Professional Master's Degree

Artificial Intelligence in Human Resources

tech technological university

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Professional Master's Degree
Artificial Intelligence in Human Resources

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/artificial-intelligence/professional-master-degree/master-artificial-intelligence-human-resources**

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01

Introduction

Artificial Intelligence (AI) is establishing itself as a crucial tool in Human Resources (HR) departments, transforming key processes such as recruitment, talent management and performance analysis. In fact, a growing number of companies are using AI systems to automate resume screening, identify suitable candidates through predictive analytics, and improve the employee experience through chatbots that answer questions and solve problems immediately. In this context, TECH has developed a program that is 100% online and adaptable to the personal and work schedules of graduates. In addition, it is based on the innovative learning methodology known as Relearning, a pioneer in this university.

Thanks to this 100% online Professional Master's Degree, you will acquire advanced technological skills, through AI, to optimize talent management and improve operational efficiency in your organization"

Artificial Intelligence (AI) is revolutionizing the Human Resources (HR) department, improving efficiency in talent management and decision making. AI-based tools, such as chatbots and sentiment analysis software, enable more fluid interaction with employees and help identify needs before they become problems.

This is how this Professional Master's Degree was created, thanks to which professionals will be able to improve operational efficiency in personnel administration by automating tasks such as resource allocation and payroll management. In addition, they will delve into predictive analysis to anticipate staffing needs and the integration of systems that ensure impeccable regulatory compliance.

Advanced tools to automate the analysis of resumes and the classification of candidates will be mastered, as well as virtual interviews assisted by Artificial Intelligence. Techniques to eliminate biases in personnel selection will also be addressed, ensuring a fairer and more accurate recruitment process, increasing the retention and suitability of selected candidates.

Finally, we will explore how Artificial Intelligence can optimize talent management within an organization, identifying and retaining key employees, personalizing career development paths, and performing competency analysis to detect skills gaps. In addition, the implementation of mentoring and virtual coaching programs, leadership potential assessments and change management strategies will be covered.

In this way, TECH has implemented a comprehensive university program, totally online, so that graduates will only need an electronic device with an Internet connection to access the teaching materials, avoiding problems such as traveling to a physical center and adjusting to a pre-established schedule. In addition, it includes the revolutionary Relearning methodology, consisting of the repetition of key concepts for optimal assimilation of the contents.

This **Professional Master's Degree in Artificial Intelligence in Human Resources** 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 the HR Department
- 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 self-assessment can be used to improve learning.
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

You will be prepared to lead the digital transformation in HR, implementing innovative solutions that automate processes, eliminate biases in personnel selection and enhance employees' professional development"

You will improve operational efficiency in personnel and payroll administration by automating crucial tasks, such as resource allocation and benefits management. What are you waiting for to enroll?"

You will become familiar with tools that will allow you to automate the analysis of resumes, filter and classify candidates, and conduct virtual interviews with the support of AI. With all TECH's quality guarantees!

Bet on TECH! You will identify and retain key employees, customize career development paths, and apply AI to perform competency analysis and detect skills gaps.

The program includes in its teaching staff, professionals of the sector who pour into this specialization the experience of their work, in addition to recognized specialists from reference 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

This university program will train professionals in the automation of processes, such as personnel administration and payroll management, as well as in the advanced use of AI to improve personnel selection, eliminate biases and personalize professional development. In addition, skills will be acquired to improve the work climate through sentiment analysis and proactive detection of labor problems. Ethics, transparency and data protection will also be addressed, ensuring that graduates will not only master AI techniques, but will also understand the ethical and legal implications of its application in Human Resources.

The main objective of the university program will be to provide you with a comprehensive and specialized approach to the application of AI in all key areas of Human 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
- Explore bio-inspired computing and its relevance in the development of intelligent systems
- Develop an in-depth understanding of how Artificial Intelligence can be integrated into key Human Resources functions
- Enable students to use AI to automate and improve recruitment processes, from recruitment to final evaluation
- Apply AI to identify, retain and develop talent within the organization, personalizing employees' career growth
- Master the tools necessary to implement advanced performance appraisal systems using AI, with a focus on continuous assessment, real-time feedback and elimination of biases
- Use AI to monitor the work climate, proactively identifying problems and improving internal communication and employee satisfaction
- Develop the ability to use AI to identify and eliminate bias in selection, evaluation and development processes
- Train students to implement AI solutions that automate administrative and managerial tasks
- Apply predictive analytics techniques in HR management, anticipating needs and improving strategic planning
- Delve into the ethical and transparency principles necessary for the responsible implementation of AI in Human Resources
- Lead digital transformation projects in the Human Resources department, using AI as a key tool to innovate and improve organizational processes

