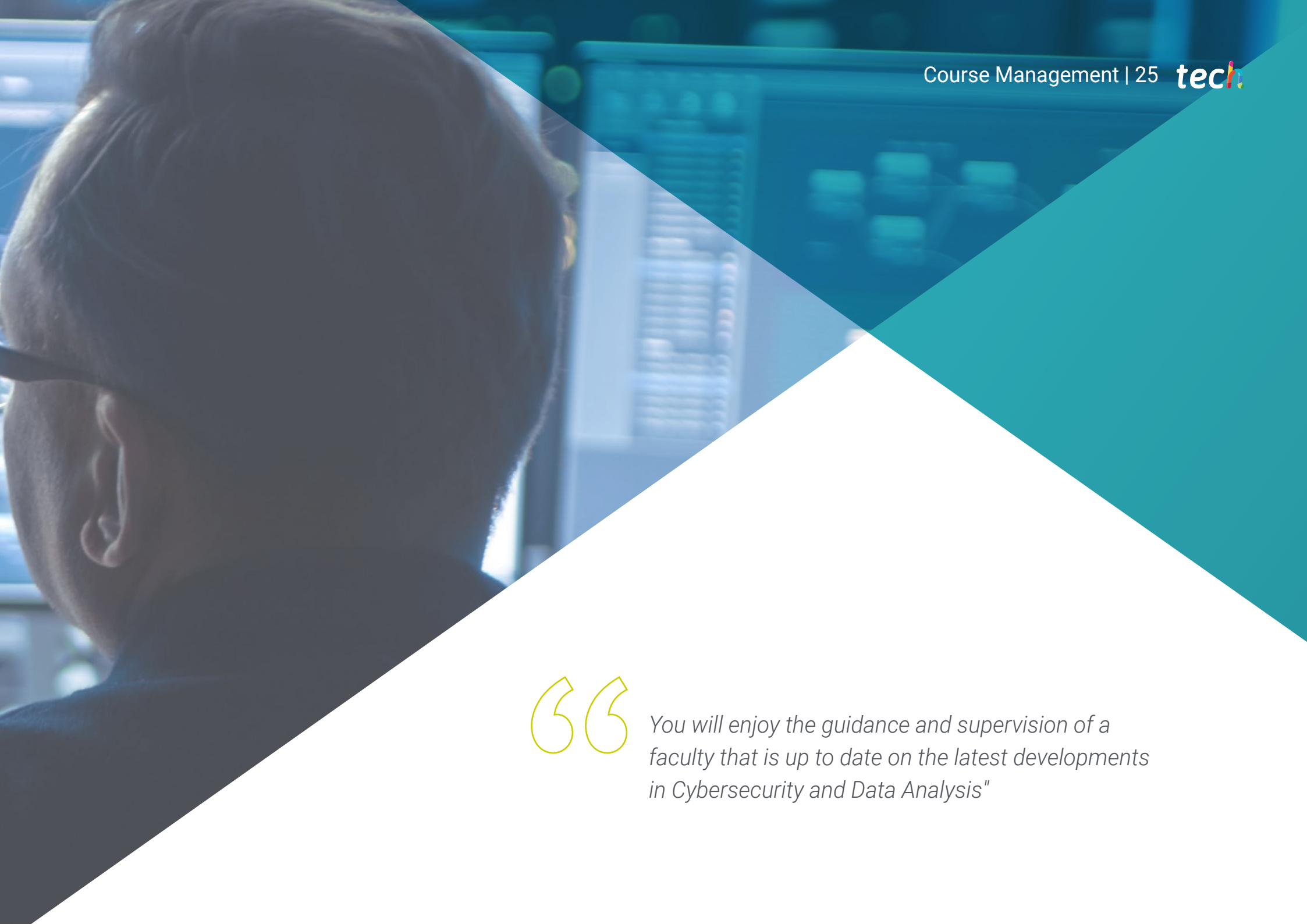
Specific Skills

- Design algorithms to develop computer programs and apply programming language
- Understand and use computer data structure
- Use the algorithms needed to solve computer problems
- Have an in-depth understanding of advanced algorithm design and search methods
- Carry out computer programming tasks
- Understand and apply the theory behind computer science, such as mathematics
- Know the theory of automata and apply the computer language
- Know the theoretical foundations of programming languages and the associated lexical, syntactic and semantic processing techniques
- Understand the basic concepts of mathematics and computational complexity in order to apply them to solve computing problems
- Know and apply the fundamental principles of computing to carry out new computer developments
- Develop an Information Security Management System (ISMS)
- Identify the key elements that make up an ISMS
- Apply the MAGERIT methodology to evolve the model and take it a step further
- Design new risk management methodologies based on the Agile Risk Management concept
- Identify, analyze, evaluate and treat the risks faced by the professional from a new business perspective based on a Risk-Driven model that allows not only to survive in its own environment, but also to boost the contribution of its own value
- Examine the process of designing a security strategy when deploying corporate Cloud services
- Evaluate the differences in the specific implementations of different public Cloud vendors
- Evaluate IoT connectivity options to address a project, with special emphasis on LPWAN technologies
- Present the basic specifications of the main LPWAN technologies for the IoT
- Specialize in Data Science from a technical and business perspective
- Visualize data in the most appropriate way to favor data sharing and understanding for different profiles
- Address the key functional areas of the organization where data science can deliver the most value
- Develop knowledge of the data life cycle, its typology and the technologies and phases necessary for its management
- Process and manipulate data using specific languages and libraries
- Develop advanced knowledge in fundamental data mining techniques for data selection, pre-processing and transformation
- Specializing in the main Machine Learning algorithms for the extraction of hidden knowledge in data
- Generate specialized knowledge in the software architectures and systems required for intensive data use
- Determine how the IoT can be a source of data generation and key information on which to apply data science for knowledge extraction
- Analyze the different ways of applying data science in different sectors or verticals by learning from real examples

04

Course Management

Successfully tackling the field of Computer Science, Cybersecurity and Data Analysis requires a complete and detailed study. For this reason, TECH has assembled the best faculty specialized in each field. Therefore, the IT specialist can count on the support of renowned professionals who make available their many years of experience and knowledge. This way, computer scientists can be sure of receiving up-to-date and specific knowledge of a sector that is booming at international level.



You will enjoy the guidance and supervision of a faculty that is up to date on the latest developments in Cybersecurity and Data Analysis"

Management

Mr. Olalla Bonal, Martín

- Blockchain Technical Specialist at IBM SPGI
- Blockchain technical sales specialist. IBM
- Director of Architecture. Blocknitive
- Digital Electronics Technician
- Blockchain Architect - IT Infrastructure Architect - IT Project Manager. Business areas: Software, Infrastructure, Telecommunications

Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometeus Global Solutions
- CTO at Korporate Technologies
- CTO in AI Shephers GmbH
- Doctorate in Psychology from the University of Castilla-La Mancha
- PhD in Economics, Business and Finance from the Camilo José Cela University. Outstanding Award in her PhD
- PhD in Psychology, University of CastillaLa Mancha
- Master's Degree in Advanced Information Technologies from the University of Castilla la Mancha
- Master MBA+E (Master's Degree in Business Administration and Organisational Engineering) from the University of Castilla la Mancha
- Associate lecturer, teaching undergraduate and master's degrees in Computer Engineering at the University of Castilla la Mancha
- Professor of the Master in Big Data and Data Science at the International University of Valencia
- Lecturer of the Master's Degree in Industry 4.0 and the Master's Degree in Industrial Design and Product Development
- Member of the SMILe Research Group of the University of Castilla la Mancha

Professors

Mr. Tobal Redondo, Javier

- HUAWEI Application Innovation Program Manager
- Head of Information Security of the Payment Systems Division. Amadeus IT Group
- Chief Information Security Officer FINTONIC, Financial Services
- Service engineer and architect in the field of Planning and architecture of services and security at Amena / Orange Spain
- security at Amena / Orange Spain
- Degree in Computer Science from the University of Deusto (Bilbao, Spain)
- Postgraduate degree in Industrial Computing. School of Industrial Engineering. Bilbao

Mr. Gonzalo Alonso, Félix

- CEO and founder. Smart REM Solutions
- Founding partner and head of risk engineering and innovation. Dynargy
- Manager and founding partner. Risknova (Expert's office specialized in technology)
- Degree in Industrial Organization Engineering from Pontificia de Comillas ICAI University
- Graduate in Industrial Technical Engineering, specializing in Industrial Electronics, Pontificia de Comillas University ICAI
- Master's Degree in Insurance Management from ICEA (Institute for Collaboration between Insurance Companies)

Mr. Sevillano Izquierdo, Javier

- Global Cyber Security Architect at Vodafone Spain
- Chief Technology Security Office (CTSO) at Vodafone Spain
- Technological Security Manager at Bankia
- Technological Security Manager at Caja Madrid
- Security Manager at Sistema 4B
- SEINCA - Senior Analyst
- Senior Technician in Business Computing at Instituto Cibernos

Mr. Entrenas, Alejandro

- Entelgy Innotec
- Degree in Technical Engineering in Computer Systems from the University of Cordoba
- Master's Degree in Information Security Management from the Polytechnic University of Madrid

Mr. Nogales Ávila, Javier

- Enterprise Cloud and sourcing senior consultant. Quint
- Cloud and Technology Consultant. Indra
- Associate Technology Consultant. Accenture
- Graduate by Jaen University y University of Technology and Economics of Budapest (BME)
- Degree in Industrial Organization Engineering

Mr. Gómez Rodríguez, Antonio

- Cloud Solutions Engineer at Oracle
- Project Manager at Sopra Group
- Project Manager at Everis
- Project Manager in a public Company of Cultural Programs Management in the Andalusian Ministry of Culture
- Information Systems Analyst at Sopra Group
- Degree in Telecommunications Engineering from the Polytechnic University of Catalonia
- Postgraduate degree in Information Technologies and Systems from the Catalan Institute of Technology
- E-Business Master by La Salle School of Business

Mr. del Valle Arias, Jorge

- IoT Division Manager at Diode Spain
- Smart Cities Business Growth Manager Spain at Itron Inc
- IoT Consultant
- Sales Manager IoT & Cellular at Aicox Soluciones
- Founder and CEO of Sensor Intelligence
- Operations Director at Codium Networks
- Head of the Electronics Area at Aitemin
- Telecommunications Engineer from Universidad Politécnica de Madrid
- Executive MBA from the International Graduate School of La Salle of Madrid

Mr. Gozalo Fernández, Juan Luis

- Computer Engineer
- Associate Professor in DevOps and Blockchain at UNIR
- Former Blockchain DevOps Director at Alastria
- Tinkerlink Mobile Application Development Manager at Cronos Telecom
- IT Director at Banco Santander
- IT Service Management Technology Director at Barclays Bank Spain
- Degree in Computer Engineering from Universidad Nacional Educación a Distancia (UNED)

Ms. Jurado Jabonero, Lorena

- Head of Information Security (CISO) at Grupo Pascual
- Graduate in Computer Engineering from the Alfonso X El Sabio University
- Technical Engineer in Computer Management from the Polytechnic University of Madrid
- Knowledge: ISO 27001, ISO 27701, ISO 22301, ISO 20000, RGPD/LOPDGDD, NIST CSF, CSA, ITIL, PCI, etc

