Professional Master's Degree

Artificial Intelligence in Clinical Research

tech technological university

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Professional Master's Degree
Artificial Intelligence in Clinical Research

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

Website: www.techtitute.com/in/artificial-intelligence/professional-master-degree/master-artificial-intelligence-clinical-research

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01

Introduction

In the context of Clinical Research, Artificial Intelligence (AI) has become an essential tool to analyze large amounts of data efficiently and accurately. In this way, this system contributes to significant advances in both the understanding and treatment of diseases. For example, in the case of cancer, Machine Learning is used to identify tumor lesions in high-resolution medical images. Likewise, by examining genomic information, patients can receive more effective therapies that reduce the occurrence of side effects. In view of this, TECH is developing a university program that will immerse physicians in innovation in this field in order to improve their healthcare practice. And all in a convenient 100% online format.

Thanks to this 100% online program, you will comprehensively analyze the essential principles of machine learning and its implementation in the analysis of biomedical data"

During therapeutic treatments, users need to be constantly monitored by medical professionals to verify the efficacy of the treatments. In this sense, Artificial Intelligence is useful for collecting real-time data on the clinical status of individuals. Likewise, its tools detect even subtle changes in health to alert specialists when necessary. As a result, doctors can apply modifications based on the reactions of individuals and prevent future life-threatening problems.

Aware of its importance, TECH implements a Professional Master's Degree that will address in detail the specific applications of Artificial Intelligence in the field of Clinical Research. Designed by experts in this field, the curriculum will delve into computational simulation in biomedicine and advanced analysis of clinical data. In this way, experts will obtain advanced skills to implement Machine Learning in complex biomedical situations. On the other hand, the syllabus will emphasize the ethical and legal considerations of the use of Artificial Intelligence so that graduates will develop their procedures under a highly deontological perspective.

It should be noted that the methodology of this program reinforces its innovative character. TECH offers a 100% online educational environment, adapted to the needs of busy professionals seeking to advance their careers. Therefore, they will be able to individually plan their schedules and evaluation timetables. Likewise, the training uses the innovative *Relearning* system, based on the repetition of key concepts to fix knowledge and facilitate learning. In this way, the combination of flexibility and a robust pedagogical approach makes it highly accessible. Professionals will also have access to a library full of audiovisual resources, including infographics and interactive summaries. In addition, the university degree will include real clinical cases that will bring the development of the program as close as possible to the reality of medical care.

This **Professional Master's Degree in Artificial Intelligence in Clinical Research** contains the most complete and up-to-date 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 ability of Artificial Intelligence to both integrate data from various sources and predict outcomes will contribute to making your medical practice more accurate and personalized"

In order for you to achieve your academic goals in a flexible way, TECH offers a 100% online learning methodology, based on free access to the contents and the personalization of the teaching"

Looking to delve deeper into the implementation of Big Data? Manage the most effective Machine Learning techniques thanks to this Professional Master's Degree.

The training includes the analysis of ethical, legal and regulatory aspects, committing to responsibility and awareness of contemporary challenges.

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

This training will provide graduates with an exhaustive knowledge of Artificial Intelligence applied to Clinical Research. In this way, professionals will be highly qualified to face current and future challenges in the medical field. Likewise, the specialists will learn about ethical and innovative aspects that will help them to transform health care. They will also learn advanced techniques for analyzing medical data, developing predictive models for clinical trials and implementing creative solutions for the personalization of treatments. In this way, experts will effectively address clinical complexities through proposals based on accurate data.

You will delve into the latest technologies and the most revolutionary applications of Artificial Intelligence in Clinical Research, through the best multimedia resources"

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
- Gain 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 solid knowledge 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, data analysis with AI 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
- Gain a solid understanding of the concepts of *Big Data* in the clinical setting and become familiar with essential tools for its analysis
- Delve into ethical dilemmas, review legal considerations, explore the socioeconomic and future impact 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 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
- 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
- Tune 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. AI Methods and Tools for Clinical Research

- Gain a comprehensive view of the AI is transforming Clinical Research, from its historical foundations to current applications
- Implement advanced statistical methods and algorithms in clinical studies to optimize data analysis
- Design experiments with innovative approaches and perform comprehensive analysis of results in Clinical Research
- Apply natural language processing to improve scientific and clinical documentation in the Research context
- Effectively integrate heterogeneous data using state-of-the-art techniques to enhance interdisciplinary clinical research

Module 17. Biomedical Research with AI

- Acquire solid knowledge on the validation of models and simulations in the biomedical field, ensuring their accuracy and clinical relevance
- Integrate heterogeneous data using advanced methods to enrich the multidisciplinary analysis in Clinical Research
- Develop deep learning algorithms to improve the interpretation and analysis of biomedical data in clinical trials
- Explore the use of synthetic *datasets* in clinical studies and understand the practical applications of AI in health research
- Understand the crucial role of computational simulation in drug discovery, analysis of molecular interactions, and modeling of complex diseases

Module 18. Practical Application of AI in Clinical Research

- Acquire expertise in key areas such as personalization of therapies, precision medicine, AI-assisted diagnostics, clinical trial management and vaccine development
- Incorporate robotics and automation in clinical laboratories to optimize processes and improve the quality of results
- Explore the impact of AI in microbiome, microbiology, *wearables* and remote monitoring in clinical studies
- Address contemporary challenges in the biomedical field, such as efficient management of clinical trials, development of AI-assisted treatments, and application of AI in immunology and immune response studies
- Innovate in AI-assisted diagnostics to improve early detection and diagnostic accuracy in clinical and biomedical research settings

