Professional Master's Degree

Artificial Intelligence in Clinical Practice

tech technological university

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Professional Master's Degree
Artificial Intelligence in Clinical Practice

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

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

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01

Introduction

The application of Artificial Intelligence (AI) in Clinical Practice allows the integration of advanced algorithms and data analysis, speeding up and improving medical diagnosis, and identifying subtle patterns that might go unnoticed by the human eye. In addition, AI facilitates disease prediction, contributing to earlier detection and the implementation of personalized preventive treatments. This technology also optimizes medical data management, enabling more efficient and accurate patient care, while supporting informed clinical decision-making through the analysis of massive scientific evidence. For these reasons, TECH has implemented a program that will immerse physicians in cutting-edge technology, leveraging the revolutionary methodology of Relearning.

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

Artificial Intelligence can be applied to Medical Practice, analyzing large medical datasets to identify patterns and trends, and facilitating more accurate and earlier diagnoses. Furthermore, in patient management, AI is able to foresee potential complications, personalize treatments and optimize resource allocation, improving the efficiency and quality of medical care. The automation of routine tasks also frees up time for professionals to focus on more complex and human aspects of care, promoting significant advances in medicine.

For this reason, TECH has developed this Professional Master's Degree in Intelligence in Clinical Practice, with a comprehensive and specialized approach. Specific modules will range from mastering the practical tools of AI to a critical understanding of its ethical and legal application in medicine. A focus on specific medical applications, such as AI-assisted diagnosis and pain management, will equip professionals with advanced skills and knowledge in key areas of healthcare.

It will also foster multidisciplinary collaboration, preparing graduates to work in diverse teams within clinical settings. In addition, its ethical, legal and governance focus will ensure responsible understanding and practical application in the development and implementation of AI solutions in healthcare. The combination of theoretical and practical learning, along with the application of Big Data in healthcare, will enable clinicians to address current and future challenges in the field in a comprehensive and competent manner.

Accordingly, TECH has devised a comprehensive program based on the innovative Relearning methodology, to train highly competent AI experts. This form of learning focuses on the repetition of key concepts to ensure a solid understanding. Only an electronic device with an Internet connection will be needed to access the content at any time, freeing participants from fixed schedules or the obligation to attend in person.

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

- Development of practical cases presented by experts in Artificial Intelligence in Clinical Practice
- 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
- 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

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

You'll delve into AI-backed data science in healthcare, exploring biostatistics and big data analytics through 2,250 hours of innovative content"

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

You will apply data mining and machine learning in the context of healthcare. What are you waiting for to enroll?"

The program's teaching staff includes professionals from the field who contribute their work experience to this educational 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 learn in 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 academic year For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