Mr. Armero Fernández, Rafael

- Business Intelligence Consultant en SDG Group
- Digital Engineer en Mi-GSO
- Logistic Engineer in Torrecid S.A
- Quality Intern at INDRA
- Degree in Aerospace Engineering from the Polytechnic University of Valencia
- Master's Degree in Professional Development 4.0 from the University of Alcalá de Henares

Mr. Peris Morillo, Luis Javier

- Technical Lead in Capitole Consulting. He leads a team at Inditex in the logistics unit of its open platform
- Senior Technical Lead y Delivery Lead Support en HCL
- Agile Coach and Director of Operations at Mirai Advisory
- Member of the Steering Committee as Chief Operating Officer
- Developer, Team Lead, Scrum Master, Agile Coach, Product Manager in DocPath
- Higher Engineering in Computer Science by the ESI of Ciudad Real (UCLM)
- Postgraduate in Project Management by CEOE - Confederación Española de Organizaciones Empresariales (Spanish Confederation of Business Organisations)
- +50 MOOCs taken, taught by renowned universities such as Stanford University, Michigan University, Yonsei University, Universidad Politécnica de Madrid, etc
- Several certifications, some of the most notable or recent ones are Azure Fundamentals

Ms. Pedrajas Parabá, Elena

- Business Analyst in Management Solutions in Madrid
- Researcher in the Department of Computer Science and Numerical Analysis at the University of Cordoba
- Researcher at the Singular Center for Research in Intelligent Technologies in Santiago de Compostela
- Degree in Computer Engineering Master's Degree in Data Science and Computer Engineering

Mr. Montoro Montarroso, Andrés

- Researcher in the SMILe Group at the University of Castilla-La Mancha
- Data Scientist at Prometeus Global Solutions
- Graduate in Computer Engineering from the University of Castilla-La Mancha
- Master's Degree in Data Science and Computer Engineering from the University of Granada
- Guest lecturer in the subject of Knowledge-Based Systems at the Escuela Superior de Informática de Ciudad Real, Giving the Lecture "Advanced Artificial Intelligence Techniques: Search and Analysis of Potential Social Media Radicals"
- Guest lecturer in the subject of Data Mining at the Escuela Superior de Informática de Ciudad Real giving the lecture: "Applications of Natural Language Processing: Fuzzy Logic to the analysis of messages in social networks"
- Speaker at the Seminar on Corruption Prevention in Public Administrations and Artificial Intelligence. Faculty of Law and Social Sciences of Toledo. Conference entitled "Artificial Intelligence Techniques". Speaker at the first International Seminar on Administrative Law and Artificial Intelligence (DAIA). Organised by Centro de Estudios Europeos Luis Ortega Álvarez and Institut de Recerca TransJus. Conference entitled "Sentiment Analysis for the prevention of hate speech on social media"

Mr. Fondón Alcalde, Rubén

- Business Analyst for SME segment at Vodafone Spain
- Business Analyst for Southern Europe at Vodafone Global Enterprise
- Senior Process Consultant at Unisys for Telefónica Global Solutions
- Service Integration Leader at Entelgy for Telefónica Global Solutions
- Degree in Telecommunications Engineering from the European University of Madrid
- Master's Degree in Big Data and Analytics from the International University of Valencia

Ms. Fernández Meléndez, Galina

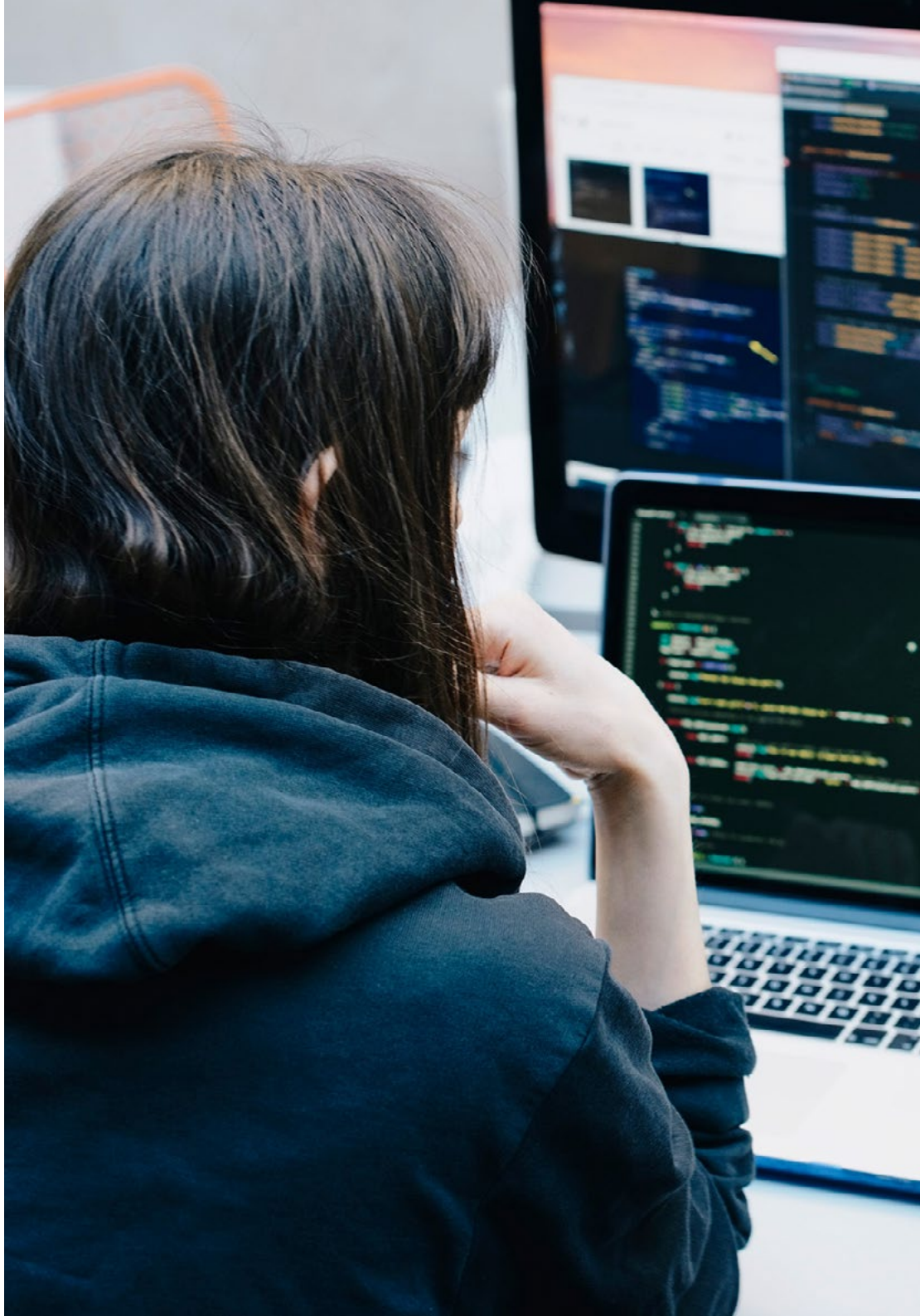
- Data Analyst in ADN Mobile Solution
- ETL processes, data mining, data analysis and visualisation, establishment of KPI's, Dashboard design and implementation, management control ADN Mobile Solution-Gijón-Spain R development, SQL management, among others
- Pattern determination, predictive modelling, machine learning
- Bachelor's degree in Business Administration. Bicentenaria de Aragua-Caracas University
- Diploma in Planning and Public Finance Venezuelan School of Planning, School of Finance
- Professional Master's Degree in Data Analysis and Business Intelligence. University of Oviedo
- MBA in Business Administration and Management (Escuela De Negocios Europea De Barcelona)
- Master in Big Data and Business Intelligence (Escuela de Negocios Europea de Barcelona)

Mr. Díaz Díaz-Chirón, Tobías

- Researcher at the ArCO laboratory of the University of Castilla-La Mancha, a group dedicated to projects related to computer architectures and networks
- Consultant at Blue Telecom, a company dedicated to the telecommunications sector
- Degree in Computer Engineering from the University of Castilla-La Mancha

Ms. Martínez Cerrato, Yésica

- Electronic Security Product Technician at Securitas Security Spain
- Business Intelligence Analyst at Ricopia Technologies
- Responsible for training new recruits on commercial management software (CRM, ERP, INTRANET.), product and procedures in Ricopia Technologies (Alcalá de Henares)
- Responsible for training new interns incorporated to the IT Classrooms at the University of Alcalá
- Project Manager in the area of Key Accounts Integration at Correos y Telégrafos (Madrid)



- Computer classes teacher in ASALUMA Association
- Computer Technician-Responsible for OTEC Computer Classrooms by the University of Alcalá
- Degree in Electronic Communications Engineering from the Polytechnic School of the University of Alcalá
- Scholarship of specialization as IT Technician in OTEC by the University of Alcalá

Mr. Tato Sánchez, Rafael

- Project Management INDRA SISTEMAS S.A
- Technical Director INDRA SISTEMAS S.A
- Systems Engineer ENA TRÁFICO S.A.U
- IFCD048PO. Software Project Management and Development Methodology with SCRUM
- Coursera: Machine Learning
- Udemy: Deep Learning A-Z. Hands-on Artificial Neural Networks
- Coursera: IBM: Fundamentals of Scalable Data Science
- Coursera: IBM: Applied AI with Deep Learning
- Coursera: IBM: Advance Machine Learning and Signal Processing
- Degree in Industrial Electronics and Automation Engineering from the European University of Madrid
- Master's Degree in Industrial Engineering from the European University of Madrid
- Master's Degree in Industry 4.0 by the International University of La Rioja (UNIR)
- Professional certification. SSCE0110. Teaching for vocational training for employment

05

Structure and Content

This Advanced Master's Degree contains a series of specialized modules that will allow the computer scientist to delve into aspects such as digital identification, access control systems, information security architecture, the structure of the security area, information security management systems in communications and software operation or the development of the business continuity plan associated with security. At the same time, the most complete and current techniques for data processing and knowledge extraction are addressed, from both a theoretical and practical perspective.

