Professional Master's Degree

Artificial Intelligence in Clinical Practice

tech global university

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Professional Master's Degree
Artificial Intelligence in Clinical Practice

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Accreditation: **90 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

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

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01

Introduction

Artificial Intelligence (AI) is playing an increasingly important role in both clinical research and medical care. Among the reasons for this is that these systems help in the identification of pathologies by analyzing medical images (such as X-rays or CT scans). In this way, specialists can detect anomalies with greater precision and speed. In turn, this means earlier diagnosis and even detection of diseases in their early stages. In this context, TECH has launched a university degree that will delve into the integration of Machine Learning in clinical matters. Moreover, it is based on a 100% online methodology so that students can balance their studies with the rest of their daily activities.

You will analyze how AI interprets genetic data to design specific therapeutic strategies, thanks to this 100% online program"

Big Data analysis significantly improves medical care and research in the healthcare field. These advanced systems give experts the opportunity to personalize treatments. Patient information such as medical history, genetics or lifestyle is used to tailor therapeutic plans and medications on a personalized basis. In addition, these tools contribute to continuous monitoring of patients outside the clinical setting, which is especially beneficial for users suffering from chronic conditions. Therefore, AI resources contribute to the development of more effective and safer care procedures.

For this reason, TECH has designed a Professional Master's Degree that will delve into the analysis of Big Data and Machine Learning in Clinical Research. The syllabus will cover aspects such as data mining in both clinical and biomedical records, while focusing on algorithms and providing predictive analysis techniques. Moreover, the program will explore the interactions that occur in biological networks for the identification of disease patterns. In addition, the syllabus will pay careful attention to the ethical and legal factors of AI in the medical context. In this way, graduates will gain a responsible conscience when carrying out their procedures.

It should be noted that, in order to consolidate all these contents, TECH relies on the revolutionary Relearning methodology. This teaching system is based on the reiteration of key concepts in order to consolidate an optimal understanding. The only requirement for students is to have an electronic device (such as a cell phone, computer or Tablet) connected to the Internet, in order to access the Virtual Campus and view the contents at any time. In this way, they will learn from the comfort of their homes, forgetting about classroom attendance and fixed schedules.

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

- The development of case studies presented by experts in Artificial Intelligence in Clinical Research
- The graphic, schematic and eminently practical contents with which it is conceived gather scientific and practical information on those disciplines that are indispensable for professional practice
- Practical exercises where self-assessment can be used to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

You will master TensorFlow Datasets for data loading and achieve efficient medical data preprocessing thanks to this program"

You will be at the forefront of the medical field! This program merges clinical excellence with the technological revolution of Machine Learning"

The modular structure of the program will allow you a coherent progression, from the fundamentals to the most advanced applications.

Forget about memorizing! With the Relearning system, you will integrate the concepts in a natural and progressive way.

The program's teaching staff includes professionals from the sector who contribute their work experience to this specializing program, as well as renowned specialists from leading societies and prestigious universities.

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

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

02

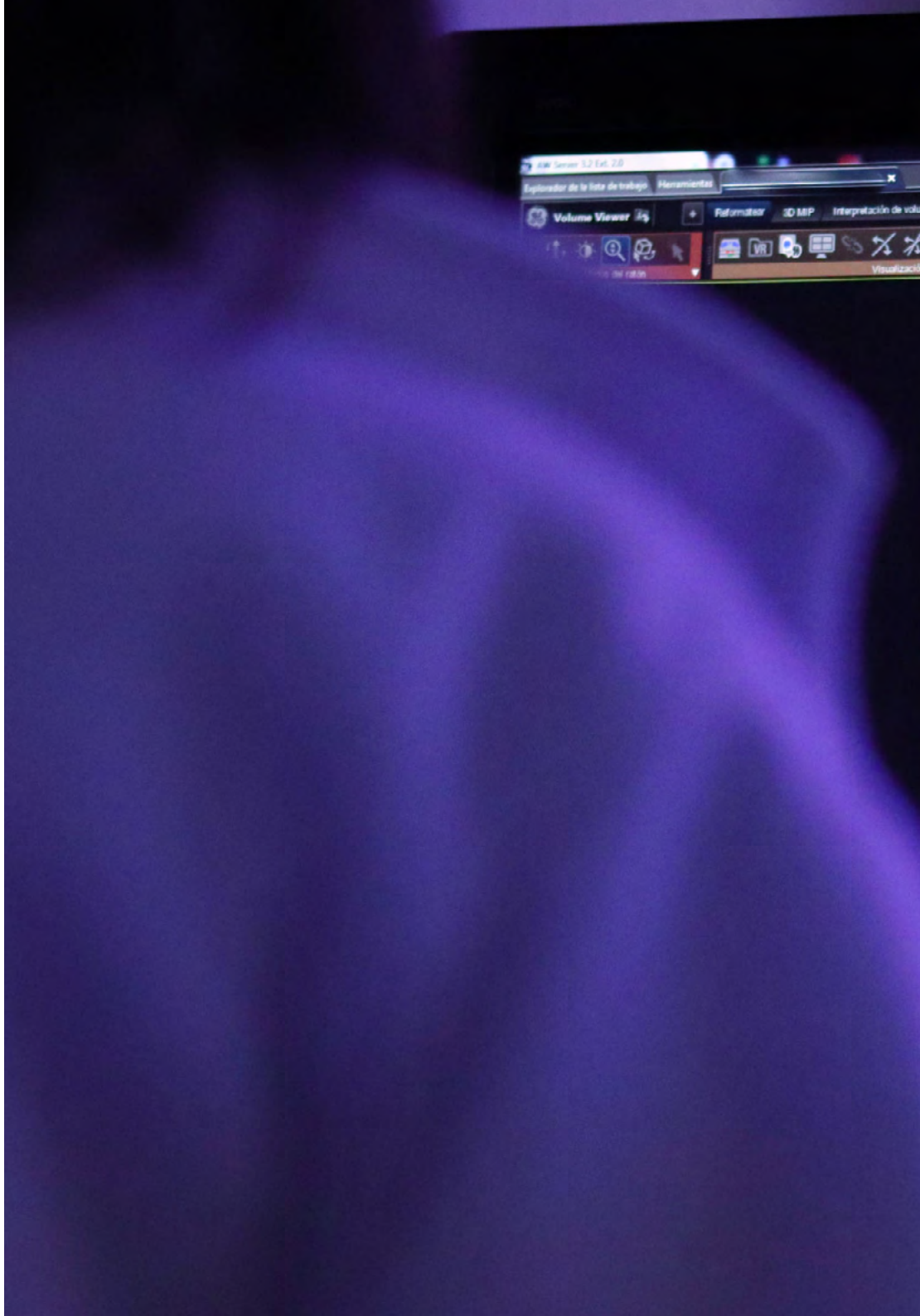
Objectives

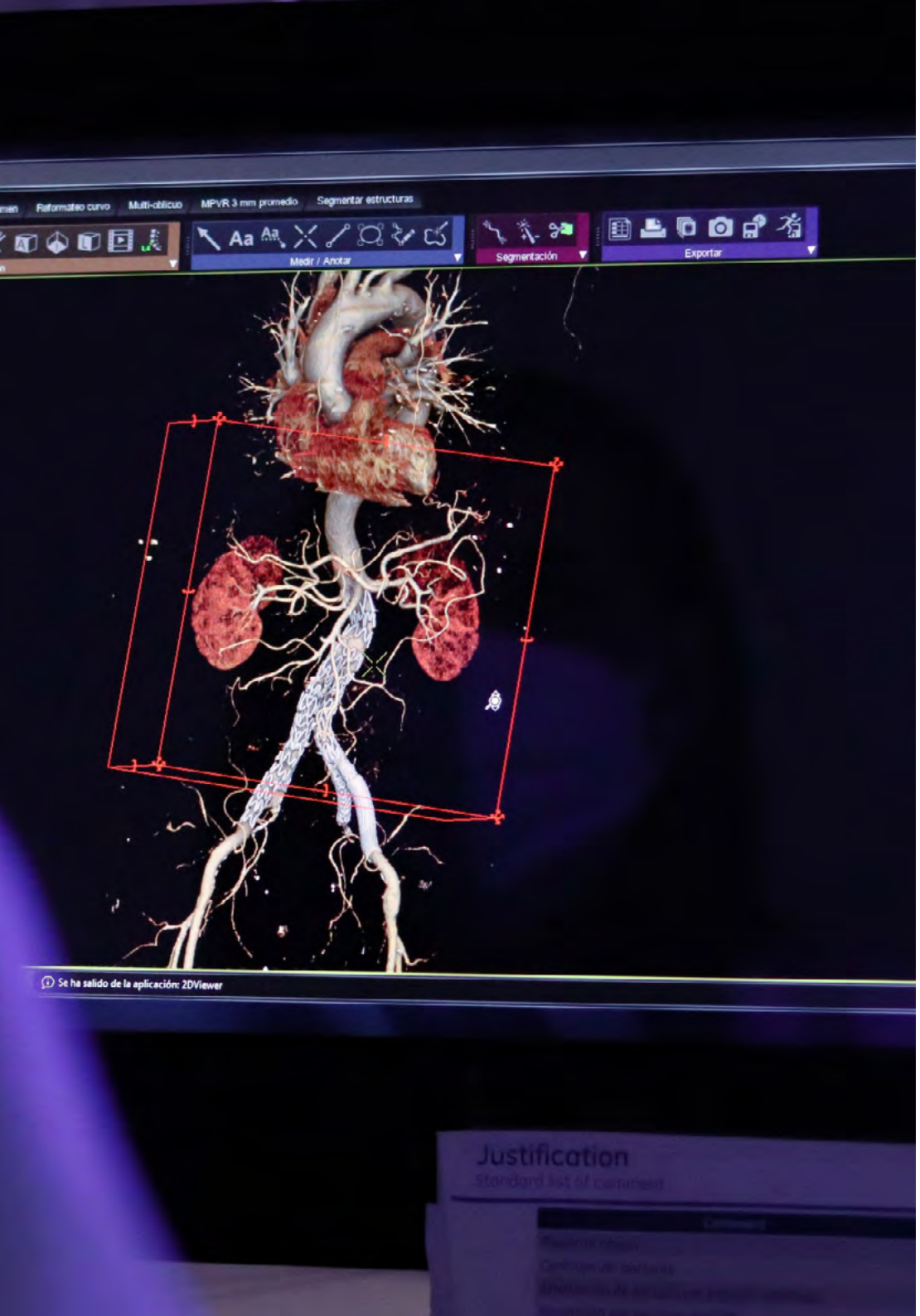
This Professional Master's Degree will turn students into true leaders, capable of overcoming current and future challenges in medicine. Graduates will have a thorough understanding of AI, which will contribute to developing innovative solutions to transform medical care. In this way, professionals will apply medical data analysis techniques, the development of predictive models for clinical trials and the implementation of innovative solutions for the personalization of treatments

Update your daily clinical practice to be at the forefront of the technological revolution in health, contributing to the advancement of Clinical Practice"

General Objectives

- Understand the theoretical foundations of Artificial Intelligence
- Study the different types of data and understand the data lifecycle
- Evaluate the crucial role of data in the development and implementation of AI solutions
- Delve into algorithms and complexity to solve specific problems
- Explore the theoretical basis of neural networks for *Deep Learning* development
- Analyze bio-inspired computing and its relevance in the development of intelligent systems
- Analyze current strategies of Artificial Intelligence in various fields, identifying opportunities and challenges
- Obtain a comprehensive view of the transformation of Clinical Research through AI, from its historical foundations to current applications
- Learn effective methods for integrating heterogeneous data into clinical research, including natural language processing and advanced data visualization
- Acquire a solid understanding of model validation and simulations in the biomedical domain, exploring the use of synthetic datasets and practical applications of AI in health research
- Understand and apply genomic sequencing technologies, AI data analysis and use of AI in biomedical imaging
- Acquire expertise in key areas such as personalization of therapies, precision medicine, AI-assisted diagnostics, and clinical trial management
- Obtain a solid understanding of Big Data concepts in the clinical setting and become familiar with essential tools for its analysis
- Delve into ethical dilemmas, review legal considerations, explore the socioeconomic impact and future of AI in healthcare, and promote innovation and entrepreneurship in the field of clinical AI