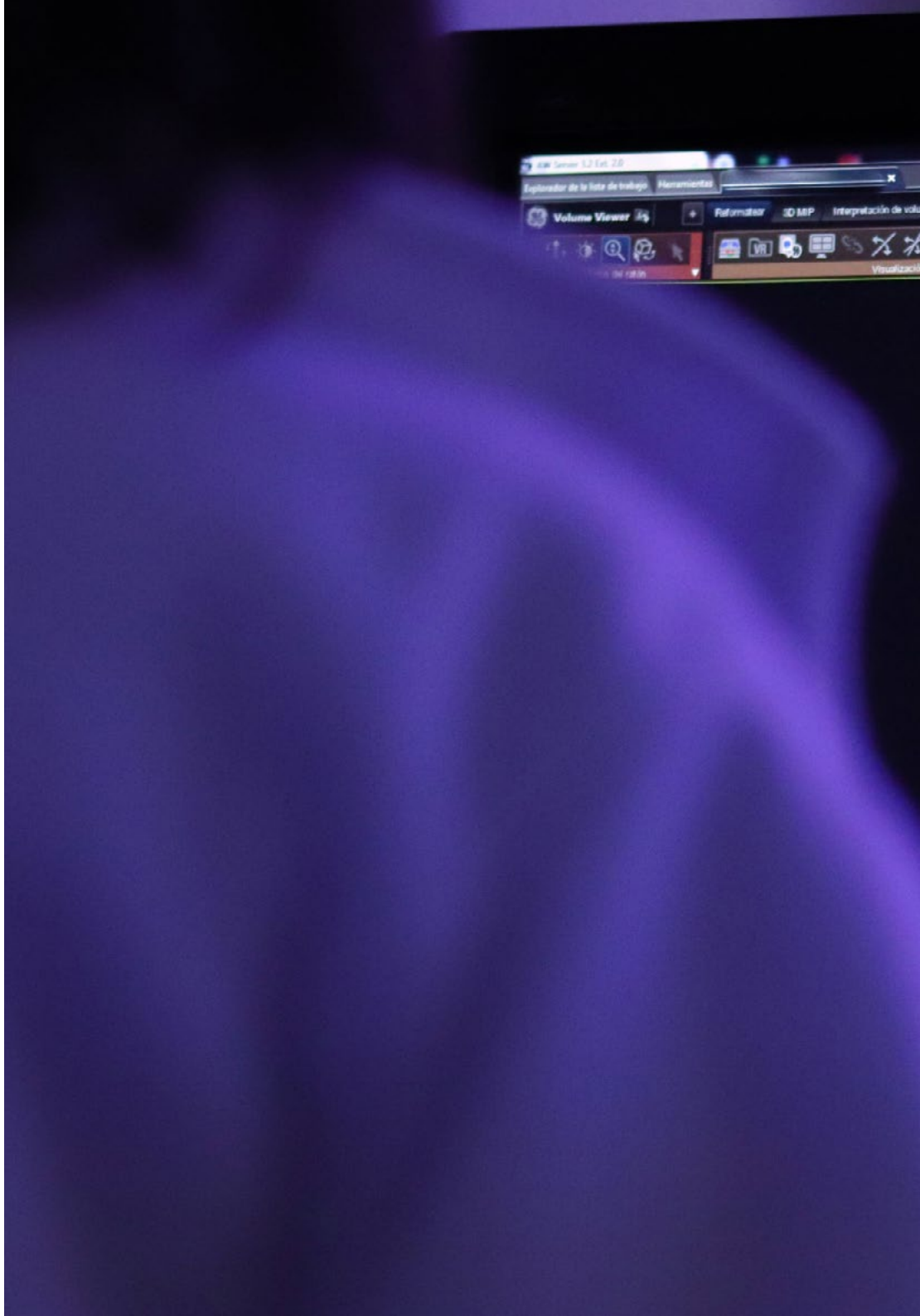
Objectives

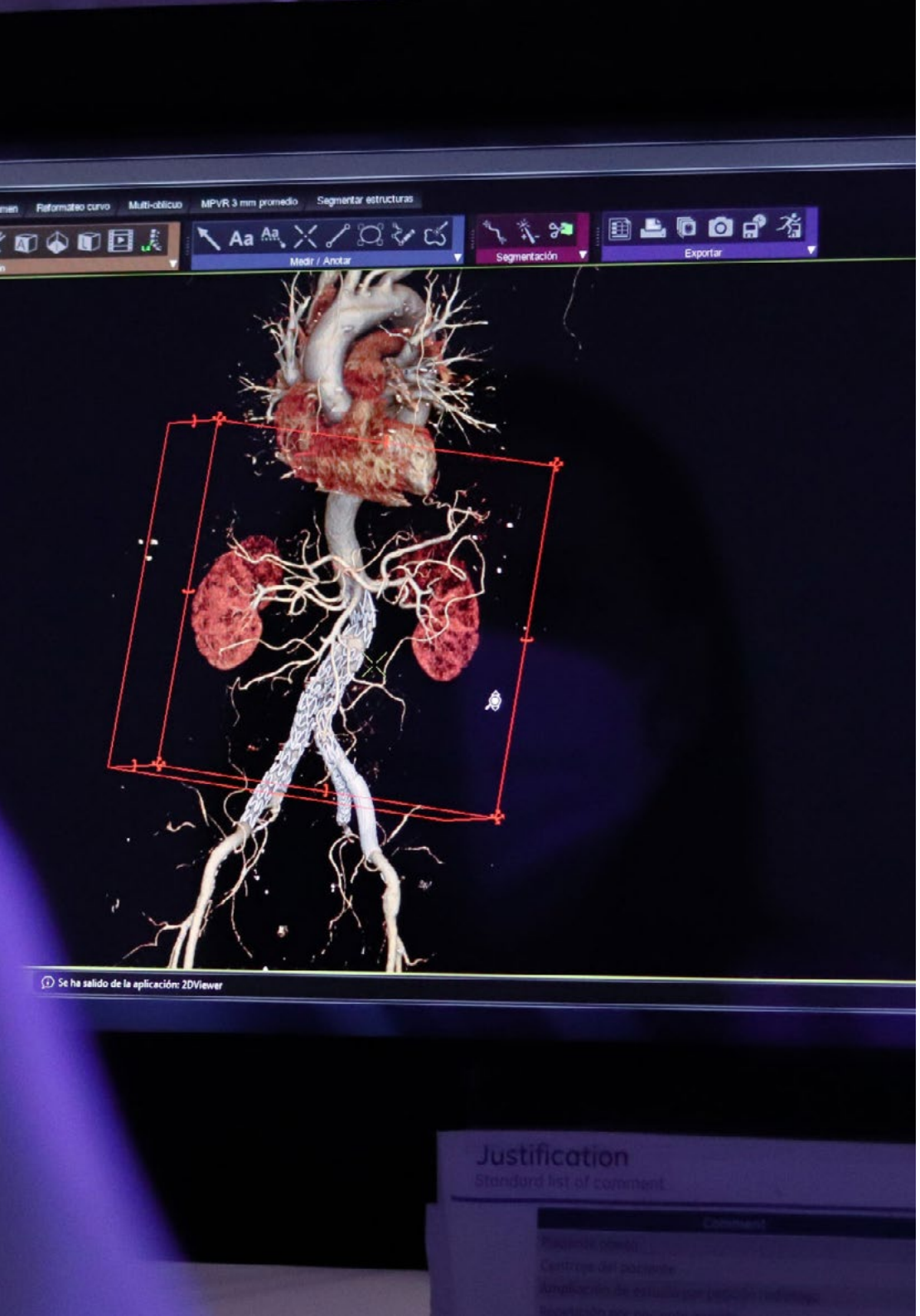
The Professional Master's Degree in Artificial Intelligence in Clinical Practice aims to train healthcare professionals to transform medical care through the strategic application of AI. This innovative program will equip graduates with solid skills in medical data analysis, AI-assisted diagnosis, treatment personalization and efficient patient care management. Upon completion of the degree, specialists will be prepared to lead change by improving diagnostic accuracy, optimizing treatment protocols, and promoting more accessible and effective medical care.

TECH will empower you to transform clinical practice, improve diagnostics and design accurate and personalized treatments"

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.
- Critically evaluate the benefits and limitations of AI in healthcare, identifying potential pitfalls and providing an informed assessment of its clinical application
- Recognize the importance of collaboration across disciplines to develop effective AI solutions
- Gain a comprehensive perspective on emerging trends and technological innovations in AI applied to healthcare
- Acquire solid knowledge in medical data acquisition, filtering, and preprocessing
- Understand the ethical principles and legal regulations applicable to the implementation of AI in medicine, promoting ethical practices, fairness, and transparency





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 Data Life Cycle

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

Module 3. Data in Artificial Intelligence

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

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

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

Module 5. Algorithm and Complexity in Artificial Intelligence

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

Module 6. Intelligent Systems

- Explore agent theory, understanding the fundamental concepts of its operation and its application in Artificial Intelligence and software engineering
- Study the representation of knowledge, including the analysis of ontologies and their application in the organization of structured information
- Analyze the concept of the semantic web and its impact on the organization and retrieval of information in digital environments

- Evaluate and compare different knowledge representations, integrating these to improve the efficiency and accuracy of intelligent systems
- Study semantic reasoners, knowledge-based systems and expert systems, understanding their functionality and applications in intelligent decision making

Module 7. Machine Learning and Data Mining

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

Module 8. Neural networks, the basis of Deep Learning

- Master the fundamentals of Deep Learning, understanding its essential role in *Deep Learning*
- Explore the fundamental operations in neural networks and understand their application in model building
- Analyze the different layers used in neural networks and learn how to select them appropriately
- Understanding 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 Natural Recurrent Networks (NRN) 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 health care
- 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 setting, focusing on aspects such as assisted diagnosis, medical image analysis and interpretation of results
- Identify potential pitfalls in the application of AI in healthcare, providing an informed view of its use in clinical settings

