Master's Degree
Deep Learning

tech global university

Master's Degree
Deep Learning

» Modality: **online**
» Duration: **12 months**
» Certificate: **TECH Global University**
» Credits: **60 ECTS**
» Schedule: **at your own pace**
» Exams: **online**

Website: **www.techtitute.com/us/artificial-intelligence/professional-master-degree/master-deep-learning**

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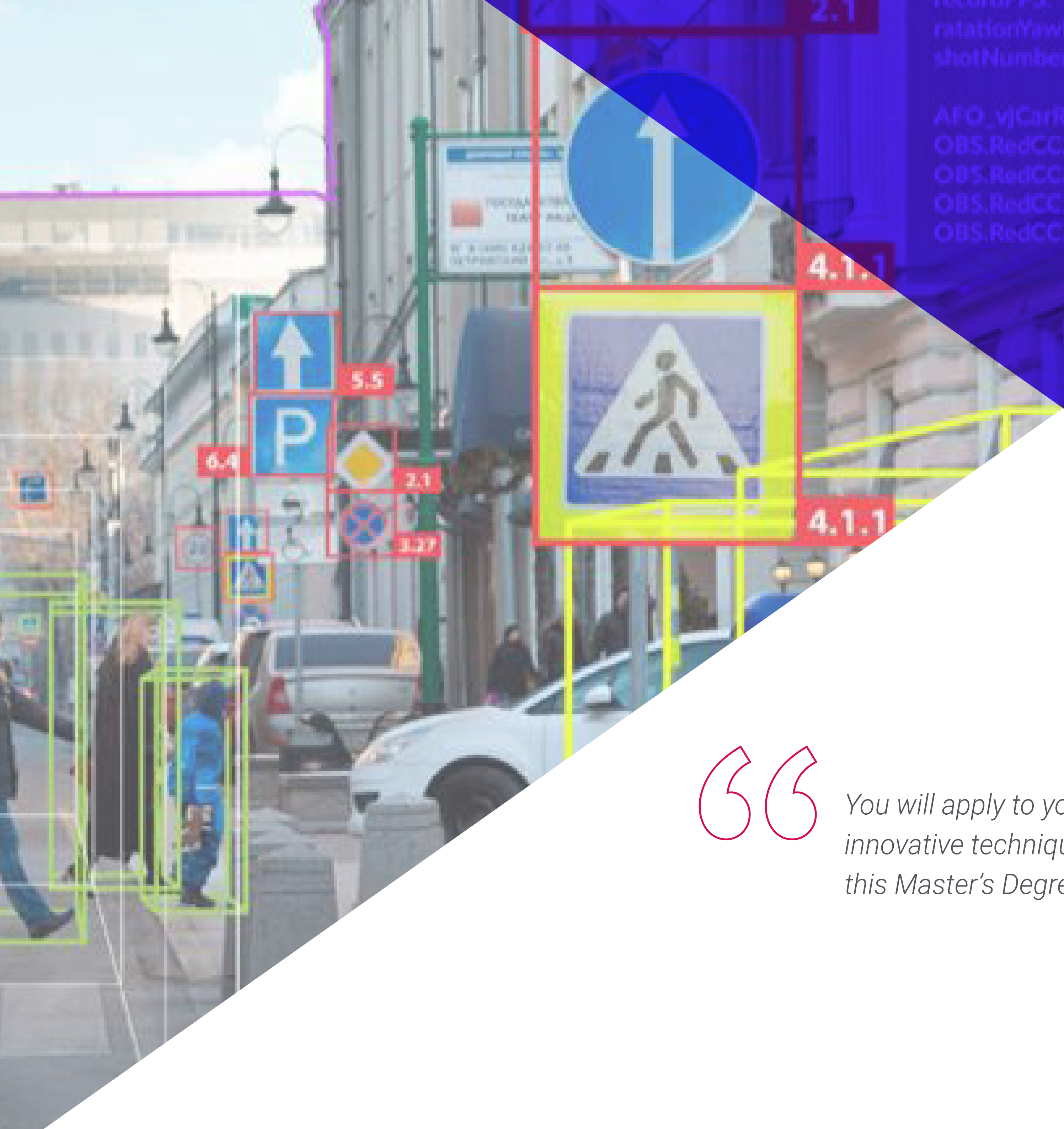
01

Introduction

Deep Learning has been a technological revolution in recent years. This variant of Artificial Intelligence focuses on training deep Neural Networks to learn hierarchical representations of data. In addition, it has a wide range of applications, one example being the world of finance. Therefore, experts are able to detect fraud, analyze risks and even predict stock prices. It is not surprising, therefore, that more and more people are choosing to specialize in this field of expertise. In response to this requirement, TECH is developing a program that will address in detail the particularities of Deep Machine Learning. All in a 100% online format, to provide greater convenience to students.



You will apply to your projects the most innovative techniques of Deep Learning thanks to this Master's Degree 100% online"

TensorFlow has become the most important tool for implementing and learning Deep Learning models. Developers use both its variety of tools and libraries to specialize models that perform automatic object detection, classification and natural language processing tasks. Along the same lines, this platform is useful for detecting anomalies in data, which is essential in areas such as cyber security, predictive maintenance and quality control. However, its use can involve a number of challenges for professionals, including the selection of the appropriate neural network architecture.

Faced with this situation, TECH implements a Master's Degree that will provide experts with a comprehensive approach to Deep Learning. Developed by experts in the field, the curriculum will delve into the mathematical foundations and principles of Deep Learning. This will enable graduates to build Neural Networks aimed at information processing involving pattern recognition, decision making and learning from data. In addition, the syllabus will delve deeper into Reinforcement Learning , taking into account factors such as reward optimization and policy search. In addition, the teaching materials will offer advanced optimization techniques and visualization of results.