All the fields of interest you need to master to work successfully in computer science, compiled in a top-quality syllabus"

Module 1. Programming Fundamentals

1.1. Introduction to Programming
- 1.1.1. Basic Structure of a Computer
- 1.1.2. Software
- 1.1.3. Programming Languages
- 1.1.4. Life Cycle of a Software Application

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

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

1.6. Static 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. Structure Pointers
- 1.7.7. Multiple Indirection
- 1.7.8. Function Pointers
- 1.7.9. Function, Structure and Array Passing 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. The 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 ADTs
- 2.2.3. Vectors and Arrays

2.3. Linear Data Structures
- 2.3.1. ADT List. Definition
- 2.3.2. Linked and Doubly Linked Lists
- 2.3.3. Sorted Lists
- 2.3.4. Lists in C++
- 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. Paths
- 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 or Minimum Height Trees
- 2.5.2. Multipath Trees
- 2.5.3. Bibliographical References

2.6. Mounds and Priority Queue
- 2.6.1. ADT Mounds
- 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 Graph Types
- 2.8.3 Graphical Representation and Basic Operations
- 2.8.4 Graph Design

2.9. Advanced Graph Algorithms and Concepts
- 2.9.1. Graph Problems
- 2.9.2. Path Algorithms
- 2.9.3. Search or Path Algorithms
- 2.9.4. Other Algorithms

2.10. Other Data Structures
- 2.10.1. Sets
- 2.10.2. Parallel Arrays
- 2.10.3. Symbol Tables
- 2.10.4. Tries

Module 3. Algorithm 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. Efficiency and Analysis of Algorithms
- 3.2.1. Efficiency Measures
- 3.2.2. Measuring the Size of the Input
- 3.2.3. Measuring Execution Time
- 3.2.4. Worst, Best and Average Case
- 3.2.5. Asymptotic Notation
- 3.2.6. Criteria for Mathematical Analysis of Non-Recursive Algorithms
- 3.2.7. Mathematical Analysis of Recursive Algorithms
- 3.2.8. Empirical Analysis of Algorithms

3.3. Sorting Algorithms
- 3.3.1. Concept of Sorting
- 3.3.2. Bubble Sorting
- 3.3.3. Sorting by Selection
- 3.3.4. Sorting by Insertion
- 3.3.5. Merge Sort
- 3.3.6. Quicksort

3.4. Algorithms with Trees
- 3.4.1. Tree Concept
- 3.4.2. Binary Trees
- 3.4.3. Tree Paths
- 3.4.4. Representing Expressions
- 3.4.5. Ordered 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. Traversal in Width
- 3.6.3. Depth Travel
- 3.6.4. Topological Sorting

3.7. Greedy Algorithms
- 3.7.1. Greedy Strategy
- 3.7.2. Elements of the Greedy Strategy
- 3.7.3. Currency Exchange
- 3.7.4. Traveler's Problem
- 3.7.5. Backpack Problem

3.8. Minimal Path Finding
- 3.8.1. The Minimum Path Problem
- 3.8.2. Negative Arcs and Cycles
- 3.8.3. Dijkstra's Algorithm

3.9. Greedy Algorithms on Graphs
- 3.9.1. The Minimum Covering 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 Algorithms 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. General Description of the Divide and Conquer Strategy

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. Characteristics of Dynamic Programming
- 4.3.2. Backtracking
- 4.3.3. Branching and Pruning

4.4. Combinatorial Optimization
- 4.4.1. Representation
- 4.4.2. 1D Optimization

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

4.7. Formal Verification of Programs
- 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. Verification of Iterative Programs
- 4.8.1. Rules of Hoare's Formal System
- 4.8.2. Concept of Invariant Iterations

4.9. Numeric Methods
- 4.9.1. The Bisection Method
- 4.9.2. 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. Advanced Programming

5.1. Introduction to Object-Oriented Programming
- 5.1.1. Introduction to Object-Oriented Programming
- 5.1.2. Class Design
- 5.1.3. Introduction to UML for Problem Modeling

5.2. Relationships Between Classes
- 5.2.1. Abstraction and Inheritance
- 5.2.2. Advanced Inheritance Concepts
- 5.2.3. Polymorphism
- 5.2.4. Composition and Aggregation

5.3. Introduction to Design Patterns for Object-Oriented Problems
- 5.3.1. What Are Design Patterns?
- 5.3.2. Factory Pattern
- 5.3.4. Singleton Pattern
- 5.3.5. Observer Pattern
- 5.3.6. Composite Pattern

5.4. Exceptions
- 5.4.1. What Are Exceptions?
- 5.4.2. Exception Catching and Handling
- 5.4.3. Throwing Exceptions
- 5.4.4. Exception Creation

5.5. User Interfaces
- 5.5.1. Introduction to Qt
- 5.5.2. Positioning
- 5.5.3. What Are Events?
- 5.5.4. Events: Definition and Catching
- 5.5.5. User Interface Development

5.6. Introduction to Concurrent Programming
- 5.6.1. Introduction to Concurrent Programming
- 5.6.2. The Concept of Process and Thread
- 5.6.3. Interaction Between Processes or Threads
- 5.6.4. Threads in C++
- 5.6.5. Advantages and Disadvantages of Concurrent Programming

5.7. Thread Management and Synchronization
- 5.7.1. Life Cycle of a Thread
- 5.7.2. Thread Class
- 5.7.3. Thread Planning
- 5.7.4. Thread Groups
- 5.7.5. Daemon Threads
- 5.7.6. Synchronization
- 5.7.7. Locking Mechanisms
- 5.7.8. Communication Mechanisms
- 5.7.9. Monitors

5.8. Common Problems in Concurrent Programming
- 5.8.1. The Problem of Consuming Producers
- 5.8.2. The Problem of Readers and Writers
- 5.8.3. The Problem of the Philosophers' Dinner Party

5.9. Software Documentation and Testing
- 5.9.1. Why Is it Important to Document Software?
- 5.9.2. Design Documentation
- 5.9.3. Documentation Tool Use

5.10. Software Testing
- 5.10.1. Introduction to Software Testing
- 5.10.2. Types of Tests
- 5.10.3. Unit Test
- 5.10.4. Integration Test
- 5.10.5. Validation Test
- 5.10.6. System Test

Module 6. Theoretical Computer Science

6.1. Mathematical Concepts Used
- 6.1.1. Introduction to Propositional Logic
- 6.1.2. Theory of Relations
- 6.1.3. Numerable and Non-Numerable Sets

6.2. Formal Languages and Grammars and Introduction to Turing Machines
- 6.2.1. Formal Languages and Grammars
- 6.2.2. Decision Problem
- 6.2.3. The Turing Machine

6.3. Extensions to Turing Machines, Constrained Turing Machines and Computers
- 6.3.1. Programming Techniques for Turing Machines
- 6.3.2. Extensions for Turing Machines
- 6.3.3. Restricted Turing Machines
- 6.3.4. Turing Machines and Computers

6.4. Undecidability
- 6.4.1. Non-Recursively Enumerable Language
- 6.4.2. A Recursively Enumerable Undecidable Problem

6.5. Other Undecidable Problems
- 6.5.1. Undecidable Problems for Turing Machines
- 6.5.2. Post Correspondence Problem (PCP)

6.6. Intractable Problems
- 6.6.1. P and NP Class
- 6.6.2. A NP-Complete Problem
- 6.6.3. Restricted Satisfiability Problem
- 6.6.4. Other NP-Complete Problems

6.7. Co-NP and PS Problems
- 6.7.1. Complementary to NP Languages
- 6.7.2. Problems Solvable in Polynomial Space
- 6.7.3. Complete PS Problems

6.8. Classes of Randomization-Based Languages
- 6.8.1. MT Model with Randomization
- 6.8.2. RP and ZPP Classes
- 6.8.3. Primality Test
- 6.8.4. Complexity of The Primality Test

6.9. Other Classes and Grammars
- 6.9.1. Probabilistic Finite Automata
- 6.9.2. Cellular Automata
- 6.9.3. *McCulloch* and Pitts Cells
- 6.9.4. Lindenmayer Grammars

6.10. Advanced Computing Systems
- 6.10.1. Membrane Computing: P-Systems
- 6.10.2. DNA Computing
- 6.10.3. Quantum Computing

Module 7: Automata Theory and Formal Languages

7.1. Introduction to Automata Theory
- 7.1.1. Why Study Automata Theory?
- 7.1.2. Introduction to Formal Demonstrations
- 7.1.3. Other Forms of Demonstration
- 7.1.4. Mathematical Induction
- 7.1.5. Alphabets, Strings and Languages

7.2. Deterministic Finite Automata
- 7.2.1. Introduction to Finite Automata
- 7.2.2. Deterministic Finite Automata

7.3. Non-Deterministic Finite Automata
- 7.3.1. Non-Deterministic Finite Automata
- 7.3.2. Equivalence Between AFD and AFND
- 7.3.3. Finite Automata with Transitions €

7.4. Languages and Regular Expressions (I)
- 7.4.1. Languages and Regular Expressions
- 7.4.2. Finite Automata and Regular Expressions

7.5. Languages and Regular Expressions (II)
- 7.5.1. Conversion of Regular Expressions into Automata
- 7.5.2. Applications of Regular Expressions
- 7.5.3. Algebra of Regular Expressions

7.6. Pumping and Closure Lemma of Regular Languages
- 7.6.1. Pumping Lemma
- 7.6.2. Closure Properties of Regular Languages

7.7. Equivalence and Minimization of Automata
- 7.7.1. FA Equivalence
- 7.7.2. AF Minimization

7.8. Context-Independent Grammars (CIGs)
- 7.8.1. Context-Independent Grammars
- 7.8.2. Derivation Trees
- 7.8.3. Applications of ICGs
- 7.8.4. Ambiguity in Grammars and Languages

7.9. Stack Automata and GICs
- 7.9.1. Definition of Stack Automata
- 7.9.2. Languages Accepted by a Stacked Automata
- 7.9.3. Equivalence Between Stacked Automata and GICs
- 7.9.4. Deterministic Stacked Automata

7.10. Normal Forms, Pumping Lemma of GICs and Properties of LICs
- 7.10.1. Normal Forms of GICs
- 7.10.2. Pumping Lemma
- 7.10.3. Closure Properties of Languages
- 7.10.4. Decision Properties of LICs

Module 8. Language Processors

8.1. Introduction to the Compilation Process
- 8.1.1. Compilation and Interpretation
- 8.1.2. Compiler Execution Environment
- 8.1.3. Analysis Process
- 8.1.4. Synthesis Process

8.2. Lexical Analyzer
- 8.2.1. What Is a Lexical Analyzer?
- 8.2.2. Implementation of the Lexical Analyzer
- 8.2.3. Semantic Actions
- 8.2.4. Error Recovery
- 8.2.5. Implementation Issues

8.3. Parsing
- 8.3.1. What Is a Parser?
- 8.3.2. Previous Concepts
- 8.3.3. Top-Down Analyzers
- 8.3.4. Bottom-Up Analyzers

8.4. Top-Down Parsing and Bottom-Up Parsing
- 8.4.1. LL Parser (1)
- 8.4.2. LR Parser (0)
- 8.4.3. Analyzer Example

8.5. Advanced Bottom-Up Parsing
- 8.5.1. SLR Parser
- 8.5.2. LR Parser (1)
- 8.5.3. LR Analyzer (k)
- 8.5.4. LALR Parser

8.6. Semantic Analysis (I)
- 8.6.1. Syntax-Driven Translation
- 8.6.2. Table of Symbols

8.7. Semantic Analysis (II)
- 8.7.1. Type Checking
- 8.7.2. The Type Subsystem
- 8.7.3. Type Equivalence and Conversions

8.8. Code Generation and Execution Environment
- 8.8.1. Design Aspects
- 8.8.2. Execution Environment
- 8.8.3. Memory Organization
- 8.8.4. Memory Allocation

8.9. Intermediate Code Generation
- 8.9.1. Synthesis-Driven Translation
- 8.9.2. Intermediate Representations
- 8.9.3. Examples of Translations

8.10. Code Optimization
- 8.10.1. Register Allocation
- 8.10.2. Elimination of Dead Assignments
- 8.10.3. Compile-Time Execution
- 8.10.4. Expression Reordering
- 8.10.5. Loop Optimization

Module 9. Computer Graphics and Visualization

9.1. Color Theory
- 9.1.1. Properties of Light
- 9.1.2. Color Models
- 9.1.3. The CIE Standard
- 9.1.4. Profiling

9.2. Output Primitives
- 9.2.1. The Video Driver
- 9.2.2. Line Drawing Algorithms
- 9.2.3. Circle Drawing Algorithms
- 9.2.4. Filling Algorithms

