Professional Master's Degree

Artificial Intelligence in Stock Exchanges and Financial Markets

tech global university

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Professional Master's Degree
Artificial Intelligence in Stock Exchanges and Financial Markets

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

Website: **www.techtitute.com/us/artificia-intelligence/professional-master-degree/master-artificial-intelligence-stock-exchanges-financial-markets**

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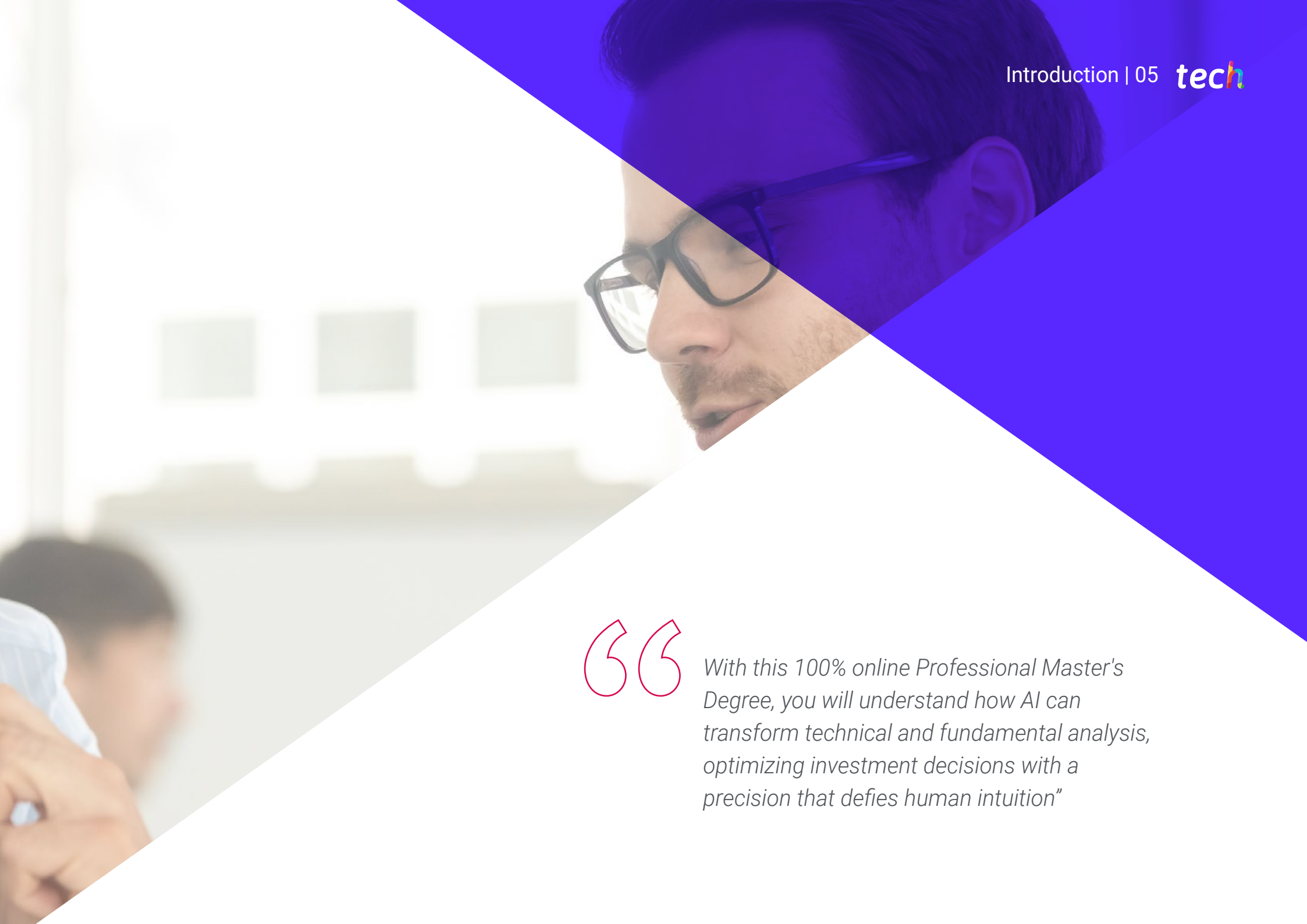
01

Introduction

Artificial Intelligence (AI) is radically transforming the world of Stock Exchanges and Financial Markets, introducing new forms of analysis and decision making. Indeed, AI algorithms, driven by machine learning and the processing of large volumes of data, allow investors to make more accurate predictions about market trends and spot opportunities that might go unnoticed by human analysts. In this context, TECH has developed a completely virtual program, which adapts to the individual and work schedules of the graduates. In addition, it employs an innovative learning methodology known as Relearning, which is unique to this university.



With this 100% online Professional Master's Degree, you will understand how AI can transform technical and fundamental analysis, optimizing investment decisions with a precision that defies human intuition"

The use of Artificial Intelligence (AI) in finance has intensified with the development of advanced Machine Learning algorithms, which optimize investment strategies and risk analysis. Financial institutions are adopting AI to automate operations, detect fraud in real time and personalize investment recommendations for their clients.

This is how this Professional Master's Degree was created, which will provide a solid understanding of how to apply advanced Artificial Intelligence techniques for the technical analysis of the markets. Therefore, professionals will be able to use modern tools for the visualization and automation of technical indicators, as well as implement sophisticated models, such as convolutional neural networks for the recognition of financial patterns.

Likewise, experts will become familiar with Machine Learning and Deep Learning techniques, as well as Natural Language Processing (NLP) to analyze financial statements and other relevant documents. Methodologies for risk and credit assessment, ESG sustainability analysis and financial fraud detection will also be addressed.

Finally, the processing of large volumes of financial data will be covered, handling and analyzing Big Data with advanced tools, such as Hadoop and Spark. In addition, the integration, cleansing and visualization of data, as well as security and privacy in the handling of financial information will be explored. At the same time, algorithmic trading strategies will be analyzed, including the design and optimization of automated and automated systems.