You will be trained to identify and eliminate biases in personnel selection, improve the work climate through sentiment analysis, and proactively address labor problems"

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 Datasetsproject 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. Personnel and Payroll Management with AI

- Develop skills to implement AI solutions that automate personnel administration, payroll and resource allocation, improving personnel administration, payroll management, and resource allocation, improving operational efficiency
- Understand and apply AI technologies to ensure compliance with legal regulations in human resource management, minimizing legal risks

Module 17. Selection Processes and Artificial Intelligence

- Acquire skills to use AI in the automation of recruitment and selection tasks, from resume analysis to candidate evaluation
- Apply AI to identify and eliminate biases in the selection process, promoting fairer and more equitable practices

Module 18. AI and Its Application in Talent Management and Professional Development

- Develop the ability to use AI to customize employees' career development plans, tailoring growth to individual needs
- Apply AI to identify key talent within the organization and design effective retention strategies

Module 19. Performance Evaluations

- Train in the implementation of continuous evaluation systems that provide real-time feedback, improving the accuracy and relevance of performance evaluations
- Develop skills to use AI to analyze performance data, identifying patterns and areas for improvement

Module 20. Monitoring and Improving Work Climate with AI

- Use AI tools to analyze work climate through sentiment analysis, identifying problems and opportunities for improvement
- Develop the ability to apply AI to proactively detect and address workplace issues, improving internal communication and employee satisfaction

03

Skills

This academic program will equip experts with essential skills to excel in modern human resources management. In this way, they will acquire skills to integrate Artificial Intelligence into key HR operations, such as the automation of administrative processes, the optimization of talent selection and retention, and the personalization of professional development. In addition, you will be prepared to improve the work climate through AI-driven data analytics and to address the ethical and legal challenges that accompany these technologies.

You will lead the digital transformation in their organizations, ensuring a fairer, more transparent, and efficient people management, thanks to an extensive library of innovative multimedia resources"

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
- Automate administrative and payroll tasks with AI
- Use AI to improve recruiting efficiency
- Apply AI to identify and develop talent within the organization
- Implement continuous evaluation and instant feedback systems using AI

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
- Monitor and improve work climate through sentiment analysis with AI
- Use AI to eliminate biases in selection and evaluation, promoting inclusiveness
- Facilitate organizational adaptation with AI support
- Develop predictive analytics to anticipate staffing and resource needs
- Apply ethical principles in the use of AI in Human Resources
- Ensure transparency in the implementation of AI in HR processes

You will use Artificial Intelligence in improving the work climate, facing the ethical and legal challenges that arise with the implementation of these technologies, and ensuring fair and transparent management"

04

Course Management

The Professional Master's Degree has a highly qualified teaching team, composed of renowned experts in Artificial Intelligence, Human Resources management and technological ethics. In fact, they include professionals with extensive experience in the implementation of AI in organizations from different sectors. In addition, they have an outstanding track record in research and development in the field of AI applied to HR, which will ensure up-to-date and relevant teaching. Therefore, their practical and academic experience will allow graduates to access cutting-edge knowledge and real applications of the technology.

The teachers of this university program will prepare future HR leaders to face the challenges of the contemporary digital environment, with an innovative and ethical approach"

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

Ms. Del Rey Sánchez, Cristina

- Talent Management Administrative Officer at Securitas Seguridad España, S.L.
- Extracurricular Activities Center Coordinator
- Support classes and pedagogical interventions with Primary and Secondary Education students.
- Postgraduate in Development, Delivery and Tutoring of e-Learning Training Actions.
- Postgraduate in Early Childhood Care
- Degree in Pedagogy from the Complutense University of Madrid

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

Unlike other programs, this degree will combine a solid theoretical foundation with practical training in the application of advanced technologies. In this way, it will analyze how to use AI to improve personnel administration, optimize selection processes, manage talent, perform accurate performance evaluations and monitor the work environment. In addition, professionals will be able to address contemporary challenges in HR, improving efficiency, decision making and ensuring fair and transparent management.