Module 19. *Big Data* Analytics and Machine Learning in Clinical Research

- Gain a solid understanding of the concepts fundamental of Big Data in the clinical setting and become familiar with essential tools Used for its analysis
- Explore advanced data mining techniques, machine learning algorithms, predictive analytics, and AI applications in epidemiology and public health
- Analyze biological networks and disease patterns to identify connections and potential treatments
- Address data security and manage the challenges associated with large volumes of data in biomedical research
- Investigate case studies that demonstrate the potential of Big Data in biomedical research

Module 20. Ethical, Legal and Future Aspects of AI in Clinical Research

- Understand the ethical dilemmas that arise when applying AI in clinical research and review the relevant legal and regulatory considerations in the biomedical field
- Address specific challenges in the management of informed consent in AI studies
- Investigate how AI can influence equity and access to health care
- Analyze future perspectives on how AI will shape Clinical Research, exploring its role in the sustainability of biomedical research practices and identifying opportunities for innovation and entrepreneurship
- Comprehensively address the ethical, legal and socioeconomic aspects of AI-driven Clinical Research

Benefit from a curriculum developed by specialists and top-quality content. Update your clinical practice with TECH!"

03

Skills

This university degree will provide students with a complete and up-to-date update in the application of Artificial Intelligence in the Clinical Research environment. Thanks to this program, graduates will have advanced and practical skills to effectively handle biomedical challenges such as data analysis or simulation of biological processes. Along the same lines, professionals will incorporate cutting-edge technologies (including genomic sequencing) into their usual procedures. In addition, their practice will be characterized by taking into account ethical, legal and regulatory aspects in the application of Artificial Intelligence in the medical field.

You will have clinical case studies that will enhance your skills in Machine Learning and Data Mining"

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 responses to treatments, using AI to improve understanding of complex biomedical phenomena
- Address contemporary challenges in the biomedical field, such including efficient management of clinical trials and 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 AI tools, platforms and techniques used in clinical research, 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 genomic sequencing and data analytics 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

A training that will enable you to enhance diagnostic accuracy and the design of personalized treatments. You will revolutionize healthcare with innovation!"

04

Course Management

In its maximum premise of providing educational excellence to its students, TECH has carefully selected the faculty that makes up this program. These professionals have a high level of knowledge about Artificial Intelligence applied to Clinical Research, thanks to their years of work experience in research. In this way, these specialists are authoritative voices in the field and will be in charge of sharing their understanding with the students. For this reason, the teaching materials will be characterized by their quality and by combining the latest technologies in this health field that is advancing by leaps and bounds.

A specialized teaching team will pour their extensive knowledge in the field of Artificial Intelligence in Clinical Research in this university program"

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
- Ph.D. in Psychology from the University of Castilla - La Mancha
- Ph.D. in Economics, Business and Finance from the Camilo José Cela University
- Ph.D. in Psychology from University of Castilla – La Mancha
- Master's 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. Popescu Radu, Daniel Vasile

- Pharmacology, Nutrition and Diet Specialist
- Freelance Producer of Didactic and Scientific Contents
- Nutritionist and Community Dietitian
- Community Pharmacist
- Researcher
- Master's Degree in Nutrition and Health at the Universidad Oberta de Catalunya
- Master's Degree in Psychopharmacology, University of Valencia
- Pharmacist by the Complutense University of Madrid
- Nutritionist-Dietician by the European University Miguel de Cervantes

Professors

Dr. Carrasco González, Ramón Alberto

- Computer Science and Artificial Intelligence Specialist
- 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, University of Granada
- Computer Engineer from the University of Granada

05

Structure and Content

This Professional Master's Degree will combine the scientific rigor of Clinical Research with the disruptive innovations of Artificial Intelligence. Composed of 20 modules, the curriculum will delve into both the interpretation of medical data and the development of predictive algorithms. The syllabus will also highlight the relevance of implementing technological solutions in clinical contexts. With a theoretical-practical approach, students will master the basics of Machine Learning and its correct application in the medical field. As a result, graduates will be able to lead advances in the individualization of treatments and the optimization of health care.

Access the multimedia resources library and the entire syllabus from day one. No fixed schedules, no attendance!"

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. Creation of 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. 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. 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 TensorFlowGraphics

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 TensorFlowTools for Data Manipulation

10.6. The API tfdata
- 10.6.1. Using the tfdataAPI for Data Processing
- 10.6.2. Construction of Data Streams with tfdata
- 10.6.3. Using thetfdata API for Model Training

10.7. The TFRecord Format
- 10.7.1. Using the TFRecordAPI 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. Data preprocessing 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. Architecture ResNet

11.5. Implementing a CNN ResNett 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
- 11.10.1. Edge Detection
- 11.10.1. Rule-based Segmentation Methods

Module 12. Natural Language Processing (NLP) with Natural Recurrent Networks (NRN) 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 TransformerModels 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 TransformersLibrary
- 12.8.1. Using the Hugging Face's TransformersLibrary
- 12.8.2. Hugging Face's TransformersLibrary App
- 12.8.3. Advantages of Hugging Face's Transformers Library