In this way, TECH has created a detailed, fully online university program, which provides graduates with access to educational materials through any electronic device with an Internet connection. This eliminates the need to travel to a physical location and adapt to a specific schedule. Additionally, it integrates the revolutionary Relearning methodology, which is based on the repetition of essential concepts to improve the understanding of the content.

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

- The development of case studies presented by experts in Artificial Intelligence focused on Stock Exchanges and Financial Markets
- The graphic, schematic, and practical contents with which they are created, provide practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

You will be able to handle and analyze large volumes of financial data, design effective algorithmic trading strategies, and address complex ethical and regulatory issues"

You will delve into advanced methods such as reinforcement learning for algorithmic trading and time series modeling with LSTM, thanks to an extensive library of innovative multimedia resources"

You will have the ability to perform accurate and efficient analysis in an environment of increasing complexity and dynamics in the financial markets, through the best teaching materials, at the forefront of technology and education.

You will address ethics and regulation in the use of AI in finance, preparing you to face ethical and regulatory challenges, as well as to develop technologies responsibly in the financial sector.

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 course. For this purpose, students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

Objectives

The program will equip professionals with the necessary skills to apply advanced Machine Learning and Deep Learning techniques in technical and fundamental analysis, optimizing investment and trading strategies. It will also focus on developing competencies to manage and process large volumes of financial data, design and evaluate algorithmic trading systems, and address ethical and regulatory issues related to the application of AI in finance. In this sense, experts will be prepared to face the challenges and take advantage of the opportunities offered by AI in a constantly changing financial environment.

The main objective of this Professional Master's Degree will be to train highly qualified professionals to integrate Artificial Intelligence in the analysis and management of financial markets. What are you waiting for to enroll?"

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
- Explore bio-inspired computing and its relevance in the development of intelligent systems
- Develop skills to apply advanced Artificial Intelligence techniques in the technical and fundamental analysis of financial markets, including the use of Machine Learning, Deep Learning and NLP
- Train students to design, implement and optimize algorithmic trading strategies, using Reinforcement Learning and Machine Learning techniques to improve efficiency and profitability in financial markets
- Acquire skills in processing and analyzing large volumes of financial data using Big Data technologies, such as Hadoop and Spark
- Foster the ability to create and apply Artificial Intelligence models that are explainable and transparent, ensuring that AI-based financial decisions are understandable and justifiable
- Develop a thorough understanding of the ethical and regulatory challenges associated with the use of Artificial Intelligence in finance
- Equip students with the tools and knowledge necessary to develop innovative financial solutions that integrate Artificial Intelligence
- Create predictive models using Machine Learning techniques, such as LSTM and time-series models, to anticipate market movements and improve investment decision making
- Develop skills in portfolio optimization and financial risk management using genetic algorithms and other advanced Artificial Intelligence techniques to maximize return and minimize investment risk
- Provide the necessary tools and techniques to implement and optimize high-frequency trading strategies, using Machine Learning models to improve the speed and accuracy of order execution
- Apply AI technologies in finance in an ethical and responsible manner, incorporating fairness, transparency and privacy considerations into their solutions

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

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

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
- 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

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

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

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

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

- Develop 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
- 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
- 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. Technical Analysis of Financial Markets with AI

- Develop the ability to visualize and optimize technical indicators using tools such as Plotly, Dash and Scikit-learn, enabling more informed decision making in the technical analysis of financial markets
- Implement Convolutional Neural Networks (CNN) for pattern recognition in financial data, improving accuracy in the identification of trading opportunities
- Acquire skills in the design and optimization of algorithmic trading strategies using Reinforcement Learning techniques with TensorFlow, focused on maximizing profitability

Module 17. Fundamental Analysis of Financial Markets with AI

- Learn to model and predict the financial performance of companies using Machine Learning and Deep Learning techniques, facilitating data-driven investment decisions
- Apply Natural Language Processing (NLP) techniques, such as ChatGPT, to analyze and extract relevant information from financial statements, improving the assessment of the financial health of companies
- Develop skills in financial fraud detection and risk assessment through the use of Machine Learning, ensuring greater security and accuracy in financial decisions

Module 18. Large Scale Financial Data Processing

- Master the use of Big Data technologies, such as Hadoop and Spark, for the storage and processing of large volumes of financial data, optimizing the capacity for analysis and decision making
- Implement tools and techniques for real-time processing of financial data, enabling fast and effective responses to market fluctuations
- Apply best practices to ensure the security and privacy of financial data, ensuring compliance with industry regulations

Module 19. Algorithmic Trading Strategies

- Acquire the necessary skills to design and develop automated trading systems, integrating Machine Learning techniques to improve the efficiency and effectiveness of operations
- Learn to evaluate and optimize trading strategies using advanced techniques such as backtesting and Machine Learning, with the objective of maximizing performance in the financial markets
- Develop a thorough understanding of risk management techniques as applied to algorithmic trading, ensuring that strategies are both profitable and safe

Module 20. Ethical and Regulatory Aspects of AI in Finance

- Explore the ethical challenges associated with the use of Artificial Intelligence in finance, including transparency, explainability, and fairness in financial modeling
- Understand the global regulations affecting the use of AI in financial markets, and learn how to develop solutions that meet these requirements
- Foster a culture of responsible development, integrating practices that ensure that AI technologies are used ethically, safely, and for the benefit of economic and social welfare

This academic itinerary is exclusive to TECH and you will be able to develop it at your own pace thanks to its 100% online Relearning methodology"

03

Skills

Professionals will acquire advanced skills in data analysis and visualization using Artificial Intelligence tools, interpreting large volumes of financial information accurately and efficiently. They will also specialize in the design and implementation of algorithmic trading strategies, optimizing investment decisions through Machine Learning and Deep Learning techniques. In addition, you will strengthen your ability to assess risks and opportunities in the context of fundamental analysis, as well as address ethical and regulatory challenges related to the use of AI.

You will equip yourself to lead the digital transformation in financial markets, providing innovative and strategic solutions in a highly competitive environment. With all the guarantees of TECH quality!"