With the rapid evolution of AI in the workplace, you will position yourself at the forefront of organizational change, equipping you to lead the digital transformation in the organizations you work in"

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 Training Models

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. Model Implementation
- 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 the 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. Personnel and Payroll Management with AI

16.1. Artificial Intelligence for Diversity and Inclusion in the Workplace
- 16.1.1. Diversity Analysis Using IBM Watson to Detect Trends and Biases
- 16.1.2. AI Tools for Detecting and Correcting Biases in HR Processes
- 16.1.3. Evaluating the Impact of Inclusion Policies using Data Analytics

16.2. Fundamentals of Personnel Administration with AI
- 16.2.1. Automation of Hiring and Onboarding Processes
- 16.2.2. Use of AI-Based Personnel Data Management Systems
- 16.2.3. Improving the Employee Experience through Intelligent Platforms

16.3. AI Technologies Applied to Payroll
- 16.3.1. AI Systems for Automated Payroll Calculation
- 16.3.2. Intelligent Profit Management with Platforms such as Gusto
- 16.3.3. Detection of Errors and Fraud in Payrolls Using AI Algorithms

16.4. Optimizing Resource Allocation with AI
- 16.4.1. Personnel Planning with Kronos Predictive Tools
- 16.4.2. AI Models for Shift and Task Assignment Optimization
- 16.4.3. Workload Analysis and Resource Allocation with Power BI

16.5. AI in HR Regulatory and Legal Compliance
- 16.5.1. Automation of Compliance with Labor Policies
- 16.5.2. AI Systems to Ensure Fairness and Transparency in HR
- 16.5.3. Contract and Regulatory Management with IBM Watson Legal Advisor

16.6. Predictive Analytics in Workforce Management
- 16.6.1. Predictive Models for Employee Retention with Retain's AI
- 16.6.2. Sentiment Analysis in Internal Communications
- 16.6.3. Predicting Training and Development Needs

16.7. Automating Benefits Management with AI
- 16.7.1. Benefits Administration Using Intelligent Platforms such as Zenefits
- 16.7.2. Customizing Benefit Packages using AI
- 16.7.3. Optimizing Benefit Costs Using Data Analytics

16.8. Integrating HR Systems with AI
- 16.8.1. Integrated Systems for Personnel Management with Salesforce Einstein
- 16.8.2. Interface and Usability in AI-Based HR Systems
- 16.8.3. Data Security and Privacy in Integrated Systems

16.9. AI-Supported Training and Development of Personnel
- 16.9.1. Adaptive and Personalized Learning Systems
- 16.9.2. AI-Powered E-Learning Platforms
- 16.9.3. Performance Assessment and Monitoring Using Intelligent Technologies

16.10. Crisis and Change Management with AI in HR
- 16.10.1. Using AI for Effective Management of Organizational Change
- 16.10.2. Predictive Tools for Crisis Preparedness with Predictive Layer
- 16.10.3. Data Analysis to Evaluate and Adapt HR Strategies in Times of Crisis

Module 17. Selection Processes and Artificial Intelligence

17.1. Introduction to the Application of Artificial Intelligence in Personnel Selection
- 17.1.1. Definition of Artificial Intelligence in the Human Resources Context. Entelo
- 17.1.2. Importance of Applying AI in Selection Processes
- 17.1.3. Benefits of Using AI in Selection Processes

17.2. Automating Tasks in the Recruitment Process
- 17.2.1. Using AI to Automate Job Postings
- 17.2.2. Implementing Chatbots to Answer Candidates' Frequently Asked Questions
- 17.2.3. Tools XOR

17.3. Resume Analysis with AI
- 17.3.1. Using AI Algorithms to Analyze and Evaluate Resumes. Talview
- 17.3.2. Automatic Identification of Skills and Experience Relevant to the Position
- 17.3.3. Advantages and Disadvantages

17.4. Candidate Filtering and Ranking
- 17.4.1. Applying AI to Automatically Filter Candidates Based on Specific Criteria. Vervoe
- 17.4.2. Ranking Candidates According to Suitability for the Position Using Machine Learning Techniques
- 17.4.3. Using AI for Dynamic Customization of Filtering Criteria based on Job Needs

17.5. Pattern Recognition on Social Networks and Professional Platforms
- 17.5.1. Using AI to Analyze Candidate Profiles on Social Networks and Professional Platforms
- 17.5.2. Identifying Behavioral Patterns and Trends Relevant to Recruiting
- 17.5.3. Assessing the Online Presence and Digital Influence of Candidates Using AI Tools

