Postgraduate Diploma

Neural Networks and Deep Learning Training

tech global university

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Postgraduate Diploma
Neural Networks and Deep Learning Training

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Global University**
- Credits: **18 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/artificial-intelligence/postgraduate-diploma/postgraduate-diploma-neural-networks-deep-learning-training**

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01

Introduction

Artificial Intelligence has been a technological boom in the business environment. One of its most widely used branches is Computer Vision, which in turn is powered by Neural Networks and Deep Learning Training. These tools imply benefits, among which data analysis, task automation and complex problem solving in a variety of aspects stand out. As emerging technologies, new tools and techniques are frequently emerging to optimize their procedures. Faced with this situation, professionals need to stay at the forefront of this field to offer top quality proposals that meet the needs of consumers. For this reason, TECH is launching a digital program that encompasses the latest trends in Deep Learning.

TECH's exclusive Relearning system will allow you to update your knowledge and skills on Visual Cortex Architecture in the most rigorous way"

There are an infinite number of resources for the development and training of Neural Network models. In this regard, Keras has become the most widely used by practitioners due to its ease of use, flexibility and compatibility with other libraries. This open source library provides developers with a high-level Application Programming Interface, which allows them to build Deep Learning models with immediacy. In this way, it contributes to the creation of image classification models that can identify different objects in snapshots. This is beneficial for aspects such as face recognition systems, medical image classification or the creation of generative art.

In this context, TECH implements a Postgraduate Diploma that will focus on Deep Computer Vision with Convolutional Neural Networks. For this purpose, the academic itinerary will delve into the Transfer Learning Training by attending to factors such as weight initialization techniques and smoothing terms. In this way, the graduates will take advantage of the previous knowledge acquired by pre-trained models to improve the performance of new machine learning tasks. The program will also address the construction of a Deep Learning application using TensorFlow and NumPy. This will enable professionals to use these tools in an optimal way in areas such as performance prediction.

The university program will be taught 100% online, on a virtual study platform that is not governed by predefined schedules. Far from this, each student will have the opportunity to self-manage their progress in a personalized way at any time of the 24 hours a day. One of the most distinctive features of the methodology is the learning process that TECH uses in all its programs:Relearning. Also, you will have Relearning, an innovative study methodology that will promote the acquisition of skills in a fast and flexible way from the analysis of theoretical content and exemplification of cases based on the real context of profession.

This **Postgraduate Diploma in Neural Networks and Deep Learning Training** contains the most complete and up-to-date program on the market. The most important features include

- The development of practical cases presented by experts in Neural Networks and Deep Learning Training
- The graphical, schematic and practical contents with which it is conceived gather technological 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

You will be equipped to contribute to the advancement of knowledge in the area of Deep Learning through research and development of new algorithms"

You will optimize your skills in the design of Deep Learning models to generate effective solutions to projects"

You will master the NumPy computational environment and perform numerical operations on multidimensional arrays.

You will have access to a multimedia library full of dynamic content that will enhance your learning in a more visual way.