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
- Design and implement algorithmic trading strategies using Machine Learning and Deep Learning
- Perform predictive analysis of financial time series using LSTM models and advanced AI techniques
- Optimize investment portfolios by applying genetic algorithms for balancing risk and return
- Detect and prevent financial fraud through the use of Artificial Intelligence models, improving security in transactions

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
- Analyze financial statements with Natural Language Processing (NLP) to extract valuable insights and perform accurate valuations of companies
- Manage and process large volumes of financial data using Big Data tools such as Hadoop and Spark
- Develop and evaluate High Frequency Trading (HFT) strategies, optimizing speed and accuracy in order execution
- Apply Explainable Artificial Intelligence (XAI) techniques to ensure transparency and understanding of models used in finance
- Comply with ethical and regulatory standards in the implementation of AI in the financial sector, ensuring responsible and legally compliant practices
- Visualize financial data in an advanced way with tools, such as Plotly and Dash, facilitating informed decision making

Bet on TECH! You will acquire skills in handling large volumes of data, using technologies such as Hadoop and Spark to efficiently process and visualize information"

04

Course Management

This university program has a faculty composed of renowned professionals in the field of finance and technology. In fact, they are experts with extensive backgrounds in the use of Artificial Intelligence applied to financial markets, combining practical and academic experience. As such, their in-depth knowledge ranges from technical and fundamental analysis to the development of algorithmic trading strategies and the handling of Big Data. In addition, they are up to date with the latest trends and developments in the industry, which will ensure that graduates receive up-to-date and relevant training.

The experience and expertise of the faculty will enrich learning, providing graduates with valuable insights and connections within the global financial industry"

Management

Dr. Peralta Martín-Palomino, Arturo

- CEO and CTO at Prometeus Global Solutions
- CTO at Korporate Technologies
- CTO at AI Shepherds 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
- Master's Degree in Executive MBA from the Isabel I University
- 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

Professors

Mr. Sánchez Mansilla, Rodrigo

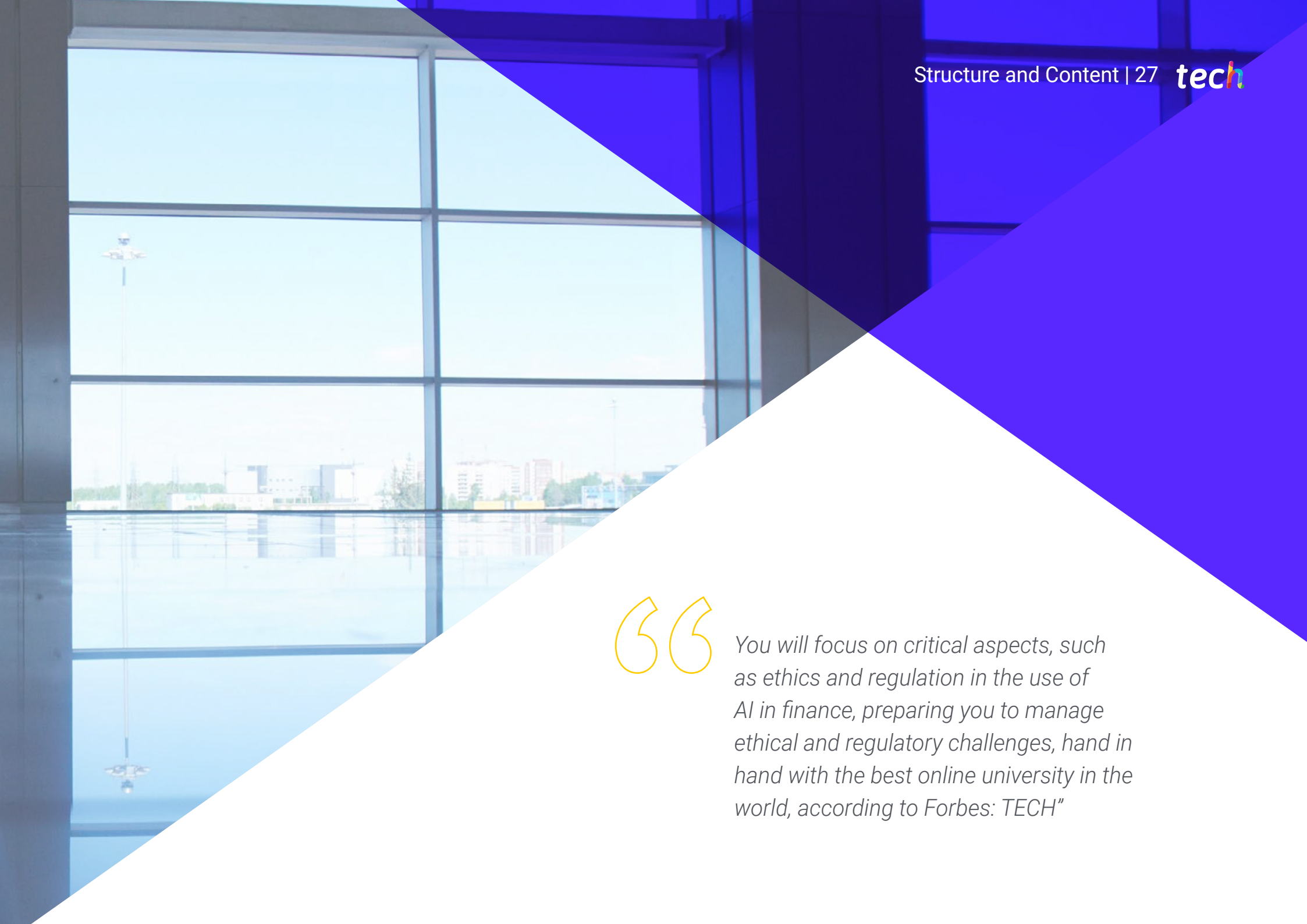
- Digital Advisor at AI Shepherds GmbH
- Digital Account Manager at Kill Draper
- Head of Digital at Kuarere
- Digital Marketing Manager at Arconi Solutions, Deltoid Energy and Brinergy Tech
- *Founder and National Sales and Marketing Manager*
- Master's Degree in Digital Marketing (MDM) by The Power Business School
- Bachelor's Degree in Business Administration (BBA) from the University of Buenos Aires

Take the opportunity to learn about the latest advances in this field in order to apply it to your daily practice"

05

Structure and Content

This academic program will offer comprehensive content, designed to address the complexities of the modern financial environment through the advanced use of AI technologies. As such, experts will delve into the technical and fundamental analysis of financial markets, applying Machine Learning and Deep Learning tools to optimize investment decisions and trading strategies. You will also cover techniques for processing and visualizing large volumes of data, as well as the development and implementation of high-frequency algorithmic systems.