17.6. AI-Assisted Virtual Interviewing
- 17.6.1. Implementing Virtual Interviewing Systems with Language and Emotion Analysis. Talentoday
- 17.6.2. Automatic Evaluation of Candidate Responses Using Natural Language Processing Techniques
- 17.6.3. Developing Automatic and Personalized Feedback for Candidates Based on AI Interview Analysis

17.7. Evaluation of Skills and Competencies
- 17.7.1. Using AI-Based Assessment Tools to Measure Technical and Soft Skills. OutMatch
- 17.7.2. Automatically Analyzing Tests and Assessment Exercises Performed by Candidates. Harver
- 17.7.3. Correlation of Assessment Results with Success on the Job Using AI Predictive Analytics

17.8. Elimination of Selection Biases
- 17.8.1. Applying AI to Identify and Mitigate Unconscious Bias in the Selection Process
- 17.8.2. Implementing Unbiased and Fair AI Algorithms in Decision Making
- 17.8.3. Training and Continuous Tuning of AI Models to Ensure Fairness in Personnel Selection

17.9. Prediction of Fit and Retention
- 17.9.1. Using Predictive AI Models to Predict Candidate Suitability and Likelihood of Retention Hiretual
- 17.9.2. Analyzing Historical Data and Performance Metrics to Identify Patterns of Success
- 17.9.3. AI Models for Simulating Job Scenarios and Their Impact on Candidate Retention

17.10. Ethics and Transparency in AI Selection
- 17.10.1. Ethical Considerations in the Use of AI in the Personnel Selection Processes
- 17.10.2. Ensuring Transparency and Explainability in AI Algorithms Used in Hiring Decisions
- 17.10.3. Developing Audit and Review Policies for Automated Decisions

Module 18. AI and Its Application in Talent Management and Professional Development

18.1. Introduction to the Application of AI in Talent Management and Professional Development
- 18.1.1. Historical Evolution of AI in Talent Management and How It Has Transformed the Industry
- 18.1.2. Definition of Artificial Intelligence in the Human Resources Context
- 18.1.3. Importance of Talent Management and Professional Development. Glint

18.2. Automation of Talent Management Processes
- 18.2.1. Using AI to Automate Administrative Tasks in Talent Management
- 18.2.2. Implementing AI-Based Talent Management Systems
- 18.2.3. Assessing Operational Efficiency and Cost Reduction through Automation with AI

18.3. Talent Identification and Retention with AI
- 18.3.1. Using AI Algorithms to Identify and Retain Talent in the Organization
- 18.3.2. Predictive Analytics for the Detection of Employees with High Growth Potential
- 18.3.3. Integrating AI with HR Management Systems for Continuous Performance and Development Tracking

18.4. Personalization of Professional Development. Leader Amp
- 18.4.1. Implementing Customized AI-Based Professional Development Programs
- 18.4.2. Using Recommendation Algorithms to Suggest Learning and Growth Opportunities
- 18.4.3. Matching Career Development Pathways to Labor Market Evolution Predictions Using AI

18.5. Competency and Skills Gap Analysis
- 18.5.1. Using AI to Analyze Employees' Current Skills and Competencies
- 18.5.2. Identification of Skills Gaps and Training Needs Using Data Analytics
- 18.5.3. Implementing Real-Time Training Programs Based on Automated AI Recommendations

18.6. Mentoring and Virtual Coaching
- 18.6.1. Implementation of AI-Assisted Virtual Mentoring Systems. Crystal
- 18.6.2. Using Chatbots and Virtual Assistants to Provide Personalized Coaching
- 18.6.3. Impact Assessment of Virtual Coaching Using Data Analysis and Automated AI Feedback

18.7. Achievement and Performance Recognition
- 18.7.1. Using AI-Based Achievement Recognition Systems to Motivate Employees BetterUp
- 18.7.2. Automatically Analyzing Employee Performance and Productivity Using AI
- 18.7.3. Developing an AI-Based Reward and Recognition System

18.8. Evaluation of Leadership Potential
- 18.8.1. Applying AI Techniques to Assess Leadership Potential of Employees
- 18.8.2. Identifying Emerging Leaders and Developing Tailored Leadership Programs
- 18.8.3. Using AI-Driven Simulations to Train and Evaluate Leadership Skills

18.9. Change Management and Organizational Adaptability
- 18.9.1. Predictive Analytics to Anticipate Change Needs and Promote Organizational Resilience
- 18.9.2. Organizational Change Planning Using AI
- 18.9.3. Using AI to Manage Organizational Change and Promote Adaptability Cognician