12.9. Other Transformers Libraries. Comparison
- 12.9.1. Comparison between different TransformersLibraries
- 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 Applications
- 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. AI Methods and Tools for Clinical Research

16.1. AI Technologies and Tools in Clinical Research
- 16.1.1. Use of Machine Learning to Identify Patterns in Clinical Data
- 16.1.2. Development of Predictive Algorithms for Clinical Trials
- 16.1.3. Implementation of AI Systems for Improved Patient Recruitment
- 16.1.4. Implementation of AI Systems for the Real-Time Analysis of groups Data

16.2. Statistical Methods and Algorithms in Clinical Trials
- 16.2.1. Application of Advanced Statistical Techniques for the Analysis of Clinical Data
- 16.2.2. Use of Algorithms for the Validation and Verification of Trial Results
- 16.2.3. Implementation of Regression and Classification Models in Clinical Studies
- 16.2.4. Analysis of Large Data Sets Using Computational Statistical Methods

16.3. Design of Experiments and Analysis of Results
- 16.3.1. Strategies for Efficient Clinical Trial Design Using AI
- 16.3.2. AI Techniques for Analysis and Interpretation of Experimental Data
- 16.3.3. Optimization of Research Protocols Using AI Simulations
- 16.3.4. Evaluation of the Efficacy and Safety of Treatments Using AI Models

16.4. Interpretation of Medical Images Using AI in Research
- 16.4.1. Development of AI systems for the Automatic Detection of Pathologies in Images
- 16.4.2. Use of Deep Learning for Classification and Segmentation in Medical Imaging
- 16.4.3. AI Tools for Improving Accuracy in Diagnostic Image
- 16.4.4. Analysis of Radiological and Magnetic Resonance Imaging using AI

16.5. Clinical Analysis and Biomedical Data Analysis
- 16.5.1. AI in Genomic and Proteomic Data Processing and Analysis
- 16.5.2. Tools for the Integrated Analysis of Clinical and Biomedical Data
- 16.5.3. Use of AI for Identifying Biomarkers in Clinical Research
- 16.5.4. Predictive Analytics of Clinical Outcomes Based on Biomedical Data

16.6. Advanced Data Visualization in Clinical Research
- 16.6.1. Development of Interactive Visualization Tools for Clinical Data
- 16.6.2. Use of AI in the Creation of Graphical Representations of Complex Data
- 16.6.3. Visualization Techniques for the Easy Interpretation of Research Results
- 16.6.4. Augmented and Virtual Reality Tools for the Visualization of Biomedical Data

16.7. Natural Language Processing in Scientific and Clinical Documentation
- 16.7.1. Application of NLP for the Analysis of Scientific Literature and Clinical Records
- 16.7.2. AI Tools for the Extraction of Relevant Information from Medical Texts
- 16.7.3. AI Systems for Summarizing and Categorizing Scientific Publications
- 16.7.4. Use of NLP in Identifying Trends and Patterns in Clinical Documentation

16.8. Heterogeneous Data Processing in Clinical Research
- 16.8.1. AI Techniques for Integrating and Analyzing Data from Diverse Clinical Sources
- 16.8.2. Tools for the Management of Unstructured Clinical Data
- 16.8.3. AI Systems for Clinical and Demographic Data Correlation
- 16.8.4. Analysis of Multidimensional Data to Obtain Clinical Insights

16.9. Applications of Neural Networks in Biomedical Research
- 16.9.1. Use of Neural Networks for Disease Modeling and Treatment Prediction
- 16.9.2. Implementation of Neural Networks in the Classification of Genetic Diseases
- 16.9.3. Development of Diagnostic Systems Based on Neural Networks
- 16.9.4. Application of Neural Networks in the Personalization of Medical Treatments

16.10. Predictive Modeling and its Impact on Clinical Research
- 16.10.1. Development of Predictive Models for the Anticipation of Clinical Outcomes
- 16.10.2. Use of AI in the Prediction of Side Effects and Adverse Reactions
- 16.10.3. Implementation of Predictive Models in Clinical Trial Optimization
- 16.10.4. Risk Analysis of Medical Treatments Using Predictive Modeling

Module 17. Biomedical Research with AI

17.1. Design and Execution of Observational Studies with AI
- 17.1.1. Implementation of AI for the Selection and Segmentation of Populations in Studies
- 17.1.2. Use of Algorithms for Real-Time Monitoring of Observational Study Data
- 17.1.3. AI Tools for the Identification of Patterns and Correlations in Observational Studies
- 17.1.4. Automation of the Data Collection and Analysis Process in Observational Studies

17.2. Validation and Calibration of Models in Clinical Research
- 17.2.1. AI Techniques for Ensuring the Accuracy and Reliability of Clinical Models
- 17.2.2. Use of AI in the Calibration of Predictive Models in Clinical Research
- 17.2.3. Cross-validation Methods Applied to Clinical Models using AI
- 17.2.4. AI Tools for the Evaluation of the Generalization of Clinical Models

17.3. Methods for Integrating Heterogeneous Data in Clinical Research
- 17.3.1. AI Techniques for Combining Clinical, Genomic, and Environmental Data
- 17.3.2. Use of Algorithms for Handling and Analyzing Unstructured Clinical Data
- 17.3.3. AI Tools for Normalization and Standardization of Clinical Data
- 17.3.4. AI Systems for Correlating Different Types of Research Data