As for the format of the university degree, it is delivered through a 100% online methodology so that graduates can complete the program with ease. To access the academic content they will only need an electronic device with Internet access, since the schedules and evaluation chronograms are planned on an individual basis. On the other hand, the syllabus will be supported by the innovative Relearningteaching innovative system, of which TECH is a pioneer. This learning system consists of the reiteration of key aspects to guarantee the mastery of its different aspects.

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

- Practical cases studies are presented by experts in Data Engineer and Data Scientist
- The graphic, schematic and practical contents of the book provide technical and practical information on those 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

Study through innovative multimedia didactic formats that will optimize your Deep Learning update process"

Looking to enrich your practice with the most advanced gradient optimization techniques? Achieve it with this program in just 12 months"

You will delve into the Backward Pass to calculate the gradients of the loss function with respect to the parameters of the network.

Thanks to the Relearning methodology, you will be free to plan both your study schedules and educational timelines.

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

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

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

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Objectives

Thanks to this Master's Degree, graduates will develop their skills and knowledge in the field of Deep Learning and Artificial Intelligence. In this way, they will implement the most advanced Deep Learning techniques in their projects to improve the performance of models in specific tasks. Likewise, experts will be able to develop intelligent systems that can automatically perform tasks such as pattern recognition in images, sentiment analysis in text or anomaly detection in data.

A university degree designed based on the latest trends in Deep Learning to guarantee you a successful learning"

General Objectives

- Fundamentalize the key concepts of mathematical functions and their derivatives
- Apply these principles to deep learning algorithms to learn automatically
- Examine the key concepts of Supervised Learning and how they apply to neural network models
- Analyze the program, evaluation and analysis of neural network models
- Fundamentals of the key concepts and main applications of deep learning
- Implement and optimize neural networks with Keras
- Develop expertise in the learning of deep neural networks
- Analyze the optimization and regularization mechanisms required for deep neural network training

Specific Objectives

Module 1. Mathematical Basis of Deep Learning
- Develop the chain rule for calculating derivatives of nested functions.
- Analyze how to create new functions from existing functions and how to compute the derivatives of these functions
- Examine the concept of *Backward Pass* and how derivatives of vector functions are applied to automatic learning
- Learn how to use TensorFlow to build custom models
- Understand how to load and process data using TensorFlow tools
- Fundamentalize the key concepts of NLP natural language processing with RNN and attention mechanisms
- Explore the functionality of Hugging Face *transformer* libraries and other natural language processing tools for application to vision problems
- Learn how to build and learn autoencoder models, GANs, and diffusion models
- Understand how autoencoders can be used to efficiently encode data

Module 2. Deep Learning Principles
- Analyze how linear regression works and how it can be applied to neural network models
- Understand the rationale for optimizing hyperparameters to improve the performance of neural network models
- Determine how the performance of neural network models can be evaluated using the learning set and the test set

Module 3. Neural Networks, the Basis of Deep Learning
- Analyze the architecture of neural networks and their principles of operation
- Determine how neural networks can be applied to a variety of problems
- Establish how to optimize the performance of deep learning models by tuning hyperparameters

Module 4. Deep Neural Networks Training
- Analyze gradient problems and how they can be avoided
- Determine how to reuse pre-trained layers to train deep neural networks
- Establish how to schedule the learning rate to get the best results

Module 5. Model Customization and Training with TensorFlow
- Determine how to use the TensorFlow API to define custom functions and graphics and custom graphs
- Fundamentally use the tf.data API to load and preprocess data efficiently.
- Discuss the TensorFlow Datasets project and how it can be used to facilitate access to preprocessed datasets.

Module 6. Deep Computer Vision with Convolutional Neural Networks
- Explore and understand how convolutional and clustering layers work for Visual Cortex architecture
- Develop CNN architectures with Keras
- Use pre-trained Keras models for object classification, localization, detection, and tracking, as well as semantic segmentation

Module 7. Processing Sequences using RNN and CNN
- Analyze the architecture of recurrent neurons and layers
- Examine the various training algorithms for training RNN models
- Evaluating the performance of RNN models using accuracy and sensitivity metrics

Module 8. NLP Natural Language Processing with RNN and Attention
- Generating text using recurrent neural networks
- Train an encoder-decoder network to perform neural machine translation
- Develop a practical application of natural language processing with RNN and attention

Module 9. Autoencoders, GANs, and Diffusion Models
- Implementing PCA techniques with an incomplete linear autoencoder
- Use convolutional and variational autoencoders to improve the performance of autoencoders
- Analyze how GANs and diffusion models can generate new and realistic images

Module 10. Reinforcement Learning
- Use gradients to optimize an agents policy.
- Evaluate the use of neural networks to improve the accuracy of an agent when making decisions
- Implement different boosting algorithms to improve the performance of an agent.

A key, unique and decisive training experience that will propel your professional development"

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Skills

Through the Master's Degree, graduates will acquire new skills to successfully face the challenges presented by Artificial Intelligence. Upon completion of the university degree, professionals will master the use of TensorFlow tools for data manipulation. Likewise, experts will make the most of Deep Neural Network training to solve complex problems and create accurate models. In this way, they will carry out innovative proposals to stand out in a booming technological sector.