Specific Objectives

Module 1. Fundamentals of Artificial Intelligence

- Analyze the historical evolution of Artificial Intelligence, from its beginnings to its current state, identifying key milestones and developments
- Understand the functioning of neural networks and their application in learning models in Artificial Intelligence
- Study the principles and applications of genetic algorithms, analyzing their usefulness in solving complex problems
- Analyze the importance of thesauri, vocabularies and taxonomies in the structuring and processing of data for AI systems
- Explore the concept of the semantic web and its influence on the organization and understanding of information in digital environments

Module 2. Data Types and Life Cycle

- Understand the fundamental concepts of statistics and their application in data analysis
- Identify and classify the different types of statistical data, from quantitative to qualitative data
- Analyze the life cycle of data, from generation to disposal, identifying key stages
- Explore the initial stages of the data life cycle, highlighting the importance of data planning and structure
- Study data collection processes, including methodology, tools and collection channels
- Explore the *Datawarehouse* concept, with emphasis on the elements that comprise it and its design
- Analyze the regulatory aspects related to data management, complying with privacy and security regulations, as well as best practices

Module 3. Data in Artificial Intelligence

- Master the fundamentals of data science, covering tools, types and sources for information analysis
- Explore the process of transforming data into information using data mining and visualization techniques
- Study the structure and characteristics of *datasets*, understanding their importance in the preparation and use of data for Artificial Intelligence models
- Analyze supervised and unsupervised models, including methods and classification
- Use specific tools and best practices in data handling and processing, ensuring efficiency and quality in the implementation of Artificial Intelligence

Module 4. Data Mining. Selection, Pre-Processing and Transformation

- Master the techniques of statistical inference to understand and apply statistical methods in data mining
- Perform detailed exploratory analysis of data sets to identify relevant patterns, anomalies, and trends
- Develop skills for data preparation, including data cleaning, integration, and formatting for use in data mining
- Implement effective strategies for handling missing values in datasets, applying imputation or elimination methods according to context
- Identify and mitigate noise present in data, using filtering and smoothing techniques to improve the quality of the data set
- Address data preprocessing in *Big Data* environments

Module 5. Algorithm and Complexity in Artificial Intelligence

- Introduce algorithm design strategies, providing a solid understanding of fundamental approaches to problem solving
- Analyze the efficiency and complexity of algorithms, applying analysis techniques to evaluate performance in terms of time and space
- Study and apply sorting algorithms, understanding their performance and comparing their efficiency in different contexts
- Explore tree-based algorithms, understanding their structure and applications
- Investigate algorithms with *Heaps*, analyzing their implementation and usefulness in efficient data manipulation
- Analyze graph-based algorithms, exploring their application in the representation and solution of problems involving complex relationships
- Study *Greedy*algorithms, understanding their logic and applications in solving optimization problems
- Investigate and apply the *backtracking* technique for systematic problem solving, analyzing its effectiveness in various scenarios

Module 6. Intelligent Systems

- Explore agent theory, understanding the fundamental concepts of its operation and its application in Artificial Intelligence and software engineering
- Study the representation of knowledge, including the analysis of ontologies and their application in the organization of structured information
- Analyze the concept of the semantic web and its impact on the organization and retrieval of information in digital environments
- Evaluate and compare different knowledge representations, integrating these to improve the efficiency and accuracy of intelligent systems
- Study semantic reasoners, knowledge-based systems and expert systems, understanding their functionality and applications in intelligent decision making

Module 7. Machine Learning and Data Mining

- Introduce the processes of knowledge discovery and the fundamental concepts of machine learning
- Study decision trees as supervised learning models, understanding their structure and applications
- Evaluate classifiers using specific techniques to measure their performance and accuracy in data classification
- Study neural networks, understanding their operation and architecture to solve complex machine learning problems
- Explore Bayesian methods and their application in machine learning, including Bayesian networks and Bayesian classifiers
- Analyze regression and continuous response models for predicting numerical values from data
- Study *clustering* techniques to identify patterns and structures in unlabeled data sets
- Explore text mining and natural language processing (NLP), understanding how machine learning techniques are applied to analyze and understand text

Module 8. Neural Networks, the Basis of Deep Learning

- Master the fundamentals of Deep Learning, understanding its essential role in *Deep Learning*
- Explore the fundamental operations in neural networks and understand their application in model building
- Analyze the different layers used in neural networks and learn how to select them appropriately
- Understand the effective linking of layers and operations to design complex and efficient neural network architectures
- Use trainers and optimizers to tune and improve the performance of neural networks
- Explore the connection between biological and artificial neurons for a deeper understanding of model design
- Tuning hyperparameters for *Fine Tuning* of neural networks, optimizing their performance on specific tasks

Module 9. Deep Neural Networks Training

- Solve gradient-related problems in deep neural network training
- Explore and apply different optimizers to improve the efficiency and convergence of models
- Program the learning rate to dynamically adjust the convergence speed of the model
- Understand and address overfitting through specific strategies during training
- Apply practical guidelines to ensure efficient and effective training of deep neural networks
- Implement *Transfer Learning* as an advanced technique to improve model performance on specific tasks
- Explore and apply *Data Augmentation* techniques to enrich datasets and improve model generalization
- Develop practical applications using *Transfer Learning* to solve real-world problems
- Understand and apply regularization techniques to improve generalization and avoid overfitting in deep neural networks

Module 10. Model Customization and Training with *TensorFlow*

- Master the fundamentals of *TensorFlow* and its integration with NumPy for efficient data management and calculations
- Customize models and training algorithms using the advanced capabilities of *TensorFlow*
- Explore the tfdata API to efficiently manage and manipulate datasets
- Implement the TFRecord format for storing and accessing large datasets in *TensorFlow*
- Use Keras preprocessing layers to facilitate the construction of custom models
- Explore the *TensorFlow Datasets* project to access predefined datasets and improve development efficiency
- Develop a *Deep Learning* application with *TensorFlow*, integrating the knowledge acquired in the module
- Apply in a practical way all the concepts learned in building and training custom models with *TensorFlow* in real-world situations

Module 11. Deep Computer Vision with Convolutional Neural Networks

- Understand the architecture of the visual cortex and its relevance in *Deep Computer Vision*
- Explore and apply convolutional layers to extract key features from images
- Implement clustering layers and their use in *Deep Computer Vision* models with Keras
- Analyze various Convolutional Neural Network (CNN) architectures and their applicability in different contexts
- Develop and implement a CNN ResNet using the Keras library to improve model efficiency and performance
- Use pre-trained Keras models to leverage transfer learning for specific tasks
- Apply classification and localization techniques in *Deep Computer Vision* environments
- Explore object detection and object tracking strategies using Convolutional Neural Networks
- Implement semantic segmentation techniques to understand and classify objects in images in a detailed manner

Module 12. Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention

- Developing skills in text generation using Recurrent Neural Networks (RNN)
- Apply RNNs in opinion classification for sentiment analysis in texts
- Understand and apply attentional mechanisms in natural language processing models
- Analyze and use *Transformers* models in specific NLP tasks
- Explore the application of *Transformers* models in the context of image processing and computer vision
- Become familiar with the *Hugging Face Transformers* library for efficient implementation of advanced models
- Compare different *Transformers* libraries to evaluate their suitability for specific tasks
- Develop a practical application of NLP that integrates RNN and attention mechanisms to solve real-world problems

Module 13. Autoencoders, GANs , and Diffusion Models

- Develop efficient representations of data using *Autoencoders*, *GANs* and Diffusion Models
- Perform PCA using an incomplete linear autoencoder to optimize data representation
- Implement and understand the operation of stacked autoencoders
- Explore and apply convolutional autoencoders for efficient visual data representations
- Analyze and apply the effectiveness of sparse automatic encoders in data representation
- Generate fashion images from the MNIST dataset using *Autoencoders*
- Understand the concept of Generative Adversarial Networks (*GANs*) and Diffusion Models
- Implement and compare the performance of Diffusion Models and *GANs* in data generation

Module 14. Bio-Inspired Computing

- Introduce the fundamental concepts of bio-inspired computing
- Explore social adaptation algorithms as a key approach in bio-inspired computing
- Analyze space exploration-exploitation strategies in genetic algorithms
- Examine models of evolutionary computation in the context of optimization
- Continue detailed analysis of evolutionary computation models
- Apply evolutionary programming to specific learning problems
- Address the complexity of multi-objective problems in the framework of bio-inspired computing
- Explore the application of neural networks in the field of bio-inspired computing
- Delve into the implementation and usefulness of neural networks in bio-inspired computing

Module 15. Artificial Intelligence: Strategies and Applications

- Develop strategies for the implementation of artificial intelligence in financial services
- Analyze the implications of artificial intelligence in the delivery of healthcare services
- Identify and assess the risks associated with the use of AI in the healthcare field
- Assess the potential risks associated with the use of AI in industry
- Apply artificial intelligence techniques in industry to improve productivity
- Design artificial intelligence solutions to optimize processes in public administration
- Evaluate the implementation of AI technologies in the education sector
- Apply artificial intelligence techniques in forestry and agriculture to improve productivity
- Optimize human resources processes through the strategic use of artificial intelligence

Module 16. Diagnosis in Clinical Practice using AI

- Critically analyze the benefits and limitations of AI in healthcare
- Identify potential pitfalls, providing an informed assessment of its application in clinical settings
- Recognize the importance of collaboration across disciplines to develop effective AI solutions
- Develop competencies to apply AI tools in the clinical context, focusing on aspects such as assisted diagnosis, analysis of medical images and interpretation of results
- Identify possible errors in the application of AI in healthcare, providing an informed view of its use in clinical settings

Module 17. Treatment and Management of Patients with AI

- Interpret results for ethical *datasets* creation and strategic application in health emergencies
- Acquire advanced skills in the presentation, visualization, and management of AI data in healthcare
- Gain a comprehensive perspective of emerging trends and technological innovations in AI applied to healthcare
- Develop AI algorithms for specific applications such as health monitoring, facilitating the effective implementation of solutions in medical practice
- Design and implement individualized medical treatments by analyzing patients' clinical and genomic data with AI

Module 18. Personalization of Healthcare through AI

- Delve into emerging trends in AI applied to personalized health and its future impact
- Define AI applications for customizing medical treatments, ranging from genomic analysis to pain management
- Differentiate specific AI algorithms for the development of applications related to drug design or surgical robotics
- Delimit emerging trends in AI applied to personalized health and its future impact
- Promote innovation by developing strategies to improve health care

Module 19. Analysis of Big Data in the health sector with AI

- Acquire a solid understanding of medical data collection, filtering, and preprocessing
- Develop a clinical approach based on data quality and integrity in the context of privacy regulations
- Apply the acquired knowledge in use cases and practical applications, enabling to understand and solve industry-specific challenges, from text analytics to data visualization and medical information security
- Define Big Data techniques specific to the healthcare sector, including the application of machine learning algorithms for analytics
- Employ Big Data procedures to track and monitor the spread of infectious diseases in real time for effective response to epidemics

Module 20. Ethics and Regulation in Medical AI

- Understand the fundamental ethical principles and legal regulations applicable to the implementation of AI in medicine
- Master the principles of data governance
- Understand international and local regulatory frameworks
- Ensure regulatory compliance in the use of AI data and tools in the healthcare sector
- Develop skills to design human-centered AI systems, promoting equity and transparency in machine learning

Enjoy the most up-to-date educational content available in innovative multimedia formats to optimize your studies"