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

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

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

02

Objectives

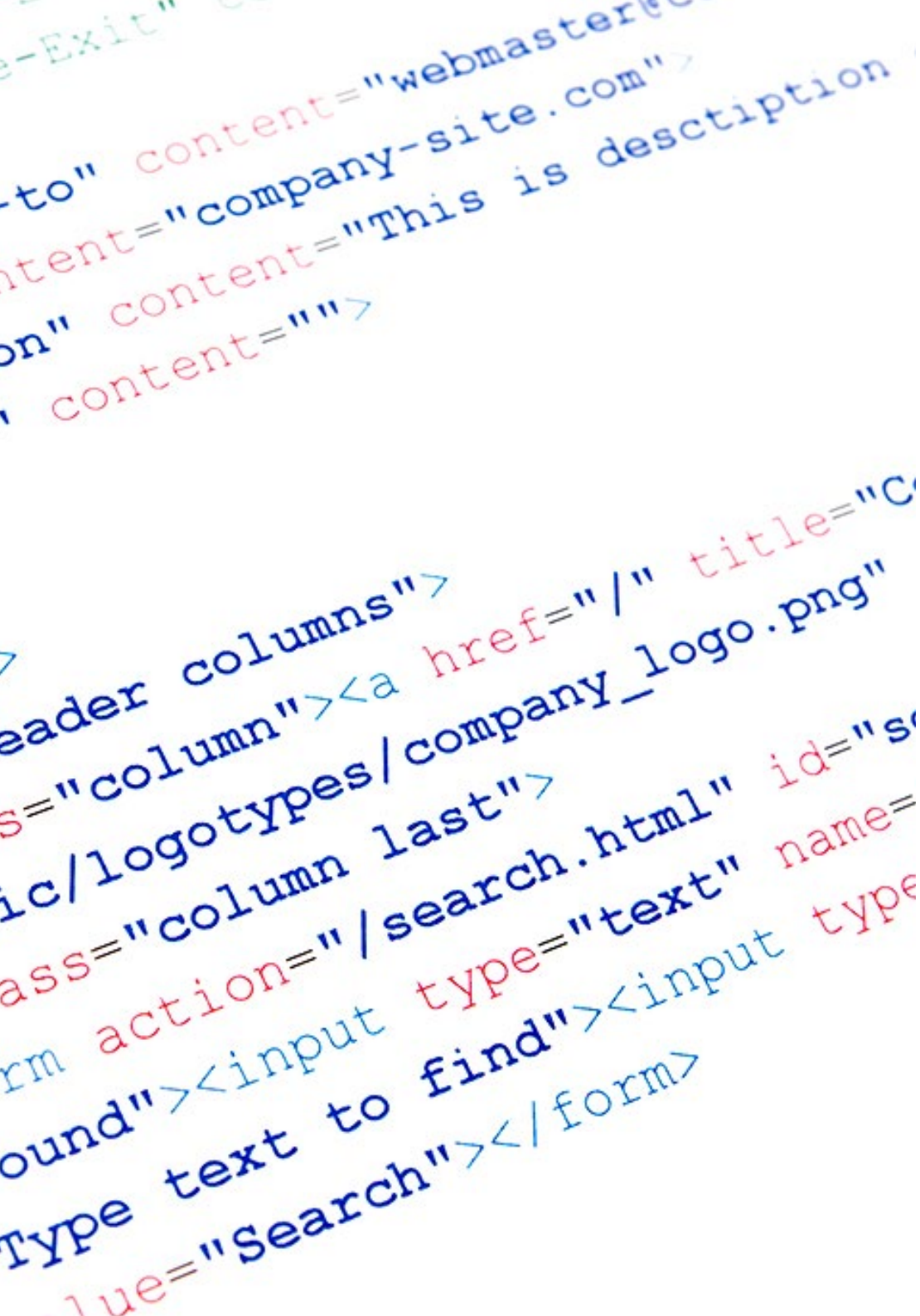
With this immersive learning experience, graduates will have at their disposal a plurality of knowledge and skills to experience a quality leap in the field of Deep Learning Professionals will have a solid knowledge of Deep Neural Network training, so they will apply its principles to algorithms effectively. In addition, they will master advanced software such as TensorFlow, designed to create different neural network architectures quickly and easily. All this will allow them to design and execute advanced Artificial Intelligence projects to stand out in an ever-expanding technological sector.

In just 6 months, you will give your career the technological boost it needs and offer innovative solutions to Gradient's problems"

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 training, 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 training of deep neural networks
- Analyze the optimization and regularization mechanisms required for deep neural network training

The didactic material of this degree will lead you to delve in a more visual way into the knowledge of Transfer Learning"



Specific Objectives

Module 1. 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 2. 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 efficiently
- Discuss the TensorFlow *Datasets* project and how it can be used to facilitate access to preprocessed datasets

Module 3. 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

03

Course Management

In order to provide educational excellence, TECH carefully selects the faculty that makes up each of its programs. Therefore, for this Postgraduate Diploma, TECH has selected the best experts in Neural Networks and Deep Learning. In addition to having an extensive professional background, these professionals have solid knowledge of the subject and are kept up to date to incorporate the latest trends in Computer Vision into their practice. They are also strongly committed to the academic preparation and teaching of students, thus providing the highest quality education.

A well-versed faculty of Machine Vision and Machine Learning experts will guide you through the entire academic journey"

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)

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

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

04

Structure and Content

This training is designed by experts in the field of Neural Networks and *Deep Learning*, with the objective of providing you with a comprehensive perspective on these subjects. The curriculum will analyze in detail the training of multi-layer neural networks, ranging from gradient optimization techniques to selection of metrics and evaluation parameters. Graduates will optimize their internal parameters to perform specific tasks with high accuracy and generalization. The syllabus will also delve into the proper handling of TensorFlow, one of the most effective softwares for both building and training machine learning models.