You will acquire advanced skills to implement Visual Cortex architecture in your projects"

General Skills

- Implement Visual Cortex architecture
- Use pretrained Keras models for transfer learning and other computer vision tasks
- Master the Recurrent Neural Network (RNN)
- Train and evaluate an RNN model for time series prediction
- Improve an agent's ability to make optimal decisions in an environment
- Increase an agent's efficiency by learning with rewards

Handle the TensorFlow tool to manipulate data and create high-level machine learning models"

Specific Skills

- Solve problems with data, which involves improving existing processes and developing new processes through the use of appropriate technology tools
- Implement data-driven projects and tasks
- Using metrics such as precision, accuracy and classification error
- Optimize neural network parameters
- Build customized models using the TensorFlow API
- Implement tasks such as classification, localization, object detection and tracking as well as semantic segmentation
- Generate new and realistic images
- Implement *Deep Q-Learning* and variants of *Deep Q-Learning*
- Use optimization techniques for training
- Successfully train deep neural networks

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Course Management

In order to offer the highest quality education, TECH has carried out a rigorous selection process for each of the teachers that make up its university programs. Therefore, students who enter this Master's Degree will have access to a curriculum designed by the best experts in the field of Deep Learning. In addition, these professionals are not only characterized by a solid understanding of the subject, but also by their extensive work experience in prestigious institutions. All of this will allow students to immerse themselves in an immersive experience that will allow them to take a leap in their professional career.

The diversity of talents of the faculty will allow you to enjoy a totally dynamic and enriching teaching environment"

Management

Mr. Gil Contreras, Armando

- Lead Big Data Scientist at Johnson Controls
- Data Scientist-Big Data at Opensistemas S.A
- Fund Auditor at Creatividad and Tecnología (CYTSA)
- Public Sector Auditor at PricewaterhouseCoopers Auditors
- Master's Degree in Data Science from the Centro Universitario de Tecnología y Arte
- MBA in International Relations and Business from the Centro de Estudios Financieros (CEF)
- Bachelor's Degree in Economics from Instituto Tecnológico de Santo Domingo

Professors

Ms. Delgado Feliz, Benedit

- Administrative Assistant and Electronic Surveillance Operator for the National Drug Control Directorate (DNCD)
- Customer Service at Cáceres y Equipos
- Claims and Customer Service at Express Parcel Services (EPS)
- Microsoft Office Specialist at the National School of Informatics (Escuela Nacional de Informática).
- Social Communicator from the Catholic University of Santo Domingo.

Mr. Villar Valor, Javier

- Director and Founding Partner of Impulsa2
- Chief Operations Officer (COO) at Summa Insurance Brokers
- Director of Transformation and Operational Excellence at Johnson Controls
- Master in Professional Coaching
- Executive MBA from Emlyon Business School, France
- Master's Degree in Quality Management from EOI, Spain
- Computer Engineering from the Universidad Acción Pro-Education and Culture (UNAPEC).

Mr. Matos Rodríguez, Dionis

- Data Engineer at Wide Agency Sodexo
- Data Consultant at Tokiota
- Data Engineer at Devoteam
- BI Developer at Ibermática
- Applications Engineer at Johnson Controls
- Database Developer at Suncapital España
- Senior Web Developer at Deadlock Solutions
- QA Analyst at Metaconxept
- Master's Degree in Big Data & Analytics by EAE Business School
- Master's Degree in Systems Analysis and Design
- Bachelor's Degree in Computer Engineering from APEC University

Ms. Gil de León, María

- Co-Director of Marketing and Secretary at RAÍZ Magazine
- Copy Editor at Gauge Magazine
- Stork Magazine reader from Emerson College
- B.A. in Writing, Literature and Publishing from Emerson College

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Structure and Content

This Master's Degree will offer students a wide range of Deep Learning techniques, which will raise their professional horizons to a higher level. To achieve this, the academic path will delve into the coding of deep learning models. In this way, graduates will be able to effectively translate deep neural network algorithms and architectures. In addition, the course will cover in detail the training of deep neural networks, as well as the visualization of the results and the evaluation of the learning models. Students will also analyze the main Transformer Models, in order to handle them to generate automatic translations.

You will apply Deep Learning principles to your projects to solve a variety of complex problems in fields such as image recognition"

Module 1. Mathematical Basis of Deep Learning

1.1. Functions and Derivatives
    1.1.1. Linear Functions
    1.1.2. Partial Derivative
    1.1.3. Higher Order Derivatives
1.2. Multiple Nested Functions
    1.2.1. Compound Functions
    1.2.2. Inverse Functions
    1.2.3. Recursive Functions
1.3. Chain Rule
    1.3.1. Derivatives of Nested Functions
    1.3.2. Derivatives of Compound Functions
    1.3.3. Derivatives of Inverse Functions
1.4. Functions with Multiple Inputs
    1.4.1. Multi-variable Functions
    1.4.2. Vectorial Functions
    1.4.3. Matrix Functions
1.5. Derivatives of Functions with Multiple Inputs
    1.5.1. Partial Derivative
    1.5.2. Directional Derivatives
    1.5.3. Mixed Derivatives
1.6. Functions with Multiple Vector Inputs
    1.6.1. Linear Vector Functions
    1.6.2. Non-linear Vector Functions
    1.6.3. Matrix Vector Functions
1.7. Creating New Functions from Existing Functions
    1.7.1. Addition of Functions
    1.7.2. Product of Functions
    1.7.3. Composition of Functions

1.8. Derivatives of Functions with Multiple Vector Entries
- 1.8.1. Derivatives of Linear Functions
- 1.8.2. Derivatives of Nonlinear Functions
- 1.8.3. Derivatives of Compound Functions

1.9. Vector Functions and their Derivatives: A Step Further
- 1.9.1. Directional Derivatives
- 1.9.2. Mixed Derivatives
- 1.9.3. Matrix Derivatives

1.10. The *Backward Pass*
- 1.10.1. Error Propagation
- 1.10.2. Application of Update Rules
- 1.10.3. Parameter Optimization

Module 2. Deep Learning Principles

2.1. Supervised Learning
- 2.1.1. Supervised Learning Machines
- 2.1.2. Uses of Supervised Learning
- 2.1.3. Differences between Supervised and Unsupervised Learning