Module 17. Treatment and Management of the AI Patient

- Interpret results for ethical *dataset* creation and strategic application in healthcare emergencies
- Acquire advanced skills in the presentation, visualization and management of health AI data
- Gain a comprehensive perspective on 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. Health Personalization through AI

- Delve into emerging trends in AI applied to personalized healthcare and their future impact
- Define the applications of AI to personalize 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
- Delineate emerging trends in AI applied to personalized health and their future impact
- Promote innovation through the creation of strategies aimed at improving medical care

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

- Acquire solid knowledge in medical data procurement, 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 fairness and transparency in machine learning

Become a leader in integrating cutting-edge technology into healthcare, improving diagnostics, treatments and patient experience"

03

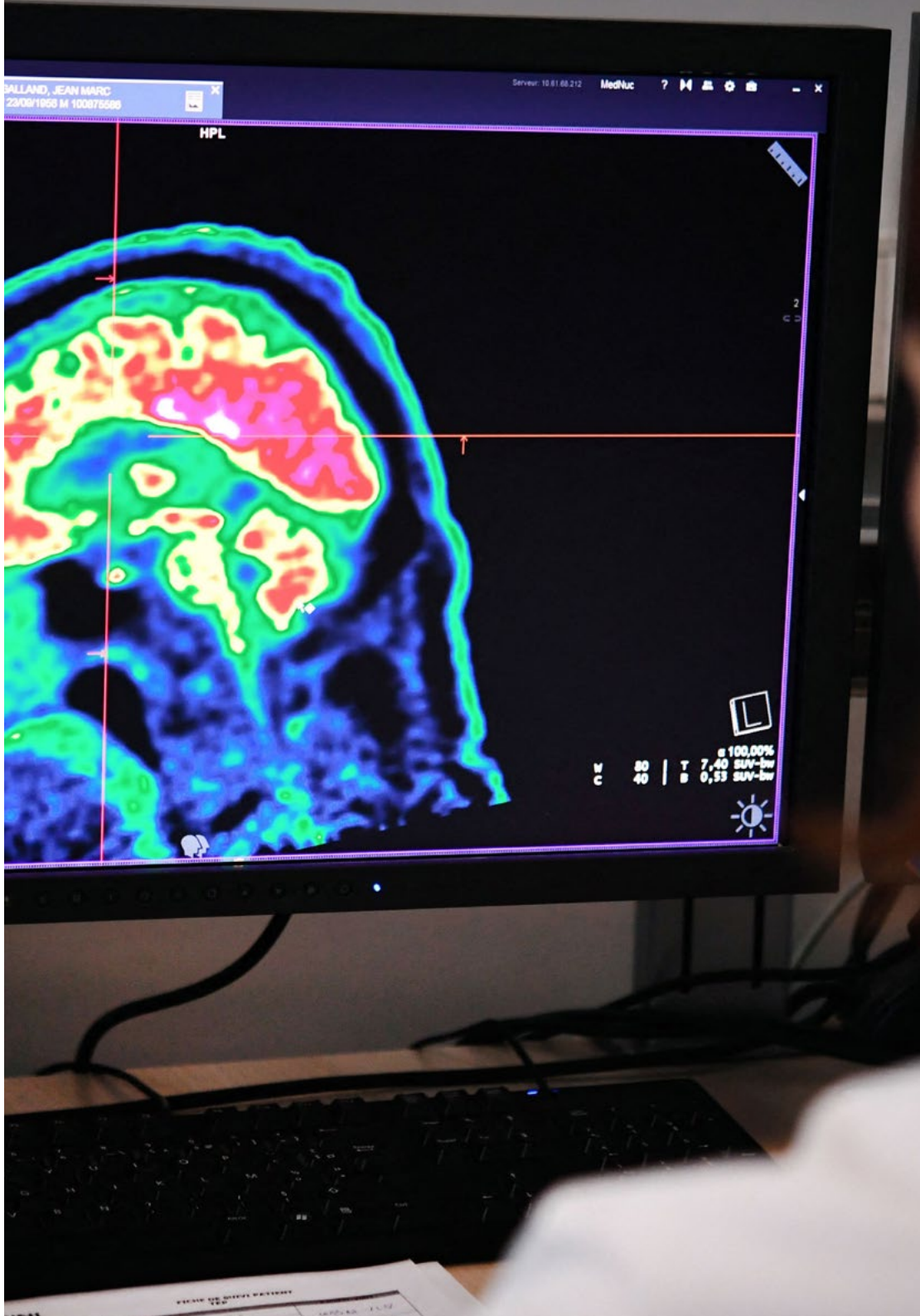
Skills

The Professional Master's Degree in Artificial Intelligence in Clinical Practice will help professionals master critical competencies to prepare for the convergence of medicine and technology. From advanced medical data analysis, to the strategic implementation of algorithms for accurate diagnoses, this program will strengthen graduates' skills in personalizing treatments and optimizing medical care, empowering them to innovate and lead change in medicine with vision and excellence.

Upgrade your skills with TECH! You will boost your skills in medical data analysis, AI-assisted diagnosis and treatment personalization"

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
- Implement AI tools in clinical settings, with an emphasis on assisted diagnosis, medical image analysis and AI modeling outcomes
- Define the applications of AI to personalize medical treatments, ranging from genomic analysis to pain management
- Acquire advanced skills in the presentation, visualization and management of healthcare AI data
- Develop AI algorithms for specific applications in medicine, such as drug design, health monitoring and surgical robotics
- Use healthcare-specific *Big Data* techniques, including text processing, quality assessment and the application of machine learning algorithms



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
- Apply AI tools in the clinical context, focusing on aided diagnosis, medical image analysis and interpretation of AI model results
- Apply and evaluate AI algorithms in real-world medical settings
- Use AI to personalize medical treatments, from genomic analysis to pain management
- Use AI algorithms for specific applications, such as drug design, health monitoring, and surgical robotics
- Master healthcare-specific *Big Data* techniques, including text processing, quality assessment and the application of machine learning algorithms and analytics
- Design human-centered AI systems, promoting fairness and transparency in machine learning, and ensuring model safety and quality through comprehensive policies and evaluations

04

Course Management

The faculty of the Professional Master's Degree in Artificial Intelligence in Clinical Practice brings together leading experts in the field of medicine and technology, offering an exceptionally complete and up-to-date perspective. These professionals not only possess in-depth knowledge in AI applied to clinical practice, but also vast practical experience in the development and implementation of innovative solutions in medical settings. Their dedication to educational excellence will ensure that graduates not only acquire theoretical knowledge, but also a thorough practical understanding.