03

Skills

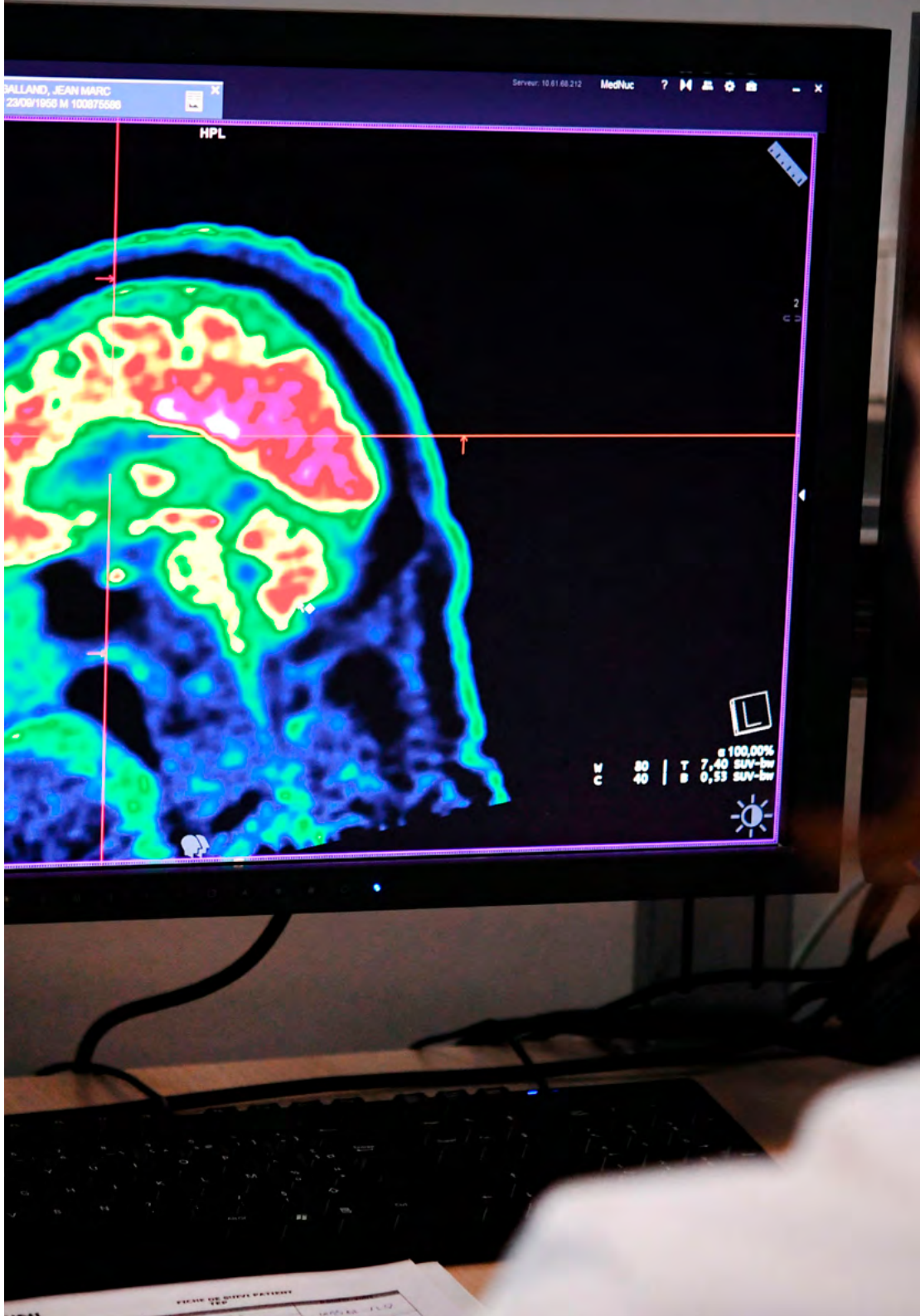
This university degree will provide graduates with an update on the application of AI in the field of Clinical Research.

In this way, experts will be equipped with advanced and practical skills to tackle complex biomedical challenges, from data analysis to simulation of biological processes. It will also provide a comprehensive understanding of cutting-edge technologies such as genomic sequencing and biomedical image analysis. Moreover, they will have a broad knowledge of ethical, legal and regulatory aspects.

AI in Clinical Practice promises to improve the quality of medical care, reduce errors and open new frontiers for personalized medicine and biomedical research"

General Skills

- Master data mining techniques, including complex data selection, preprocessing and transformation
- Design and develop intelligent systems capable of learning and adapting to changing environments
- Control machine learning tools and their application in data mining for decision making
- Employ Autoencoders, GANs and Diffusion Models to solve specific challenges in Artificial Intelligence
- Implement an encoder-decoder network for neural machine translation
- Apply the fundamental principles of neural networks in solving specific problems
- Use AI tools, platforms and techniques, from data analysis to the application of neural networks and predictive modeling
- Apply computational models to simulate biological processes and treatment responses, using AI to improve understanding of complex biomedical phenomena
- Face contemporary challenges in the biomedical field, including the efficient management of clinical trials and the application of AI in immunology



Specific Skills

- Apply AI techniques and strategies to improve efficiency in the *retail* sector
- Delve into understanding and application of genetic algorithms
- Implement noise removal techniques using automatic encoders
- Effectively create training data sets for natural language processing (NLP) tasks
- Run grouping layers and their use in *Deep Computer Vision* models with Keras
- Use *TensorFlow* features and graphics to optimize the performance of custom models
- Optimize the development and application of *chatbots* and virtual assistants, understanding their operation and potential applications
- Master reuse of pre-workout layers to optimize and accelerate the training process
- Build the first neural network, applying the concepts learned in practice
- Activate Multilayer Perceptron (MLP) using the Keras library
- Apply data scanning and preprocessing techniques, identifying and preparing data for effective use in machine learning models
- Implement effective strategies for handling missing values in datasets, applying imputation or elimination methods according to context
- Investigate languages and software for the creation of ontologies, using specific tools for the development of semantic models
- Develop data cleaning techniques to ensure the quality and accuracy of the information used in subsequent analyses
- Master the AI tools, platforms and techniques, from data analysis to the application of neural networks and predictive modeling
- Apply computational models in the simulation of biological processes, diseases and responses to treatments, using AI tools to improve the understanding and representation of complex biomedical phenomena
- Apply genome sequencing and data analysis technologies with AI intelligence
- Use AI in biomedical image analysis
- Acquire skills in advanced visualization and effective communication of complex data, with a focus on the development of AI-based tools

04

Course Management

In order to offer quality training with a high educational level, TECH brings together prestigious professionals with extensive experience in AI in Clinical Practice. In this sense, the program is characterized by having a teaching staff that provides the most exclusive and complete syllabus of the academic market. As such, they have designed each module with the highest degree of specificity, allowing the student to consolidate and develop their skills to the maximum. Therefore, they will have the guarantees they demand to specialize and evolve towards their professional success.

An experienced teaching group will guide you throughout the learning process and resolve any doubts that may arise"

Management

Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometeus Global Solutions
- CTO at Korporate Technologies
- CTO at AI Shephers GmbH
- Consultant and Strategic Business Advisor at Alliance Medical
- Director of Design and Development at DocPath
- PhD in Computer Engineering from the University of Castilla-La Mancha
- PhD in Economics, Business and Finance from the Camilo José Cela University
- PhD in Psychology from University of Castilla La Mancha
- Master's Degree in Executive MBA from the Isabel I University
- Master's Degree in Sales and Marketing Management, Isabel I University
- Master's Degree in Expert in Big Data by Hadoop Training
- Master's Degree in Advanced Information Technologies from the University of Castilla La Mancha
- Member of: SMILE Research Group

Mr. Martín-Palomino Sahagún, Fernando

- Chief Technology Officer and R+D+i Director at AURA Diagnostics (medTech)
- Business Development at SARLIN
- Chief Operating Officer at Alliance Diagnostics
- Chief Innovation Officer at Alliance Medical
- Chief Information Officer at Alliance Medical
- Field Engineer & Project Management in Digital Radiology at Kodak
- MBA from Polytechnic University of Madrid
- Executive Master's Degree in Marketing and Sales at ESADE
- Telecommunications Engineer from the University Alfonso X El Sabio

Professors

Dr. Carrasco González, Ramón Alberto

- Specialist in Computer Science and Artificial Intelligence
- Researcher
- Head of Business Intelligence (Marketing) at the Caja General de Ahorros de Granada and Banco Mare Nostrum
- Head of Information Systems (Data Warehousing and Business Intelligence) at Caja General de Ahorros de Granada and Banco Mare Nostrum
- Doctor in Artificial Intelligence by the University of Granada
- Higher Engineering Degree in Computer Science from the University of Granada

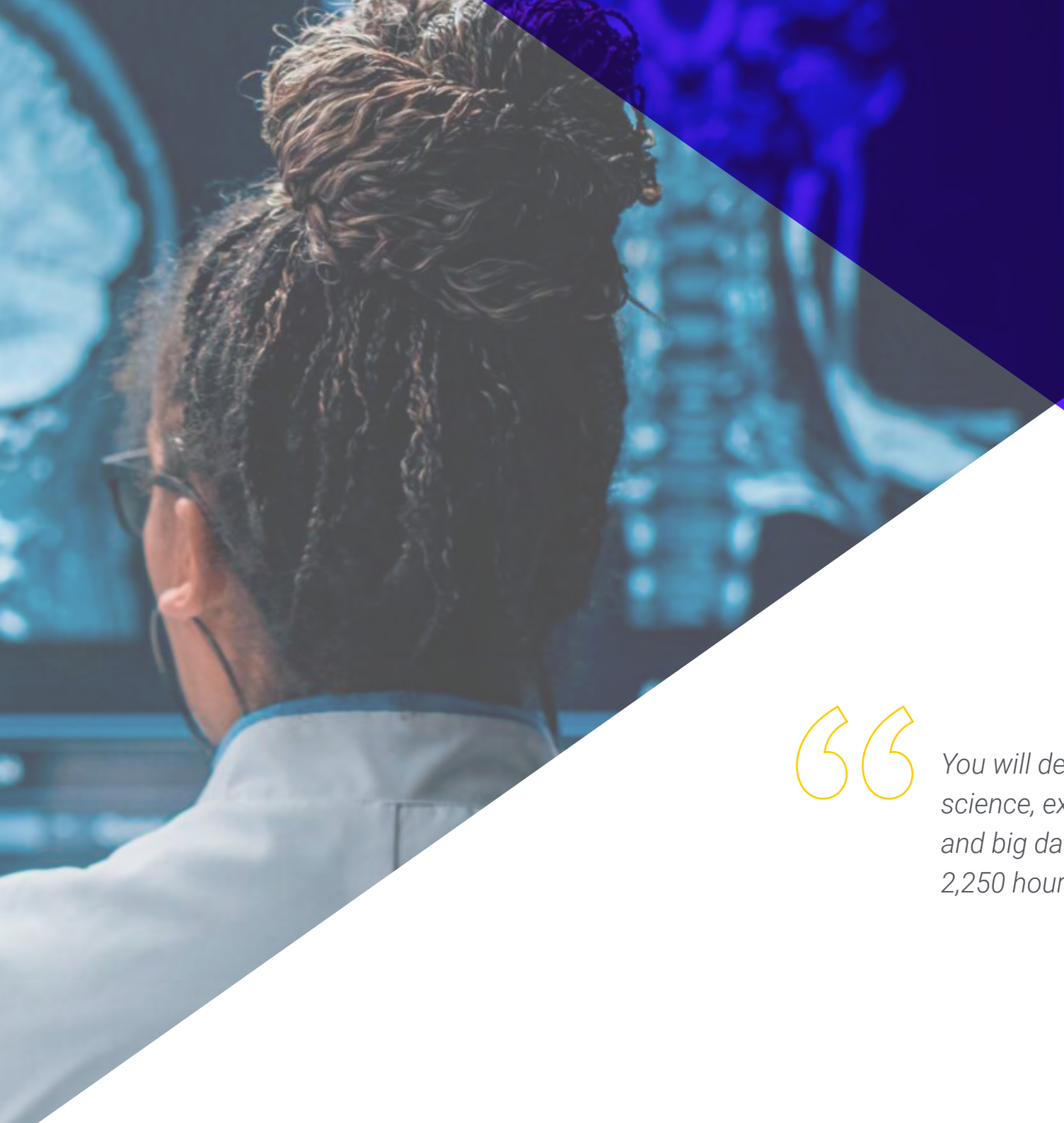
Mr. Popescu Radu, Daniel Vasile

- Independent Specialist in Pharmacology, Nutrition and Dietetics
- Freelance Producer of Teaching and Scientific Content
- Nutritionist and Community Dietitian
- Community Pharmacist
- Researcher
- Master's Degree in Nutrition and Health at the Open University of Catalonia
- Master's Degree in Psychopharmacology from the University of Valencia
- Pharmacist from the Complutense University of Madrid
- Nutritionist-Dietitian by the European University Miguel de Cervantes

05

Structure and Content

This academic degree merges the scientific rigor of Clinical Research with the disruptive innovations of Machine Learning. Made up of 20 modules, this program will cover everything from the interpretation of medical data to the development of predictive algorithms and the implementation of technological solutions in clinical settings. The syllabus will offer content that combines theory and practice, laying the foundations of AI and its specific application in the medical field. In this way, graduates will be prepared to lead advances in the personalization of treatments and the optimization of healthcare



You will delve into health data science, exploring biostatistics and big data analytics through 2,250 hours of innovative content"

Module 1. Fundamentals of Artificial Intelligence

1.1. History of Artificial Intelligence
- 1.1.1. When Do We Start Talking About Artificial Intelligence?
- 1.1.2. References in Film
- 1.1.3. Importance of Artificial Intelligence
- 1.1.4. Technologies that Enable and Support Artificial Intelligence