2.2. Supervised Learning Models
- 2.2.1. Linear Models
- 2.2.2. Decision Tree Models
- 2.2.3. Neural Network Models

2.3. Linear Regression
- 2.3.1. Simple Linear Regression
- 2.3.2. Multiple Linear Regression
- 2.3.3. Regression Analysis

2.4. Model Training
- 2.4.1. Batch Learning
- 2.4.2. Online Learning
- 2.4.3. Optimization Methods

2.5. Model Evaluation: Training Set vs. Test Set
- 2.5.1. Evaluation Metrics
- 2.5.2. Cross Validation
- 2.5.3. Comparison of Data Sets

2.6. Model Evaluation: The Code
- 2.6.1. Prediction Generation
- 2.6.2. Error Analysis
- 2.6.3. Evaluation Metrics

2.7. Variables Analysis
- 2.7.1. Identification of Relevant Variables
- 2.7.2. Correlation Analysis
- 2.7.3. Regression Analysis

2.8. Explainability of Neural Network Models
- 2.8.1. Interpretable Models
- 2.8.2. Visualization Methods
- 2.8.3. Evaluation Methods

2.9. Optimization
- 2.9.1. Optimization Methods
- 2.9.2. Regularization Techniques
- 2.9.3. The Use of Graphs

2.10. Hyperparameters
- 2.10.1. Selection of Hyperparameters
- 2.10.2. Parameter Search
- 2.10.3. Hyperparameter Tuning

Module 3. Neural Networks, the Basis of Deep Learning

3.1. Deep Learning
- 3.1.1. Types of Deep Learning
- 3.1.2. Applications of Deep Learning
- 3.1.3. Advantages and Disadvantages of Deep Learning

3.2. Operations
- 3.2.1. Sum
- 3.2.2. Product
- 3.2.3. Transfer

3.3. Layers
- 3.3.1. Input Layer
- 3.3.2. Cloak
- 3.3.3. Output Layer

3.4. Union of Layers and Operations
  3.4.1. Architecture Design
  3.4.2. Connection between Layers
  3.4.3. Forward Propagation
3.5. Construction of the First Neural Network
  3.5.1. Network Design
  3.5.2. Establish the Weights
  3.5.3. Network Training
3.6. Trainer and Optimizer
  3.6.1. Optimizer Selection
  3.6.2. Establishment of a Loss Function
  3.6.3. Establishing a Metric
3.7. Application of the Principles of Neural Networks
  3.7.1. Activation Functions
  3.7.2. Backward Propagation
  3.7.3. Parameter Adjustment
3.8. From Biological to Artificial Neurons
  3.8.1. Functioning of a Biological Neuron
  3.8.2. Transfer of Knowledge to Artificial Neurons
  3.8.3. Establish Relations between the Two
3.9. Implementation of MLP (Multilayer Perceptron) with Keras
  3.9.1. Definition of the Network Structure
  3.9.2. Model Compilation
  3.9.3. Model Training
3.10. *Fine Tuning* Hyperparameters of Neural Networks
  3.10.1. Selection of the Activation Function
  3.10.2. Set the *Learning* Rate
  3.10.3. Adjustment of Weights

Module 4. Deep Neural Networks Training

4.1. Gradient Problems
  4.1.1. Gradient Optimization Techniques
  4.1.2. Stochastic Gradients
  4.1.3. Weight Initialization Techniques
4.2. Reuse of Pre-Trained Layers
  4.2.1. Learning Transfer Training
  4.2.2. Feature Extraction
  4.2.3. Deep Learning
4.3. Optimizers
  4.3.1. Stochastic Gradient Descent Optimizers
  4.3.2. Adam and RMSprop Optimizers
  4.3.3. Moment Optimizers
4.4. Learning Rate Programming
  4.4.1. Automatic Learning Rate Control
  4.4.2. Learning Cycles
  4.4.3. Smoothing Terms
4.5. Overfitting
  4.5.1. Cross Validation
  4.5.2. Regularization
  4.5.3. Evaluation Metrics
4.6. Practical Guidelines
  4.6.1. Model Design
  4.6.2. Selection of Metrics and Evaluation Parameters
  4.6.3. Hypothesis Testing
4.7. *Transfer Learning*
  4.7.1. Learning Transfer Training
  4.7.2. Feature Extraction
  4.7.3. Deep Learning
4.8. *Data Augmentation*
  4.8.1. Image Transformations
  4.8.2. Synthetic Data Generation
  4.8.3. Text Transformation

4.9. Practical Application of *Transfer Learning*
- 4.9.1. Learning Transfer Training
- 4.9.2. Feature Extraction
- 4.9.3. Deep Learning

4.10. Regularization
- 4.10.1. L1 and L2
- 4.10.2. Regularization by Maximum Entropy
- 4.10.3. *Dropout*

Module 5. Model Customization and Training with TensorFlow

5.1. TensorFlow
- 5.1.1. Using the TensorFlow Library
- 5.1.2. Model Education with TensorFlow
- 5.1.3. Operations with Graphs in TensorFlow

5.2. TensorFlow and NumPy
- 5.2.1. NumPy Computational Environment for TensorFlow
- 5.2.2. Using NumPy Arrays with TensorFlow
- 5.2.3. NumPy Operations for TensorFlow Graphs
- 5.3. Model Customization and Training Algorithms
- 5.3.1. Building Custom Models with TensorFlow
- 5.3.2. Management of Training Parameters
- 5.3.3. Use of Optimization Techniques for Training

5.4. TensorFlow Functions and Graphs
- 5.4.1. Functions with TensorFlow
- 5.4.2. Use of Graphs for Model Training
- 5.4.3. Optimization of Graphs with TensorFlow Operations

5.5. Data Loading and Preprocessing with TensorFlow
- 5.5.1. Loading of Datasets with TensorFlow
- 5.5.2. Data Preprocessing with TensorFlow
- 5.5.3. Using TensorFlow Tools for Data Manipulation