Learn from the best! The faculty will prepare you to address current and future health care challenges"

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 Psychology from the University of Castilla - La Mancha
- PhD in Economics, Business and Finance from the Camilo José Cela University
- PhD in Psychology from University of Castilla – La Mancha
- Máster in Executive MBA por la Universidad Isabel I
- Master's Degree in Sales and Marketing Management, Isabel I University
- Expert Master's Degree in Big Data by Hadoop Training
- Master's Degree in Advanced Information Technologies from the University of Castilla - la Mancha
- Member of: SMILE Research Group

Mr. Martín-Palomino Sahagún, Fernando

- Private Orthodontist
- Researcher
- Doctor of Dentistry, Alfonso X El Sabio University
- Postgraduate degree in Orthodontics from the Alfonso X El Sabio University
- Degree in Dentistry from the University Alfonso X El Sabio

Professors

Dr. Carrasco González, Ramón Alberto

- Researcher
- Head of Business Intelligence (Marketing) at 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
- PhD in Artificial Intelligence from the University of Granada
- Degree in Computer Engineering from the University of Granada

Mr. Popescu Radu, Daniel Vasile

- Freelance Producer of Teaching and Scientific Contents
- 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 by the Complutense University of Madrid
- Nutritionist-Dietician by the European University Miguel de Cervantes

05

Structure and Content

This Professional Master's Degree is meticulously designed to merge clinical excellence with technological innovation. Its structure is based on specialized modules, ranging from the fundamentals of AI to specific applications in medical environments. Accordingly, the contents will offer a perfect balance between advanced theory and practical application, enabling professionals to tackle everything from data analysis to the personalization of treatments. In this way, graduates are prepared to make a difference in medicine, with a progressive vision and solid technical skills.

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

Module 1. Fundamentals of Artificial Intelligence

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

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

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

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

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

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

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

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

1.9. AI Implementation Strategy

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

Module 2. Data Types and Data Life Cycle

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

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

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

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

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

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

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

2.8. Data Warehouse (*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/Safety

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

Module 3. Data in Artificial Intelligence

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.7. From Continuous to Discrete Attributes
- 4.7.1. Continuous Data Vs. 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. Mathematical Analysis Criteria for Non-Recursive Algorithms
- 5.2.7. Mathematical Analysis of Recursive Algorithms
- 5.2.8. Empirical Analysis of Algorithms

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

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

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

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

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

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

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

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

Module 6. Intelligent Systems

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

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

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

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

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

6.6. Ontology Languages and Ontology Creation Software
- 6.6.1. Triple RDF, *Turtle* and N
- 6.6.2. RDF *Schema*
- 6.6.3. OWL
- 6.6.4. SPARQL

6.6.5. Introduction to Ontology Creation Tools
6.6.6. Installing and Using *Protégé*
6.7. Semantic Web
6.7.1. Current and Future Status of the Semantic Web
6.7.2. Semantic Web Applications
6.8. Other Knowledge Representation Models
6.8.1. Vocabulary
6.8.2. Global Vision
6.8.3. Taxonomy
6.8.4. Thesauri
6.8.5. Folksonomy
6.8.6. Comparison
6.8.7. Mind Maps
6.9. Knowledge Representation Assessment and Integration
6.9.1. Zero-Order Logic
6.9.2. First-Order Logic
6.9.3. Descriptive Logic
6.9.4. Relationship between Different Types of Logic
6.9.5. *Prolog*: Programming Based on First-Order Logic
6.10. Semantic Reasoners, Knowledge-Based Systems and Expert Systems
6.10.1. Concept of Reasoner
6.10.2. Reasoner Applications
6.10.3. Knowledge-Based Systems
6.10.4. MYCIN: History of Expert Systems
6.10.5. Expert Systems Elements and Architecture
6.10.6. Creating Expert Systems

Module 7. Machine Learning and Data Mining

7.1. Introduction to Knowledge Discovery Processes and Basic Concepts of Machine Learning
7.1.1. Key Concepts of Knowledge Discovery Processes
7.1.2. Historical Perspective of Knowledge Discovery Processes
7.1.3. Stages of the Knowledge Discovery Processes
7.1.4. Techniques Used in Knowledge Discovery Processes
7.1.5. Characteristics of Good Machine Learning Models
7.1.6. Types of Machine Learning Information
7.1.7. Basic Learning Concepts
7.1.8. Basic Concepts of Unsupervised Learning
7.2. Data Exploration and Pre-processing
7.2.1. Data Processing
7.2.2. Data Processing in the Data Analysis Flow
7.2.3. Types of Data
7.2.4. Data Transformations
7.2.5. Visualization and Exploration of Continuous Variables
7.2.6. Visualization and Exploration of Categorical Variables
7.2.7. Correlation Measures
7.2.8. Most Common Graphic Representations
7.2.9. Introduction to Multivariate Analysis and Dimensionality Reduction
7.3. Decision Trees
7.3.1. ID Algorithm
7.3.2. Algorithm C
7.3.3. Overtraining and Pruning
7.3.4. Analysis of Results
7.4. Evaluation of Classifiers
7.4.1. Confusion Matrixes
7.4.2. Numerical Evaluation Matrixes
7.4.3. Kappa Statistic
7.4.4. ROC Curves
7.5. Classification Rules
7.5.1. Rule Evaluation Measures
7.5.2. Introduction to Graphic Representation
7.5.3. Sequential Overlay Algorithm
7.6. Neural Networks
7.6.1. Basic Concepts
7.6.2. Simple Neural Networks
7.6.3. *Backpropagation* Algorithm
7.6.4. Introduction to Recurrent Neural Networks

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

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

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

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

Module 8. Neural Networks, the Basis of Deep Learning

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

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

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

8.4. Union of Layers and Operations
- 8.4.1. Architecture Design
- 8.4.2. Connection between Layers
- 8.4.3. Forward Propagation

8.5. Construction of the First Neural Network
- 8.5.1. Network Design
- 8.5.2. Establish the Weights
- 8.5.3. Network Training