You will enter a process of professional growth that will equip you with advanced skills to excel in the field of Computer Vision"

Module 1. Deep Neural Networks Training

1.1. Gradient Problems
- 1.1.1. Gradient Optimization Techniques
- 1.1.2. Stochastic Gradients
- 1.1.3. Weight Initialization Techniques

1.2. Reuse of Pre-Trained Layers
- 1.2.1. Learning Transfer Training
- 1.2.2. Feature Extraction
- 1.2.3. Deep Learning

1.3. Optimizers
- 1.3.1. Stochastic Gradient Descent Optimizers
- 1.3.2. Adam and RMSprop Optimizers
- 1.3.3. Moment Optimizers

1.4. Learning Rate Programming
- 1.4.1. Automatic Learning Rate Control
- 1.4.2. Learning Cycles
- 1.4.3. Smoothing Terms

1.5. Overfitting
- 1.5.1. Cross Validation
- 1.5.2. Regularization
- 1.5.3. Evaluation Metrics

1.6. Practical Guidelines
- 1.6.1. Model Design
- 1.6.2. Selection of Metrics and Evaluation Parameters
- 1.6.3. Hypothesis Testing

1.7. *Transfer Learning*
- 1.7.1. Learning Transfer Training
- 1.7.2. Feature Extraction
- 1.7.3. Deep Learning

1.8. *Data Augmentation*
- 1.8.1. Image Transformations
- 1.8.2. Synthetic Data Generation
- 1.8.3. Text Transformation

1.9. Practical Application of Transfer Learning
- 1.9.1. Learning Transfer Training
- 1.9.2. Feature Extraction
- 1.9.3. Deep Learning

1.10. Regularization
- 1.10.1. L1 and L2
- 1.10.2. Regularization by Maximum Entropy
- 1.10.3. *Dropout*

Module 2. Model Customization and training with TensorFlow

2.1. TensorFlow
- 2.1.1. Using the TensorFlow Library
- 2.1.2. Model Education with TensorFlow
- 2.1.3. Operations with Graphs in TensorFlow

2.2. TensorFlow and NumPy
- 2.2.1. NumPy Computational Environment for TensorFlow
- 2.2.2. Using NumPy Arrays with TensorFlow
- 2.2.3. NumPy Operations for TensorFlow Graphs

2.3. Model Customization and Training Algorithms
- 2.3.1. Building Custom Models with TensorFlow
- 2.3.2. Management of Training Parameters
- 2.3.3. Use of Optimization Techniques for Training

2.4. TensorFlow Functions and Graphs
- 2.4.1. Functions with TensorFlow
- 2.4.2. Use of Graphs for Model Training
- 2.4.3. Optimization of Graphs with TensorFlow Operations

2.5. Data Loading and Preprocessing with TensorFlow
- 2.5.1. Loading of Datasets with TensorFlow
- 2.5.2. Data Preprocessing with TensorFlow
- 2.5.3. Using TensorFlow Tools for Data Manipulation

2.6. The tf.data API
- 2.6.1. Using the tf.data API for Data Processing
- 2.6.2. Constructing Data Streams with tf.data
- 2.6.3. Use of the tf.data API for training models

2.7. The TFRecord Format
- 2.7.1. Using the TFRecord API for Data Serialization
- 2.7.2. Loading TFRecord Files with TensorFlow
- 2.7.3. Using TFRecord Files for Training Models

2.8. Keras Preprocessing Layers
- 2.8.1. Using the Keras Preprocessing API
- 2.8.2. Construction of preprocessing pipelined with Keras
- 2.8.3. Using the Keras Preprocessing API for Model Training

2.9. The TensorFlow *Datasets* Project
- 2.9.1. Using TensorFlow *Datasets* for Data Loading
- 2.9.2. Data Preprocessing with TensorFlow *Datasets*
- 2.9.3. Using TensorFlow *Datasets* for Model Training

2.10. Construction of a *Deep Learning* Application with TensorFlow. Practical Application
- 2.10.1. Building a Deep *Learning* App with TensorFlow
- 2.10.2. Training a Model with TensorFlow
- 2.10.3. Use of the Application for the Prediction of Results