17.4. Integration of Multidisciplinary Biomedical Data
- 17.4.1. AI Systems to Combine Data from Different Biomedical Disciplines
- 17.4.2. Algorithms for the Integrated Analysis of Clinical and of Laboratory Data
- 17.4.3. AI Tools for the Visualization of Complex Biomedical Data
- 17.4.4. Use of AI in the Creation of Holistic Health Models from Multidisciplinary Data

17.5. Deep Learning Algorithms in Biomedical Data Analysis
- 17.5.1. Implementation of Neural Networks in Analysis of Genetic and Proteomic Data
- 17.5.2. Using Deep Learning to Identify Patterns in Biomedical Data
- 17.5.3. Development of Predictive Models in Precision Medicine with Deep Learning
- 17.5.4. Application of AI in Advanced Biomedical Image Analysis

17.6. Optimization of Research Processes with Automation
- 17.6.1. Automation of Laboratory Routines with AI Systems
- 17.6.2. Use of AI for Efficient Management of Resources and Time in Research
- 17.6.3. AI Tools for Workflow Optimization in Clinical Research
- 17.6.4. Automated Systems for Tracking and Reporting of Research Progress

17.7. Simulation and Computational Modeling in Medicine with AI
- 17.7.1. Development of Computational Models to Simulate Clinical Scenarios
- 17.7.2. Use of AI for Simulation of Molecular and Cellular Interactions
- 17.7.3. AI Tools in the Creation of Predictive Disease Models
- 17.7.4. Application of AI in the Simulation of Drug and Treatment Effects

17.8. Use of Virtual and Augmented Reality in Clinical Trials
- 17.8.1. Implementation of Virtual Reality for Training and Simulation in Medicine
- 17.8.2. Use of Augmented Reality in Surgical and Diagnostic Procedures
- 17.8.3. Virtual Reality Tools for Behavioral and Psychological Studies
- 17.8.4. Application of Immersive Technologies in Rehabilitation and Therapy

17.9. Data Mining Tools Applied to Biomedical Research
- 17.9.1. Use of Data Mining Techniques to Extract Knowledge from Biomedical Databases
- 17.9.2. Implementation of AI Algorithms to Discover Patterns in Clinical Data
- 17.9.3. AI Tools for Trend Identification in Large Datasets
- 17.9.4. Application of Data Mining in the Generation of Research Hypotheses

17.10. Development and Validation of Biomarkers with Artificial Intelligence
- 17.10.1. Use of AI for the Identification and Characterization of New Biomarkers
- 17.10.2. Implementation of AI Models for the Validation of Biomarkers in Clinical Studies
- 17.10.3. AI Tools in Correlating Biomarkers with Clinical Results
- 17.10.4. AI Applications in the analysis of Biomarkers for Personalized Medicine

Module 18. Practical Application of AI in Clinical Research

18.1. Genomic Sequencing Technologies and Data Analysis with AI
- 18.1.1. Use of AI for Rapid and Accurate Analysis of Genetic Sequences
- 18.1.2. Implementation of Automatic Learning Algorithms in the Interpretation of Genomic Data
- 18.1.3. AI Tools to Identify Genetic Variants and Mutations
- 18.1.4. Application of AI in Genomic Correlation with Diseases and Traits

18.2. AI in Biomedical Image Analysis
- 18.2.1. Development of AI Systems for the Detection of Anomalies in Medical Imaging
- 18.2.2. Use of Deep Learning in the interpretation of X-rays, MRI and CT scans.
- 18.2.3. AI Tools for Improving Accuracy in Diagnostic Imaging
- 18.2.4. Implementation of AI in the Classification and Segmentation of Biomedical Images

18.3. Robotics and Automation in Clinical Laboratories
- 18.3.1. Use of Robots for the Automation of Tests and Processes in Laboratories
- 18.3.2. Implementation of Automated Systems for the Management of Biological Samples
- 18.3.3. Development of Robotic Technologies to Improve Efficiency and Accuracy in Clinical Analyses
- 18.3.4. Application of AI in the Optimization of Laboratory Workflows

18.4. AI in the Personalization of Therapies and Precision Medicine
- 18.4.1. Development of AI Models for the Personalization of Medical Treatments
- 18.4.2. Use of Predictive Algorithms in the Selection of Therapies Based on Genetic Profiles
- 18.4.3. AI Tools in Dose Adaptation and Drug Combinations
- 18.4.4. Application of AI in the Identification of Effective Treatments for Specific Groups

18.5. Innovations in AI-assisted Diagnosis
- 18.5.1. Implementation of AI Systems for Rapid and Accurate Diagnostics
- 18.5.2. Use of AI in Early Disease Identification through Data Analysis
- 18.5.3. Development of AI Tools for Clinical Test Interpretation
- 18.5.4. Application of AI in Combining Clinical and Biomedical Data for Comprehensive Diagnostics

18.6. Applications of AI in Microbiome and Microbiology Studies
- 18.6.1. Use of AI in the Analysis and Mapping of the Human Microbiome
- 18.6.2. Implementation of Algorithms to Study the Relationship Between the Microbiome and Disease
- 18.6.3. AI Tools in the Identification of Patterns in Microbiological Studies
- 18.6.4. Application of AI in Microbiome-based Therapeutics Research