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

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

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

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

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

Module 9. Deep Neural Networks Training

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

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

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

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

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

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

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

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

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

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

Module 10. Model Customization and training with TensorFlow

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

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 Graphics
- 10.4.1. Functions with *TensorFlow*
- 10.4.2. Use of Graphs for Model Training
- 10.4.3. Graphics 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 API *tfdata*
- 10.6.1. Using the *tfdata*API for Data Processing
- 10.6.2. Construction of Data Streams with *tfdata*
- 10.6.3. Using the *tfdata* API for Model Training

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

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

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

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

Module 11. Deep Computer Vision with Convolutional Neural Networks

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

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

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

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

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

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

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

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

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

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

Module 12. Natural Language Processing (NLP) with Natural Recurrent Networks (NNN) 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 *Transformer*Models for Natural Language Processing
- 12.6.2. Application of *Transformer* Models for Vision
- 12.6.3. Advantages of *Transformer* Models

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

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

12.9. Other *Transformers* Libraries. Comparison
- 12.9.1. Comparison between different *Transformers*Libraries
- 12.9.2. Use of the other *Transformers* Libraries
- 12.9.3. Advantages of the other *Transformers* Libraries

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

Module 13. Autoencoders, GANs, and Diffusion Models

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

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

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

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

13.5. Automatic Encoder Denoising
- 13.5.1. Application of Filters
- 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. Educational
- 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 Diagnosis
- 16.1.1. Development of Software for AI-assisted Diagnosis in Various Medical Specialties
- 16.1.2. Use of Advanced Algorithms for Rapid and Accurate Analysis of Clinical Symptoms and Signs
- 16.1.3. Integration of AI in Diagnostic Devices to Improve Efficiency
- 16.1.4. AI Tools to Assist in the Interpretation of Laboratory Test Results

16.2. Integration of Multimodal Clinical Data for Diagnosis
- 16.2.1. AI Systems for Combining Imaging, Laboratory, and Clinical Record Data
- 16.2.2. Tools for Correlating Multimodality Data into More Accurate Diagnoses
- 16.2.3. Use of AI to Analyze Complex Patterns from Different Types of Clinical Data
- 16.2.4. Integration of Genomic and Molecular Data in AI-assisted Diagnosis

16.3. Creation and Analysis of Health *Datasets* with AI
- 16.3.1. Development of Clinical Databases for Training AI Models
- 16.3.2. Use of AI for 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 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
- 16.5.3. Development of Predictive Models for More Accurate Diagnoses
- 16.5.4. Implementation of Automatic Learning Algorithms in the Interpretation of Health Data

16.6. Interpretation of Medical Images Using AI
- 16.6.1. AI Systems for Anomaly Detection and Classification of Medical Image Anomalies
- 16.6.2. Use of Deep Learning in the Interpretation of X-rays, MRIs and CT Scans
- 16.6.3. AI Tools for Improving Accuracy and Speed in Diagnostic Imaging
- 16.6.4. Implementation of AI for Image-Based Clinical Decision-Making Assistance

16.7. Natural Language Processing on Medical Records for Clinical Diagnosis
- 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 Information from Medical Records
- 16.7.4. Application of NLP in Identifying Symptoms and Diagnoses 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 Environments
- 16.8.2. Evaluation of the Performance and Accuracy 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 Health Care

16.9. AI in the Diagnosis of Rare Diseases
- 16.9.1. Development of AI Systems Specializing in the Identification of Rare Diseases
- 16.9.2. Use of AI to Analyze 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 the Challenges in the Adoption of AI in Clinical Settings
- 16.10.3. Discussion of Ethical and Practical Barriers in Implementing AI for Diagnosis
- 16.10.4. Examination of Strategies to Overcome Obstacles in Integrating AI in Medical Diagnostics

Module 17. Treatment and Management of the AI Patient

17.1. AI-assisted Treatment Systems
- 17.1.1. Development of AI Systems to Assist in Therapeutic Decision Making
- 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 Monitoring and Controlling 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
- 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. Use of AI to Improve Accuracy and Efficiency 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
- 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
- 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. Health Personalization through AI

18.1. AI Applications in Genomics for Personalized Medicine
- 18.1.1. Development of AI Algorithms for the Analysis of Genetic Sequences and their Relationship to 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

18.2.1. Development of AI Models for Predicting 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 Personalization of Treatments
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
18.3.3. Implementation of AI-based Early Warning Systems for Health Conditions
18.3.4. AI Tools for Personalization of Lifestyle and Health Recommendations
18.4. Clinical Decision Support Systems with AI
18.4.1. Implementation of AI to Assist Clinicians in Clinical Decision Support Systems
18.4.2. Development of AI Systems that Provide Clinical Data-Based Recommendations
18.4.3. Use of AI in Risk/Benefit Assessment of Different Therapeutic Options
18.4.4. AI tools for the Integration and Analysis of Real-Time Healthcare Data
18.5. Trends in Health Personalization with AI
18.5.1. Analysis of the Latest Trends in AI for Healthcare Personalization
18.5.2. Use of AI in the Development of Preventive and Predictive Approaches in Health Care
18.5.3. Implementation of AI in the Adaptation of Health Plans to Individual Needs
18.5.4. Exploration of New AI Technologies in the Field of Personalized Health Care
18.6. Advances in AI-assisted Surgical Robotics
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
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. Use of AI to Create Predictive Models of Disease Based on Individual Data
18.7.2. Implementation of AI in the Prediction of Treatment Responses
18.7.3. Development of AI Tools for Health Risk Anticipation
18.7.4. Application of Predictive Models in the Planning of Preventive Interventions
18.8. AI in Pain Management and Personalized Pain Treatment
18.8.1. Development of AI Systems for Personalized Pain Assessment and Management
18.8.2. Use of AI in the Identification of Pain Patterns and Treatment Responses
18.8.3. Implementation of AI Tools in the Personalization of Pain Therapies
18.8.4. Application of AI in Monitoring and Adjustment of Pain Treatment Plans
18.9. Patient Autonomy and Active Participation in Customization
18.9.1. Promotion of Patient Autonomy through AI Tools for Health Management
18.9.2. Development of AI Systems that Empower Patients in Decision Making
18.9.3. Use of AI to Provide Personalized Information and Education to Patients
18.9.4. AI Tools that Facilitate Active Patient Involvement in Treatment
18.10. Integration of AI in Electronic Medical Records
18.10.1. Implementation of AI for the Efficient Analysis and Management of Electronic Medical Records
18.10.2. Development of AI Tools for Extraction of Clinical *Insights* from Electronic Records
18.10.3. Use of AI to Improve the Accuracy and Accessibility of Medical Record Data
18.10.4. AI Application for Correlation of Medical Record Data with Treatment Plans