Module 3. Deep Computer Vision with Convolutional Neural Networks

3.1. The Visual Cortex Architecture
- 3.1.1. Functions of the Visual Cortex
- 3.1.2. Theories of Computational Vision
- 3.1.3. Models of Image Processing

3.2. Convolutional Layers
- 3.2.1. Reuse of Weights in Convolution
- 3.2.2. 2D Convolution
- 3.2.3. Activation Functions

3.3. Grouping Layers and Implementation of Grouping Layers with Keras
- 3.3.1. *Pooling* and *Striding*
- 3.3.2. *Flattening*
- 3.3.3. Types of Pooling

3.4. CNN Architecture
- 3.4.1. VGG Architecture
- 3.4.2. AlexNet Architecture
- 3.4.3. ResNet Architecture

3.5. Implementation of a ResNet-34 CNN using Keras
- 3.5.1. Weight Initialization
- 3.5.2. Input Layer Definition
- 3.5.3. Output Definition

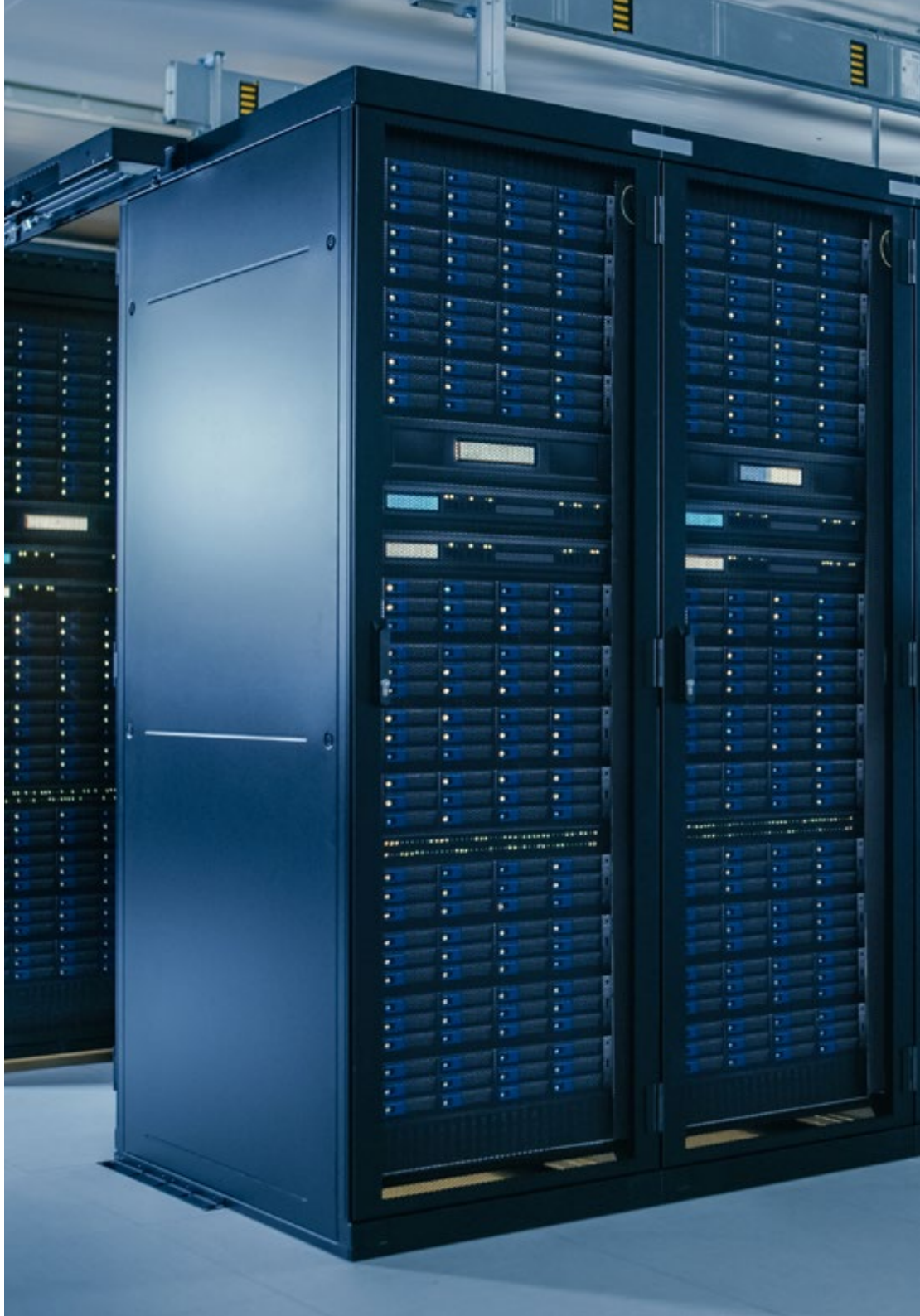
3.6. Use of Pre-trained Keras Models
- 3.6.1. Characteristics of Pre-trained Models
- 3.6.2. Uses of Pre-trained Models
- 3.6.3. Advantages of Pre-trained Models