5.6. The tf.data API
- 5.6.1. Using the tf.data API for Data Processing
- 5.6.2. Constructing Data Streams with tf.data
- 5.6.3. Use of the tf.data API for Training Models

5.7. The TFRecord Format
5.7.1. Using the TFRecord API for Data Serialization
5.7.2. Loading TFRecord Files with TensorFlow
5.7.3. Using TFRecord Files for Training Models
5.8. Keras Preprocessing Layers
5.8.1. Using the Keras Preprocessing API
5.8.2. Construction of Preprocessing Pipelined with Keras
5.8.3. Using the Keras Preprocessing API for Model Training
5.9. The TensorFlow Datasets Project
5.9.1. Using TensorFlow Datasets for Data Loading
5.9.2. Data Preprocessing with TensorFlow Datasets
5.9.3. Using TensorFlow Datasets for Model Training
5.10. Construction of a *Deep Learning* Application with TensorFlow. Practical Application
5.10.1. Building a Deep *Learning* App with TensorFlow
5.10.2. Training a Model with TensorFlow
5.10.3. Use of the Application for the Prediction of Results

Module 6. Deep Computer Vision with Convolutional Neural Networks

6.1. The Cortex Visual Architecture
6.1.1. Functions of the Visual Cortex
6.1.2. Theories of Computational Vision
6.1.3. Models of Image Processing
6.2. Convolutional Layers
6.2.1. Reuse of Weights in Convolution
6.2.2. 2D convolution
6.2.3. Activation Functions
6.3. Grouping Layers and Implementation of Grouping Layers with Keras
6.3.1. *Pooling* and *Striding*
6.3.2. *Flattening*
6.3.3. Types of *Pooling*
6.4. CNN Architecture
6.4.1. VGG Architecture
6.4.2. AlexNet architecture
6.4.3. ResNet Architecture
6.5. Implementation of a ResNet-34 CNN using Keras
6.5.1. Weight Initialization
6.5.2. Input Layer Definition
6.5.3. Output Definition
6.6. Use of Pre-trained Keras Models
6.6.1. Characteristics of Pre-trained Models
6.6.2. Uses of Pre-trained Models
6.6.3. Advantages of Pre-trained Models
6.7. Pre-trained Models for Transfer Learning
6.7.1. Transfer Learning
6.7.2. Transfer Learning Process
6.7.3. Advantages of Transfer Learning
6.8. Classification and Localization in Deep Computer Vision
6.8.1. Image Classification
6.8.2. Localization of Objects in Images
6.8.3. Object Detection
6.9. Object Detection and Object Tracking
6.9.1. Object Detection Methods
6.9.2. Object Tracking Algorithms
6.9.3. Tracking and Localization Techniques
6.10. Semantic Segmentation
6.10.1. Deep Learning for Semantic Segmentation
6.10.2. Edge Detection
6.10.3. Rule-based Segmentation Methods

Module 7. Processing Sequences using RNN (Recurrent Neural Networks) and CNN (Convolutional Neural Networks)

7.1. Recurrent Neurons and Layers
   7.1.1. Types of Recurring Neurons
   7.1.2. Architecture of a Recurrent Layer
   7.1.3. Applications of Recurrent Layers
7.2. Recurrent Neural Network (RNN) Training
   7.2.1. Backpropagation over Time (BPTT)
   7.2.2. Stochastic Downward Gradient
   7.2.3. Regularization in RNN Training
7.3. Evaluation of RNN Models
   7.3.1. Evaluation Metrics
   7.3.2. Cross Validation
   7.3.3. Hyperparameter Tuning
7.4. Prerenal RNNs
   7.4.1. Pre-trained Networks
   7.4.2. Transfer of Learning
   7.4.3. Fine Tuning
7.5. Forecasting a Time Series
   7.5.1. Statistical Models for Forecasting
   7.5.2. Time Series Models
   7.5.3. Models based on Neural Networks
7.6. Interpretation of Time Series Analysis Results
   7.6.1. Main Component Analysis
   7.6.2. Cluster Analysis
   7.6.3. Correlation Analysis
7.7. Handling of Long Sequences
   7.7.1. Long Short-Term Memory (LSTM)
   7.7.2. Gated Recurrent Units (GRU)
   7.7.3. 1D Convolutional
7.8. Partial Sequence Learning
   7.8.1. Deep Learning Methods
   7.8.2. Generative Models
   7.8.3. Reinforcement Learning
7.9. Practical Application of RNN and CNN
   7.9.1. Natural Language Processing
   7.9.2. Pattern Recognition
   7.9.3. Computer Vision
7.10. Differences in Classical Results
   7.10.1. Classical vs. RNN Methods
   7.10.2. Classical vs. CNN Methods
   7.10.3. Difference in Training Time

Module 8. Natural Language Processing (NLP) with Natural Recurrent Networks (NRN) and Attention

8.1. Text Generation Using RNN
   8.1.1. Training an RNN for Text Generation
   8.1.2. Natural Language Generation with RNN
   8.1.3. Text Generation Applications with RNN
8.2. Training Data Set Creation
   8.2.1. Preparation of the Data for Training an RNN
   8.2.2. Storage of the Training Dataset
   8.2.3. Data Cleaning and Transformation
8.3. Sentiment Analysis
   8.3.1. Classification of Opinions with RNN
   8.3.2. Detection of Themes in Comments
   8.3.3. Sentiment Analysis with Deep Learning Algorithms
8.4. Encoder-decoder Network for Neural Machine Translation
   8.4.1. Training an RNN for Machine Translation
   8.4.2. Use of an *Encoder-decoder* Network for Machine Translation
   8.4.3. Improving the Accuracy of Machine Translation with RNNs
8.5. Attention Mechanisms
   8.5.1. Application of Care Mechanisms in RNN
   8.5.2. Use of Care Mechanisms to Improve the Accuracy of the Models
   8.5.3. Advantages of Attention Mechanisms in Neural Networks