18.10. Ethics and Accountability in Talent Management with AI
- 18.10.1. Ethical Considerations in the Use of AI in Talent Management and Professional Development. Reflektive
- 18.10.2. Ensuring Fairness and Transparency in AI Algorithms Used in Talent Management Decision-Making
- 18.10.3. Implementation of Audits to Monitor and Adjust AI Algorithms to Ensure Ethical Practices

Module 19. Performance Evaluations

19.1. Introduction to the Application of AI in Performance Appraisals
- 19.1.1. Definition of Artificial Intelligence and Its Role in Performance Appraisals. 15Five
- 19.1.2. Importance of Using AI to Improve the Objectivity and Efficiency of Appraisals
- 19.1.3. Limitations of AI in Performance Appraisals

19.2. Automation of Evaluation Processes
- 19.2.1. Using AI to Automate Data Collection and Analysis in Performance Appraisals Peakon
- 19.2.2. Implementing AI-Based Automated Evaluation Systems
- 19.2.3. Successful Studies in Automation with AI

19.3. Data Analysis and Performance Metrics
- 19.3.1. Using AI Algorithms to Analyze Performance Data and Trends
- 19.3.2. Identifying Key Metrics and KPIs Using Advanced Data Analysis Techniques
- 19.3.3. AI Data Analytics Training

19.4. Continuous Evaluation and Real-Time Feedback
- 19.4.1. Implementing AI-Assisted Continuous Assessment Systems. Lattice
- 19.4.2. Using Chatbots and Real-Time Feedback Tools to Provide Feedback to Employees
- 19.4.3. Impact of AI-Based Feedback

19.5. Identification of Strengths and Areas for Improvement
- 19.5.1. Applying AI to Identify Employee Strengths and Weaknesses
- 19.5.2. Automatic Analysis of Competencies and Skills Using Machine Learning Techniques. *Workday Performance Management*
- 19.5.3. Connection with Professional Development and Planning

19.6. Detection of Trends and Performance Patterns
- 19.6.1. Using AI to Detect Trends and Patterns in Employee Performance. TAlentSoft
- 19.6.2. Predictive Analytics to Anticipate Potential Performance Problems and Take Proactive Measures
- 19.6.3. Advanced Data Visualization Dashboards

19.7. Customization of Objectives and Development Plans
- 19.7.1. Implementing AI-Based Personalized Target Setting Systems. Reflektive
- 19.7.2. Using Recommendation Algorithms to Suggest Individualized Development Plans
- 19.7.3. Long-Term Impact of Personalized Targets

19.8. Elimination of Bias in Evaluations
- 19.8.1. Applying AI to Identify and Mitigate Bias in Performance Appraisals
- 19.8.2. Implementing Impartial and Equitable Algorithms in Evaluation Processes
- 19.8.3. AI Ethics Training for Evaluators

19.9. Data Security and Protection in AI Evaluations
- 19.9.1. Ethical and Legal Considerations in the Use of Personal Data in Performance Evaluations with AI. LEver
- 19.9.2. Ensuring the Privacy and Security of Employee Information in AI-Based Evaluation Systems
- 19.9.3. Implementing Data Access Protocols

19.10. Continuous Improvement and Adaptability of the System
- 19.10.1. Using Feedback and Data Analysis to Continuously Improve Evaluation Processes
- 19.10.2. Adapting Evaluation Systems as the Organization's Needs and Objectives Change
- 19.10.3. Review Committee for Adjustment of Metrics

Module 20. Monitoring and Improving Work Climate with AI

20.1. Applying AI in Workplace Climate Management
- 20.1.1. Definition and Relevance of Work Climate
- 20.1.2. Overview of AI in the Management of Workplace Climate
- 20.1.3. Benefits of Using AI to Monitor Workplace Climate

20.2. AI Tools for Workplace Data Collection
- 20.2.1. Real-Time Feedback Systems with IBM Watson
- 20.2.2. Automated Survey Platforms
- 20.2.3. Sensors and Wearables for Physical and Environmental Data Collection

20.3. Sentiment Analysis with AI
- 20.3.1. Fundamentals of Sentiment Analysis
- 20.3.2. Using Google Cloud Natural Language to Analyze Emotions in Written Communication
- 20.3.3. Applying Sentiment Analysis in Emails and Corporate Social Networks

20.4. Machine Learning for the Identification of Behavioral Patterns
- 20.4.1. Clustering with K-Means in Python for Segmenting Workplace Behaviors
- 20.4.2. Pattern Recognition in Behavioral Data
- 20.4.3. Predicting Trends in Work Climate