3.7. Pre-trained Models for Transfer Learning
- 3.7.1. Transfer Learning
- 3.7.2. Transfer Learning Process
- 3.7.3. Advantages of Transfer Learning

3.8. Deep Computer Vision Classification and Localization
- 3.8.1. Image Classification
- 3.8.2. Localization of Objects in Images
- 3.8.3. Object Detection

3.9. Object Detection and Object Tracking
- 3.9.1. Object Detection Methods
- 3.9.2. Object Tracking Algorithms
- 3.9.3. Tracking and Localization Techniques

3.10. Semantic Segmentation
- 3.10.1. Deep Learning for Semantic Segmentation
- 3.10.2. Edge Detection
- 3.10.3. Rule-based Segmentation Methods



This training will give your career a boost and make you a true Deep Learning expert"

05

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

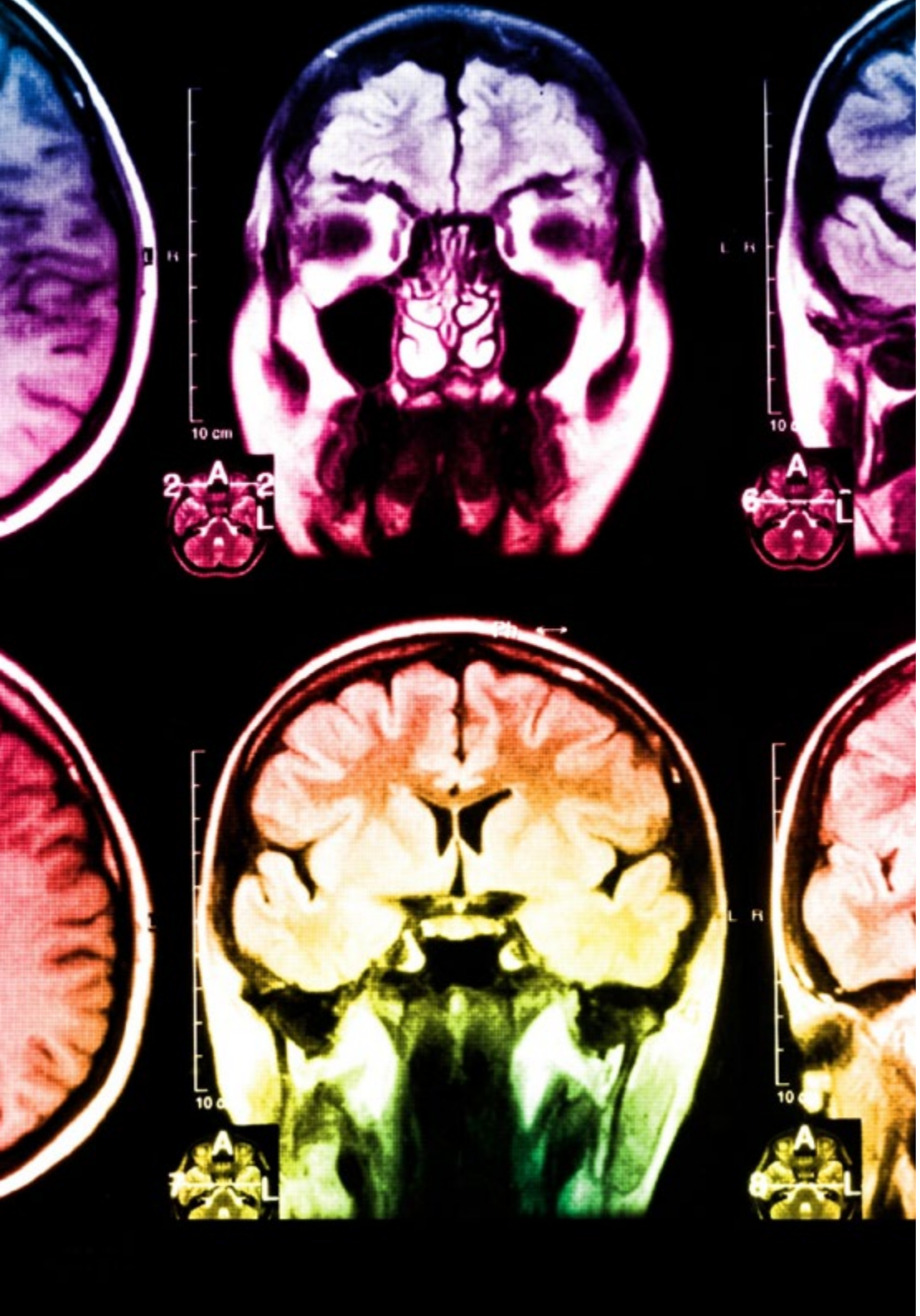
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

