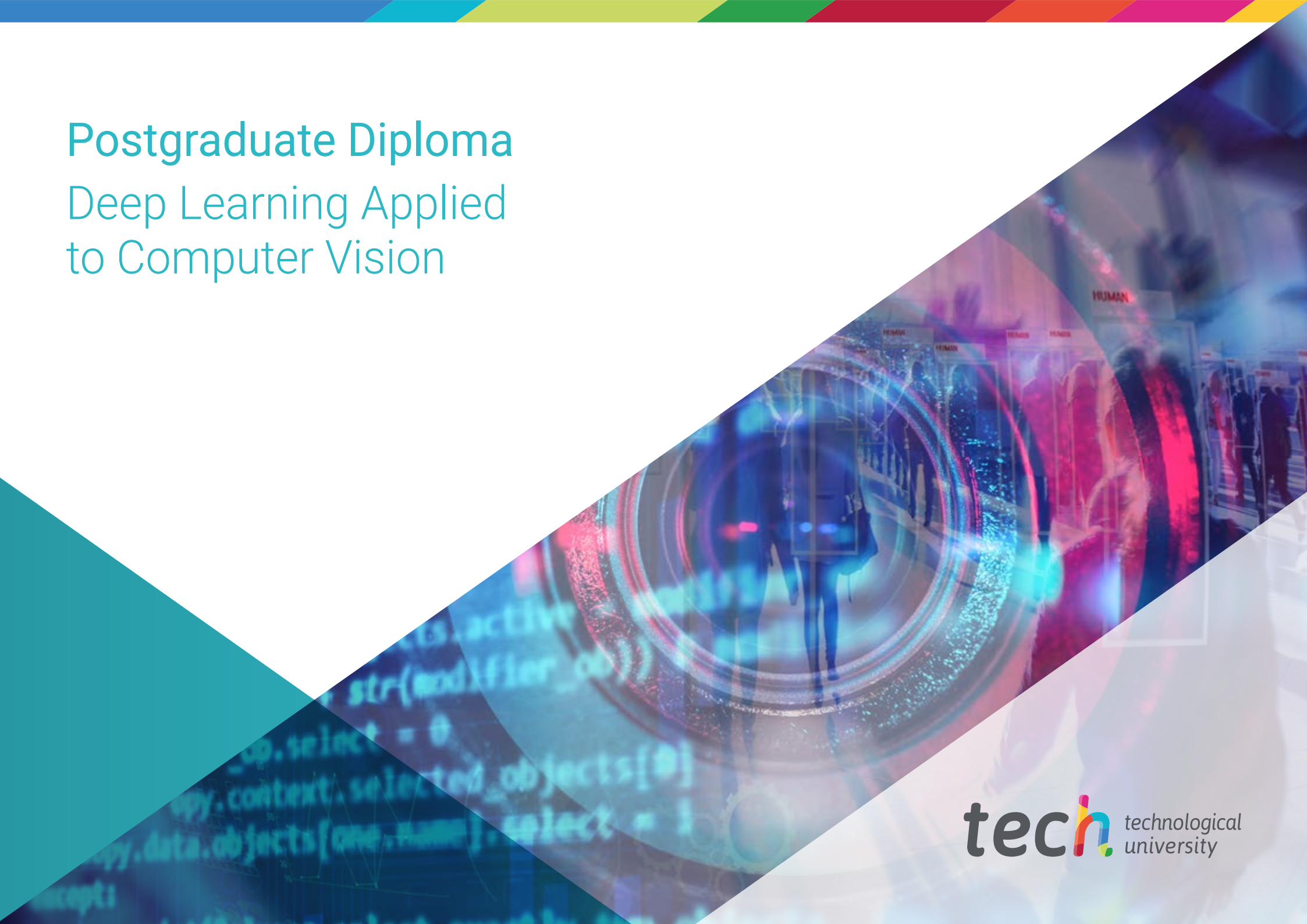
Postgraduate Diploma

Deep Learning Applied to Computer Vision



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Postgraduate Diploma
Deep Learning Applied to Computer Vision

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/pk/information-technology/postgraduate-diploma/postgraduate-diploma-deep-learning-applied-computer-vision