18.7. Wearables and Remote Monitoring in Clinical Studies
- 18.7.1. Development of Wearable Devices with AI for Continuous Health Monitoring
- 18.7.2. Use of AI in the Interpretation of Data Collected by Wearable Devices
- 18.7.3. Implementation of Remote Monitoring Systems in Clinical Trials
- 18.7.4. Application of AI in the Prediction of Clinical Events through Wearable Data

18.8. AI in Clinical Trial Management
- 18.8.1. Use of AI Systems to Optimize Clinical Trials Management
- 18.8.2. Implementation of AI in Participant Selection and Follow-Up
- 18.8.3. AI Tools for the Analysis of Clinical Trial Data and Results
- 18.8.4. Application of AI in Improving Trial Efficiency and Reducing Trial Costs

18.9. AI-assisted Development of Vaccines and Treatments
- 18.9.1. Use of AI in Accelerating Vaccine Development
- 18.9.2. Implementation of Predictive Models in the Identification of Potential Treatments
- 18.9.3. AI Tools for Simulating Vaccine and Drug Responses
- 18.9.4. Application of AI in the Personalization of Vaccines and Therapies

18.10. AI Applications in Immunology and Immune Response Studies
- 18.10.1. Development of AI Models for Understanding Immunological Mechanisms
- 18.10.2. Use of AI in the Identification of Patterns in Immune Responses
- 18.10.3. Implementation of AI in the Investigation of Autoimmune Disorders
- 18.10.4. Application of AI in the Design of Personalized Immunotherapies

Module 19. Big Data Analytics and Machine Learning in Clinical Research

19.1. Big Data in Clinical Research: Concepts and Tools
- 19.1.1. The Explosion of Data in Clinical Research
- 19.1.2. Concept of Big Data and Main Tools
- 19.1.3. Applications of Big Data in Clinical Research

19.2. Data Mining in Clinical and Biomedical Registries
- 19.2.1. Main Methodologies for Data Mining
- 19.2.2. Data Integration from Clinical and Biomedical Registries
- 19.2.3. Detection of Patterns and Anomalies in Biomedical and Clinical Records

19.3. Machine Learning Algorithms in Biomedical Research
- 19.3.1. Classification Techniques in Biomedical Research
- 19.3.2. Regression Techniques in Biomedical Research
- 19.3.4. Unsupervised Techniques in Biomedical Research

19.4. Predictive Analytics Techniques in Clinical Research
- 19.4.1. Classification Techniques in Clinical Research
- 19.4.2. Regression Techniques in Clinical Research
- 19.4.3. Deep Learning in Clinical Research

19.5. AI Models in Epidemiology and Public Health
- 19.5.1. Classification Techniques in Epidemiology and Public Health
- 19.5.2. Regression Techniques in Epidemiology and Public Health
- 19.5.3. Unsupervised Techniques in Epidemiology and Public Health

19.6. Analysis of Biological Networks and Disease Patterns
- 19.6.1. Exploration of Interactions in Biological Networks for the Identification of Disease Patterns
- 19.6.2. Integration of Omics Data in Network Analysis to Characterize Biological Complexities
- 19.6.3. Application of Machine Learning Algorithms for Disease Pattern Discovery

19.7. Development of Tools for Clinical Prognostics
- 19.7.1. Creation of Innovative Tools for Clinical Prognosis Based on Multidimensional Data
- 19.7.2. Integration of Clinical and Molecular Variables in the Development of Prognostic Tools
- 19.7.3. Evaluating the Effectiveness of Prognostic Tools in Various Clinical Contexts

19.8. Advanced Visualization and Communication of Complex Data
- 19.8.1. Use of Advanced Visualization Techniques to Represent Complex Biomedical Data
- 19.8.2. Development of Effective Communication Strategies for Presenting Complex Analysis Results
- 19.8.3. Implementation of Interactivity Tools in Visualizations to Enhance Comprehension

19.9. Data Security and Challenges inBig DataManagement
- 19.9.1. Addressing Data Security Challenges in the Context of Biomedical Big Data
- 19.9.1. Strategies for Privacy Protection in the Management of Large Biomedical Data Sets
- 19.9.3. Implementation of Security Measures to Mitigate Risks in the Management of Sensitive Data

19.10. Practical Applications and Case Studies in Biomedical Big Data
- 19.10.1. Exploration of Successful Cases in the Implementation of Biomedical Big Data n Clinical Research
- 19.10.2. Development of Practical Strategies for the Application of Big Data in Clinical Decision Making
- 19.10.3. Impact Assessment and Lessons Learned through Case Studies in the Biomedical Domain

Module 20. Ethical, Legal and Future Aspects of AI in Clinical Research

20.1. Ethics in the Application of AI in Clinical Research
- 20.1.1. Ethical Analysis of AI-assisted Decision Making in Clinical Research Settings
- 20.1.2. Ethics in the Use of AI Algorithms for Participant Selection in Clinical Studies
- 20.1.3. Ethical Considerations in the Interpretation of Results Generated by AI Systems in Clinical Research

20.2. Legal and Regulatory Considerations in Biomedical AI
- 20.2.1. Analysis of Legal Regulations in the Development and Application of AI Technologies in the Biomedical Field
- 20.2.2. Assessment of Compliance with Specific Regulations to Ensure the Safety and Efficacy of AI-based Solutions
- 20.2.3. Addressing Emerging Regulatory Challenges Associated with the Use of AI in Biomedical Research