You will focus on critical aspects, such as ethics and regulation in the use of AI in finance, preparing you to manage ethical and regulatory challenges, hand in hand with the best online university in the world, according to Forbes: TECH"

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 Its Shape
  - 2.2.2.1. Numeric
  - 2.2.2.2. Text:
  - 2.2.2.3. Logical
- 2.2.3. According to Its Source
  - 2.2.3.1. Primary
  - 2.2.3.2. Secondary

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

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

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

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

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

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

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

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

Module 3. Data in Artificial Intelligence

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.10. Data Pre-processing in Big Data Environments

Module 5. Algorithm and Complexity in Artificial Intelligence

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

5.2. Efficiency and Analysis of Algorithms
- 5.2.1. Efficiency Measures
- 5.2.2. Measuring the Size of the Input
- 5.2.3. Measuring Execution Time
- 5.2.4. Worst, Best and Average Case
- 5.2.5. Asymptotic Notation
- 5.2.6. 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. Result Analysis

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

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

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

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

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

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

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

Module 8. Neural Networks, the Basis of Deep Learning

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

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

8.3. Layers
- 8.3.1. Input Layer
- 8.3.2. Hidden Layer
- 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 Graphs in TensorFlow

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

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

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

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

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

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

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

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

10.10. Building a Deep Learning App with TensorFlow
- 10.10.1. Practical 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. ResNet Architecture

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

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

11.7. Pre-Trained Models for Transfer Learning
- 11.7.1. 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 Recurrent Neural Networks (RNN) and Attention

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

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

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

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

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

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

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

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

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

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

Module 13. Autoencoders, GANs, and Diffusion Models

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

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

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

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

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

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

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

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

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

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

Module 14. Bio-Inspired Computing

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

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

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

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

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

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

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

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

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

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

Module 15. Artificial Intelligence: Strategies and Applications

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

15.2. Implications of Artificial Intelligence in 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 Healthcare 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. Technical Analysis of Financial Markets with AI

16.1. Analysis and Visualization of Technical Indicators with Plotly and Dash
- 16.1.1. Implementation of Interactive Charts with Plotly
- 16.1.2. Advanced Visualization of Time Series with Matplotlib
- 16.1.3. Creating Real-Time Dynamic Dashboards with Dash

16.2. Optimization and Automation of Technical Indicators with Scikit-learn
- 16.2.1. Automation of Indicators with Scikit-learn
- 16.2.2. Optimization of Technical Indicators
- 16.2.3. Creating Personalized Indicators with Keras

16.3. Financial Pattern Recognition with CNN
- 16.3.1. Using CNN in TensorFlow to Identify Patterns in Charts
- 16.3.2. Improving Recognition Models with Transfer Learning Techniques
- 16.3.3. Validation of Recognition Models in Real-Time Markets

16.4. Quantitative Trading Strategies with QuantConnect
- 16.4.1. Building Algorithmic Trading Systems with QuantConnect
- 16.4.2. Backtesting Strategies with QuantConnect
- 16.4.3. Integrating Machine Learning into Trading Strategies with QuantConnect

16.5. Algorithmic Trading with Reinforcement Learning Using TensorFlow
- 16.5.1. Reinforcement Learning for Trading
- 16.5.2. Creating Trading Agents with TensorFlow Reinforcement Learning
- 16.5.3. Simulating and Tuning Agents in OpenAI Gym

16.6. Time Series Modeling with LSTM in Keras for Price Forecasting
- 16.6.1. Applying LSTM to Price Forecasting
- 16.6.2. Implementing LSTM Models in Keras for Financial Time Series
- 16.6.3. Optimization and Parameter Fitting in Time Series Models

16.7. Application of Explainable Artificial Intelligence (XAI) in Finance
- 16.7.1. Applicability of XAI in Finances
- 16.7.2. Applying LIME to Trading Models
- 16.7.3. Using SHAP for Feature Contribution Analysis in AI Decisions

16.8. High-Frequency Trading (HFT) Optimized with Machine Learning Models
- 16.8.1. Developing ML Models for HFT
- 16.8.2. Implementing HFT Strategies with TensorFlow
- 16.8.3. Simulation and Evaluation of HFT in Controlled Environments

16.9. Volatility Analysis Using Machine Learning
- 16.9.1. Applying Intelligent Models to Predict Volatility
- 16.9.2. Implementing Volatility Models with PyTorch
- 16.9.3. Integrating Volatility Analysis into Portfolio Risk Management

16.10. Portfolio Optimization with Genetic Algorithms
- 16.10.1. Fundamentals of Genetic Algorithms for Investment Optimization in Markets
- 16.10.2. Implementing Genetic Algorithms for Portfolio Selection
- 16.10.3. Evaluation of Portfolio Optimization Strategies

Module 17. Fundamental Analysis of Financial Markets with AI

17.1. Predictive Financial Performance Modeling with Scikit-Learn
- 17.1.1. Linear and Logistic Regression for Financial Forecasting with Scikit-Learn
- 17.1.2. Using Neural Networks with TensorFlow to Forecast Revenues and Earnings
- 17.1.3. Validating Predictive Models with Cross-Validation Using Scikit-Learn

17.2. Valuation of Companies with Deep Learning
- 17.2.1. Automating the Discounted Cash Flows (DCF) Model with TensorFlow
- 17.2.2. Advanced Valuation Models Using PyTorch
- 17.2.3. Integration and Analysis of Multiple Valuation Models with Pandas