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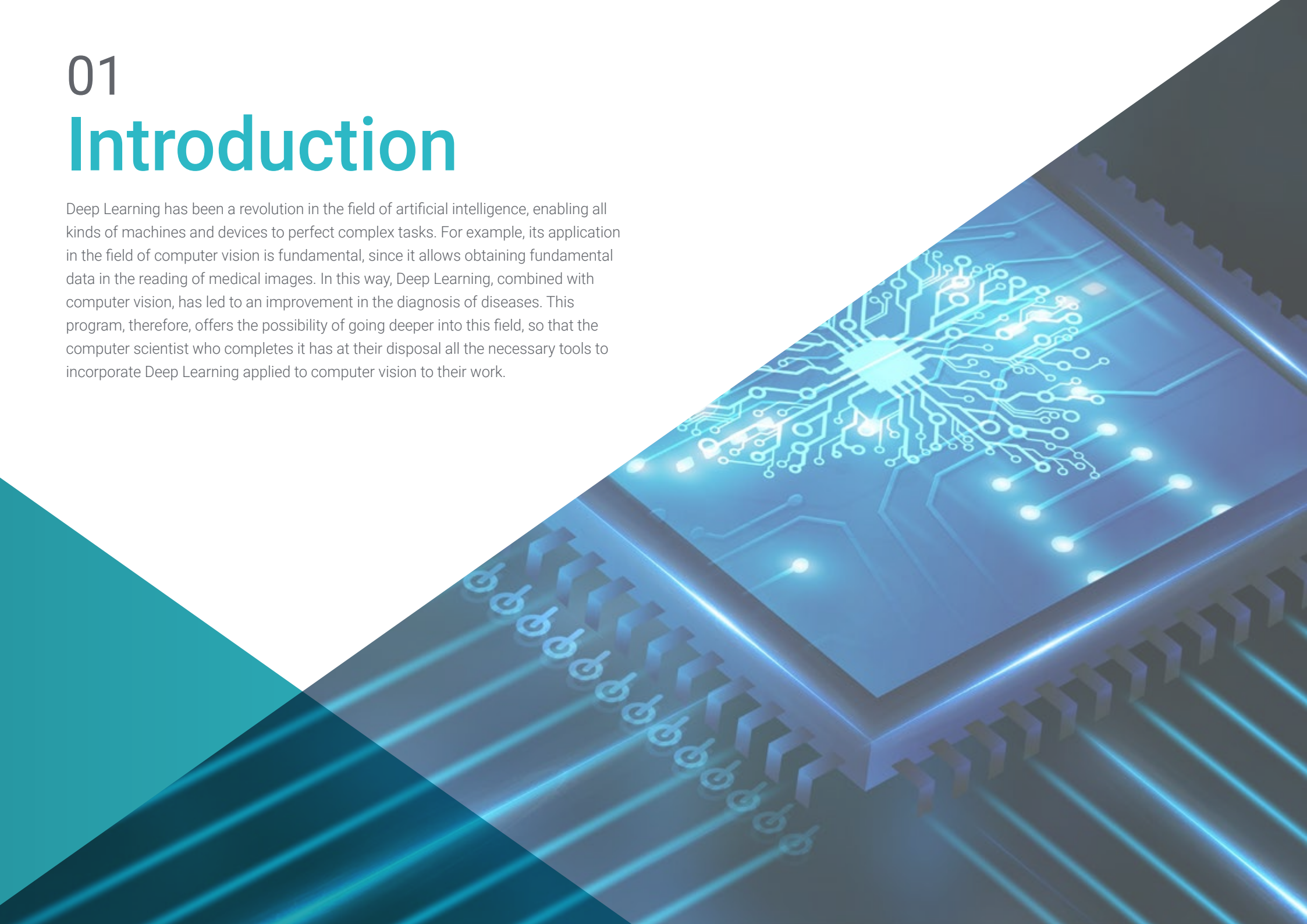
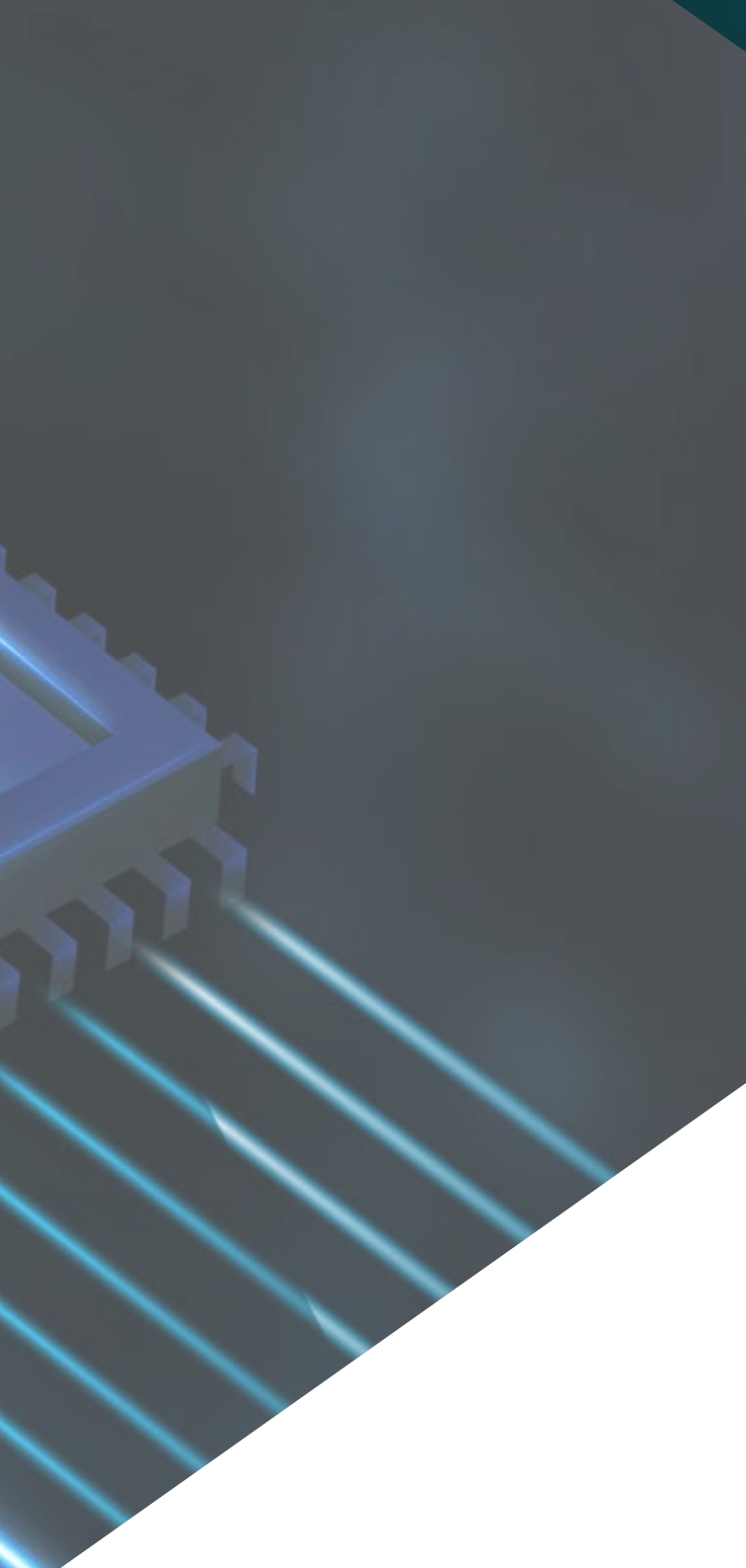
01