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

19.1. *Big Data* Fundamentals in Health
19.1.1. The Explosion of Data in 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 of Health Data
19.2.1. Concepts of Natural Language Processing
19.2.2. *Embedding* Techniques
19.2.3. Application of Natural Language Processing in Health Care
19.3. Advanced Methods for Data Retrieval in Health Care
19.3.1. Exploration of Innovative Techniques for Efficient Data Retrieval in Health Care
19.3.2. Development of Advanced Strategies for Extracting and Organizing Information in Health Care Settings

19.3.3. Implementation of Adaptive and Personalized Data Retrieval Methods for Diverse Clinical Contexts

19.4. Quality Assessment in Health Data Analysis
19.4.1. Development of Indicators for Rigorous Assessment of Data Quality in Health Care 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 Automatic Learning in Healthcare
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
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
19.8.1. Design of Innovative Visualization Tools in Health Care
19.8.2. Creative Health Communication Strategies
19.8.3. Integration of Interactive Technologies in Health

19.9. Data Security and Governance in the Health 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 Health 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. Integration of Ethical Values in AI-assisted Decision Making in Medical Contexts
20.1.3. Establishment of Ethical Guidelines to Ensure Responsible Use of Artificial Intelligence in Medicine

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

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

20.4. Social Impact and Accountability in AI for Health
20.4.1. Analysis of the Social Impact of AI in Health Care Delivery
20.4.2. Development of Strategies to Mitigate Risks and Ethical Responsibility in AI Applications in Medicine

20.4.3. Continuous Evaluation of the Social Impact and Adaptation of AI Systems to Make a Positive Contribution to Public Health

20.5. Sustainable Development of AI in the Health Sector

20.5.1. Integration of Sustainable Practices in the Development and Maintenance of AI Systems in Health

20.5.2. Assessment of the Environmental and Economic Impact of AI Technologies in the Health Sector

20.5.3. Development of Sustainable Business Models to Ensure Continuity and Improvement of AI Solutions in Healthcare

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 Standards and 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 Field

20.7.1. Analysis of Economic and Cost-Benefit Implications in the Implementation of AI Systems in Healthcare

20.7.2. Development of Business and Financing Models 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 Acceptability of Medical AI Systems

20.8.2. Involvement of Healthcare Professionals and Patients in the Design Process to Ensure Relevance and Effectiveness of Solutions

20.8.3. Continuous Evaluation of User Experience and Feedback to Optimize Interaction with AI Systems in Medical Settings

20.9. Fairness and Transparency in Medical Machine Learning

20.9.1. Development of Medical Machine Learning Models that Promote Fairness and Transparency

20.9.2. Implementation of Practices to Mitigate Bias and Ensure Fairness in the Application of AI Algorithms in Healthcare

20.9.3. Continued Assessment of Fairness and Transparency in the Development and Deployment of Machine Learning Solutions in Medicine

20.10. Safety and Policy in the Deployment of AI in Medicine

20.10.1. Development of 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 Deployment of AI in Medicine

06

Methodology

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

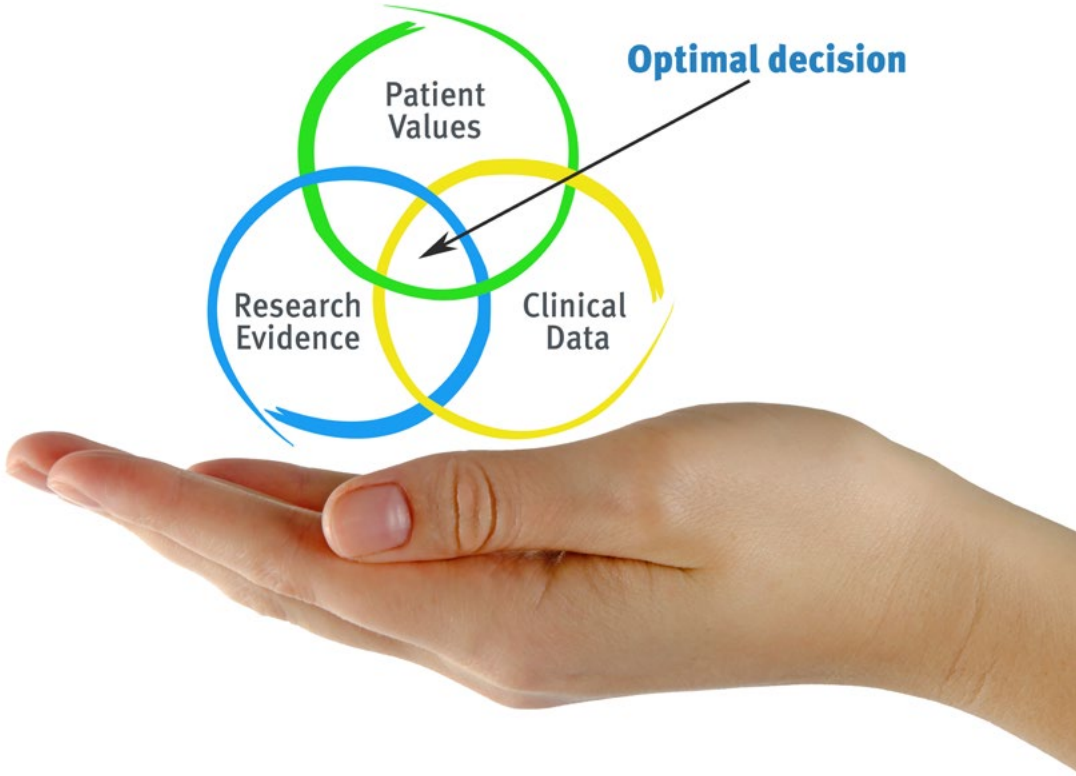
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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"

At TECH we use the Case Method

What should a professional do in a given situation? Throughout the program, students will face multiple simulated clinical cases, based on real patients, in which they will have to do research, establish hypotheses, and ultimately resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Specialists learn better, faster, and more sustainably over time.

With TECH you will experience a way of learning that is shaking the foundations of traditional universities around the world.



According to Dr. Gérvas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, trying to recreate the real conditions in the physician's professional practice.

Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method"

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

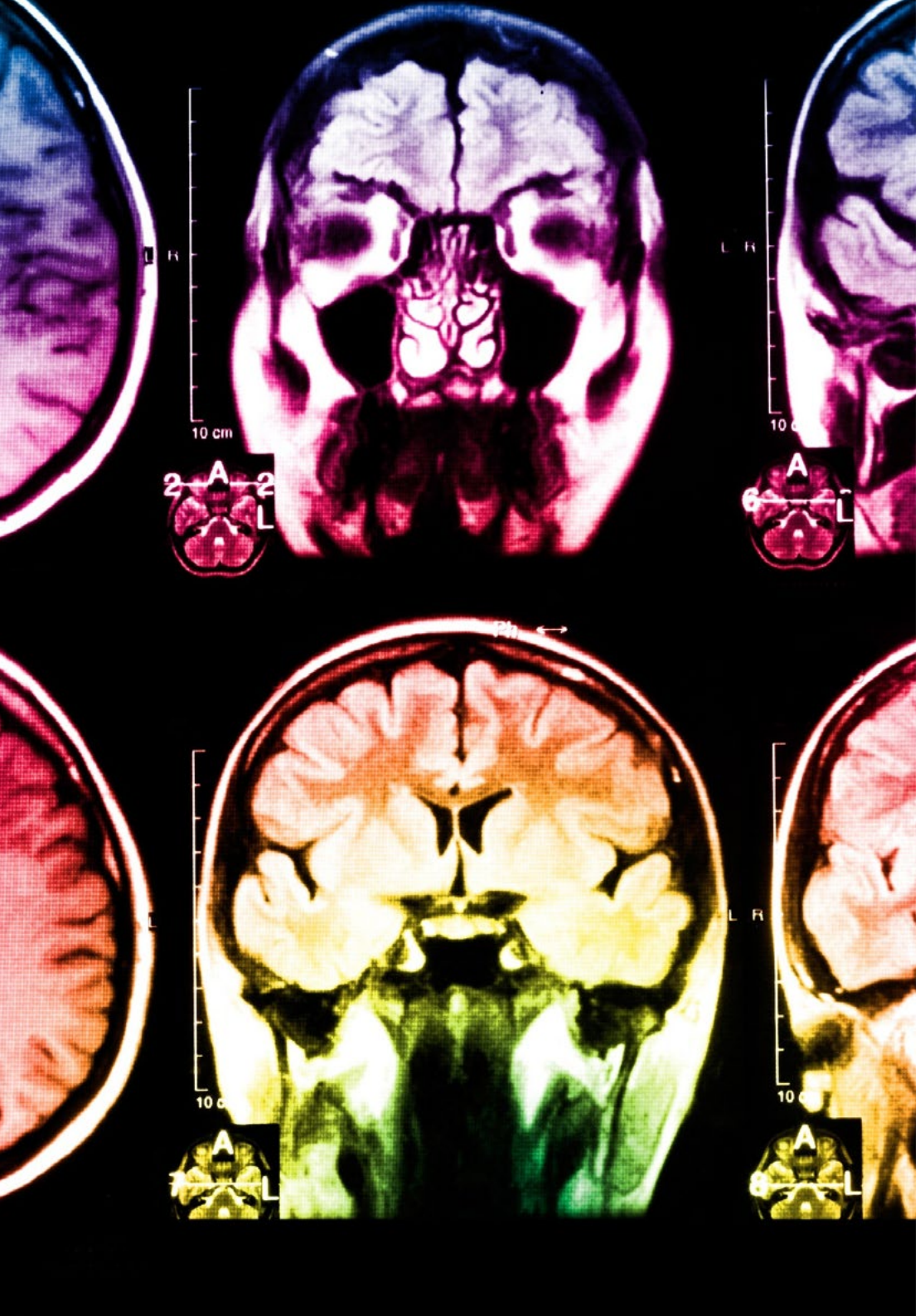
1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better 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.

Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.

Professionals will learn through real cases and by resolving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.



At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology, more than 250,000 physicians have been trained with unprecedented success in all clinical specialties regardless of surgical load. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

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.

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.

The overall score obtained by TECH's learning system is 8.01, according to the highest international standards.

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.

Surgical Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances and to the forefront of current medical techniques. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch the videos as many times as you like.