17.3. Analysis of Financial Statements with NLP Using ChatGPT
- 17.3.1. Extracting Key Information from Annual Reports with ChatGPT
- 17.3.2. Sentiment Analysis of Analyst Reports and Financial News with ChatGPT
- 17.3.3. Implementing NLP Models with Chat GPT for Interpreting Financial Texts

17.4. Risk and Credit Analysis with Machine Learning
- 17.4.1. Credit Scoring Models Using SVM and Decision Trees in Scikit-Learn
- 17.4.2. Credit Risk Analysis in Corporations and Bonds with TensorFlow
- 17.4.3. Visualization of Risk Data with Tableau

17.5. Credit Analysis with Scikit-Learn
- 17.5.1. Implementing Credit Scoring Models
- 17.5.2. Credit Risk Analysis with RandomForest in Scikit-Learn
- 17.5.3. Advanced Visualization of Credit Scoring Results with Tableau

17.6. ESG Sustainability Assessment with Data Mining Techniques
- 17.6.1. ESG Data Mining Methods
- 17.6.2. ESG Impact Modeling with Regression Techniques
- 17.6.3. Applications of ESG Analysis in Investment Decisions

17.7. Sector Benchmarking with Artificial Intelligence Using TensorFlow and Power BI
- 17.7.1. Comparative Analysis of Companies Using AI
- 17.7.2. Predictive Modeling of Sector Performance with TensorFlow
- 17.7.3. Implementing Industry Dashboards with Power BI

17.8. Portfolio Management with AI Optimization
- 17.8.1. Portfolio Optimization
- 17.8.2. Use of Machine Learning Techniques for Portfolio Optimization with Scikit-Optimize
- 17.8.3. Implementing and Evaluating the Effectiveness of Algorithms in Portfolio Management

17.9. Financial Fraud Detection with AI Using TensorFlow and Keras
- 17.9.1. Basic Concepts and Techniques of Fraud Detection with AI
- 17.9.2. Constructing Neural Network Detection Models in TensorFlow
- 17.9.3. Practical Implementation of Fraud Detection Systems in Financial Transactions

17.10. Analysis and Modeling in Mergers and Acquisitions with AI
- 17.10.1. Using Predictive AI Models to Evaluate Mergers and Acquisitions
- 17.10.2. Simulating Post-Merger Scenarios Using Machine Learning Techniques
- 17.10.3. Evaluating the Financial Impact of M&A with Intelligent Models

Module 18. Large Scale Financial Data Processing

18.1. Big Data in the Financial Context
- 18.1.1. Key Characteristics of Big Data in Finance
- 18.1.2. Importance of the 5 Vs (Volume, Velocity, Variety, Veracity, Value) in Financial Data
- 18.1.3. Use Cases of Big Data in Risk Analysis and Compliance

18.2. Technologies for Storage and Management of Financial Big Data
- 18.2.1. NoSQL Database Systems for Financial Warehousing
- 18.2.2. Using Data Warehouses and Data Lakes in the Financial Sector
- 18.2.3. Comparison between On-Premises and Cloud-Based Solutions

18.3. Real-Time Processing Tools for Financial Data
- 18.3.1. Introduction to Tools such as Apache Kafka and Apache Storm
- 18.3.2. Real-Time Processing Applications for Fraud Detection
- 18.3.3. Benefits of Real-Time Processing in Algorithmic Trading

18.4. Integration and Data Cleaning in Finance
- 18.4.1. Methods and Tools for Integrating Data from Multiple Sources
- 18.4.2. Data Cleaning Techniques to Ensure Data Quality and Accuracy
- 18.4.3. Challenges in the Standardization of Financial Data

18.5. Data Mining Techniques Applied to The Financial Markets
- 18.5.1. Classification and Prediction Algorithms in Market Data
- 18.5.2. Sentiment Analysis in Social Networks for Predicting Market Movements
- 18.5.3. Data Mining to Identify Trading Patterns and Investor Behavior

18.6. Advanced Data Visualization for Financial Analysis
- 18.6.1. Visualization Tools and Software for Financial Data
- 18.6.2. Design of Interactive Dashboards for Market Monitoring
- 18.6.3. The Role of Visualization in Risk Analysis Communication

18.7. Use of Hadoop and Related Ecosystems in Finance
- 18.7.1. Key Components of the Hadoop Ecosystem and Their Application in Finance
- 18.7.2. Hadoop Use Cases for Large Transaction Volume Analysis
- 18.7.3. Advantages and Challenges of Integrating Hadoop into Existing Financial Infrastructures

18.8. Spark Applications in Financial Analytics
- 18.8.1. Spark for Real-Time and Batch Data Analytics
- 18.8.2. Predictive Model Building Using Spark MLlib
- 18.8.3. Integration of Spark with Other Big Data Tools in Finance

18.9. Data Security and Privacy in the Financial Sector
- 18.9.1. Data Protection Rules and Regulations (GDPR, CCPA)
- 18.9.2. Encryption and Access Management Strategies for Sensitive Data
- 18.9.3. Impact of Data Breaches on Financial Institutions

18.10. Impact of Cloud Computing on Large-Scale Financial Analysis
- 18.10.1. Advantages of the Cloud for Scalability and Efficiency in Financial Analysis
- 18.10.2. Comparison of Cloud Providers and Their Specific Financial Services
- 18.10.3. Case Studies on Migration to the Cloud in Large Financial Institutions

Module 19. Algorithmic Trading Strategies

19.1. Fundamentals of Algorithmic Trading
- 19.1.1. Algorithmic Trading Strategies
- 19.1.2. Key Technologies and Platforms for the Development of Algorithmic Trading Algorithms
- 19.1.3. Advantages and Challenges of Automated Trading versus Manual Trading

19.2. Design of Automated Trading Systems
- 19.2.1. Structure and Components of an Automated Trading System
- 19.2.2. Algorithm Programming: from the Idea to the Implementation
- 19.2.3. Latency and Hardware Considerations in Trading Systems

19.3. Backtesting and Evaluation of Trading Strategies
- 19.3.1. Methodologies for Effective Backtesting of Algorithmic Strategies
- 19.3.2. Importance of Quality Historical Data in Backtesting
- 19.3.3. Key Performance Indicators for Evaluating Trading Strategies