9.3. 2D Transformations and 2D Coordinate Systems and 2D Clipping
- 9.3.1. Basic Geometric Transformations
- 9.3.2. Homogeneous Coordinates
- 9.3.3. Inverse Transformation
- 9.3.4. Composition of Transformations
- 9.3.5. Other Transformations

9.3.6. Coordinate Change
9.3.7. 2D Coordinate Systems
9.3.8. Coordinate Change
9.3.9. Standardization
9.3.10. Trimming Algorithms

9.4. 3D Transformations
9.4.1. Translation
9.4.2. Rotation
9.4.3. Scaling
9.4.4. Reflection
9.4.5. Shearing

9.5. Display and Change of 3D Coordinates
9.5.1. 3D Coordinate Systems
9.5.2. Visualization
9.5.3. Coordinate Change
9.5.4. Projection and Normalization

9.6. 3D Projection and Clipping
9.6.1. Orthogonal Projection
9.6.2. Oblique Parallel Projection
9.6.3. Perspective Projection
9.6.4. 3D Clipping Algorithms

9.7. Hidden Surface Removal
9.7.1. Back-Face Removal
9.7.2. Z-Buffer
9.7.3. Painter Algorithm
9.7.4. Warnock Algorithm
9.7.5. Hidden Line Detection

9.8. Interpolation and Parametric Curves
- 9.8.1. Interpolation and Polynomial Approximation
- 9.8.2. Parametric Representation
- 9.8.3. Lagrange Polynomial
- 9.8.4. Natural Cubic Splines
- 9.8.5. Basic Functions
- 9.8.6. Matrix Representation

9.9. Bézier Curves
- 9.9.1. Algebraic Construction
- 9.9.2. Matrix Form
- 9.9.3. Composition
- 9.9.4. Geometric Construction
- 9.9.5. Drawing Algorithm

9.10. B-Splines
- 9.10.1. The Local Control Problem
- 9.10.2. Uniform Cubic B-Splines
- 9.10.3. Basis Functions and Control Points
- 9.10.4. Derivative to the Origin and Multiplicity
- 9.10.5. Matrix Representation
- 9.10.6. Non-Uniform B-Splines

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 Computation 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 Major Operators

10.4. Space Exploration-Exploitation Strategies for Genetic Algorithms
- 10.4.1. CHC Algorithm
- 10.4.2. Multimodal Problems

10.5. Evolutionary Computing Models (I)
- 10.5.1. Evolutionary Strategies
- 10.5.2. Evolutionary Programming
- 10.5.3. Algorithms Based on Differential Evolution

10.6. Evolutionary Computation Models (II)
- 10.6.1. Evolutionary Models Based on Estimation of Distributions (EDA)
- 10.6.2. Genetic Programming

10.7. Evolutionary Programming Applied to Learning Problems
- 10.7.1 Rule-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 Economics
- 10.10.3. Use Cases of Neural Networks in Computer Vision

Module 11. Security in System Design and Development

11.1. Information Systems
- 11.1.1. Information System Domains
- 11.1.2. Components of an Information System
- 11.1.3. Activities of an Information System
- 11.1.4. Life Cycle of an Information System
- 11.1.5. Information System Resources

11.2. IT Systems: Typology
- 11.2.1. Types of Information Systems
  - 11.2.1.1. Enterprise
  - 11.2.1.2. Strategic
  - 11.2.1.3. According to the Scope of Application
  - 11.2.1.4. Specific
- 11.2.2. IT Systems: Real Examples
- 11.2.3. Evolution of Information Systems: Stages
- 11.2.4. Information Systems Methodologies

11.3. Security of Information Systems: Legal Implications
- 11.3.1. Data Access
- 11.3.2. Security Threats: Vulnerabilities
- 11.3.3. Legal Implications: Crimes
- 11.3.4. Information System Maintenance Procedures

11.4. Security of an Information System: Security Protocols
- 11.4.1. Security of an Information System
  - 11.4.1.1. Integrity
  - 11.4.1.2. Confidentiality
  - 11.4.1.3. Availability
  - 11.4.1.4. Authentication
- 11.4.2. Security Services
- 11.4.3. Information Security Protocols: Typology
- 11.4.4. Sensitivity of an Information System

11.5. Security in an Information System: Access Control Measures and Systems
- 11.5.1. Safety Measures
- 11.5.2. Type of Security Measures
  - 11.5.2.1. Prevention
  - 11.5.2.2. Detection
  - 11.5.2.3. Correction
- 11.5.3. Access Control Systems. Typology
- 11.5.4. Cryptography

11.6. Network and Internet Security
- 11.6.1. Firewalls
- 11.6.2. Digital Identification
- 11.6.3. Viruses and Worms
- 11.6.4. Hacking
- 11.6.5. Examples and Real Cases

11.7. Computer Crimes
- 11.7.1. Computer Crime
- 11.7.2. Computer Crimes Typology
- 11.7.3. Computer Crime: Attacks. Typology
- 11.7.4. The Case of Virtual Reality
- 11.7.5. Profiles of Offenders and Victims: Typification of the Crime
- 11.7.6. Computer Crimes: Examples and Real Cases

11.8. Security Plan in an Information System
- 11.8.1. Security Plan: Objectives
- 11.8.2. Security Plan: Planning
- 11.8.3. Risk Plan: Analysis
- 11.8.4. Security Policy: Implementation in the Organization
- 11.8.5. Security Plan: Implementation in the Organization
- 11.8.6. Security Procedures. Types
- 11.8.7. Security Plans: Examples:

11.9. Contingency Plan
- 11.9.1. Contingency Plan: Functions
- 11.9.2. Emergency Plan: Elements and Objectives
- 11.9.3. Contingency Plan in the Organization: Implementation
- 11.9.4. Contingency Plans: Examples:

11.10. Information Systems Security Governance
- 11.10.1. Legal Regulations
- 11.10.2. Standards
- 11.10.3. Certifications
- 11.10.4. Technologies

Module 12. Information Security Architectures and Models

12.1. Information Security Architecture
- 12.1.1. SGSI/PDS
- 12.1.2. Strategic Alignment
- 12.1.3. Risk Management
- 12.1.4. Performance Measurement

12.2. Information Security Models
- 12.2.1. Based on Security Policies
- 12.2.2. Based on Protection Tools
- 12.2.3. Based on Work Teams

12.3. Safety Model: Key Components
- 12.3.1. Identification of Risks
- 12.3.2. Definition of Controls
- 12.3.3. Continuous Assessment of Risk Levels
- 12.3.4. Awareness-Raising Plan for Employees, Suppliers, Partners, etc

12.4. Risk Management Process
- 12.4.1. Asset Identification
- 12.4.2. Threat Identification
- 12.4.3. Risk Assessment
- 12.4.4. Prioritization of Controls
- 12.4.5. Re-Evaluation and Residual Risk

12.5. Business Processes and Information Security
- 12.5.1. Business Processes
- 12.5.2. Risk Assessment Based on Business Parameters
- 12.5.3. Business Impact Analysis
- 12.5.4. Business Operations and Information Security

12.6. Continuous Improvement Process
- 12.6.1. The Deming Cycle
  - 12.6.1.1. Planning
  - 12.6.1.2. Do
  - 12.6.1.3. Verify
  - 12.6.1.4. Act

12.7. Security Architectures
- 12.7.1. Selection and Homogenization of Technologies
- 12.7.2. Identity Management: Authentication
- 12.7.3. Access Management: Authorization
- 12.7.4. Network Infrastructure Security
- 12.7.5. Encryption Technologies and Solutions
- 12.7.6. Terminal Equipment Security (EDR)

12.8. Regulatory Framework
- 12.8.1. Sectoral Regulations
- 12.8.2. Certifications
- 12.8.3. Legislation

12.9. The ISO 27001 Standard
- 12.9.1. Implementation
- 12.9.2. Certification
- 12.9.3. Audits and Penetration Tests
- 12.9.4. Continuous Risk Management
- 12.9.5. Classification of Information

12.10. Privacy Legislation. GDPR
- 12.10.1. Scope of the General Data Protection Regulation (GDPR)
- 12.10.2. Personal Data
- 12.10.3. Roles in the Processing of Personal Data
- 12.10.4. ARCO Rights
- 12.10.5. The DPO: Functions

Module 13. IT Security Management

13.1. Safety Management
- 13.1.1. Security Operations
- 13.1.2. Legal and Regulatory Aspects
- 13.1.3. Business Qualification
- 13.1.4. Risk Management
- 13.1.5. Identity and Access Management

13.2. Structure of the Security Area: The CISO's Office
- 13.2.1. Organizational Structure: Position of the CISO in the Structure
- 13.2.2. Lines of Defense
- 13.2.3. Organizational Chart of the CISO's Office
- 13.2.4. Budget Management

13.3. Security Governance
- 13.3.1. Safety Committee
- 13.3.2. Risk Monitoring Committee
- 13.3.3. Audit Committee
- 13.3.4. Crisis Committee

13.4. Security Governance. Functions
- 13.4.1. Policies and Standards
- 13.4.2. Security Master Plan
- 13.4.3. Control Panels
- 13.4.4. Awareness and Education
- 13.4.5. Supply Chain Security

13.5. Security Operations
- 13.5.1. Identity and Access Management
- 13.5.2. Configuration of Network Security Rules: Firewalls
- 13.5.3. IDS/IPS Platform Management
- 13.5.4. Vulnerability Analysis

13.6. Cybersecurity Framework: NIST CSF
- 13.6.1. NIST Methodology
  - 13.6.1.1. Identify
  - 13.6.1.2. Protect
  - 13.6.1.3. Detect

13.6.1.4. Respond
13.6.1.5. Retrieve
13.7. Security Operations Center (SOC). Functions
13.7.1. Protection *Red Team, Pentesting, Threat Intelligence*
13.7.2. Detection. SIEM, *User Behavior Analytics, Fraud Prevention*
13.7.3. Response
13.8. Security Audits
13.8.1. Intrusion Test
13.8.2. *Red Team* Exercises
13.8.3. Source Code Audits: Secure Development
13.8.4. Component Safety (*Software Supply Chain*)
13.8.5. Forensic Analysis
13.9. Incident Response
13.9.1. Preparation
13.9.2. Detection, Analysis and Notification
13.9.3. Containment, Eradication and Recovery
13.9.4. Post-Incident Activity
13.9.4.1. Evidence Retention
13.9.4.2. Forensic Analysis
13.9.4.3. Gap Management
13.9.5. Official Cyber-Incident Management Guidelines
13.10. Vulnerability Management
13.10.1. Vulnerability Analysis
13.10.2. Vulnerability Assessment
13.10.3. System Basing
13.10.4. Zero-Day Vulnerabilities. *Zero-Day*

Module 14. Risk Analysis and IT Security Environment

14.1. Environment Analysis
14.1.1. Economic Situation Analysis
14.1.1.1. VUCA Environments
14.1.1.1.1. Volatile
14.1.1.1.2. Uncertain
14.1.1.1.3. Complex
14.1.1.1.4. Ambiguous
14.1.1.2. BANI Environments
14.1.1.2.1. Brittle
14.1.1.2.2. Anxious
14.1.1.2.3. Non-Linear
14.1.1.2.4. Incomprehensible
14.1.2. General Environment Analysis: PESTEL
14.1.2.1. Politics
14.1.2.2. Economics
14.1.2.3. Social
14.1.2.4. Technological
14.1.2.5. Ecological/Environmental
14.1.2.6. Legal
14.1.3. Internal Situation Analysis: SWOT Analysis
14.1.3.1. Objectives
14.1.3.2. Threats
14.1.3.3. Opportunities
14.1.3.4. Strengths
14.2. Risk and Uncertainty
14.2.1. Risk
14.2.2. Risk Management
14.2.3. Risk Management Standards
14.3. ISO 31.000:2018 Risk Management Guidelines
14.3.1. Object
14.3.2. Principles
14.3.3. Frame of Reference
14.3.4. Process