20.5. AI in the Proactive Detection of Workplace Problems
- 20.5.1. Predictive Models to Identify Conflict Risks
- 20.5.2. AI-Based Early Warning Systems
- 20.5.3. Detection of Harassment and Discrimination Using Text Analytics with spaCy

20.6. Improving Internal Communication with AI
- 20.6.1. Chatbots for Internal Communication
- 20.6.2. Network Analysis with AI to Improve Collaboration Using Gephi
- 20.6.3. AI Tools to Personalize Internal Communications

20.7. Change Management with AI Support
- 20.7.1. AI Simulations to Predict Impacts of Organizational Change with AnyLogic
- 20.7.2. AI Tools to Manage Resistance to Change
- 20.7.3. AI Models for Optimizing Change Strategies

20.8. Assessment and Continuous Improvement of Work Climate with AI
- 20.8.1. Continuous Work Climate Monitoring Systems
- 20.8.2. Algorithms for Analyzing the Effectiveness of Interventions
- 20.8.3. AI for the Customization of Work Climate Improvement Plans

20.9. Integration of AI and Organizational Psychology
- 20.9.1. Psychological Theories Applied to AI Analysis
- 20.9.2. AI Models for Understanding Motivation and Job Satisfaction
- 20.9.3. AI Tools to Support Employee Emotional Well-Being

20.10. Ethics and Privacy in the Use of AI to Monitor Workplace Climate
- 20.10.1. Ethical Considerations of Workplace Monitoring
- 20.10.2. Data Privacy and Regulatory Compliance
- 20.10.3. Transparent and Responsible Data Management

You will have access to a library of multimedia resources 7 days a week, 24 hours a day"

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

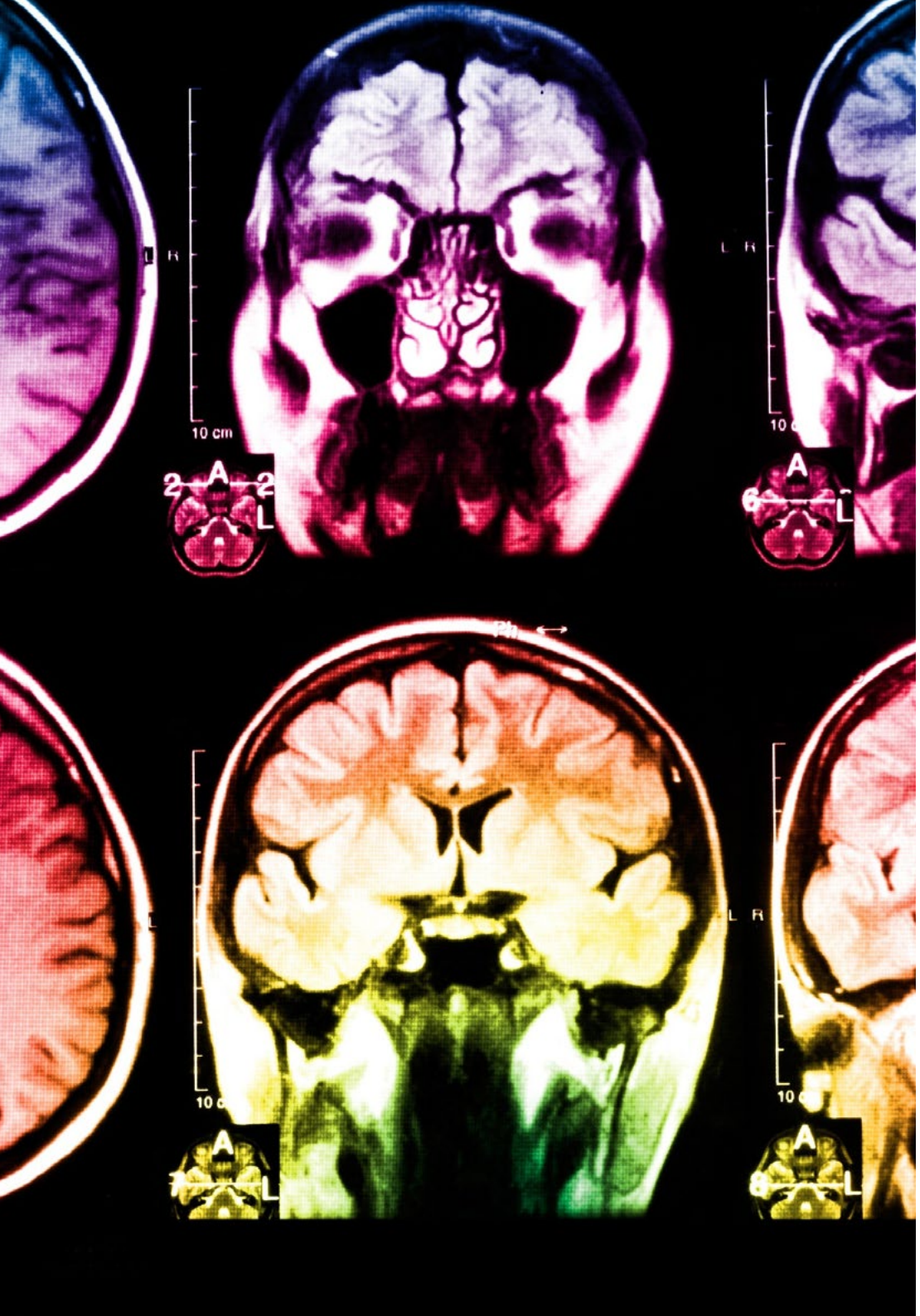
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