19.4. Optimizing Strategies with Machine Learning
- 19.4.1. Applying Supervised Learning Techniques in Strategy Improvement
- 19.4.2. Using Particle Swarm Optimization and Genetic Algorithms
- 19.4.3. Challenges of Overfitting in Trading Strategy Optimization

19.5. High Frequency Trading (HFT)
- 19.5.1. Principles and Technologies behind HFT
- 19.5.2. Impact of HFT on Market Liquidity and Volatility
- 19.5.3. Common HFT Strategies and Their Effectiveness

19.6. Order Execution Algorithms
- 19.6.1. Types of Execution Algorithms and Their Practical Application
- 19.6.2. Algorithms for Minimizing the Market Impact
- 19.6.3. Using Simulations to Improve Order Execution

19.7. Arbitration Strategies in Financial Markets
- 19.7.1. Statistical Arbitrage and Price Merger in Markets
- 19.7.2. Index and ETF Arbitrage
- 19.7.3. Technical and Legal Challenges of Arbitrage in Modern Trading

19.8. Risk Management in Algorithmic Trading
- 19.8.1. Risk Measures for Algorithmic Trading
- 19.8.2. Integrating Risk Limits and Stop-Loss in Algorithms
- 19.8.3. Specific Risks of Algorithmic Trading and How to Mitigate Them

19.9. Regulatory Aspects and Compliance in Algorithmic Trading
- 19.9.1. Global Regulations Impacting Algorithmic Trading
- 19.9.2. Regulatory Compliance and Reporting in an Automated Environment
- 19.9.3. Ethical Implications of Automated Trading

19.10. Future of Algorithmic Trading and Emerging Trends
- 19.10.1. Impact of Artificial Intelligence on the Future Development of Algorithmic Trading
- 19.10.2. New Blockchain Technologies and Their Application in Algorithmic Trading
- 19.10.3. Trends in Adaptability and Customization of Trading Algorithms

Module 20. Ethical and Regulatory Aspects of AI in Finance

20.1. Ethics in Artificial Intelligence Applied to Finance
- 20.1.1. Fundamental Ethical Principles for the Development and Use of AI in Finance
- 20.1.2. Case Studies on Ethical Dilemmas in Financial AI Applications
- 20.1.3. Developing Ethical Codes of Conduct for Financial Technology Professionals

20.2. Global Regulations Affecting the Use of AI in Financial Markets
- 20.2.1. Overview of the Main International Financial Regulations on AI
- 20.2.2. Comparison of AI Regulatory Policies among Different Jurisdictions
- 20.2.3. Implications of AI Regulation on Financial Innovation

20.3. Transparency and Explainability of AI Models in Finance
- 20.3.1. Importance of Transparency in AI Algorithms for User Confidence
- 20.3.2. Techniques and Tools to Improve the Explainability of AI Models
- 20.3.3. Challenges of Implementing Interpretable Models in Complex Financial Environments

20.4. Risk Management and Ethical Compliance in the Use of AI
- 20.4.1. Risk Mitigation Strategies Associated with the Deployment of AI in Finance
- 20.4.2. Ethics Compliance in the Development and Application of AI Technologies
- 20.4.3. Ethical Oversight and Audits of AI Systems in Financial Operations

20.5. Social and Economic Impact of AI in Financial Markets
- 20.5.1. Effects of AI on the Stability and Efficiency of Financial Markets
- 20.5.2. AI and Its Impact on Employment and Professional Skills in Finance
- 20.5.3. Benefits and Social Risks of Large-Scale Financial Automation

20.6. Data Privacy and Protection in AI Financial Applications
- 20.6.1. Data Privacy Regulations Applicable to AI Technologies in Finance
- 20.6.2. Personal Data Protection Techniques in AI-Based Financial Systems
- 20.6.3. Challenges in Managing Sensitive Data in Predictive and Analytics Models

20.7. Algorithmic Bias and Fairness in AI Financial Models
- 20.7.1. Identification and Mitigation of Bias in Financial AI Algorithms
- 20.7.2. Strategies to Ensure Fairness in Automated Decision-Making Models
- 20.7.3. Impact of Algorithmic Bias on Financial Inclusion and Equity

20.8. Challenges of Regulatory Oversight in Financial AI
- 20.8.1. Difficulties in the Supervision and Control of Advanced AI Technologies
- 20.8.2. Role of Financial Authorities in the Ongoing Supervision of AI
- 20.8.3. Need for Regulatory Adaptation in the Face of Advancing AI Technology

20.9. Strategies for Responsible Development of AI Technologies in Finance
- 20.9.1. Best Practices for Sustainable and Responsible AI Development in the Financial Sector
- 20.9.2. Initiatives and Frameworks for Ethical Assessment of AI Projects in Finance
- 20.9.3. Collaboration between Regulators and Businesses to Encourage Responsible Practices

20.10. Future of AI Regulation in the Financial Sector
- 20.10.1. Emerging Trends and Future Challenges in AI Regulation in Finance
- 20.10.2. Preparation of Legal Frameworks for Disruptive Innovations in Financial Technology
- 20.10.3. International Dialogue and Cooperation for Effective and Unified Regulation of AI in Finance

You will receive robust, up-to-date training, combining advanced theory with practical applications for you to lead at the intersection of Artificial Intelligence and finance"