20.3. Informed Consent and Ethical Aspects in the Use of Clinical Data
- 20.3.1. Developing Strategies to Ensure Effective Informed Consent in Projects Involving AI
- 20.3.2. Ethics in the Collection and Use of Sensitive Clinical Data in the Context of AI-driven Research
- 20.3.3. Addressing Ethical Issues Related to Ownership of and Access to Clinical Data in Research Projects

20.4. AI and Accountability in Clinical Research
- 20.4.1. Assessing Ethical and Legal Liability in the Implementation of AI Systems in Clinical Research Protocols
- 20.4.2. Development of Strategies to Address Potential Adverse Consequences of AI Implementation in Biomedical Research
- 20.4.3. Ethical Considerations in the Active Involvement of AI in Clinical Research Decision Making

20.5. Impact of AI on Equity and Access to Health Care
- 20.5.1. Evaluation of the Impact of AI Solutions on Equity in Clinical Trial Participation
- 20.5.2. Developing Strategies to Improve Access to AI Technologies in Diverse Clinical Settings
- 20.5.3. Ethics in the Distribution of Benefits and Risks Associated with the Application of AI in Health Care

20.6. Privacy and Data Protection in Research Projects
- 20.6.1. Assurance of Privacy of Participants in Research Projects Involving the Use of AI
- 20.6.2. Development of Policies and Practices for Data Protection in Biomedical Research
- 20.6.3. Addressing Specific Privacy and Security Challenges in the Handling of Sensitive Data in the Clinical Environment

20.7. AI and Sustainability in Biomedical Research
- 20.7.1. Assessing the Environmental Impact and Resources Associated with the Implementation of AI in Biomedical Research
- 20.7.2. Development of Sustainable Practices in the Integration of AI Technologies in Clinical Research Projects
- 20.7.3. Ethics in Resource Management and Sustainability in the Adoption of AI in Biomedical Research

20.8. Auditing and Explainability of AI Models in the Clinical Setting
- 20.8.1. Development of Audit Protocols for Assessing the Reliability and Accuracy of AI Models in Clinical Research
- 20.8.2. Ethics in the Explainability of Algorithms to Ensure Understanding of Decisions Made by AI Systems in Clinical Contexts
- 20.8.3. Addressing Ethical Challenges in Interpreting Results of AI Models in Biomedical Research

20.9. Innovation and Entrepreneurship in the field of Clinical AI
- 20.9.1. Ethics in Responsible Innovation When Developing AI Solutions for Clinical Applications
- 20.9.2. Development of Ethical Business Strategies in the Field of Clinical AI
- 20.9.3. Ethical Considerations in the Commercialization and Adoption of AI Solutions in the Clinical Sector

20.10. Ethical Considerations in International Clinical Research Collaboration
- 20.10.1. Development of Ethical and Legal Agreements for International Collaboration in AI-driven Research Projects
- 20.10.2. Ethics in Multi-Institution and Multi-Country Involvement in Clinical Research with AI Technologies
- 20.10.3. Addressing Emerging Ethical Challenges Associated with Global Biomedical Research Collaborations

06

Methodology

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

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

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

Case Study to contextualize all content

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

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

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

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

A learning method that is different and innovative

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

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

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

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

Relearning Methodology

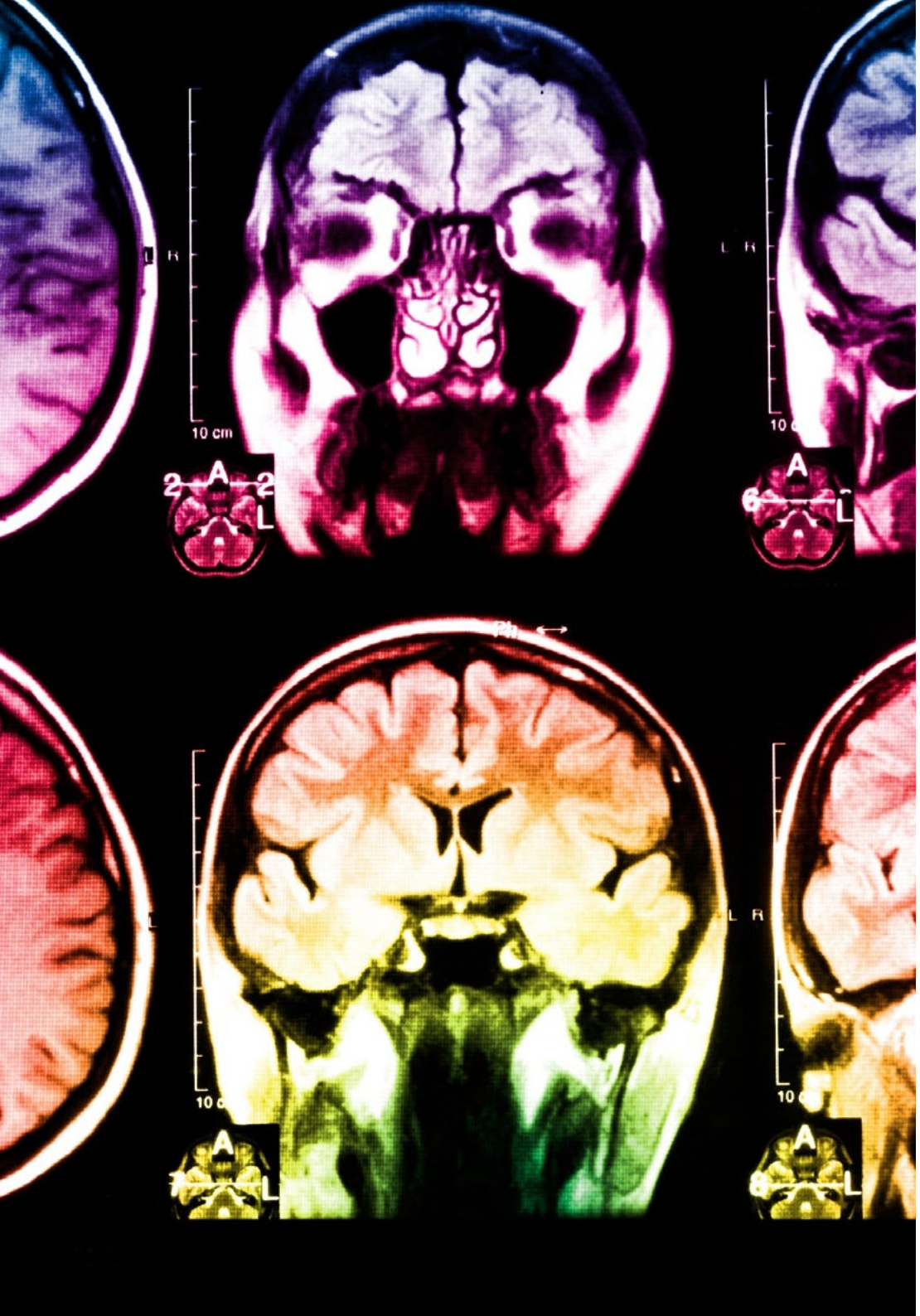
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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