8.6. Transformer Models
- 8.6.1. Using TransformerModels for Natural Language Processing
- 8.6.2. Application of Transformer Models for Vision
- 8.6.3. Advantages of Transformer Models

8.7. Transformers for Vision
- 8.7.1. Use of Transformer Models for Vision
- 8.7.2. Image Data Preprocessing
- 8.7.3. Training of a Transformer model for vision

8.8. Hugging Face Transformer Library
- 8.8.1. Using the Hugging Face Transformers Library
- 8.8.2. Application of the Hugging Face Transformers Library
- 8.8.3. Advantages of the Hugging Face Transformers library

8.9. Other Transformers Libraries. Comparison
- 8.9.1. Comparison between different TransformersLibraries
- 8.9.2. Use of the other Transformers Libraries
- 8.9.3. Advantages of the other Transformers Libraries

8.10. Development of an NLP Application with RNN and Attention. Practical Application
- 8.10.1. Development of a Natural Language Processing Application with RNN and Attention
- 8.10.2. Use of RNN, Attention Mechanisms and Transformers Models in the Application
- 8.10.3. Evaluation of the Practical Application

Module 9. Autoencoders, GANs, and Diffusion Models

9.1. Representation of Efficient Data
- 9.1.1. Dimensionality Reduction
- 9.1.2. Deep Learning
- 9.1.3. Compact Representations

9.2. PCA Realization with an Incomplete Linear Automatic Encoder
- 9.2.1. Training Process
- 9.2.2. Implementation in Python
- 9.2.3. Use of Test Data

9.3. Stacked Automatic Encoders
- 9.3.1. Deep Neural Networks
- 9.3.2. Construction of Coding Architectures
- 9.3.3. Use of Regularization

9.4. Convolutional Autoencoders
- 9.4.1. Design of Convolutional Models
- 9.4.2. Convolutional Model Training
- 9.4.3. Results Evaluation

9.5. Automatic Encoder Denoising
- 9.5.1. Application of Filters
- 9.5.2. Design of Coding Models
- 9.5.3. Use of Regularization Techniques

9.6. Sparse Automatic Encoders
- 9.6.1. Increasing Coding Efficiency
- 9.6.2. Minimizing the Number of Parameters
- 9.6.3. Using Regularization Techniques

9.7. Variational Automatic Encoders
- 9.7.1. Use of Variational Optimization
- 9.7.2. Unsupervised Deep Learning
- 9.7.3. Deep Latent Representations

9.8. Generation of Fashion MNIST Images
- 9.8.1. Pattern Recognition
- 9.8.2. Image Generation
- 9.8.3. Deep Neural Networks Training

9.9. Generative Adversarial Networks and Diffusion Models
- 9.9.1. Content Generation from Images
- 9.9.2. Modeling of Data Distributions
- 9.9.3. Use of Adversarial Networks

9.10. Implementation of the Models. Practical Application
- 9.10.1. Implementation of the Models
- 9.10.2. Use of Real Data
- 9.10.3. Results Evaluation

Module 10. Reinforcement Learning

10.1. Optimization of Rewards and Policy Search
- 10.1.1. Reward Optimization Algorithms
- 10.1.2. Policy Search Processes
- 10.1.3. Reinforcement Learning for Reward Optimization

10.2. OpenAI
- 10.2.1. OpenAI Gym Environment
- 10.2.2. Creation of OpenAI Environments
- 10.2.3. Reinforcement Learning Algorithms in OpenAI

10.3. Neural Network Policies
- 10.3.1. Convolutional Neural Networks for Policy Search
- 10.3.2. Deep Learning Policies
- 10.3.3. Extending Neural Network Policies

10.4. Stock Evaluation: the Credit Allocation Problem
- 10.4.1. Risk Analysis for Credit Allocation
- 10.4.2. Estimating the Profitability of Loans
- 10.4.3. Credit Evaluation Models based on Neural Networks

10.5. Policy Gradients
- 10.5.1. Reinforcement Learning with Policy Gradients
- 10.5.2. Optimization of Policy Gradients
- 10.5.3. Policy Gradient Algorithms

10.6. Markov Decision Processes
- 10.6.1. Optimization of Markov Decision Processes
- 10.6.2. Reinforcement Learning for Markov Decision ¨Processes
- 10.6.3. Models of Markov Decision Processes

10.7. Temporal Difference Learning and *Q-Learning*
- 10.7.1. Application of Temporal Differences in Learning
- 10.7.2. Application of *Q-Learning* in Learning
- 10.7.3. Optimization of *Q-Learning*Parameters

10.8. Implementation of Deep *Q-Learning* and *Deep Q-Learning* Variants
- 10.8.1. Construction of Deep Neural Networks for *Deep Q-Learning*
- 10.8.2. Implementation of *Deep Q-Learning*
- 10.8.3. Variations of *Deep Q-Learning*

10.9. Reinforcement Learning Algorithms
- 10.9.1. Reinforcement Learning Algorithms
- 10.9.2. Reward Learning Algorithms
- 10.9.3. Punishment Learning Algorithms

10.10. Design of a Reinforcement Learning Environment. Practical Application
- 10.10.1. Design of a Reinforcement Learning Environment
- 10.10.2. Implementation of a Reinforcement Learning Algorithm
- 10.10.3. Evaluation of a Reinforcement Learning Algorithm

> *Study from the comfort of your home and update your knowledge online with TECH Global University, the biggest online university in the world”*