14.4. Information Systems Risk Analysis and Management Methodology (MAGERIT)
- 14.4.1. MAGERIT Methodology
  - 14.4.1.1. Objectives
  - 14.4.1.2. Method
  - 14.4.1.3. Components
  - 14.4.1.4. Techniques
  - 14.4.1.5. Available Tools (PILAR)

14.5. Cyber Risk Transfer
- 14.5.1. Risk Transfer
- 14.5.2. Cyber Risks. Typology
- 14.5.3. Cyber Risk Insurance

14.6. Agile Methodologies for Risk Management
- 14.6.1. Agile Methodologies
- 14.6.2. Scrum for Risk Management
- 14.6.3. Agile Risk Management

14.7. Technologies for Risk Management
- 14.7.1. Artificial Intelligence Applied to Risk Management
- 14.7.2. Blockchain and Cryptography: Value Preservation Methods
- 14.7.3. Quantum Computing: Opportunity or Threat

14.8. IT Risk Mapping Based on Agile Methodologies
- 14.8.1. Representation of Probability and Impact in Agile Environments
- 14.8.2. Risk as a Threat to Value
- 14.8.3. Re-Evolution in Project Management and Agile Processes based on KRIs

14.9. Risk-Driven in Risk Management
- 14.9.1. Risk-Driven
- 14.9.2. Risk-Driven in Risk Management
- 14.9.3. Development of a Risk-Driven Business Management Model

14.10. Innovation and Digital Transformation in IT Risk Management
- 14.10.1. Agile Risk Management as a Source of Business Innovation
- 14.10.2. Transformation of Data into Useful Information for Decision-Making
- 14.10.3. Holistic View of the Enterprise through Risk

Module 15. Cryptography in IT

15.1. Cryptography
- 15.1.1. Cryptography
- 15.1.2. Fundamentals of Mathematics

15.2. Cryptology
- 15.2.1. Cryptology
- 15.2.2. Cryptanalysis
- 15.2.3. Steganography and Stegoanalysis

15.3. Cryptographic Protocols
- 15.3.1. Basic Blocks
- 15.3.2. Basic Protocols
- 15.3.3. Intermediate Protocols
- 15.3.4. Advanced Protocol
- 15.3.5. Esoteric Protocols

15.4. Cryptographic Techniques
- 15.4.1. Key Length
- 15.4.2. Key Management
- 15.4.3. Types of Algorithms
- 15.4.4. Summary of Functions: Hash
- 15.4.5. Pseudo-Random Number Generators
- 15.4.6. Use of Algorithms

15.5. Symmetric Cryptography
- 15.5.1. Block Ciphers
- 15.5.2. DES (Data Encryption Standard)
- 15.5.3. RC4 Algorithm
- 15.5.4. AES (Advanced Encryption Standard)
- 15.5.5. Combination of Block Ciphers
- 15.5.6. Key Derivation

15.6. Asymmetric Cryptography
- 15.6.1. Diffie-Hellman
- 15.6.2. DSA (Digital Signature Algorithm)
- 15.6.3. RSA (Rivest, Shamir and Adleman)
- 15.6.4. Elliptic Curve
- 15.6.5. Asymmetric Cryptography: Typology

15.7. Digital Certificates
- 15.7.1. Digital Signature
- 15.7.2. X509 Certificates
- 15.7.3. Public Key Infrastructure (PKI)

15.8. Implementations
- 15.8.1. Kerberos
- 15.8.2. IBM CCA
- 15.8.3. Pretty Good Privacy (PGP)
- 15.8.4. ISO Authentication Framework
- 15.8.5. SSL and TLS
- 15.8.6. Smart Cards in Means of Payment (EMV)
- 15.8.7. Mobile Telephony Protocols
- 15.8.8. Blockchain

15.9. Steganography
- 15.9.1. Steganography
- 15.9.2. Stegoanalysis
- 15.9.3. Applications and Uses

15.10. Quantum Cryptography
- 15.10.1. Quantum Algorithms
- 15.10.2. Protection of Algorithms from Quantum Computing
- 15.10.3. Quantum Key Distribution

Module 16. Identity and Access Management in IT security

16.1. Identity and Access Management (IAM)
- 16.1.1. Digital Identity
- 16.1.2. Identity Management
- 16.1.3. Identity Federation

16.2. Physical Access Control
- 16.2.1. Protection Systems
- 16.2.2. Area Security
- 16.2.3. Recovery Facilities

16.3. Logical Access Control
- 16.3.1. Authentication: Typology
- 16.3.2. Authentication Protocols
- 16.3.3. Authentication Attacks

16.4. Logical Access Control: MFA Authentication
- 16.4.1. Logical Access Control: MFA Authentication
- 16.4.2. Passwords: Importance
- 16.4.3. Authentication Attacks

16.5. Logical Access Control: Biometric Authentication
- 16.5.1. Logical Access Control: Biometric Authentication
  - 16.5.1.1. Biometric Authentication: Requirements
- 16.5.2. Operation
- 16.5.3. Models and Techniques

16.6. Authentication Management Systems
- 16.6.1. Single Sign On
- 16.6.2. Kerberos
- 16.6.3. AAA Systems

16.7. Authentication Management Systems: AAA Systems
- 16.7.1. TACACS
- 16.7.2. RADIUS
- 16.7.3. DIAMETER

16.8. Access Control Services
- 16.8.1. FW - Firewall
- 16.8.2. VPN - Virtual Private Networks
- 16.8.3. IDS - Intrusion Detection System

16.9. Network Access Control Systems
- 16.9.1. NAC
- 16.9.2. Architecture and Elements
- 16.9.3. Operation and Standardization

16.10. Wireless Network Access
- 16.10.1. Types of Wireless Networks
- 16.10.2. Wireless Network Security
- 16.10.3. Wireless Network Attacks

Module 17. Security in Communications and Software Operation

17.1. Computer Security in Communications and Software Operation
- 17.1.1. Computer Security
- 17.1.2. Cybersecurity
- 17.1.3. Cloud Security

17.2. Computer Security in Communications and Software Operation: Typology
- 17.2.1. Physical Security
- 17.2.2. Logical Security

17.3. Communications Security
- 17.3.1. Main Elements
- 17.3.2. Network Security
- 17.3.3. Best Practices

17.4. Cyberintelligence
- 17.4.1. Social Engineering
- 17.4.2. Deep Web
- 17.4.3. Phishing
- 17.4.4. Malware

17.5. Secure Development in Communications and Software Operation
- 17.5.1. Secure Development: HTTP Protocol
- 17.5.2. Secure Development. Life Cycle
- 17.5.3. Secure Development: PHP Security
- 17.5.4. Secure Development: NET Security
- 17.5.5. Secure Development: Best Practices

17.6. Information Security Management Systems in Communications and Software Operation
- 17.6.1. GDPR
- 17.6.2. ISO 27021
- 17.6.3. ISO 27017/18

17.7. SIEM Technologies
- 17.7.1. SIEM Technologies
- 17.7.2. SOC Operation
- 17.7.3. SIEM Vendors

17.8. The Role of Security in Organizations
- 17.8.1. Roles in Organizations
- 17.8.2. Role of IoT Specialists in Companies
- 17.8.3. Recognized Certifications in the Market

17.9. Forensic Analysis
- 17.9.1. Forensic Analysis
- 17.9.2. Forensic Analysis: Methodology
- 17.9.3. Forensic Analysis: Tools and Implementation

17.10. Cybersecurity Today
- 17.10.1. Major Cyber-Attacks
- 17.10.2. Employability Forecasts
- 17.10.3. Challenges

Module 18. Security in Cloud Environments

18.1. Security in Cloud Computing Environments
- 18.1.1. Security in Cloud Computing Environments
- 18.1.2. Security in Cloud Computing Environments. Threats and Security Risks
- 18.1.3. Security in Cloud Computing Environments. Key Security Aspects

18.2. Types of Cloud Infrastructure
- 18.2.1. Public
- 18.2.2. Private
- 18.2.3. Hybrid

18.3. Shared Management Model
- 18.3.1. Security Elements Managed by Vendor
- 18.3.2. Elements Managed by Customer
- 18.3.3. Definition of the Security Strategy

18.4. Prevention Mechanisms
- 18.4.1. Authentication Management Systems
- 18.4.2. Authorization Management System: Access Policies
- 18.4.3. Key Management Systems

18.5. System Securitization
- 18.5.1. Storage System Securitization
- 18.5.2. Database System Protection
- 18.5.3. Securitization of Data in Transit

18.6. Infrastructure Protection
- 18.6.1. Secure Network Design and Implementation
- 18.6.2. Security in Computing Resources
- 18.6.3. Tools and Resources for Infrastructure Protection

18.7. Detection of Threats and Attacks
- 18.7.1. Auditing, Logging and Monitoring Systems
- 18.7.2. Event and Alarm Systems
- 18.7.3. SIEM Systems

18.8. Incident Response
- 18.8.1. Incident Response Plan
- 18.8.2. Business Continuity
- 18.8.3. Forensic Analysis and Remediation of Incidents of the Same Nature

18.9. Security in Public Clouds
- 18.9.1. AWS (Amazon Web Services)
- 18.9.2. Microsoft Azure
- 18.9.3. Google GCP
- 18.9.4. Oracle Cloud

18.10. Regulations and Compliance
- 18.10.1. Security Compliance
- 18.10.2. Risk Management
- 18.10.3. People and Process in Organizations

Module 19. Security in IoT Device Communications

19.1. From Telemetry to IoT
- 19.1.1. Telemetry
- 19.1.2. M2M Connectivity
- 19.1.3. Democratization of Telemetry

19.2. IoT Reference Models
- 19.2.1. IoT Reference Model
- 19.2.2. Simplified IoT Architecture

19.3. IoT Security Vulnerabilities
- 19.3.1. IoT Devices
- 19.3.2. IoT Devices. Usage Case Studies
- 19.3.3. IoT Devices: Vulnerabilities

19.4. IoT Connectivity
- 19.4.1. PAN, LAN, WAN Networks
- 19.4.2. Non-IoT Wireless Technologies
- 19.4.3. LPWAN Wireless Technologies

19.5. LPWAN Technologies
- 19.5.1. The Iron Triangle of LPWAN Networks
- 19.5.2. Free Frequency Bands vs. Licensed Bands
- 19.5.3. LPWAN Technology Options

19.6. LoRaWAN Technology
- 19.6.1. LoRaWAN Technology
- 19.6.2. LoRaWAN Use Cases. Ecosystem
- 19.6.3. LoRaWAN Security

19.7. Sigfox Technology
- 19.7.1. Sigfox Technology
- 19.7.2. Sigfox Use Cases: Ecosystem
- 19.7.3. Sigfox Security

19.8. IoT Cellular Technology
- 19.8.1. IoT Cellular Technology (NB-IoT and LTE-M)
- 19.8.2. IoT Cellular Use Cases: Ecosystem
- 19.8.3. IoT Cellular Security