1.2. Artificial Intelligence in Games
- 1.2.1. Game Theory
- 1.2.2. Minimax and Alpha-Beta Pruning
- 1.2.3. Simulation: Monte Carlo

1.3. Neural Networks
- 1.3.1. Biological Fundamentals
- 1.3.2. Computational Model
- 1.3.3. Supervised and Unsupervised Neural Networks
- 1.3.4. Simple Perceptron
- 1.3.5. Multilayer Perceptron

1.4. Genetic Algorithms
- 1.4.1. History
- 1.4.2. Biological Basis
- 1.4.3. Problem Coding
- 1.4.4. Generation of the Initial Population
- 1.4.5. Main Algorithm and Genetic Operators
- 1.4.6. Evaluation of Individuals: Fitness

1.5. Thesauri, Vocabularies, Taxonomies
- 1.5.1. Vocabulary
- 1.5.2. Taxonomy
- 1.5.3. Thesauri
- 1.5.4. Ontologies
- 1.5.5. Knowledge Representation: Semantic Web

1.6. Semantic Web
- 1.6.1. Specifications RDF, RDFS and OWL
- 1.6.2. Inference/Reasoning
- 1.6.3. *Linked Data*

1.7. Expert Systems and DSS
- 1.7.1. Expert Systems
- 1.7.2. Decision Support Systems

1.8. Chatbots and Virtual Assistants
- 1.8.1. Types of Assistants: Voice and Text Assistants
- 1.8.2. Fundamental Parts for the Development of an Assistant: Intents, Entities and Dialog Flow
- 1.8.3. Integrations: Web, Slack, WhatsApp, Facebook
- 1.8.4. Assistant Development Tools: *Dialog Flow*, *Watson Assistant*

1.9. AI Implementation Strategy

1.10. Future of Artificial Intelligence
- 1.10.1. Understand How to Detect Emotions Using Algorithms
- 1.10.2. Creating a Personality: Language, Expressions and Content
- 1.10.3. Trends of Artificial Intelligence
- 1.10.4. Reflections

Module 2. Data Types and Life Cycle

2.1. Statistics
- 2.1.1. Statistics: Descriptive Statistics, Statistical Inferences
- 2.1.2. Population, Sample, Individual
- 2.1.3. Variables: Definition, Measurement Scales

2.2. Types of Data Statistics
- 2.2.1. According to Type
  - 2.2.1.1. Quantitative: Continuous Data and Discrete Data
  - 2.2.1.2. Qualitative. Binomial Data, Nominal Data and Ordinal Data
- 2.2.2. According to their Shape
  - 2.2.2.1. Numeric
  - 2.2.2.2. Text
  - 2.2.2.3. Logical
- 2.2.3. According to its Source
  - 2.2.3.1. Primary
  - 2.2.3.2. Secondary

2.3. Life Cycle of Data
- 2.3.1. Stages of the Cycle
- 2.3.2. Milestones of the Cycle
- 2.3.3. FAIR Principles

2.4. Initial Stages of the Cycle
- 2.4.1. Definition of Goals
- 2.4.2. Determination of Resource Requirements
- 2.4.3. Gantt Chart
- 2.4.4. Data Structure

2.5. Data Collection
- 2.5.1. Methodology of Data Collection
- 2.5.2. Data Collection Tools
- 2.5.3. Data Collection Channels

2.6. Data Cleaning
- 2.6.1. Phases of Data Cleansing
- 2.6.2. Data Quality
- 2.6.3. Data Manipulation (with R)

2.7. Data Analysis, Interpretation and Evaluation of Results
- 2.7.1. Statistical Measures
- 2.7.2. Relationship Indexes
- 2.7.3. Data Mining

2.8. Datawarehouse
- 2.8.1. Elements that Comprise it
- 2.8.2. Design
- 2.8.3. Aspects to Consider

2.9. Data Availability
- 2.9.1. Access
- 2.9.2. Uses
- 2.9.3. Security

2.10. Regulatory Framework
- 2.10.1. Data Protection Law
- 2.10.2. Good Practices
- 2.10.3. Other Regulatory Aspects

Module 3. Data in Artificial Intelligence

3.1. Data Science
- 3.1.1. Data Science
- 3.1.2. Advanced Tools for Data Scientists

3.2. Data, Information and Knowledge
- 3.2.1. Data, Information and Knowledge
- 3.2.2. Types of Data
- 3.2.3. Data Sources

3.3. From Data to Information
- 3.3.1. Data Analysis
- 3.3.2. Types of Analysis
- 3.3.3. Extraction of Information from a Dataset

3.4. Extraction of Information Through Visualization
- 3.4.1. Visualization as an Analysis Tool
- 3.4.2. Visualization Methods
- 3.4.3. Visualization of a Data Set

3.5. Data Quality
- 3.5.1. Quality Data
- 3.5.2. Data Cleaning
- 3.5.3. Basic Data Pre-Processing

3.6. *Dataset*
- 3.6.1. Dataset Enrichment
- 3.6.2. The Curse of Dimensionality
- 3.6.3. Modification of Our Data Set

3.7. Unbalance
- 3.7.1. Classes of Unbalance
- 3.7.2. Unbalance Mitigation Techniques
- 3.7.3. Balancing a Dataset

3.8. Unsupervised Models
- 3.8.1. Unsupervised Model
- 3.8.2. Methods
- 3.8.3. Classification with Unsupervised Models

3.9. Supervised Models
- 3.9.1. Supervised Model
- 3.9.2. Methods
- 3.9.3. Classification with Supervised Models

3.10. Tools and Good Practices
- 3.10.1. Good Practices for Data Scientists
- 3.10.2. The Best Model
- 3.10.3. Useful Tools

Module 4. Data Mining. Selection, Pre-Processing and Transformation

4.1. Statistical Inference
- 4.1.1. Descriptive Statistics vs. Statistical Inference
- 4.1.2. Parametric Procedures
- 4.1.3. Non-Parametric Procedures

4.2. Exploratory Analysis
- 4.2.1. Descriptive Analysis
- 4.2.2. Visualization
- 4.2.3. Data Preparation

4.3. Data Preparation
- 4.3.1. Integration and Data Cleaning
- 4.3.2. Normalization of Data
- 4.3.3. Transforming Attributes

4.4. Missing Values
- 4.4.1. Treatment of Missing Values
- 4.4.2. Maximum Likelihood Imputation Methods
- 4.4.3. Missing Value Imputation Using Machine Learning

4.5. Noise in the Data
- 4.5.1. Noise Classes and Attributes
- 4.5.2. Noise Filtering
- 4.5.3. The Effect of Noise

4.6. The Curse of Dimensionality
- 4.6.1. *Oversampling*
- 4.6.2. *Undersampling*
- 4.6.3. Multidimensional Data Reduction

4.7. From Continuous to Discrete Attributes
- 4.7.1. Continuous Data Vs. Discreet Data
- 4.7.2. Discretization Process

4.8. The Data
- 4.8.1. Data Selection
- 4.8.2. Prospects and Selection Criteria
- 4.8.3. Selection Methods

4.9. Instance Selection
- 4.9.1. Methods for Instance Selection
- 4.9.2. Prototype Selection
- 4.9.3. Advanced Methods for Instance Selection

4.10. Data Pre-Processing in Big Data Environments

Module 5. Algorithm and Complexity in Artificial Intelligence

5.1. Introduction to Algorithm Design Strategies
- 5.1.1. Recursion
- 5.1.2. Divide and Conquer
- 5.1.3. Other Strategies

5.2. Efficiency and Analysis of Algorithms
- 5.2.1. Efficiency Measures
- 5.2.2. Measuring the Size of the Input
- 5.2.3. Measuring Execution Time
- 5.2.4. Worst, Best and Average Case
- 5.2.5. Asymptotic Notation
- 5.2.6. Criteria for Mathematical Analysis of Non-Recursive Algorithms
- 5.2.7. Mathematical Analysis of Recursive Algorithms
- 5.2.8. Empirical Analysis of Algorithms

5.3. Sorting Algorithms
- 5.3.1. Concept of Sorting
- 5.3.2. Bubble Sorting
- 5.3.3. Sorting by Selection
- 5.3.4. Sorting by Insertion
- 5.3.5. *Merge Sort*
- 5.3.6. *Quick Sort*

5.4. Algorithms with Trees
- 5.4.1. Tree Concept
- 5.4.2. Binary Trees
- 5.4.3. Tree Paths
- 5.4.4. Representing Expressions
- 5.4.5. Ordered Binary Trees
- 5.4.6. Balanced Binary Trees

5.5. Algorithms Using Heaps
- 5.5.1. Heaps
- 5.5.2. The Heapsort Algorithm
- 5.5.3. Priority Queues

5.6. Graph Algorithms
- 5.6.1. Representation
- 5.6.2. Traversal in Width
- 5.6.3. Depth Travel
- 5.6.4. Topological Sorting

5.7. Greedy Algorithms
- 5.7.1. *Greedy* Strategy
- 5.7.2. Elements of the Greedy Strategy
- 5.7.3. Currency Exchange
- 5.7.4. Traveler's Problem
- 5.7.5. Backpack Problem

5.8. Minimal Path Finding
- 5.8.1. The Minimum Path Problem
- 5.8.2. Negative Arcs and Cycles
- 5.8.3. Dijkstra's Algorithm

5.9. Greedy Algorithms on Graphs
- 5.9.1. The Minimum Covering Tree
- 5.9.2. Prim's Algorithm
- 5.9.3. Kruskal's Algorithm
- 5.9.4. Complexity Analysis

5.10. *Backtracking*
- 5.10.1. Backtracking
- 5.10.2. Alternative Techniques

Module 6. Intelligent Systems

6.1. Agent Theory
- 6.1.1. Concept History
- 6.1.2. Agent Definition
- 6.1.3. Agents in Artificial Intelligence
- 6.1.4. Agents in Software Engineering

6.2. Agent Architectures
- 6.2.1. The Reasoning Process of an Agent
- 6.2.2. Reactive Agents
- 6.2.3. Deductive Agents
- 6.2.4. Hybrid Agents
- 6.2.5. Comparison

6.3. Information and Knowledge
- 6.3.1. Difference between Data, Information and Knowledge
- 6.3.2. Data Quality Assessment
- 6.3.3. Data Collection Methods
- 6.3.4. Information Acquisition Methods
- 6.3.5. Knowledge Acquisition Methods

6.4. Knowledge Representation
- 6.4.1. The Importance of Knowledge Representation
- 6.4.2. Definition of Knowledge Representation According to Roles
- 6.4.3. Knowledge Representation Features

6.5. Ontologies
- 6.5.1. Introduction to Metadata
- 6.5.2. Philosophical Concept of Ontology
- 6.5.3. Computing Concept of Ontology
- 6.5.4. Domain Ontologies and Higher-Level Ontologies
- 6.5.5. How to Build an Ontology?