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

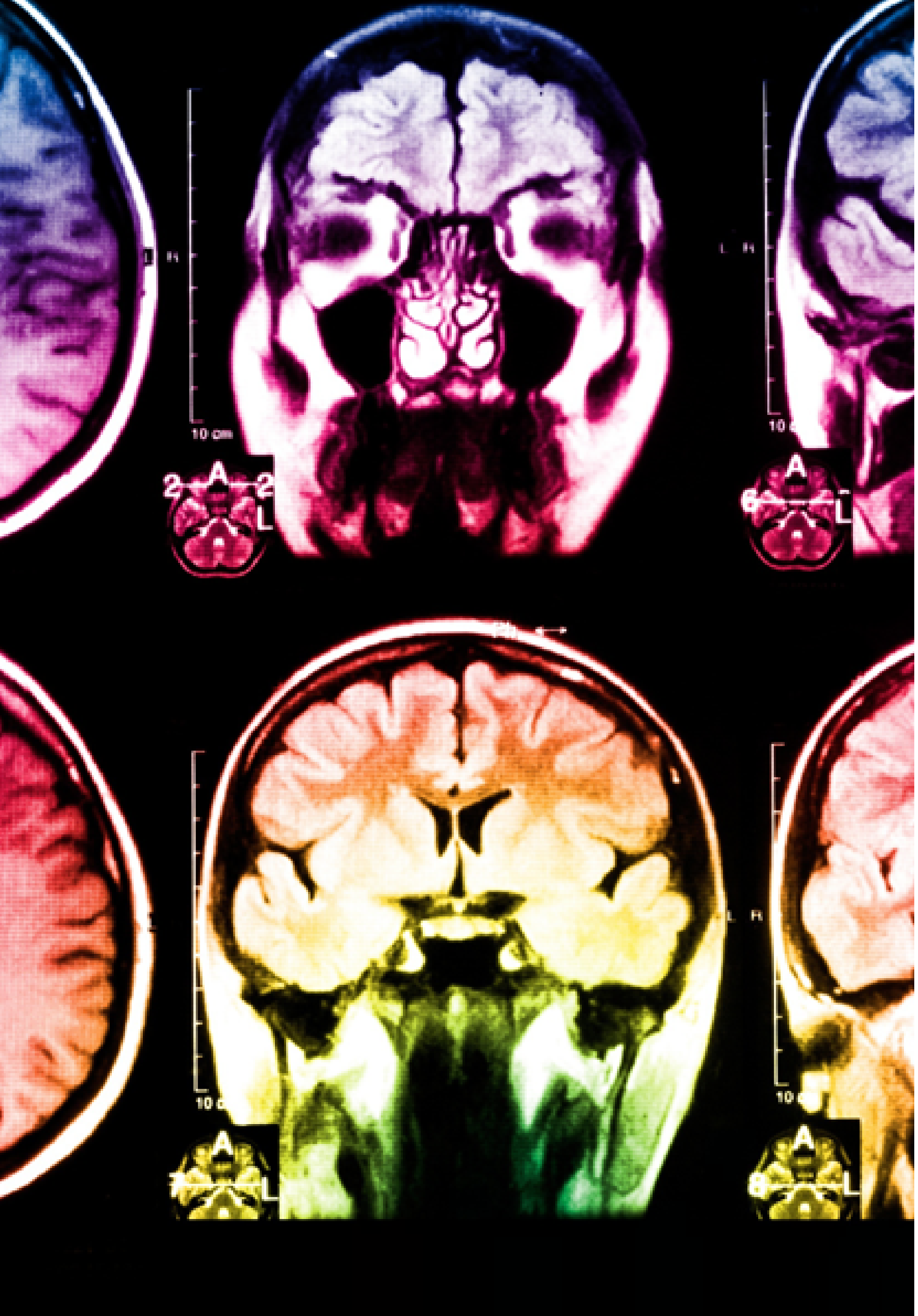
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

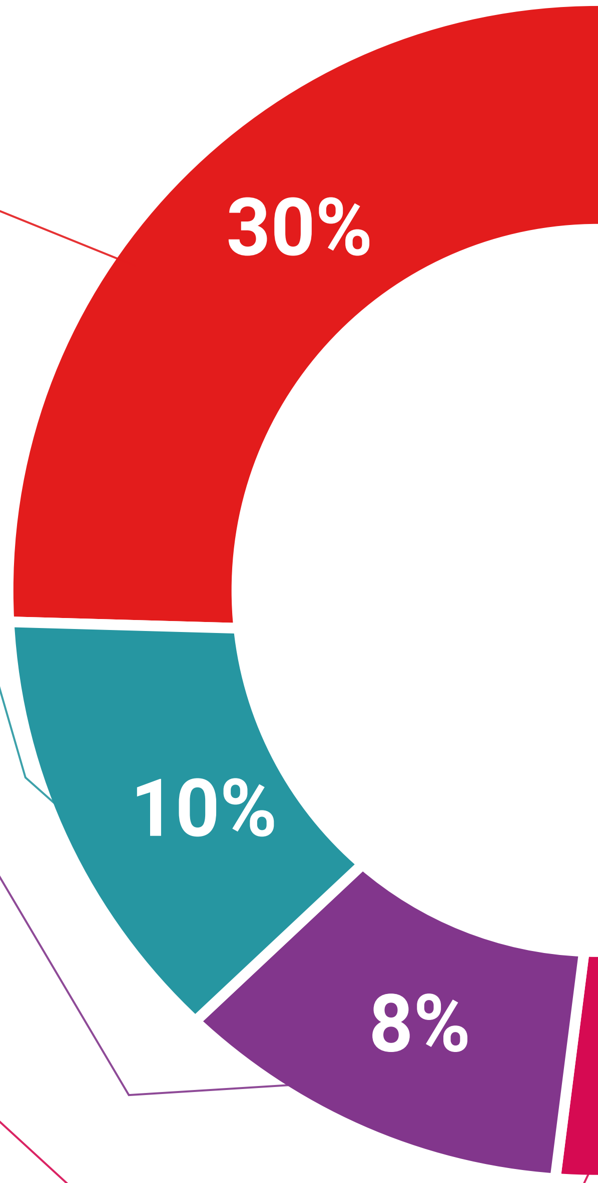
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