19.9. Wi-SUN Technology
- 19.9.1. Wi-SUN Technology
- 19.9.2. Wi-SUN Use Cases: Ecosystem
- 19.9.3. Wi-SUN Security

19.10. Other IoT Technologies
- 19.10.1. Other IoT Technologies
- 19.10.2. Use Cases and Ecosystem of Other IoT Technologies
- 19.10.3. Security in Other IoT Technologies

Module 20. Business Continuity Plan Associated with Security

20.1. Business Continuity Plans
- 20.1.1. Business Continuity Plans (BCP)
- 20.1.2. Business Continuity Plans (BCP) Key Aspects
- 20.1.3. Business Continuity Plan (BCP) for Business Valuation

20.2. Metrics in a Business Continuity Plan (BCP)
- 20.2.1. Recovery Time Objective (RTO) and Recovery Point Objective (RPO)
- 20.2.2. Maximum Tolerable Time (MTD)
- 20.2.3. Minimum Recovery Levels (ROL)
- 20.2.4. Recovery Point Objective (RPO)

20.3. Continuity Projects. Typology
- 20.3.1. Business Continuity Plan (BCP)
- 20.3.2. ICT Continuity Plan (ICTCP)
- 20.3.3. Disaster Recovery Plan (DRP)

20.4. Risk Management Associated with the BCP
- 20.4.1. Business Impact Analysis
- 20.4.2. Benefits of Implementing a BCP
- 20.4.3. Risk-Based Mentality

20.5. Life Cycle of a Business Continuity Plan
- 20.5.1. Phase 1: Analysis of the Organization
- 20.5.2. Phase 2: Determination of the Continuity Strategy
- 20.5.3. Phase 3: Contingency Response
- 20.5.4. Phase 4: Testing, Maintenance and Review

20.6. Organizational Analysis Phase of a BCP
- 20.6.1. Identification of Processes in the Scope of the BCP
- 20.6.2. Identification of Critical Business Areas
- 20.6.3. Identification of Dependencies Between Areas and Processes
- 20.6.4. Determination of Appropriate BAT
- 20.6.5. Deliverables: Creation of a Plan

20.7. Determination Phase of the Continuity Strategy in a BCP
- 20.7.1. Roles in the Strategy Determination Phase
- 20.7.2. Tasks in the Strategy Determination Phase
- 20.7.3. Deliverables

20.8. Contingency Response Phase of a BCP
- 20.8.1. Roles in the Response Phase
- 20.8.2. Tasks in This Phase
- 20.8.3. Deliverables

20.9. Testing, Maintenance and Revision Phase of a BCP
- 20.9.1. Roles in the Testing, Maintenance and Review Phase
- 20.9.2. Tasks in the Testing, Maintenance and Review Phase
- 20.9.3. Deliverables

20.10. ISO Standards Associated with Business Continuity Plans (BCP)
- 20.10.1. ISO 22301:2019
- 20.10.2. ISO 22313:2020
- 20.10.3. Other Related ISO and International Standards

Module 21. Data Analysis in a Business Organization

21.1. Business Analysis
- 21.1.1. Business Analysis
- 21.1.2. Data Structure
- 21.1.3. Phases and Elements

21.2. Data Analysis in the Business
- 21.2.1. Scorecards and KPIs by Departments
- 21.2.2. Operational, Tactical and Strategic Reports
- 21.2.3. Data Analysis Applied to Each Department
  - 21.2.3.1. Marketing and Communication
  - 21.2.3.2. Commercial
  - 21.2.3.3. Customer Service
  - 21.2.3.4. Purchasing
  - 21.2.3.5. Administration
  - 21.2.3.6. Human Resources
  - 21.2.3.7. Production
  - 21.2.3.8. IT

21.3. Marketing and Communication
- 21.3.1. KPIs to be Measured, Applications and Benefits
- 21.3.2. Marketing Systems and Data Warehouse
- 21.3.3. Implementation of a Data Analysis Framework in Marketing
- 21.3.4. Marketing and Communication Plan
- 21.3.5. Strategies, Prediction and Campaign Management

21.4. Commerce and Sales
- 21.4.1. Contributions of Data Analysis in the Commercial Area
- 21.4.2. Sales Department Needs
- 21.4.3. Market Research

21.5. Customer Service
- 21.5.1. Loyalty
- 21.5.2. Personal Coaching and Emotional Intelligence
- 21.5.3. Customer Satisfaction

21.6. Purchasing
- 21.6.1. Data Analysis for Market Research
- 21.6.2. Data Analysis for Competency Research
- 21.6.3. Other Applications

21.7. Administration
- 21.7.1. Needs of the Administration Department
- 21.7.2. Data Warehouse and Financial Risk Analysis
- 21.7.3. Data Warehouse and Credit Risk Analysis

21.8. Human Resources
- 21.8.1. HR and the Benefits of Data Analysis
- 21.8.2. Data Analysis Tools in the HR Department
- 21.8.3. Data Analysis Applications in the HR Department

21.9. Production
- 21.9.1. Data Analysis in a Production Department
- 21.9.2. Applications
- 21.9.3. Benefits

21.10. IT
- 21.10.1. IT Department
- 21.10.2. Data Analysis and Digital Transformation
- 21.10.3. Innovation and Productivity

Module 22. Data Management, Data Manipulation and Information Management for Data Science

22.1. Statistics. Variables, Indices and Ratios
- 22.1.1. Statistics
- 22.1.2. Statistical Dimensions
- 22.1.3. Variables, Indices and Ratios

22.2. Type of Data
- 22.2.1. Qualitative
- 22.2.2. Quantitative
- 22.2.3. Characterization and Categories

22.3. Data Knowledge from Measurements
- 22.3.1. Centralization Measurements
- 22.3.2. Measures of Dispersion
- 22.3.3. Correlation

22.4. Knowledge of Data from Graphs
- 22.4.1. Visualization According to Type of Data
- 22.4.2. Interpretation of Graphic Information
- 22.4.3. Customization of graphics with R

22.5. Probability
- 22.5.1. Probability
- 22.5.2. Function of Probability
- 22.5.3. Distributions

22.6. Data Collection
- 22.6.1. Methodology of Data Collection
- 22.6.2. Data Collection Tools
- 22.6.3. Data Collection Channels

22.7. Data Cleaning
- 22.7.1. Phases of Data Cleansing
- 22.7.2. Data Quality
- 22.7.3. Data Manipulation (With R)

22.8. Data Analysis, Interpretation and Evaluation of Results
- 22.8.1. Statistical Measures
- 22.8.2. Relationship Indices
- 22.8.3. Data Mining

22.9. Data Warehouse
- 22.9.1. Components
- 22.9.2. Design

22.10. Data Availability
- 22.10.1. Access
- 22.10.2. Uses
- 22.10.3. Security

Module 23. IoT Devices and Platforms as the Basis for Data Science

23.1. *I*nternet of Things
- 23.1.1. Internet of the Future, Internet of Things
- 23.1.2. The Industrial Internet Consortium

23.2. Architecture of Reference
- 23.2.1. The Architecture of Reference
- 23.2.2. Layers
- 23.2.3. Components

23.3. Sensors and IoT Devices
- 23.3.1 Main Components
- 23.3.2. Sensors and Actuators

23.4. Communications and Protocols
- 23.4.1. Protocols. OSI Model
- 23.4.2. Communication Technologies

23.5. Cloud Platforms for IoT and IIoT
- 23.5.1. General Purpose Platforms
- 23.5.2. Industrial Platforms
- 23.5.3. Open Code Platforms

23.6. Data Management on IoT Platforms
- 23.6.1. Data Management Mechanisms. Open Data
- 23.6.2. Data Exchange and Visualization

23.7. IoT Security
- 23.7.1. Requirements and Security Areas
- 23.7.2. Security Strategies in IIoT

23.8. Applications of IoT
- 23.8.1. Intelligent Cities
- 23.8.2. Health and Fitness
- 23.8.3. Smart Home
- 23.8.4. Other Applications

23.9. Applications of IIoT
- 23.9.1. Fabrication
- 23.9.2. Transport
- 23.9.3. Energy
- 23.9.4. Agriculture and Livestock
- 23.9.5. Other Sectors

23.10. Industry 4.0
- 23.10.1. IoRT (Internet of Robotics Things)
- 23.10.2. 3D Additive Manufacturing
- 23.10.3. Big Data Analysis

Module 24. Graphical Representation of Data Analysis

24.1. Exploratory Analysis
- 24.1.1. Representation for Information Analysis
- 24.1.2. The Value of Graphical Representation
- 24.1.3. New Paradigms of Graphical Representation

24.2. Optimization for Data Science
- 24.2.1. Color Range and Design
- 24.2.2. Gestalt in Graphic Representation
- 24.2.3. Errors to Avoid and Advice

24.3. Basic Data Sources
- 24.3.1. For Quality Representation
- 24.3.2. For Quantity Representation
- 24.3.3. For Time Representation

24.4. Complex Data Sources
- 24.4.1. Files, Lists and Databases
- 24.4.2. Open Data
- 24.4.3. Continuous Data Generation

24.5. Types of Graphs
- 24.5.1. Basic Representations
- 24.5.2. Block Representation
- 24.5.3. Representation for Dispersion Analysis
- 24.5.4. Circular Representations
- 24.5.5. Bubble Representations
- 24.5.6. Geographical Representations

24.6. Types of Visualization
- 24.6.1. Comparative and Relational
- 24.6.2. Distribution
- 24.6.3. Hierarchical

24.7. Report Design with Graphic Representation
- 24.7.1. Application of Graphs in Marketing Reports
- 24.7.2. Application of Graphs in Scorecards and KPI's
- 24.7.3. Application of Graphs in Strategic Plans
- 24.7.4. Other Uses: Science, Health, Business

24.8. Graphic Narration
- 24.8.1. Graphic Narration
- 24.8.2. Evolution
- 24.8.3. Uses

24.9. Tools Oriented Towards Visualization
- 24.9.1. Advanced Tools
- 24.9.2. Online Software
- 24.9.3. Open Source

24.10. New Technologies in Data Visualization
- 24.10.1. Systems for Virtualization of Reality
- 24.10.2. Reality Enhancement and Improvement Systems
- 24.10.3. Intelligent Systems

Module 25. Data Science Tools

25.1. Data Science
- 25.1.1. Data Science
- 25.1.2. Advanced Tools for the Data Scientist

25.2. Data, Information and Knowledge
- 25.2.1. Data, Information and Knowledge
- 25.2.2. Types of Data
- 25.2.3. Data Sources

25.3. From Data to Information
- 25.3.1. Data Analysis
- 25.3.2. Types of Analysis
- 25.3.3. Extraction of Information from a Dataset

25.4. Extraction of Information Through Visualization
- 25.4.1. Visualization as an Analysis Tool
- 25.4.2. Visualization Methods
- 25.4.3. Visualization of a Data Set

25.5. Data Quality
- 25.5.1. Quality Data
- 25.5.2. Data Cleansing
- 25.5.3. Basic Data Pre-Processing

25.6. Dataset
- 25.6.1. Dataset Enrichment
- 25.6.2. The Curse of Dimensionality
- 25.6.3. Modification of Our Data Set

25.7. Imbalance
- 25.7.1. Class Imbalance
- 25.7.2. Imbalance Mitigation Techniques
- 25.7.3. Balancing a Dataset

25.8. Unsupervised Models
- 25.8.1. Unsupervised Model
- 25.8.2. Methods
- 25.8.3. Classification with Unsupervised Models