6.6. Ontology Languages and Ontology Creation Software
- 6.6.1. Triple RDF, *Turtle* and N
- 6.6.2. RDF *Schema*
- 6.6.3. OWL
- 6.6.4. SPARQL
- 6.6.5. Introduction to Ontology Creation Tools
- 6.6.6. Installing and Using Protégé

6.7. Semantic Web
- 6.7.1. Current and Future Status of the Semantic Web
- 6.7.2. Semantic Web Applications

6.8. Other Knowledge Representation Models
- 6.8.1. Vocabulary
- 6.8.2. Global Vision
- 6.8.3. Taxonomy
- 6.8.4. Thesauri
- 6.8.5. Folksonomy
- 6.8.6. Comparison
- 6.8.7. Mind Maps

6.9. Knowledge Representation Assessment and Integration
- 6.9.1. Zero-Order Logic
- 6.9.2. First-Order Logic
- 6.9.3. Descriptive Logic
- 6.9.4. Relationship between Different Types of Logic
- 6.9.5. Prolog: Programming Based on First-Order Logic

6.10. Semantic Reasoners, Knowledge-Based Systems and Expert Systems
- 6.10.1. Concept of Reasoner
- 6.10.2. Reasoner Applications
- 6.10.3. Knowledge-Based Systems
- 6.10.4. MYCIN: History of Expert Systems
- 6.10.5. Expert Systems Elements and Architecture
- 6.10.6. Creating Expert Systems

Module 7. Machine Learning and Data Mining

7.1. Introduction to Knowledge Discovery Processes and Basic Concepts of Machine Learning
- 7.1.1. Key Concepts of Knowledge Discovery Processes
- 7.1.2. Historical Perspective of Knowledge Discovery Processes
- 7.1.3. Stages of the Knowledge Discovery Processes
- 7.1.4. Techniques Used in Knowledge Discovery Processes
- 7.1.5. Characteristics of Good Machine Learning Models
- 7.1.6. Types of Machine Learning Information
- 7.1.7. Basic Learning Concepts
- 7.1.8. Basic Concepts of Unsupervised Learning

7.2. Data Exploration and Pre-processing
- 7.2.1. Data Processing
- 7.2.2. Data Processing in the Data Analysis Flow
- 7.2.3. Types of Data
- 7.2.4. Data Transformations
- 7.2.5. Visualization and Exploration of Continuous Variables
- 7.2.6. Visualization and Exploration of Categorical Variables
- 7.2.7. Correlation Measures
- 7.2.8. Most Common Graphic Representations
- 7.2.9. Introduction to Multivariate Analysis and Dimensionality Reduction

7.3. Decision Trees
- 7.3.1. ID Algorithm
- 7.3.2. C Algorithm
- 7.3.3. Overtraining and Pruning
- 7.3.4. Result Analysis

7.4. Evaluation of Classifiers
- 7.4.1. Confusion Matrixes
- 7.4.2. Numerical Evaluation Matrixes
- 7.4.3. Kappa Statistic
- 7.4.4. ROC Curves

7.5. Classification Rules
- 7.5.1. Rule Evaluation Measures
- 7.5.2. Introduction to Graphic Representation
- 7.5.3. Sequential Overlay Algorithm

7.6. Neural Networks
- 7.6.1. Basic Concepts
- 7.6.2. Simple Neural Networks
- 7.6.3. Backpropagation Algorithm
- 7.6.4. Introduction to Recurrent Neural Networks

7.7. Bayesian Methods
- 7.7.1. Basic Probability Concepts
- 7.7.2. Bayes' Theorem
- 7.7.3. Naive Bayes
- 7.7.4. Introduction to Bayesian Networks

7.8. Regression and Continuous Response Models
- 7.8.1. Simple Linear Regression
- 7.8.2. Multiple Linear Regression
- 7.8.3. Logistic Regression
- 7.8.4. Regression Trees
- 7.8.5. Introduction to Support Vector Machines (SVM)
- 7.8.6. Goodness-of-Fit Measures

7.9. *Clustering*
- 7.9.1. Basic Concepts
- 7.9.2. Hierarchical Clustering
- 7.9.3. Probabilistic Methods
- 7.9.4. EM Algorithm
- 7.9.5. B-Cubed Method
- 7.9.6. Implicit Methods

7.10. Text Mining and Natural Language Processing (NLP)
- 7.10.1. Basic Concepts
- 7.10.2. Corpus Creation
- 7.10.3. Descriptive Analysis
- 7.10.4. Introduction to Feelings Analysis

Module 8. Neural Networks, the Basis of Deep Learning

8.1. Deep Learning
- 8.1.1. Types of Deep Learning
- 8.1.2. Applications of Deep Learning
- 8.1.3. Advantages and Disadvantages of Deep Learning

8.2. Surgery
- 8.2.1. Sum
- 8.2.2. Product
- 8.2.3. Transfer

8.3. Layers
- 8.3.1. Input Layer
- 8.3.2. Cloak
- 8.3.3. Output Layer

8.4. Layer Bonding and Operations
- 8.4.1. Architecture Design
- 8.4.2. Connection between Layers
- 8.4.3. Forward Propagation

8.5. Construction of the first neural network
- 8.5.1. Network Design
- 8.5.2. Establish the Weights
- 8.5.3. Network Training

8.6. Trainer and Optimizer
- 8.6.1. Optimizer Selection
- 8.6.2. Establishment of a Loss Function
- 8.6.3. Establishing a Metric

8.7. Application of the Principles of Neural Networks
- 8.7.1. Activation Functions
- 8.7.2. Backward Propagation
- 8.7.3. Parameter Adjustment

8.8. From Biological to Artificial Neurons
- 8.8.1. Functioning of a Biological Neuron
- 8.8.2. Transfer of Knowledge to Artificial Neurons
- 8.8.3. Establish Relations Between the Two

8.9. Implementation of MLP (Multilayer Perceptron) with Keras
- 8.9.1. Definition of the Network Structure
- 8.9.2. Model Compilation
- 8.9.3. Model Training

8.10. *Fine Tuning* Hyperparameters of Neural Networks
- 8.10.1. Selection of the Activation Function
- 8.10.2. Set the *Learning* Rate
- 8.10.3. Adjustment of Weights

Module 9. Deep Neural Networks Training

9.1. Gradient Problems
- 9.1.1. Gradient Optimization Techniques
- 9.1.2. Stochastic Gradients
- 9.1.3. Weight Initialization Techniques

9.2. Reuse of Pre-Trained Layers
- 9.2.1. Learning Transfer Training
- 9.2.2. Feature Extraction
- 9.2.3. Deep Learning

9.3. Optimizers
- 9.3.1. Stochastic Gradient Descent Optimizers
- 9.3.2. Optimizers Adam and RMSprop
- 9.3.3. Moment Optimizers

9.4. Learning Rate Programming
- 9.4.1. Automatic Learning Rate Control
- 9.4.2. Learning Cycles
- 9.4.3. Smoothing Terms

9.5. Overfitting
- 9.5.1. Cross Validation
- 9.5.2. Regularization
- 9.5.3. Evaluation Metrics

9.6. Practical Guidelines
- 9.6.1. Model Design
- 9.6.2. Selection of Metrics and Evaluation Parameters
- 9.6.3. Hypothesis Testing

9.7. *Transfer Learning*
- 9.7.1. Learning Transfer Training
- 9.7.2. Feature Extraction
- 9.7.3. Deep Learning

9.8. *Data Augmentation*
- 9.8.1. Image Transformations
- 9.8.2. Synthetic Data Generation
- 9.8.3. Text Transformation

9.9. Practical Application of Transfer Learning
- 9.9.1. Learning Transfer Training
- 9.9.2. Feature Extraction
- 9.9.3. Deep Learning

9.10. Regularization
- 9.10.1. L and L
- 9.10.2. Regularization by Maximum Entropy
- 9.10.3. *Dropout*

Module 10. Model Customization and Training with TensorFlow

10.1. *TensorFlow*
- 10.1.1. Use of the TensorFlow Library
- 10.1.2. Model Training with TensorFlow
- 10.1.3. Operations with Graphs in TensorFlow

10.2. *TensorFlow* and NumPy
- 10.2.1. NumPy Computing Environment for *TensorFlow*
- 10.2.2. Using NumPy Arrays with *TensorFlow*
- 10.2.3. NumPy Operations for *TensorFlow* Graphs

10.3. Model Customization and Training Algorithms
- 10.3.1. Building Custom Models with TensorFlow
- 10.3.2. Management of Training Parameters
- 10.3.3. Use of Optimization Techniques for Training

10.4. TensorFlow Features and Graphs
- 10.4.1. Functions with *TensorFlow*
- 10.4.2. Use of Graphs for Model Training
- 10.4.3. Grap Optimization with *TensorFlow* Operations

10.5. Loading and Preprocessing Data with TensorFlow
- 10.5.1. Loading Data Sets with *TensorFlow*
- 10.5.2. Preprocessing Data with TensorFlow
- 10.5.3. Using TensorFlow Tools for Data Manipulation

10.6. The tf.data API
- 10.6.1. Using the *tf.data*API for Data Processing
- 10.6.2. Construction of Data Streams with tf.data
- 10.6.3. Using the tf.data API for Model Training

10.7. The *TFRecord* Format
- 10.7.1. Using the TFRecord API for Data Serialization
- 10.7.2. TFRecord File Upload with TensorFlow
- 10.7.3. Using TFRecord Files for Model Training

10.8. Keras Preprocessing Layers
- 10.8.1. Using the Keras Preprocessing API
- 10.8.2. Preprocessing Pipelined Construction with Keras
- 10.8.3. Using the Keras Preprocessing API for Model Training

10.9. The *TensorFlow Datasets* Project
- 10.9.1. Using *TensorFlow Datasets* for Data Loading
- 10.9.2. Preprocessing Data with TensorFlow Datasets
- 10.9.3. Using *TensorFlow Datasets* for Model Training

10.10. Building a Deep *Learning* App with *TensorFlow*
- 10.10.1. Practical Applications
- 10.10.2. Building a Deep *Learning* App with *TensorFlow*
- 10.10.3. Model Training with TensorFlow
- 10.10.4. Use of the Application for the Prediction of Results

Module 11. Deep Computer Vision with Convolutional Neural Networks

11.1. The Visual Cortex Architecture
- 11.1.1. Functions of the Visual Cortex
- 11.1.2. Theories of Computational Vision
- 11.1.3. Models of Image Processing

11.2. Convolutional Layers
- 11.2.1. Reuse of Weights in Convolution
- 11.2.2. Convolution D
- 11.2.3. Activation Functions

11.3. Grouping Layers and Implementation of Grouping Layers with Keras
- 11.3.1. Pooling and Striding
- 11.3.2. *Flattening*
- 11.3.3. Types of Pooling

11.4. CNN Architecture
- 11.4.1. VGG Architecture
- 11.4.2. AlexNet Architecture
- 11.4.3. ResNet Architecture

11.5. Implementing a CNN ResNet- using Keras
- 11.5.1. Weight Initialization
- 11.5.2. Input Layer Definition
- 11.5.3. Output Definition

11.6. Use of Pre-trained Keras Models
- 11.6.1. Characteristics of Pre-trained Models
- 11.6.2. Uses of Pre-trained Models
- 11.6.3. Advantages of Pre-trained Models

11.7. Pre-trained Models for Transfer Learning
- 11.7.1. Learning by Transfer
- 11.7.2. Transfer Learning Process
- 11.7.3. Advantages of Transfer Learning

11.8. Deep Computer Vision Classification and Localization
- 11.8.1. Image Classification
- 11.8.2. Localization of Objects in Images
- 11.8.3. Object Detection

11.9. Object Detection and Object Tracking
- 11.9.1. Object Detection Methods
- 11.9.2. Object Tracking Algorithms
- 11.9.3. Tracking and Localization Techniques

11.10. Semantic Segmentation
- 11.10.1. Deep Learning for Semantic Segmentation
- 11.10.2. Edge Detection
- 11.10.3. Rule-based Segmentation Methods

Module 12. Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention

12.1. Text Generation using RNN
- 12.1.1. Training an RNN for Text Generation
- 12.1.2. Natural Language Generation with RNN
- 12.1.3. Text Generation Applications with RNN

12.2. Training Data Set Creation
- 12.2.1. Preparation of the Data for Training an RNN
- 12.2.2. Storage of the Training Dataset
- 12.2.3. Data Cleaning and Transformation
- 12.2.4. Sentiment Analysis

12.3. Classification of Opinions with RNN
- 12.3.1. Detection of Themes in Comments
- 12.3.2. Sentiment Analysis with Deep Learning Algorithms

12.4. Encoder-Decoder Network for Neural Machine Translation
- 12.4.1. Training an RNN for Machine Translation
- 12.4.2. Use of an Encoder-Decoder Network for Machine Translation
- 12.4.3. Improving the Accuracy of Machine Translation with RNNs

12.5. Attention Mechanisms
- 12.5.1. Application of Care Mechanisms in RNN
- 12.5.2. Use of Care Mechanisms to Improve the Accuracy of the Models
- 12.5.3. Advantages of Attention Mechanisms in Neural Networks

12.6. Transformer Models
- 12.6.1. Using Transformers Models for Natural Language Processing
- 12.6.2. Application of *Transformers* Models for Vision
- 12.6.3. Advantages of Transformers Models

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

12.8. *Hugging Face's Transformers*Bookstore
- 12.8.1. Using the Hugging Face's Transformers Library
- 12.8.2. *Hugging Face´s Transformers* Library Application
- 12.8.3. Advantages of *Hugging Face´s Transformers* Library

12.9. Other Transformers Libraries. Comparison
- 12.9.1. Comparison Between Different Transformers Libraries
- 12.9.2. Use of the Other Transformers Libraries
- 12.9.3. Advantages of the Other *Transformers* Libraries

12.10. Development of an NLP Application with RNN and Attention. Practical Application
- 12.10.1. Development of a Natural Language Processing Application with RNN and Attention
- 12.10.2. Use of RNN, Attention Mechanisms and Transformers Models in the Application
- 12.10.3. Evaluation of the Practical Application