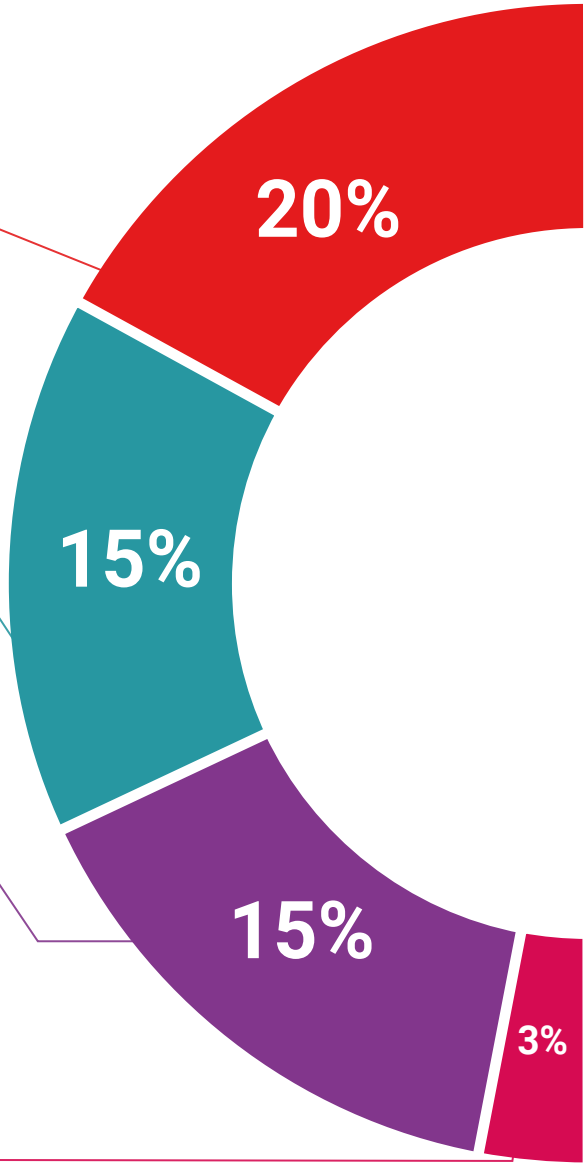
Interactive Summaries

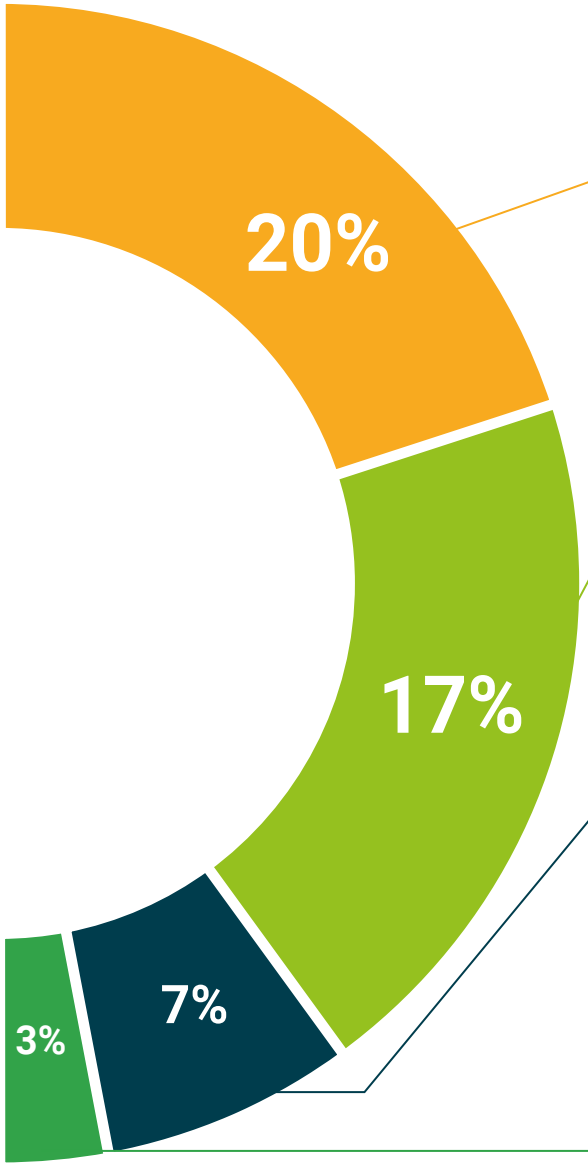
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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

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.





Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.

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.

Classes

There is scientific evidence on the usefulness of learning by observing experts. The system known as Learning from an Expert strengthens knowledge and memory, and generates confidence in 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 Technological University.

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

This **Professional Master's Degree in Artificial Intelligence in Clinical Practice** contains the most complete and up-to-date scientific on the market.

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

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

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

Official Nº of Hours: **2,250 h.**


tech technological university

Awards the following

CERTIFICATE

to

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

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Artificial Intelligence in Clinical Practice

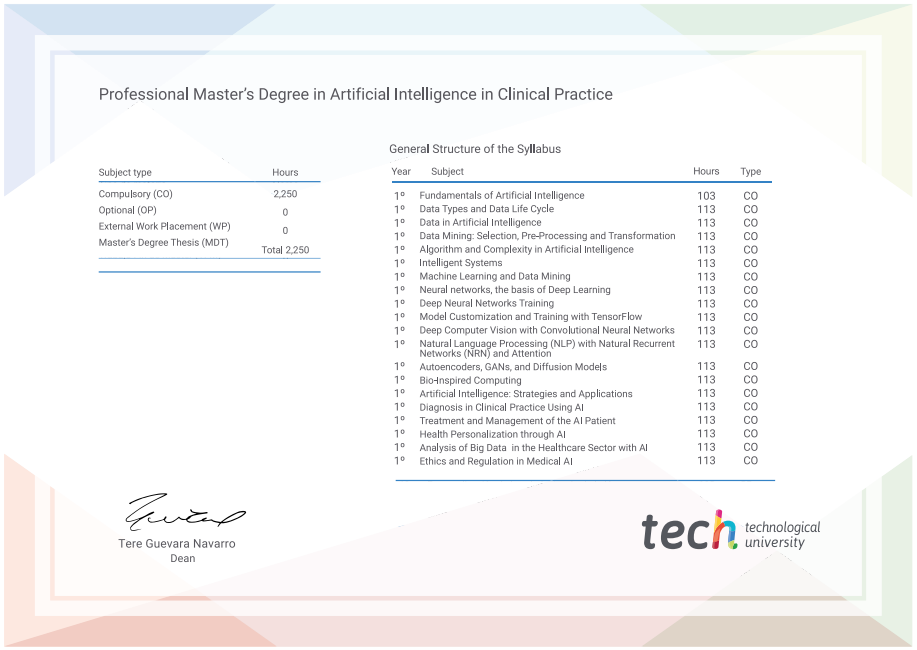
This is a qualification awarded by this University, equivalent to 2,250 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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

June 17, 2020

Tere Guevara Navarro
Dean

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


Professional Master's Degree in Artificial Intelligence in Clinical Practice

Subject type	Hours
Compulsory (CO)	2,250
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	
	Total 2,250

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Fundamentals of Artificial Intelligence	103	CO
1º	Data Types and Data Life Cycle	113	CO
1º	Data in Artificial Intelligence	113	CO
1º	Data Mining: Selection, Pre-Processing and Transformation	113	CO
1º	Algorithm and Complexity in Artificial Intelligence	113	CO
1º	Intelligent Systems	113	CO
1º	Machine Learning and Data Mining	113	CO
1º	Neural networks, the basis of Deep Learning	113	CO
1º	Deep Neural Networks Training	113	CO
1º	Model Customization and Training with TensorFlow	113	CO
1º	Deep Computer Vision with Convolutional Neural Networks	113	CO
1º	Natural Language Processing (NLP) with Natural Recurrent Networks (NRN) and Attention	113	CO
1º	Autoencoders, GANs, and Diffusion Models	113	CO
1º	Bio-Inspired Computing	113	CO
1º	Artificial Intelligence: Strategies and Applications	113	CO
1º	Diagnosis in Clinical Practice Using AI	113	CO
1º	Treatment and Management of the AI Patient	113	CO
1º	Health Personalization through AI	113	CO
1º	Analysis of Big Data in the Healthcare Sector with AI	113	CO
1º	Ethics and Regulation in Medical AI	113	CO

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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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Professional Master's Degree

Artificial Intelligence in Clinical Practice

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

Professional Master's Degree

Artificial Intelligence in Clinical Practice

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