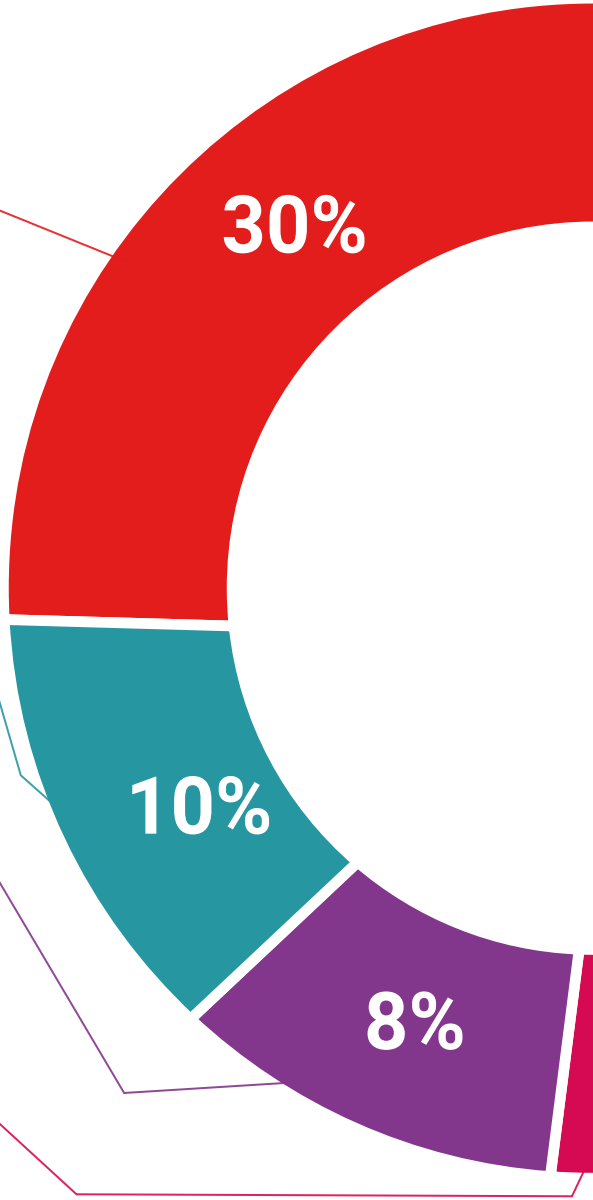
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