Module 13. *Autoencoders, GANs* and Diffusion Models

13.1. Representation of Efficient Data
- 13.1.1. Dimensionality Reduction
- 13.1.2. Deep Learning
- 13.1.3. Compact Representations

13.2. PCA Realization with an Incomplete Linear Automatic Encoder
- 13.2.1. Training Process
- 13.2.2. Implementation in Python
- 13.2.3. Use of Test Data

13.3. Stacked Automatic Encoders
- 13.3.1. Deep Neural Networks
- 13.3.2. Construction of Coding Architectures
- 13.3.3. Use of Regularization

13.4. Convolutional Autoencoders
- 13.4.1. Design of Convolutional Models
- 13.4.2. Convolutional Model Training
- 13.4.3. Results Evaluation

13.5. Noise Suppression of Autoencoders
- 13.5.1. Filter Application
- 13.5.2. Design of Coding Models
- 13.5.3. Use of Regularization Techniques

13.6. Sparse Automatic Encoders
- 13.6.1. Increasing Coding Efficiency
- 13.6.2. Minimizing the Number of Parameters
- 13.6.3. Using Regularization Techniques

13.7. Variational Automatic Encoders
- 13.7.1. Use of Variational Optimization
- 13.7.2. Unsupervised Deep Learning
- 13.7.3. Deep Latent Representations

13.8. Generation of Fashion MNIST Images
- 13.8.1. Pattern Recognition
- 13.8.2. Image Generation
- 13.8.3. Deep Neural Networks Training

13.9. Generative Adversarial Networks and Diffusion Models
- 13.9.1. Content Generation from Images
- 13.9.2. Modeling of Data Distributions
- 13.9.3. Use of Adversarial Networks

13.10. Implementation of the Models
- 13.10.1. Practical Application
- 13.10.2. Implementation of the Models
- 13.10.3. Use of Real Data
- 13.10.4. Results Evaluation

Module 14. Bio-Inspired Computing

14.1. Introduction to Bio-Inspired Computing
- 14.1.1. Introduction to Bio-Inspired Computing

14.2. Social Adaptation Algorithms
- 14.2.1. Bio-Inspired Computation Based on Ant Colonies
- 14.2.2. Variants of Ant Colony Algorithms
- 14.2.3. Particle Cloud Computing

14.3. Genetic Algorithms
- 14.3.1. General Structure
- 14.3.2. Implementations of the Major Operators

14.4. Space Exploration-Exploitation Strategies for Genetic Algorithms
- 14.4.1. CHC Algorithm
- 14.4.2. Multimodal Problems

14.5. Evolutionary Computing Models (I)
- 14.5.1. Evolutionary Strategies
- 14.5.2. Evolutionary Programming
- 14.5.3. Algorithms Based on Differential Evolution

14.6. Evolutionary Computation Models (II)
- 14.6.1. Evolutionary Models Based on Estimation of Distributions (EDA)
- 14.6.2. Genetic Programming

14.7. Evolutionary Programming Applied to Learning Problems
- 14.7.1. Rules-Based Learning
- 14.7.2. Evolutionary Methods in Instance Selection Problems

14.8. Multi-Objective Problems
- 14.8.1. Concept of Dominance
- 14.8.2. Application of Evolutionary Algorithms to Multi-Objective Problems

14.9. Neural Networks (I)
- 14.9.1. Introduction to Neural Networks
- 14.9.2. Practical Example with Neural Networks

14.10. Neural Networks (II)
- 14.10.1. Use Cases of Neural Networks in Medical Research
- 14.10.2. Use Cases of Neural Networks in Economics
- 14.10.3. Use Cases of Neural Networks in Artificial Vision

Module 15. Artificial Intelligence: Strategies and Applications

15.1. Financial Services
- 15.1.1. The implications of Artificial Intelligence (AI) in Financial Services. Opportunities and Challenges
- 15.1.2. Case Uses
- 15.1.3. Potential Risks Related to the Use of AI
- 15.1.4. Potential Future Developments/Uses of AI

15.2. Implications of Artificial Intelligence in the Healthcare Service
- 15.2.1. Implications of AI in the Healthcare Sector. Opportunities and Challenges
- 15.2.2. Case Uses

15.3. Risks Related to the Use of AI in the Health Service
- 15.3.1. Potential Risks Related to the Use of AI
- 15.3.2. Potential Future Developments/Uses of AI

15.4. *Retail*
- 15.4.1. Implications of AI in Retail. Opportunities and Challenges
- 15.4.2. Case Uses
- 15.4.3. Potential Risks Related to the Use of AI
- 15.4.4. Potential Future Developments/Uses of AI

15.5. Industry
- 15.5.1. Implications of AI in Industry. Opportunities and Challenges
- 15.5.2. Case Uses

15.6. Potential Risks Related to the Use of AI in Industry
- 15.6.1. Case Uses
- 15.6.2. Potential Risks Related to the Use of AI
- 15.6.3. Potential Future Developments/Uses of AI

15.7. Public Administration
- 15.7.1. AI Implications for Public Administration. Opportunities and Challenges
- 15.7.2. Case Uses
- 15.7.3. Potential Risks Related to the Use of AI
- 15.7.4. Potential Future Developments/Uses of AI

15.8. Education
- 15.8.1. AI Implications for Education. Opportunities and Challenges
- 15.8.2. Case Uses
- 15.8.3. Potential Risks Related to the Use of AI
- 15.8.4. Potential Future Developments/Uses of AI

15.9. Forestry and Agriculture
- 15.9.1. Implications of AI in Forestry and Agriculture. Opportunities and Challenges
- 15.9.2. Case Uses
- 15.9.3. Potential Risks Related to the Use of AI
- 15.9.4. Potential Future Developments/Uses of AI

15.10. Human Resources
- 15.10.1. Implications of AI for Human Resources. Opportunities and Challenges
- 15.10.2. Case Uses
- 15.10.3. Potential Risks Related to the Use of AI
- 15.10.4. Potential Future Developments/Uses of AI

Module 16. Diagnosis in Clinical Practice using AI

16.1. Technologies and Tools for AI-assisted Diagnostics
- 16.1.1. Development of Software for AI-assisted Diagnosis in Different Medical Specialties using ChatGPT
- 16.1.2. Use of Advanced Algorithms for Rapid and Accurate Analysis of Clinical Symptoms and Signs
- 16.1.3. Integration of AI into Diagnostic Devices to Improve Efficiency
- 16.1.4. AI Tools to Assist in the Interpretation of Laboratory Test Results using IBM Watson Health

16.2. Integration of Multimodal Clinical Data for Diagnosis
- 16.2.1. AI Systems to Combine Imaging, Laboratory and Clinical Record Data using AutoML
- 16.2.2. Tools for Correlating Multimodality Data into More Accurate Diagnoses using Enlitic Curie
- 16.2.3. Use of AI to Analyze Complex Patterns from Different Types of Clinical Data using Flatiron Health's OncologyCloud
- 16.2.4. Integration of Genomic and Molecular Data in AI-assisted Diagnosis

16.3. Creation and Analysis of Health Datasets with AI using Google Cloud Healthcare API
- 16.3.1. Development of Clinical Databases for AI Model Training
- 16.3.2. Use of AI for the Analysis and Extraction of Insights from Large Health Datasets
- 16.3.3. AI Tools for Clinical Data Cleaning and Preparation
- 16.3.4. AI Systems for Identifying Trends and Patterns in Health Data

16.4. Visualization and Management of Health Data with AI
- 16.4.1. AI Tools for Interactive and Understandable Visualization of Health Data
- 16.4.2. AI Systems for Efficient Management of Large Volumes of Clinical Data
- 16.4.3. Use of AI-based Dashboards for the Monitoring of Health Indicators
- 16.4.4. AI Technologies for Health Data Management and Security

16.5. Pattern Recognition and Machine Learning in Clinical Diagnostics
- 16.5.1. Application of Machine Learning Techniques for Pattern Recognition in Clinical Data
- 16.5.2. Use of AI in the Early Identification of Diseases through Pattern Analysis using PathAI
- 16.5.3. Development of Predictive Models for More Accurate Diagnoses
- 16.5.4. Implementation of Machine Learning Algorithms in the Interpretation of Health Data

16.6. Interpretation of Medical Images with AI using Aidoc
- 16.6.1. AI Systems for Detection and Classification of Medical Image Anomalies
- 16.6.2. Use of Deep Learning in the Interpretation of X-rays, MRI and CT Scans
- 16.6.3. AI Tools to Improve Accuracy and Speed in Diagnostic Imaging
- 16.6.4. Implementation of AI for Image-based Clinical Decision Support

16.7. Natural Language Processing on Medical Records for Clinical Diagnosis using ChatGPT and Amazon Comprehend Medical
- 16.7.1. Use of NLP for the Extraction of Relevant Information from Medical Records
- 16.7.2. AI Systems for Analyzing Physician Notes and Patient Reports
- 16.7.3. AI Tools for Summarizing and Classifying Medical Record Information
- 16.7.4. Application of NLP in the Identification of Symptoms and Diagnosis from Clinical Texts

16.8. Validation and Evaluation of AI-assisted Diagnostic Models
- 16.8.1. Methods for Validation and Testing of AI Models in Real Clinical Settings
- 16.8.2. Performance and Accuracy Evaluation of AI-Assisted Diagnostic Tools
- 16.8.3. Use of AI to Ensure Reliability and Ethics in Clinical Diagnosis
- 16.8.4. Implementation of Continuous Assessment Protocols for AI Systems in Healthcare

16.9. AI in the Diagnosis of Rare Diseases using Face2Gene
- 16.9.1. Development of AI Systems Specialized in Rare Diseases Identification
- 16.9.2. Use of AI for Analyzing Atypical Patterns and Complex Symptomatology
- 16.9.3. AI Tools for Early and Accurate Diagnosis of Rare Diseases
- 16.9.4. Implementation of Global Databases with AI to Improve Diagnosis of Rare Diseases

16.10. Success Stories and Challenges in AI Diagnostics Implementation
- 16.10.1. Analysis of Case Studies where AI has Significantly Improved Clinical Diagnosis
- 16.10.2. Assessment of Challenges in AI adoption in Clinical Settings
- 16.10.3. Discussion on Ethical and Practical Barriers in the Implementation of AI for Diagnosis
- 16.10.4. Examination of Strategies for Overcoming Obstacles to the Integration of AI in Medical Diagnosis

Module 17. Treatment and Management of Patients with AI

17.1. AI-assisted Treatment Systems
- 17.1.1. Development of AI Systems to Assist in Decision-Making Therapeutics
- 17.1.2. Use of AI for the Personalization of Treatments Based on Individual Profiles
- 17.1.3. Implementation of AI Tools in the Administration of Dosage and Medication Scheduling
- 17.1.4. Integration of AI in Real-Time Monitoring and Adjustment of Treatments

17.2. Definition of Indicators for Monitoring Patient Health Status
- 17.2.1. Establishment of Key Parameters using AI for Patient Health Monitoring
- 17.2.2. Use of AI to Identify Predictive Indicators of Health and Disease
- 17.2.3. Development of Early Warning Systems Based on Health Indicators
- 17.2.4. Implementation of AI for Continuous Assessment of Patient Health Status

17.3. Tools for the Monitoring and Control of Health Indicators
- 17.3.1. Development of AI-enabled Mobile and Wearable Applications for Health Monitoring
- 17.3.2. Implementation of AI Systems for the Real-Time Analysis of Health Data
- 17.3.3. Use of AI-based Dashboards for Visualization and Monitoring of Health Indicators
- 17.3.4. Integration of IoT Devices in the Continuous Monitoring of Health Indicators with AI

17.4. AI in the Planning and Execution of Medical Procedures with Intuitive Surgical's da Vinci Surgical System
- 17.4.1. Use of AI Systems to Optimize the Planning of Surgeries and Medical Procedures
- 17.4.2. Implementation of AI in the Simulation and Practice of Surgical Procedures
- 17.4.3. Using AI to Improve Accuracy and Efficacy in the Execution of Medical Procedures
- 17.4.4. Application of AI in Surgical Resource Coordination and Management

17.5. Machine Learning Algorithms for the Establishment of Therapeutic Treatments
- 17.5.1. Use of Machine Learning to Develop Personalized Treatment Protocols
- 17.5.2. Implementation of Predictive Algorithms for the Selection of Effective Therapies
- 17.5.3. Development of AI Systems for Real-time Tailoring of Treatments
- 17.5.4. Application of AI in the Analysis of the Effectiveness of Different Therapeutic Options