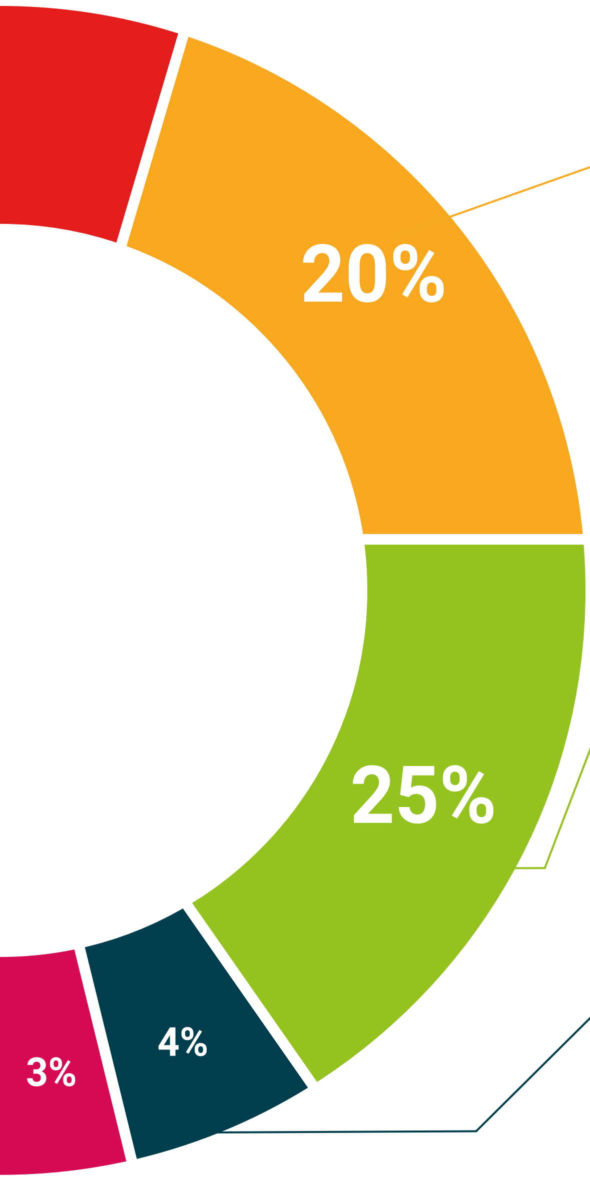
Practising Skills and Abilities

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 Master's Degree in Deep Learning guarantees students, in addition to the most rigorous and up-to-date education, access to a Master's Degree diploma issued by TECH Global University.

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

This program will allow you to obtain your **Master's Degree diploma in Deep Learning** 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** title 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: **Master's Degree in Deep Learning**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**

tech global university

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

Master's Degree in Deep Learning

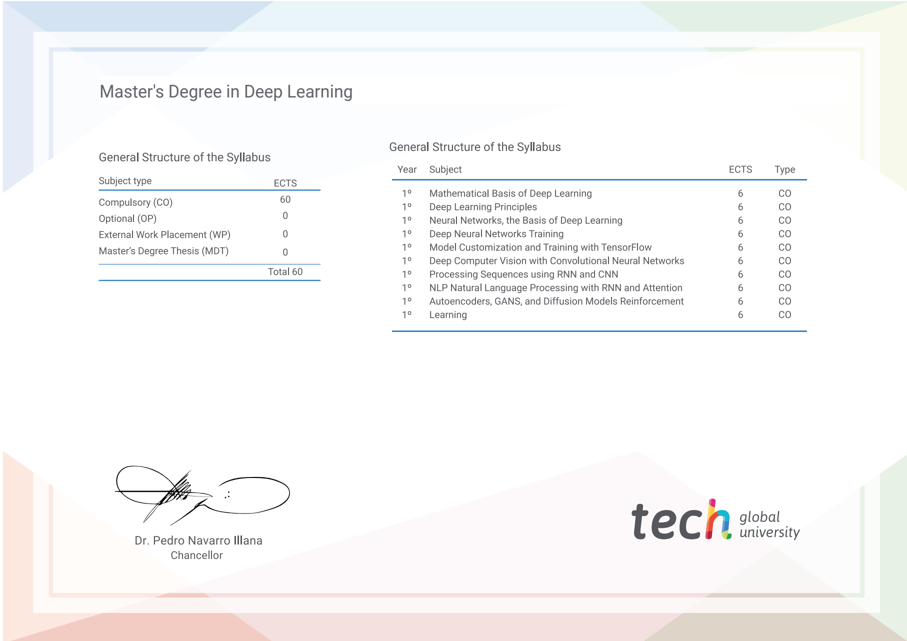
This is a program of 1,500 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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
Chancellor

Unique TECH Code: AFWORD23S techtitute.com/certificates



Master's Degree in Deep Learning

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Mathematical Basis of Deep Learning	6	CO
1º	Deep Learning Principles	6	CO
1º	Neural Networks, the Basis of Deep Learning	6	CO
1º	Deep Neural Networks Training	6	CO
1º	Model Customization and Training with TensorFlow	6	CO
1º	Deep Computer Vision with Convolutional Neural Networks	6	CO
1º	Processing Sequences using RNN and CNN	6	CO
1º	NLP Natural Language Processing with RNN and Attention	6	CO
1º	Autoencoders, GANS, and Diffusion Models Reinforcement	6	CO
1º	Learning	6	CO

Dr. Pedro Navarro Illana
Chancellor

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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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Master's Degree
Deep Learning

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Credits: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Master's Degree

Deep Learning