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

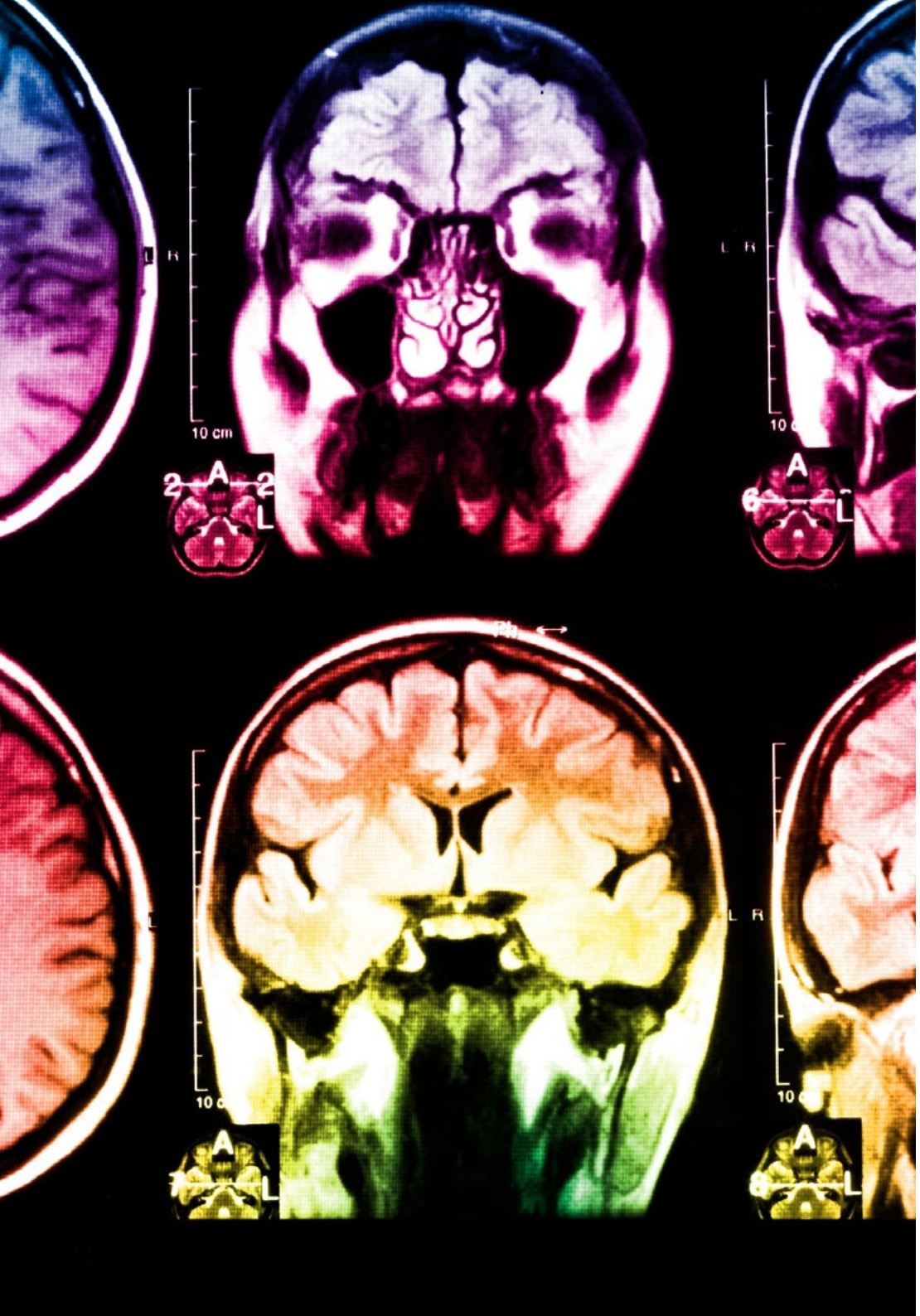
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

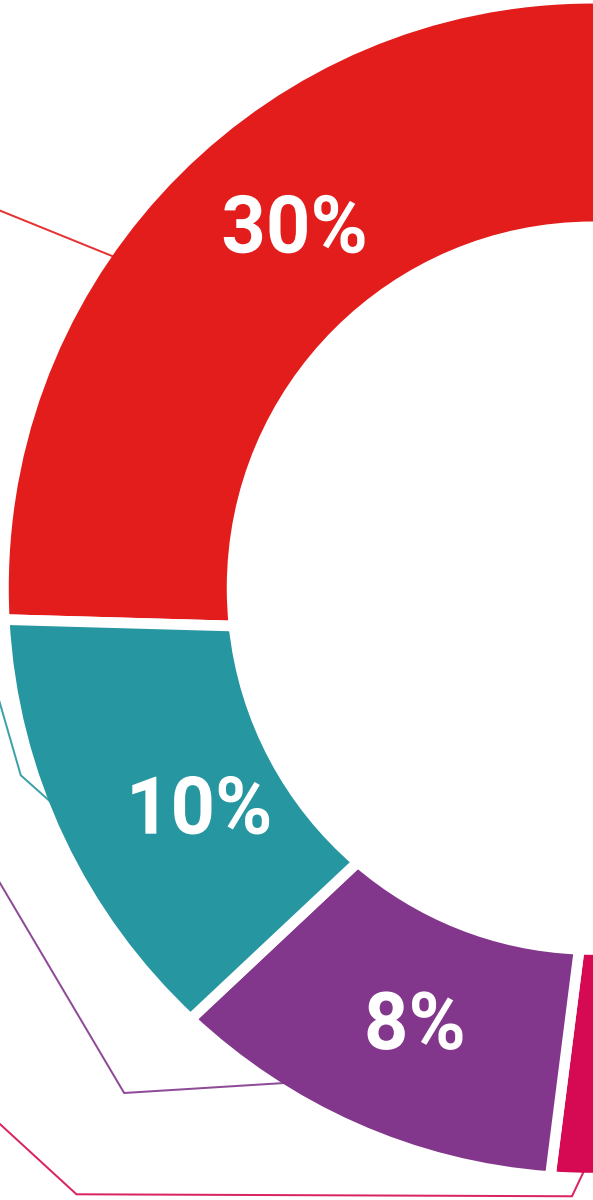
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