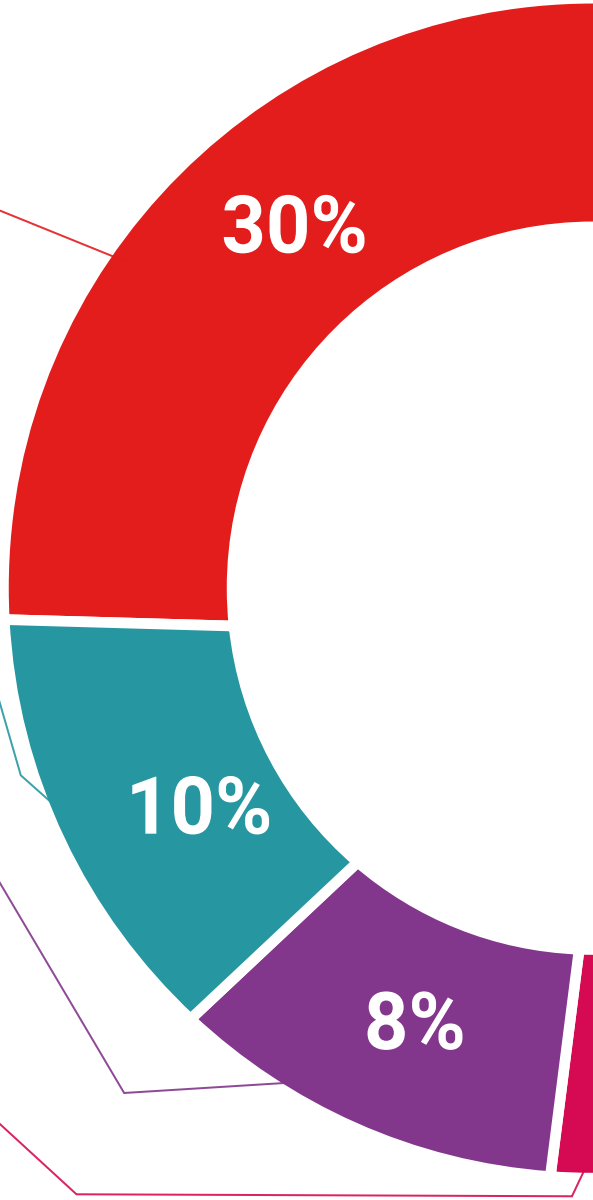
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