17.6. Adaptability and Continuous Updating of Therapeutic Protocols Using AI with BM Watson for Oncology
- 17.6.1. Implementation of AI Systems for Dynamic Review and Updating of Treatments
- 17.6.2. Use of AI in Adaptation of Therapeutic Protocols to New Findings and Data
- 17.6.3. Development of AI Tools for Continuous Personalization of Treatments
- 17.6.4. Integration of AI in Adaptive Response to Evolving Patient Conditions

17.7. Optimization of Healthcare Services with AI Technology
- 17.7.1. Use of AI to Improve the Efficiency and Quality of Health Care Services
- 17.7.2. Implementation of AI Systems for Healthcare Resource Management
- 17.7.3. Development of AI Tools for Workflow Optimization in Hospitals
- 17.7.4. Application of AI in the Reduction of Waiting Times and Improvement of Patient Care

17.8. Application of AI in the Response to Health Emergencies
- 17.8.1. Implementation of AI Systems for Rapid and Efficient Healthcare Crisis Management with BlueDot
- 17.8.2. Use of AI in Optimizing the Distribution of Resources in Emergencies
- 17.8.3. Development of AI Tools for Disease Outbreak Prediction and Response
- 17.8.4. Integration of AI in Warning and Communication Systems during Health Emergencies

17.9. Interdisciplinary Collaboration in AI-assisted Treatments
- 17.9.1. Promotion of Collaboration between Different Medical Specialties through AI Systems
- 17.9.2. Use of AI to Integrate Knowledge and Techniques from Different Disciplines in Treatment
- 17.9.3. Development of AI Platforms to Facilitate Interdisciplinary Communication and Coordination
- 17.9.4. Implementation of AI in the Creation of Multidisciplinary Treatment Teams

17.10. Successful Experiences of AI in the Treatment of Diseases
- 17.10.1. Analysis of Successful Cases in the Use of AI for Effective Treatment of Diseases
- 17.10.2. Evaluation of the Impact of AI in Improving Treatment Outcomes
- 17.10.3. Documentation of Innovative Experiences in the Use of AI in Different Medical Areas
- 17.10.4. Discussion on the Advances and Challenges in the Implementation of AI in Medical Treatments

Module 18. Personalization of Healthcare through AI

18.1. AI Applications in Genomics for Personalized Medicine with DeepGenomics
- 18.1.1. Development of AI Algorithms for the Analysis of Genetic Sequences and their Relation with Diseases
- 18.1.2. Use of AI in the Identification of Genetic Markers for Personalized Treatments
- 18.1.3. Implementation of AI for the Rapid and Accurate Interpretation of Genomic Data
- 18.1.4. AI Tools in Correlating Genotypes with Drug Responses

18.2. AI in Pharmacogenomics and Drug Design using AtomWise
- 18.2.1. Development of AI Models to Predict Drug Efficacy and Safety
- 18.2.2. Use of AI in the Identification of Therapeutic Targets and Drug Design
- 18.2.3. Application of AI in the Analysis of Gene-Drug Interactions for Treatment Personalization
- 18.2.4. Implementation of AI Algorithms to Accelerate New Drug Discovery

18.3. Personalized Monitoring with Smart Devices and AI
- 18.3.1. Development of Wearables with AI for Continuous Monitoring of Health Indicators
- 18.3.2. Use of AI in the Interpretation of Data Collected by Smart Devices with FitBit
- 18.3.3. Implementation of AI-based Early Warning Systems for Health Conditions
- 18.3.4. AI Tools for the Personalization of Lifestyle and Health Recommendations

18.4. Clinical Decision Support Systems with AI
- 18.4.1. AI Implementation to Assist Physicians in Clinical Decision Making with Oracle Cerner
- 18.4.2. Development of AI Systems that Provide Recommendations Based on Clinical Data
- 18.4.3. Use of AI in the Assessment of Risks and Benefits of Different Therapeutic Options
- 18.4.4. AI Tools for Real-time Health Data Integration and Analysis

18.5. Trends in Health Personalization with AI
- 18.5.1. Analyzing the Latest AI Trends for Healthcare Personalization
- 18.5.2. Use of AI in the Development of Preventive and Predictive Approaches in Health
- 18.5.3. Implementation of AI in Adapting Health Plans to Individual Needs
- 18.5.4. Exploring New AI Technologies in the Field of Personalized Health

18.6. Advances in AI-assisted Surgical Robotics with Intuitive Surgical's da Vinci Surgical System
- 18.6.1. Development of AI-assisted Surgical Robots for Precise and Minimally Invasive Procedures
- 18.6.2. Use of AI to Improve Accuracy and Safety in Robotic-Assisted Surgeries with OncoraMedical
- 18.6.3. Implementation of AI Systems for Surgical Planning and Operative Simulation
- 18.6.4. Advances in the Integration of Tactile and Visual Feedback in Surgical Robotics with AI

18.7. Development of Predictive Models for Personalized Clinical Practice
- 18.7.1. Using AI to Create Predictive Disease Models Based on Individual Data
- 18.7.2. Implementation of AI in Predicting Treatment Responses
- 18.7.3. Development of AI Tools for Anticipating Health Risks
- 18.7.4. Applying Predictive Models in the Planning of Preventive Interventions

18.8. AI in Personalized Pain Management and Treatment with Kaia Health
- 18.8.1. Development of AI Systems for Personalized Pain Assessment and Management
- 18.8.2. Use of AI in Identifying Pain Patterns and Responses to Treatments
- 18.8.3. Implementation of AI Tools in the Personalization of Pain Therapies
- 18.8.4. Application of AI in Monitoring and Adjusting Pain Treatment Plans

18.9. Patient Autonomy and Active Participation in Personalization
- 18.9.1. Promoting Patient Autonomy through AI Tools for Managing Patient Health with Ada Health
- 18.9.2. Development of AI Systems that Empower Patients in Decision Making
- 18.9.3. Using AI to Provide Personalized Information and Education to Patients
- 18.9.4. AI Tools that Facilitate Active Patient Participation in Treatment

18.10. Integration of AI in Electronic Medical Records with Oracle Cerner
- 18.10.1. AI Implementation for Efficient Analysis and Management of Electronic Medical Records
- 18.10.2. Development of AI Tools for Extracting Clinical Insights from Electronic Records
- 18.10.3. Using AI to Improve Accuracy and Accessibility of Data in Medical Records
- 18.10.4. Application of AI for the Correlation of Clinical History Data with Treatment Plans

Module 19. Analysis of Big Data in the Healthcare Sector with AI

19.1. Fundamentals of Big Data in Healthcare
- 19.1.1. The Explosion of Data in the Field of Healthcare
- 19.1.2. Concept of Big Data and Main Tools
- 19.1.3. Applications of Big Data in Healthcare

19.2. Text Processing and Analysis in Health Data with KNIME and Python
- 19.2.1. Concepts of Natural Language Processing
- 19.2.2. Embedding Techniques
- 19.2.3. Application of Natural Language Processing in Healthcare

19.3. Advanced Methods for Data Retrieval in Healthcare with KNIME and Python
- 19.3.1. Exploration of Innovative Techniques for Efficient Data Retrieval in Healthcare
- 19.3.2. Development of Advanced Strategies for Extracting and Organizing Information in Healthcare Settings
- 19.3.3. Implementation of Adaptive and Personalized Data Retrieval Methods for Diverse Clinical Contexts

19.4. Quality Assessment in Health Data Analysis with KNIME and Phyton
- 19.4.1. Development of Indicators for Rigorous Assessment of Data Quality in Healthcare Settings
- 19.4.2. Implementation of Tools and Protocols for Quality Assurance of Data Used in Clinical Analyses
- 19.4.3. Continuous Assessment of the Accuracy and Reliability of Results in Health Data Analysis Projects

19.5. Data Mining and Machine Learning in Healthcare with KNIME and Phyton
- 19.5.1. Main Methodologies for Data Mining
- 19.5.2. Health Data Integration
- 19.5.3. Detection of Patterns and Anomalies in Health Data

19.6. Innovative Areas of Big Data and AI in Healthcare
- 19.6.1. Exploring New Frontiers in the Application of Big Data and AI to Transform the Healthcare Sector
- 19.6.2. Identifying Innovative Opportunities for the Integration of Big Data and AI Technologies in Medical Practices
- 19.6.3. Development of Cutting-edge Approaches to Maximize the Potential of Big Data and AI in Healthcare

19.7. Medical Data Collection and Preprocessing with KNIME and Phyton
- 19.7.1. Development of Efficient Methodologies for Medical Data Collection in Clinical and Research Settings
- 19.7.2. Implementation of Advanced Preprocessing Techniques to Optimize Medical Data Quality and Utility
- 19.7.3. Design of Collection and Preprocessing Strategies that Guarantee the Confidentiality and Privacy of Medical Information

19.8. Data Visualization and Health Communication with Tools such as PowerBI and Python
- 19.8.1. Design of Innovative Visualization Tools in Healthcare
- 19.8.2. Creative Communication Strategies in Healthcare
- 19.8.3. Integration of Interactive Technologies in Healthcare

19.9. Data Security and Governance in the Healthcare Sector
- 19.9.1. Development of Comprehensive Data Security Strategies to Protect Confidentiality and Privacy in the Health Sector
- 19.9.2. Implementation of Effective Governance Frameworks to Ensure Responsible and Ethical Data Management in Medical Settings
- 19.9.3. Design of Policies and Procedures to Ensure the Integrity and Availability of Medical Data, Addressing Healthcare Sector-Specific Challenges

19.10. Practical Applications of *Big Data* in Healthcare
- 19.10.1. Development of Specialized Solutions for Managing and Analyzing Large Data Sets in Healthcare Environments
- 19.10.2. Use of Practical Tools Based on Big Data to Support Clinical Decision Making
- 19.10.3. Application of Innovative Big Data Approaches to Address Specific Challenges within the Healthcare Sector

Module 20. Ethics and Regulation in Medical AI

20.1. Ethical Principles in the Use of AI in Medicine
- 20.1.1. Analysis and Adoption of Ethical Principles in the Development and Use of Medical AI Systems
- 20.1.2. Integrating Ethical Values into AI-Assisted Decision Making in Medical Settings
- 20.1.3. Establishing Ethical Guidelines to Ensure the Responsible Use of Artificial Intelligence in Medicine

20.2. Data Privacy and Consent in Medical Contexts
- 20.2.1. Developing Privacy Policies to Protect Sensitive Data in Medical AI Applications
- 20.2.2. Guarantee of Informed Consent in the Collection and Use of Personal Data in the Medical Field
- 20.2.3. Implementing Security Measures to Safeguard Patient Privacy in Medical AI Environments

20.3. Ethics in Research and Development of Medical AI Systems
- 20.3.1. Ethical Evaluation of Research Protocols in the Development of AI Systems for Healthcare
- 20.3.2. Ensuring Transparency and Ethical Rigor in the Development and Validation of Medical AI Systems
- 20.3.3. Ethical Considerations in the Publication and Sharing of Medical AI Results

20.4. Social Impact and Accountability in Health AI
- 20.4.1. Analysis of the Social Impact of AI on Health Service Delivery
- 20.4.2. Development of Strategies to Mitigate Risks and Ethical Responsibility in Medical AI Applications
- 20.4.3. Continuous Social Impact Assessment and Adaptation of AI Systems to Positively Contribute to Public Health

20.5. Sustainable Development of AI in the Healthcare Sector
- 20.5.1. Integration of Sustainable Practices in the Development and Maintenance of AI Systems in Healthcare
- 20.5.2. Environmental and Economic Impact Assessment of AI Technologies in Healthcare
- 20.5.3. Development of Sustainable Business Models to Ensure Continuity and Improvement of AI Solutions in the Healthcare Sector

20.6. Data Governance and International Regulatory Frameworks in Medical AI
- 20.6.1. Development of Governance Frameworks for Ethical and Efficient Data Management in Medical AI Applications
- 20.6.2. Adaptation to International Regulations to Ensure Ethical and Legal Compliance
- 20.6.3. Active Participation in International Initiatives to Establish Ethical Standards in the Development of Medical AI Systems

20.7. Economic Aspects of AI in the Healthcare Sector
- 20.7.1. Analysis of Economic Implications and Cost-Benefits in the Implementation of AI Systems in Healthcare
- 20.7.2. Development of Business Models and Financing to Facilitate the Adoption of AI Technologies in the Healthcare Sector
- 20.7.3. Assessment of Economic Efficiency and Equity in Access to AI-Driven Health Services

20.8. Human-Centered Design of Medical AI Systems
- 20.8.1. Integration of Human-Centered Design Principles to Improve Usability and Acceptance of Medical AI Systems
- 20.8.2. Participation of Health Professionals and Patients in the Design Process to Ensure the Relevance and Effectiveness of the Solutions
- 20.8.3. Continuous User Experience Assessment and Feedback to Optimize Interaction with AI Systems in Medical Environments

20.9. Fairness and Transparency in Medical Machine Learning
- 20.9.1. Development of Medical Machine Learning Models that Promote Equity and Transparency
- 20.9.2. Implementation of Practices to Mitigate Biases and Ensure Equity in the Application of AI Algorithms in the Field of Healthcare
- 20.9.3. Continuous Assessment of Equity and Transparency in the Development and Deployment of Machine Learning Solutions in Medicine

20.10. Safety and Policy in the Implementation of AI in Medicine
- 20.10.1. Development Security Policies to Protect Data Integrity and Confidentiality in Medical AI Applications
- 20.10.2. Implementation of Safety Measures in the Deployment of AI Systems to Prevent Risks and Ensure Patient Safety
- 20.10.3. Continuous Evaluation of Safety Policies to Adapt to Technological Advances and New Challenges in the Implementation of AI in Medicine

06

Study Methodology

TECH is the world's first university to combine the **case study** methodology with **Relearning**, a 100% online learning system based on guided repetition.