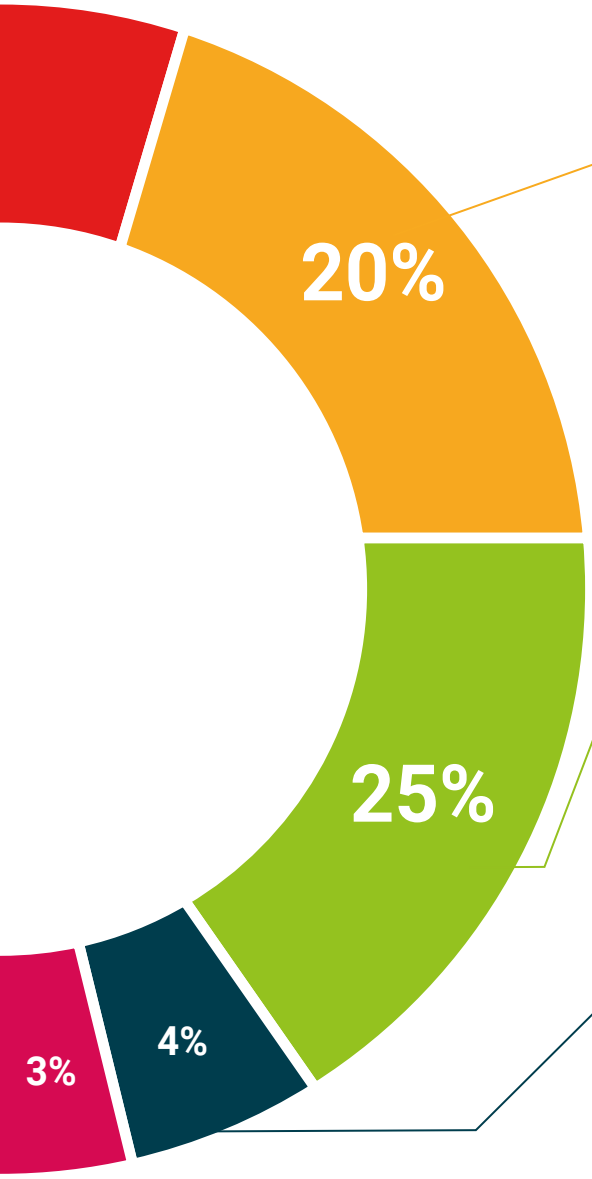
Practising Skills and Abilities

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 Stock Exchanges and Financial Markets guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree issued by TECH Global University.

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

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

TECH Global University, is an official European University publicly recognized by the Government of Andorra (***official bulletin***). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

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

Title: **Professional Master's Degree in Artificial Intelligence in Stock Exchanges and Financial Markets**

Modality: **online**

Duration: **12 months**

Accreditation: **90 ECTS**


tech global university

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

Professional Master's Degree in Artificial Intelligence in Stock Exchanges and Financial Markets

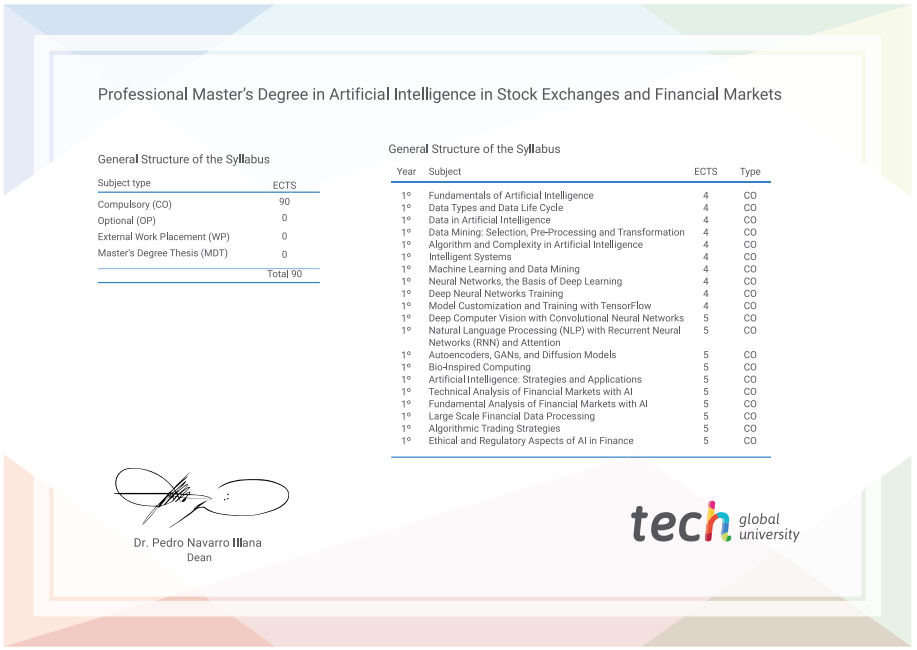
This is a private qualification of 2,700 hours of duration equivalent to 90 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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

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

Dr. Pedro Navarro Illana
Dean

Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Artificial Intelligence in Stock Exchanges and Financial Markets

General Structure of the Syllabus

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

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Fundamentals of Artificial Intelligence	4	CO
1º	Data Types and Data Life Cycle	4	CO
1º	Data in Artificial Intelligence	4	CO
1º	Data Mining: Selection, Pre-Processing and Transformation	4	CO
1º	Algorithm and Complexity in Artificial Intelligence	4	CO
1º	Intelligent Systems	4	CO
1º	Machine Learning and Data Mining	4	CO
1º	Neural Networks, the Basis of Deep Learning	4	CO
1º	Deep Neural Networks Training	4	CO
1º	Model Customization and Training with TensorFlow	4	CO
1º	Deep Computer Vision with Convolutional Neural Networks	5	CO
1º	Natural Language Processing (NLP) with Recurrent Neural Networks (RNN) and Attention	5	CO
1º	Autoencoders, GANs, and Diffusion Models	5	CO
1º	Bio-Inspired Computing	5	CO
1º	Artificial Intelligence: Strategies and Applications	5	CO
1º	Technical Analysis of Financial Markets with AI	5	CO
1º	Fundamental Analysis of Financial Markets with AI	5	CO
1º	Large Scale Financial Data Processing	5	CO
1º	Algorithmic Trading Strategies	5	CO
1º	Ethical and Regulatory Aspects of AI in Finance	5	CO

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

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Professional Master's Degree

Artificial Intelligence in Stock Exchanges and Financial Markets

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

Professional Master's Degree

Artificial Intelligence in Stock Exchanges and Financial Markets

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