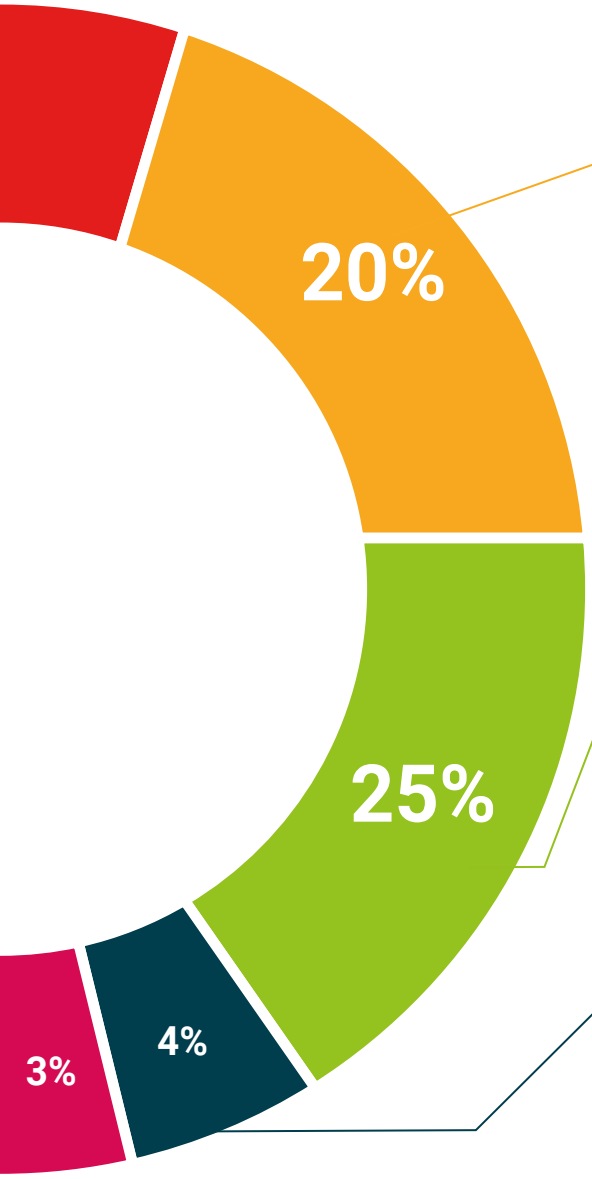
Practising Skills and Abilities

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.

06

Certificate

The Postgraduate Diploma in Neural Networks and in Deep Learning Training guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate 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 **Postgraduate Diploma in Neural Networks and Deep Learning Training** 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.

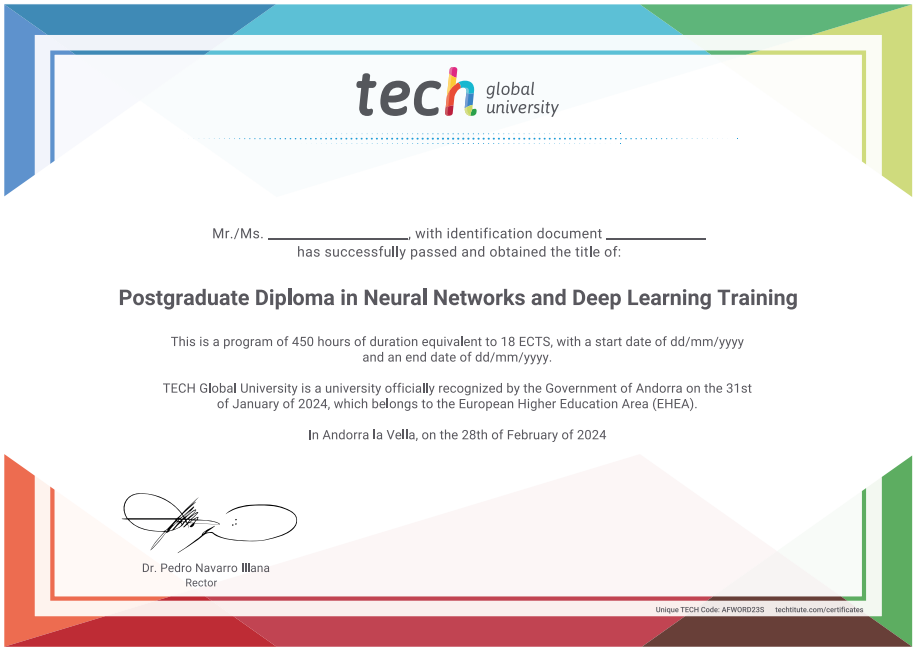
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Diploma in Neural Networks and Deep Learning Training**

Modality: **online**

Duration: **6 months**

Accreditation: **18 ECTS**


tech global university

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

Postgraduate Diploma in Neural Networks and Deep Learning Training

This is a program of 450 hours of duration equivalent to 18 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
Rector

Unique TECH Code: AFWORD23S techtitute.com/certificates

*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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