This disruptive pedagogical strategy has been conceived to offer professionals the opportunity to update their knowledge and develop their skills in an intensive and rigorous way. A learning model that places students at the center of the educational process giving them the leading role, adapting to their needs and leaving aside more conventional methodologies.

TECH will prepare you to face new challenges in uncertain environments and achieve success in your career"

The student: the priority of all TECH programs

In TECH's study methodology, the student is the main protagonist.
The teaching tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is students who choose the time they dedicate to study, how they decide to establish their routines, and all this from the comfort of the electronic device of their choice. The student will not have to participate in live classes, which in many cases they will not be able to attend. The learning activities will be done when it is convenient for them. They can always decide when and from where they want to study.

"At TECH you will NOT have live classes (which you might not be able to attend)"

The most comprehensive study plans at the international level

TECH is distinguished by offering the most complete academic itineraries on the university scene. This comprehensiveness is achieved through the creation of syllabi that not only cover the essential knowledge, but also the most recent innovations in each area.

By being constantly up to date, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive education that provides them with a notable competitive advantage to further their careers.

And what's more, they will be able to do so from any device, pc, tablet or smartphone.

> *TECH's model is asynchronous, so it allows you to study with your pc, tablet or your smartphone wherever you want, whenever you want and for as long as you want"*

Case Studies and Case Method

The case method has been the learning system most used by the world's best business schools. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

With this teaching model, it is students themselves who build their professional competence through strategies such as Learning by Doing or Design Thinking, used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, discuss and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.

Relearning Methodology

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, it manages to review and reiterate the key concepts of each subject and learn to apply them in a real context.

In the same line, and according to multiple scientific researches, reiteration is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

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

A 100% online Virtual Campus with the best teaching resources

In order to apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on repetition, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neuroscience points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus to retain it in the long term. This is a model called Neurocognitive context-dependent e-learning that is consciously applied in this university qualification.

In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, based on their fast-paced professional update.

The online study mode of this program will allow you to organize your time and learning pace, adapting it to your schedule"

The effectiveness of the method is justified by four fundamental achievements:

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that assess real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

The university methodology top-rated by its students

The results of this innovative teaching model can be seen in the overall satisfaction levels of TECH graduates.

The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution became the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is at the forefront of technology and teaching.

You will be able to learn with the advantages that come with having access to simulated learning environments and the learning by observation approach, that is, Learning from an expert.

As such, the best educational materials, thoroughly prepared, will be available in this program:

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.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.

Practicing Skills and Abilities

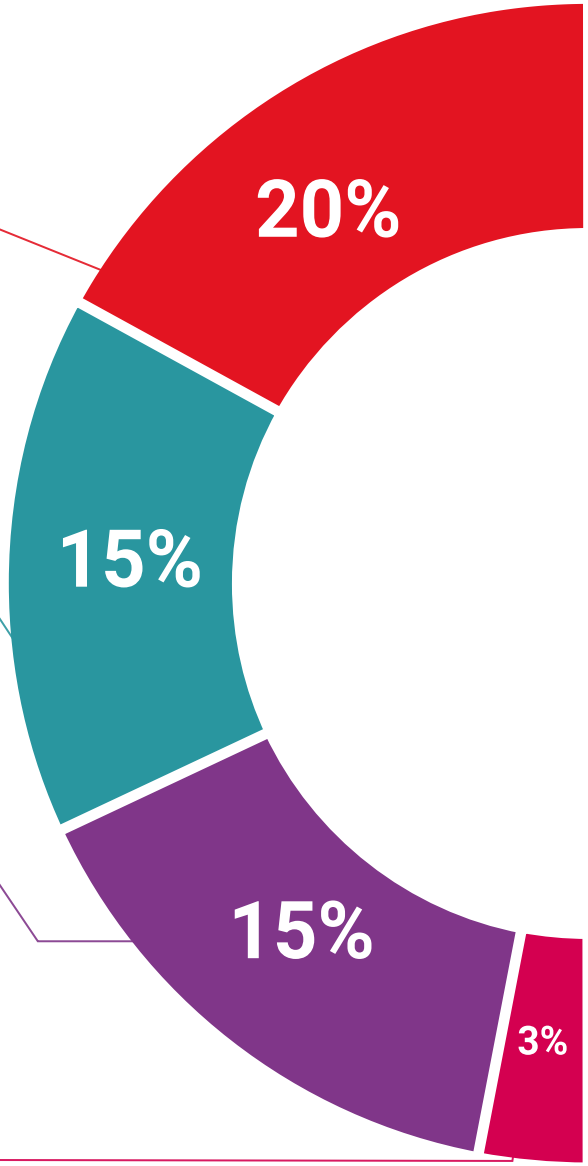
You will carry out activities to develop specific competencies and skills in each thematic field. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the framework of the globalization we live in.

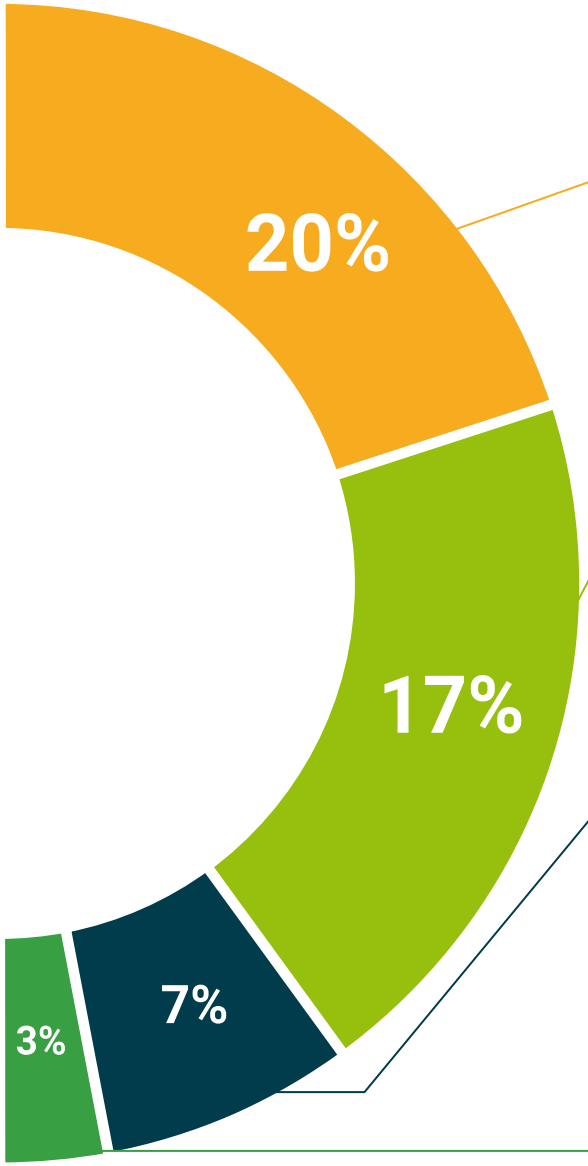
Interactive Summaries

We present 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".

Additional Reading

Recent articles, consensus documents, international guides... In our virtual library you will have access to everything you need to complete your education.





Case Studies

Students will complete a selection of the best case studies in the field.
Cases that are presented, analyzed, and supervised by the best specialists in the world.

Testing & Retesting

We periodically assess and re-assess your knowledge throughout the program. We do this on 3 of the 4 levels of Miller's Pyramid.

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 for future difficult decisions.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical and effective way to help students progress in their learning.

07

Certificate

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

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

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

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

Title: **Professional Master's Degree in Artificial Intelligence in Clinical Practice**

Modality: **online**

Duration: **12 months**

Accreditation: **90 ECTS**


tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Professional Master's Degree in Artificial Intelligence in Clinical Practice

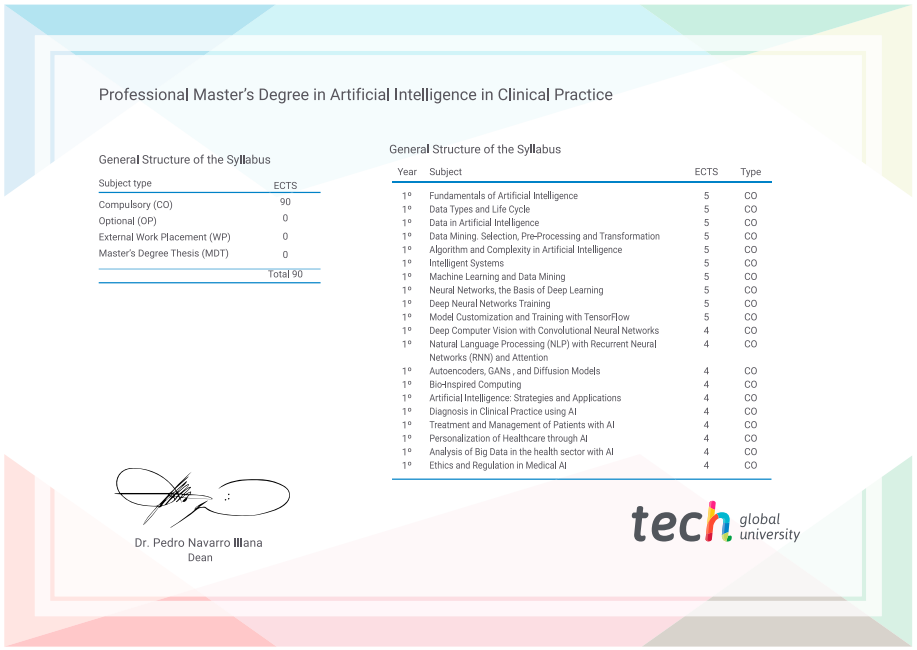
This is a private qualification of 2,700 hours of duration equivalent to 90 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Artificial Intelligence in Clinical Practice

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	90
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 90

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Fundamentals of Artificial Intelligence	5	CO
1º	Data Types and Life Cycle	5	CO
1º	Data in Artificial Intelligence	5	CO
1º	Data Mining. Selection, Pre-Processing and Transformation	5	CO
1º	Algorithm and Complexity in Artificial Intelligence	5	CO
1º	Intelligent Systems	5	CO
1º	Machine Learning and Data Mining	5	CO
1º	Neural Networks, the Basis of Deep Learning	5	CO
1º	Deep Neural Networks Training	5	CO
1º	Model Customization and Training with TensorFlow	5	CO
1º	Deep Computer Vision with Convolutional Neural Networks	4	CO
1º	Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention	4	CO
1º	Autoencoders, GANs , and Diffusion Models	4	CO
1º	Bio-Inspired Computing	4	CO
1º	Artificial Intelligence: Strategies and Applications	4	CO
1º	Diagnosis in Clinical Practice using AI	4	CO
1º	Treatment and Management of Patients with AI	4	CO
1º	Personalization of Healthcare through AI	4	CO
1º	Analysis of Big Data in the health sector with AI	4	CO
1º	Ethics and Regulation in Medical AI	4	CO

Dr. Pedro Navarro Illana
Dean

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

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Professional Master's Degree
Artificial Intelligence in Clinical Practice

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Accreditation: **90 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

Artificial Intelligence in Clinical Practice

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