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

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

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



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

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

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

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

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

Study Material

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

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

Classes

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

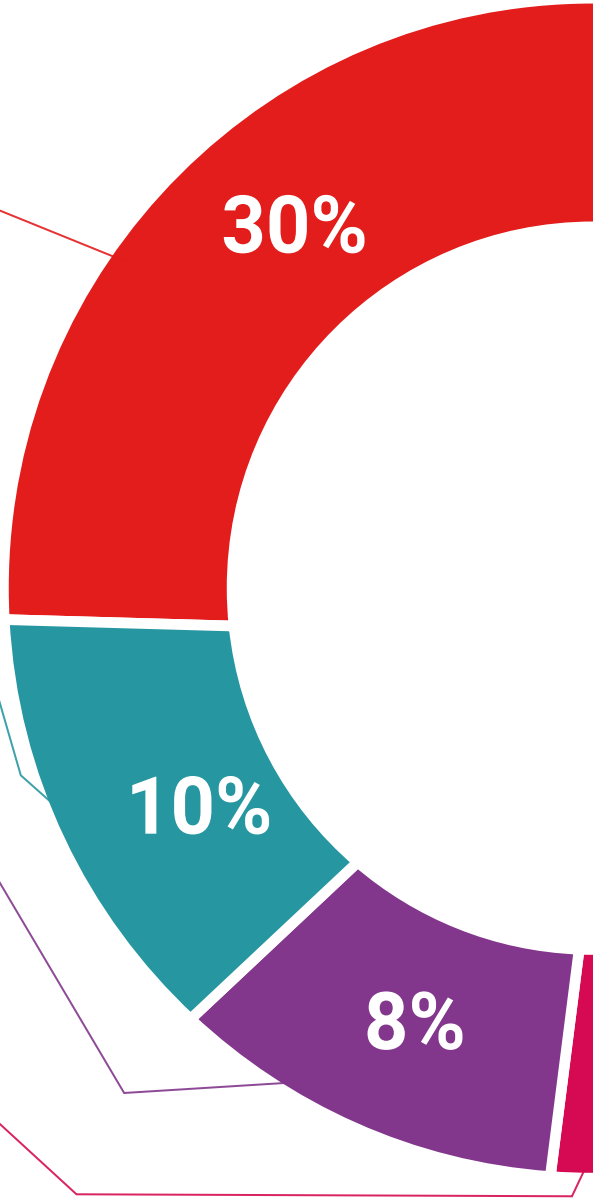
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