25.9. Supervised Models
- 25.9.1. Supervised Model
- 25.9.2. Methods
- 25.9.3. Classification with Supervised Models

25.10. Tools and Good Practices
- 25.10.1. Good Practices for Data Scientists
- 25.10.2. The Best Model
- 25.10.3. Useful Tools

Module 26. Data Mining: Selection, Pre-Processing and Transformation

26.1. Statistical Inference
- 26.1.1. Descriptive Statistics vs. Statistical Inference
- 26.1.2. Parametric Procedures
- 26.1.3. Non-Parametric Procedures

26.2. Exploratory Analysis
- 26.2.1. Descriptive Analysis
- 26.2.2. Visualization
- 26.2.3. Data Preparation

26.3. Data Preparation
- 26.3.1. Integration and Data Cleaning
- 26.3.2. Data Standardization
- 26.3.3. Transforming Attributes

26.4. Missing Values
- 26.4.1. Treatment of Missing Values
- 26.4.2. Maximum Likelihood Imputation Methods
- 26.4.3. Missing Value Imputation Using Machine Learning

26.5. Noise in the Data
- 26.5.1. Noise Classes and Attributes
- 26.5.2. Noise Filtering
- 26.5.3. The Effect of Noise

26.6. The Curse of Dimensionality
- 26.6.1. Oversampling
- 26.6.2. Undersampling
- 26.6.3. Multidimensional Data Reduction

26.7. From Continuous to Discrete Attributes
- 26.7.1. Continuous vs. Discrete
- 26.7.2. Discretization Process

26.8. The Data
- 26.8.1. Data Selection
- 26.8.2. Prospects and Selection Criteria
- 26.8.3. Selection Methods

26.9. Instance Selection
- 26.9.1. Methods for Instance Selection
- 26.9.2. Prototype Selection
- 26.9.3. Advanced Methods for Instance Selection

26.10. Data Pre-Processing in Big Data Environments
- 26.10.1. Big Data
- 26.10.2. Classical vs. Massive Pre-Processing
- 26.10.3. Smart Data

Module 27. Predictability and Analysis of Stochastic Phenomena

27.1. Time Series
- 27.1.1. Time Series
- 27.1.2. Utility and Applicability
- 27.1.3. Related Case Studies

27.2. Time Series
- 27.2.1. Seasonal Trend of ST
- 27.2.2. Typical Variations
- 27.2.3. Waste Analysis

27.3. Typology
- 27.3.1. Stationary
- 27.3.2. Non-Stationary
- 27.3.3. Transformations and Settings

27.4. Time Series Schemes
- 27.4.1. Additive Scheme (Model)
- 27.4.2. Multiplicative Scheme (Model)
- 27.4.3. Procedures to Determine the Type of Model

27.5. Basic Forecast Methods
- 27.5.1. Media
- 27.5.2. Naïve
- 27.5.3. Seasonal Naivety
- 27.5.4. Method Comparison

27.6. Waste Analysis
- 27.6.1. Autocorrelation
- 27.6.2. ACF of Waste
- 27.6.3. Correlation Test

27.7. Regression in the Context of Time Series
- 27.7.1. ANOVA
- 27.7.2. Fundamentals
- 27.7.3. Practical Applications

27.8. Predictive Methods of Time Series
- 27.8.1. ARIMA
- 27.8.2. Exponential Smoothing

27.9. Manipulation and Analysis of Time Series with R
- 27.9.1. Data Preparation
- 27.9.2. Identification of Patterns
- 27.9.3. Model Analysis
- 27.9.4. Prediction

27.10. Combined Graphical Analysis with R
- 27.10.1. Normal Situations
- 27.10.2. Practical Application for the Resolution of Simple Problems
- 27.10.3. Practical Application for the Resolution of Advanced Problems

Module 28. Design and Development of Intelligent Systems

28.1. Data Pre-Processing
- 28.1.1. Data Pre-Processing
- 28.1.2. Data Transformation
- 28.1.3. Data Mining

28.2. Machine Learning
- 28.2.1. Supervised and Unsupervised Learning
- 28.2.2. Reinforcement Learning
- 28.2.3. Other Learning Paradigms

28.3. Classification Algorithms
- 28.3.1. Inductive Machine Learning
- 28.3.2. SVM and KNN
- 28.3.3. Metrics and Scores for Ranking

28.4. Regression Algorithms
- 28.4.1. Lineal Regression, Logistical Regressions and Non-Lineal Models
- 28.4.2. Time Series
- 28.4.3. Metrics and Scores for Regression

28.5. Clustering Algorithms
- 28.5.1. Hierarchical Clustering Techniques
- 28.5.2. Partitional Clustering Techniques
- 28.5.3. Metrics and Scores for Clustering

28.6. Association Rules Techniques
- 28.6.1. Methods for Rule Extraction
- 28.6.2. Metrics and Scores for Association Rule Algorithms

28.7. Advanced Classification Techniques: Multiclassifiers
- 28.7.1. Bagging Algorithms
- 28.7.2. Random Forests Sorter
- 28.7.3. "Boosting" for Decision Trees

28.8. Probabilistic Graphical Models
- 28.8.1. Probabilistic Models
- 28.8.2. Bayesian Networks. Properties, Representation and Parameterization
- 28.8.3. Other Probabilistic Graphical Models

28.9. Neural Networks
- 28.9.1. Machine Learning with Artificial Neural Networks
- 28.9.2. Feedforward Networks

28.10. Deep Learning
- 28.10.1. Deep Feedforward Networks
- 28.10.2. Convolutional Neural Networks and Sequence Models
- 28.10.3. Tools for Implementing Deep Neural Networks

Module 29. Data-Intensive Systems and Architectures

29.1. Non-Functional Requirements: Pillars of Big Data Applications
- 29.1.1. Reliability
- 29.1.2. Adaptation
- 29.1.3. Maintainability

29.2. Data Models
- 29.2.1. Relational Model
- 29.2.2. Document Model
- 29.2.3. Graph Data Model

29.3. Databases: Data Storage and Retrieval Management
- 29.3.1. Hash Index
- 29.3.2. Log Structured Storage
- 29.3.3. B-Trees

29.4. Data Encoding Formats
- 29.4.1. Language-Specific Formats
- 29.4.2. Standardized Formats
- 29.4.3. Binary Coding Formats
- 29.4.4. Data Flow Between Processes

29.5. Replication
- 29.5.1. Objectives of Replication
- 29.5.2. Replication Models
- 29.5.3. Problems with Replication

29.6. Distributed Transactions
- 29.6.1. Transaction
- 29.6.2. Protocols for Distributed Transactions
- 29.6.3. Serializable Transactions

29.7. Partitions
- 29.7.1. Forms of Partitioning
- 29.7.2. Secondary Index Interaction and Partitioning
- 29.7.3. Partition Rebalancing

29.8. Offline Data Processing
- 29.8.1. Batch Processing
- 29.8.2. Distributed File Systems
- 29.8.3. MapReduce

29.9 Data Processing in Real Time
- 29.9.1. Types of Message Brokers
- 29.9.2. Representation of Databases as Data Streams
- 29.9.3. Data Stream Processing

29.10. Practical Applications in Business
- 29.10.1. Consistency in Readings
- 29.10.2. Holistic Approach to Data
- 29.10.3. Scaling of a Distributed Service

Module 30. Practical Application of Data Science in Business Sectors

30.1. Health Sector
- 30.1.1. Implications of AI and Data Analysis in the Health Sector
- 30.1.2. Opportunities and Challenges

30.2. Risks and Trends in the Health Sector
- 30.2.1. Use in the Health Sector
- 30.2.2. Potential Risks Related to the Use of AI

30.3. Financial Services
- 30.3.1. Implications of AI and Data Analysis in the Financial Services Industry
- 30.3.2. Use in the Financial Services
- 30.3.3. Potential Risks Related to the Use of AI

30.4. Retail
- 30.4.1. Implications of AI and Data Analysis in the Retail Sector
- 30.4.2. Use in Retail
- 30.4.3. Potential Risks Related to the Use of AI

30.5. Industry 4.0
- 30.5.1. Implications of AI and Data Analysis in Industry 4.0
- 30.5.2. Use in Industry 4.0

30.6. Risks and Trends in Industry 4.0
- 30.6.1. Potential Risks Related to the Use of AI

30.7. Public Administration
- 30.7.1. Implications of AI and Data Analysis for Public Administration
- 30.7.2. Use in Public Administration
- 30.7.3. Potential Risks Related to the Use of AI

30.8. Educational
- 30.8.1. Implications of AI and Data Analysis in Education
- 30.8.2. Potential Risks Related to the Use of AI

30.9. Forestry and Agriculture
- 30.9.1. Implications of AI and Data Analysis in Forestry and Agriculture
- 30.9.2. Use in Forestry and Agriculture
- 30.9.3. Potential Risks Related to the Use of AI

30.10. Human Resources
- 30.10.1. Implications of AI and Data Analysis for Human Resource Management
- 30.10.2. Practical Applications in the Business World
- 30.10.3. Potential Risks Related to the Use of AI

TECH offers you the best program for computer scientists like you who want a change in their career to boost their professional career"

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 goalt is to strengthen skills in a changing, competitive, and highly demanding environment.

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

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

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

A learning method that is different and innovative

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

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

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

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

Relearning Methodology

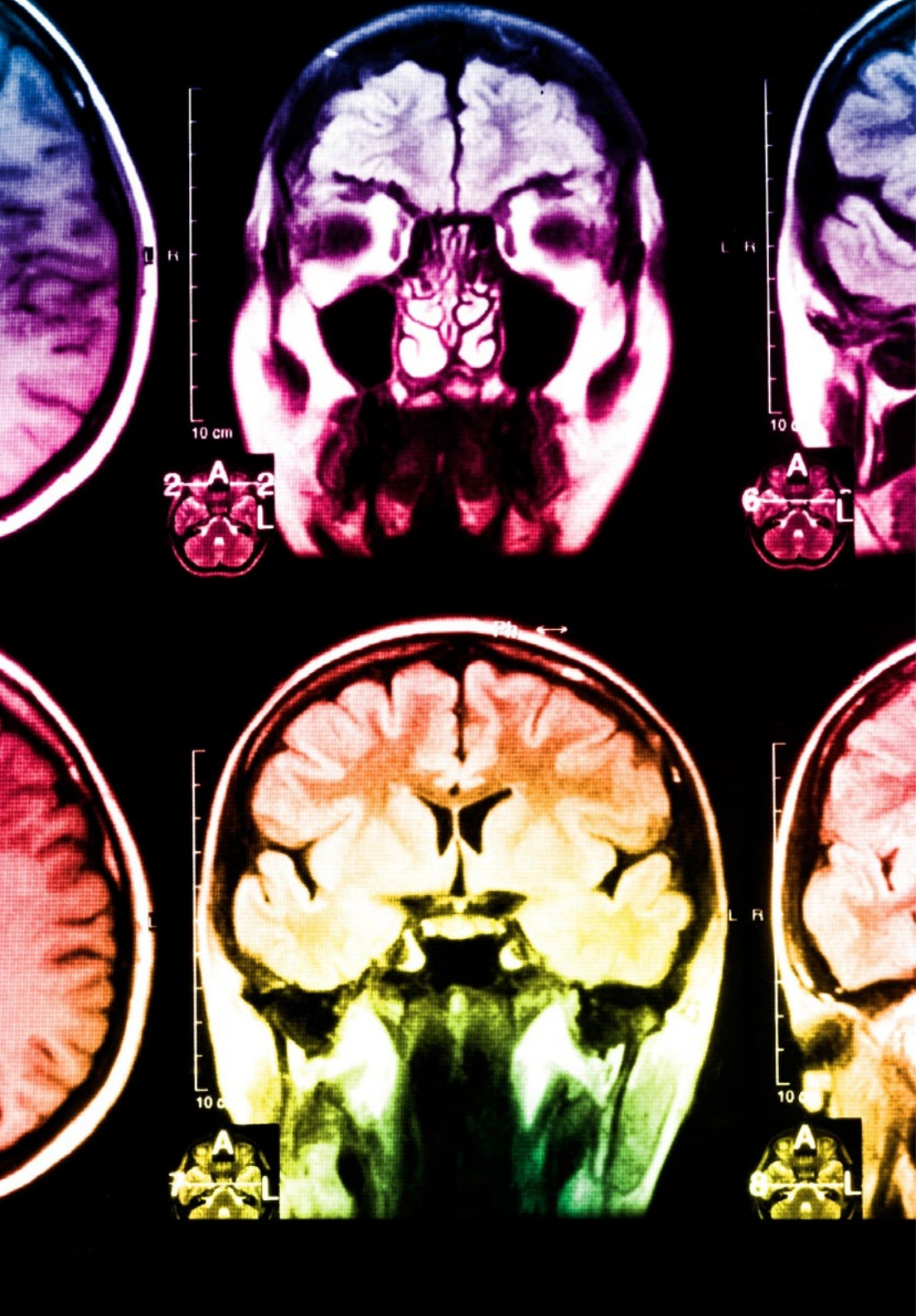
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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