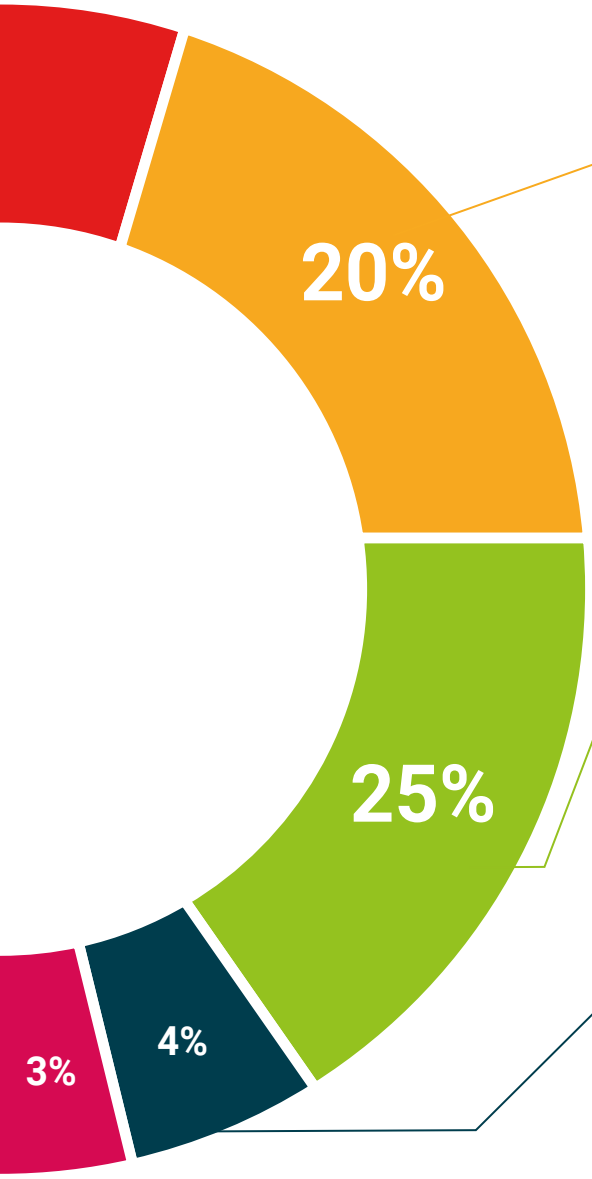
Practising Skills and Abilities

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 Human Resources guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree issued by TECH Technological University.

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

This **Professional Master's Degree in Artificial Intelligence in Translation and Interpreting** contains the most complete and up-to-date scientific 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 diploma 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 Human Resources**

Modality: **online**

Duration: **12 months**


tech technological university

Awards the following

DIPLOMA

to

Mr./Ms. _____ with identification number _____.

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Artificial Intelligence in Human Resources

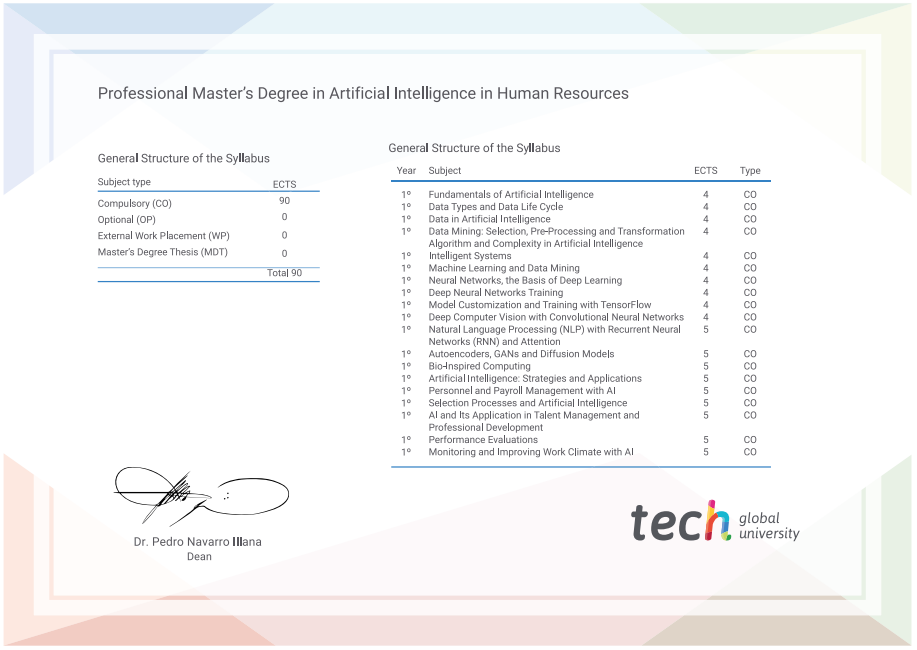
This is a qualification awarded by this University, equivalent to 2,250 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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 Human Resources

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	4	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	Personnel and Payroll Management with AI	5	CO
1º	Selection Processes and Artificial Intelligence	5	CO
1º	AI and Its Application in Talent Management and Professional Development	5	CO
1º	Performance Evaluations	5	CO
1º	Monitoring and Improving Work Climate with AI	5	CO

Dr. Pedro Navarro Illana
Dean

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

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Professional Master's Degree
Artificial Intelligence in Human Resources

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

Artificial Intelligence in Human Resources

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