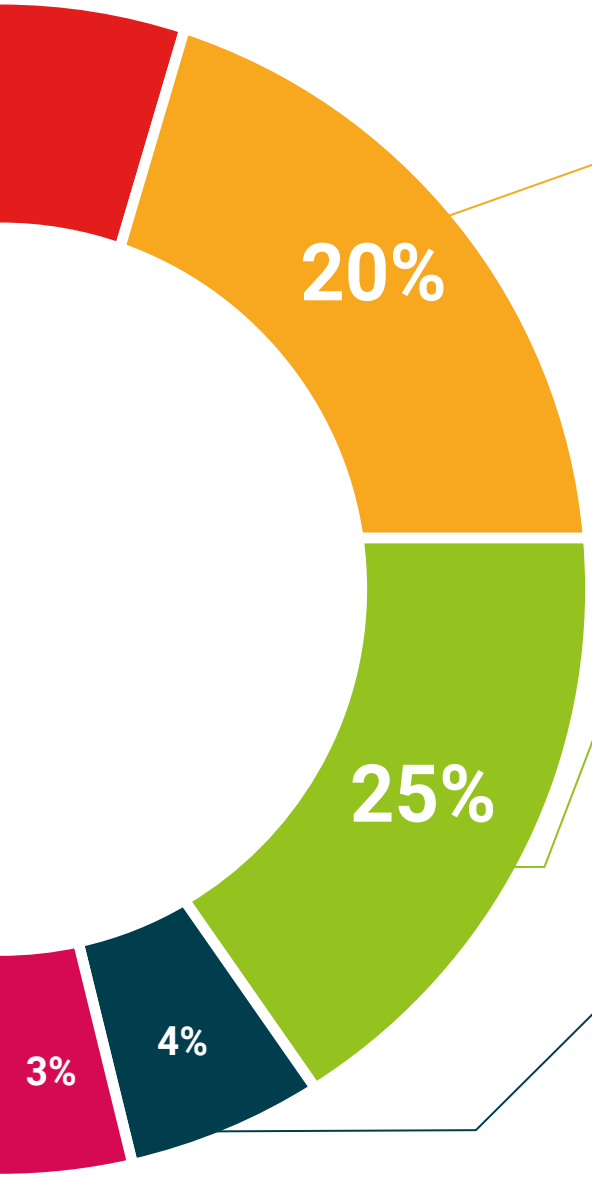
Practising Skills and Abilities

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

Additional Reading

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





Case Studies

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

Interactive Summaries

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

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

Testing & Retesting

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

07

Certificate

The Professional Master's Degree in Artificial Intelligence in Clinical Research 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 Research** contains the most complete and up-to-date program on the market.

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

The 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 Research**

Official Nº of Hours: **2250 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 Research

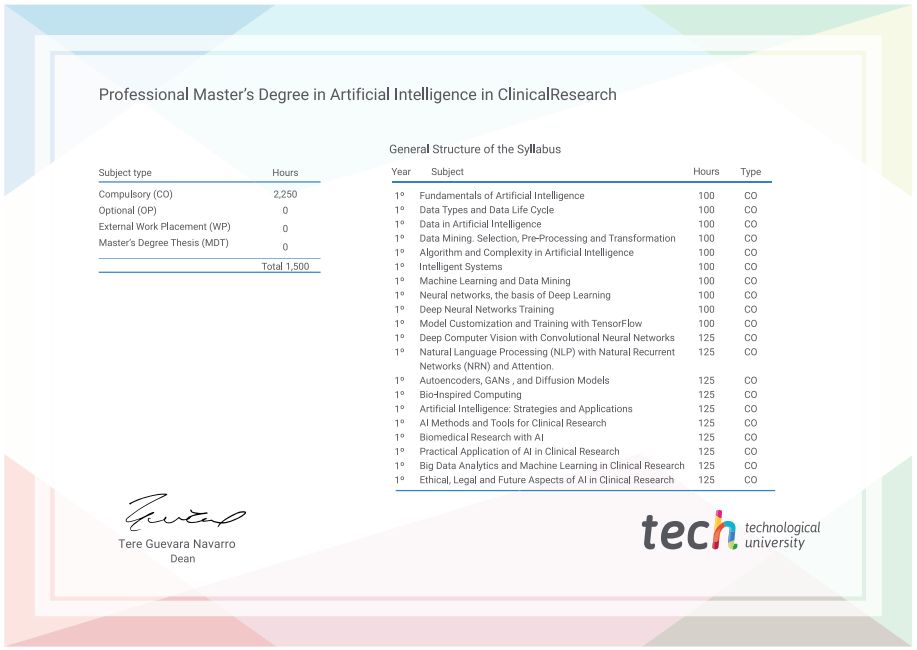
This is a qualification awarded by this University, equivalent to 2,250 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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

Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Artificial Intelligence in ClinicalResearch

Subject type	Hours
Compulsory (CO)	2,250
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 1,500

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Fundamentals of Artificial Intelligence	100	CO
1º	Data Types and Data Life Cycle	100	CO
1º	Data in Artificial Intelligence	100	CO
1º	Data Mining. Selection, Pre-Processing and Transformation	100	CO
1º	Algorithm and Complexity in Artificial Intelligence	100	CO
1º	Intelligent Systems	100	CO
1º	Machine Learning and Data Mining	100	CO
1º	Neural networks, the basis of Deep Learning	100	CO
1º	Deep Neural Networks Training	100	CO
1º	Model Customization and Training with TensorFlow	100	CO
1º	Deep Computer Vision with Convolutional Neural Networks	125	CO
1º	Natural Language Processing (NLP) with Natural Recurrent Networks (NRN) and Attention.	125	CO
1º	Autoencoders, GANs , and Diffusion Models	125	CO
1º	Bio-Inspired Computing	125	CO
1º	Artificial Intelligence: Strategies and Applications	125	CO
1º	AI Methods and Tools for Clinical Research	125	CO
1º	Biomedical Research with AI	125	CO
1º	Practical Application of AI in Clinical Research	125	CO
1º	Big Data Analytics and Machine Learning in Clinical Research	125	CO
1º	Ethical, Legal and Future Aspects of AI in Clinical Research	125	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 Research

- 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 Research

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