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

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

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



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

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

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

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

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

Study Material

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

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

Classes

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

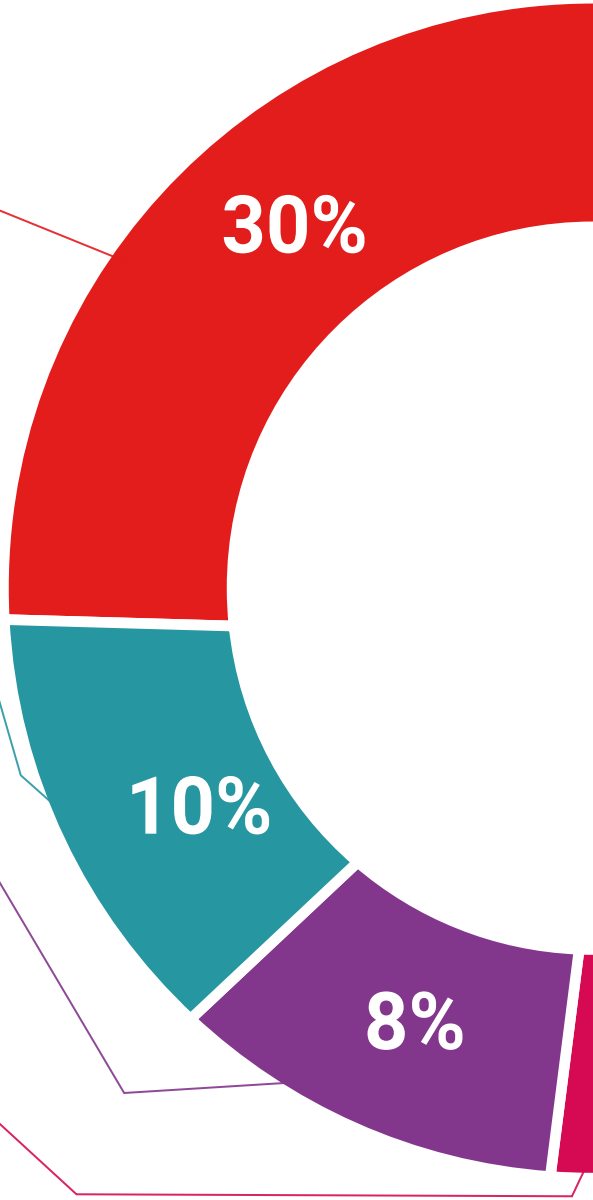
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

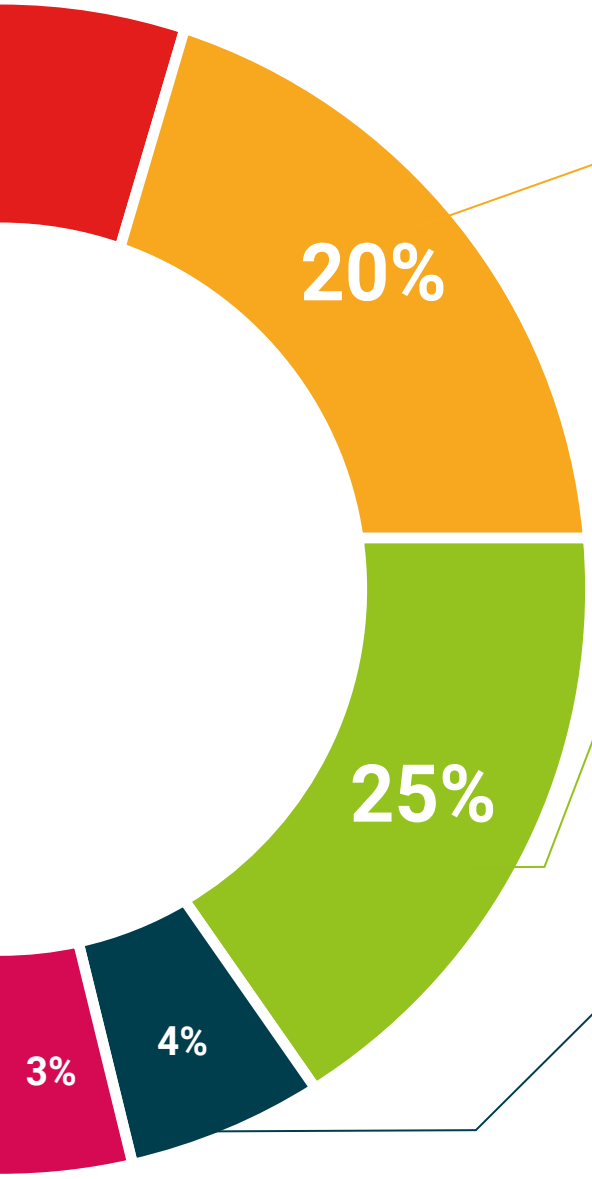
Practising Skills and Abilities

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

Additional Reading

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





Case Studies

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

Interactive Summaries

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

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

Testing & Retesting

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

07

Certificate

The Advanced Master's Degree in Computer Science, Cybersecurity and Data Analysis guarantees students, in addition to the most rigorous and up-to-date education, access to an Advanced Master's Degree issued by TECH Technological University.

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

This **Advanced Master's Degree in Computer Science, Cybersecurity and Data Analysis** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Advanced 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 Advanced Master's Degree, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Advanced Master's Degree in Computer Science, Cybersecurity and Data Analysis**

Official Nº of Hours: **3,000 h.**

tech technological university

Awards the following

CERTIFICATE

to

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

For having successfully passed and accredited the following program

ADVANCED MASTER'S DEGREE

in

Computer Science, Cybersecurity and Data Analysis

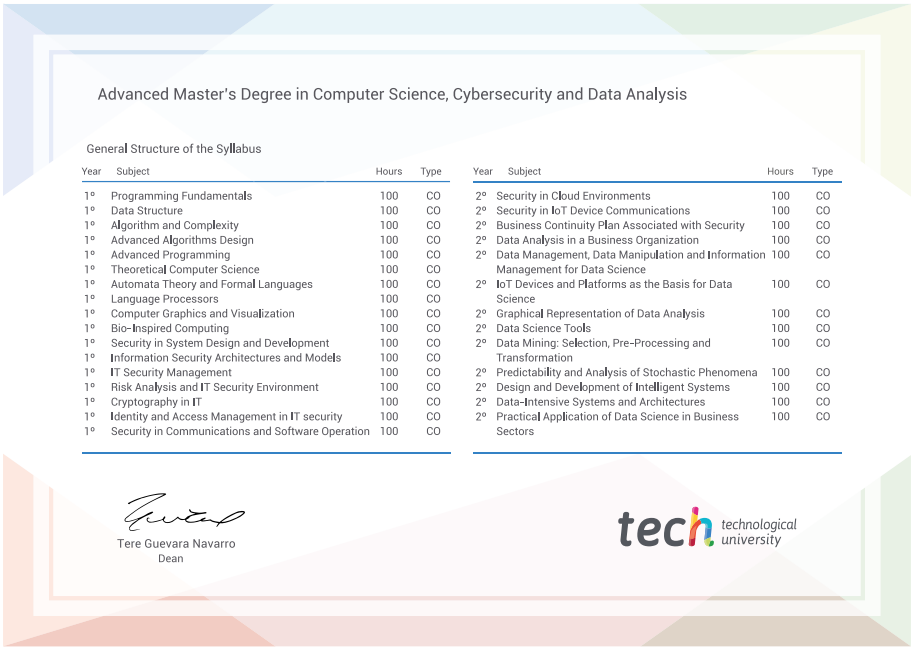
This is a qualification awarded by this University, equivalent to 3,000 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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

June 17, 2020

Tere Guevara Navarro
Dean

Unique TECH Code: AFWORD23S techtitute.com/certificates


Advanced Master's Degree in Computer Science, Cybersecurity and Data Analysis

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Programming Fundamentals	100	CO
1º	Data Structure	100	CO
1º	Algorithm and Complexity	100	CO
1º	Advanced Algorithms Design	100	CO
1º	Advanced Programming	100	CO
1º	Theoretical Computer Science	100	CO
1º	Automata Theory and Formal Languages	100	CO
1º	Language Processors	100	CO
1º	Computer Graphics and Visualization	100	CO
1º	Bio-Inspired Computing	100	CO
1º	Security in System Design and Development	100	CO
1º	Information Security Architectures and Models	100	CO
1º	IT Security Management	100	CO
1º	Risk Analysis and IT Security Environment	100	CO
1º	Cryptography in IT	100	CO
1º	Identity and Access Management in IT security	100	CO
1º	Security in Communications and Software Operation	100	CO

Year	Subject	Hours	Type
2º	Security in Cloud Environments	100	CO
2º	Security in IoT Device Communications	100	CO
2º	Business Continuity Plan Associated with Security	100	CO
2º	Data Analysis in a Business Organization	100	CO
2º	Data Management, Data Manipulation and Information Management for Data Science	100	CO
2º	IoT Devices and Platforms as the Basis for Data Science	100	CO
2º	Graphical Representation of Data Analysis	100	CO
2º	Data Science Tools	100	CO
2º	Data Mining: Selection, Pre-Processing and Transformation	100	CO
2º	Predictability and Analysis of Stochastic Phenomena	100	CO
2º	Design and Development of Intelligent Systems	100	CO
2º	Data-Intensive Systems and Architectures	100	CO
2º	Practical Application of Data Science in Business Sectors	100	CO

Tere Guevara Navarro
Dean

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

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Advanced Master's Degree

Computer Science, Cybersecurity and Data Analysis

- Modality: **online**
- Duration: **2 years**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Advanced Master's Degree

Computer Science, Cybersecurity and Data Analysis

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