Introduction

Deep Learning has been a revolution in the field of artificial intelligence, enabling all kinds of machines and devices to perfect complex tasks. For example, its application in the field of computer vision is fundamental, since it allows obtaining fundamental data in the reading of medical images. In this way, Deep Learning, combined with computer vision, has led to an improvement in the diagnosis of diseases. This program, therefore, offers the possibility of going deeper into this field, so that the computer scientist who completes it has at their disposal all the necessary tools to incorporate Deep Learning applied to computer vision to their work.





Combine Deep Learning with Computer Vision thanks to this Postgraduate Diploma, which offers you all the latest developments in this booming technology"

Artificial intelligence has revolutionized the technological landscape. Its principles are applied in many areas and are of great importance in fields such as healthcare, which takes advantage of this technology to improve diagnostic processes and treatments. Deep Learning is an essential area in this whole process, since it is what determines how the machine learning work will be carried out.

Therefore, by combining the potential of Deep Learning with another discipline such as computer vision, spectacular results can be obtained in all types of sectors. By combining these two specialties, a complete and in-depth visual data collection and reading is produced, perfecting the performance of complex technological tasks. This Postgraduate Diploma, therefore, offers the computer scientists the possibility of accessing the latest innovations in this area, so that they can incorporate new knowledge about neural networks and their activation functions, convolutional neural networks and object detection, among others, into their work.

All of this is based on a 100% online teaching methodology that allows professionals to choose how, when and where to study, since it adapts to their personal circumstances. In addition, the computer scientist who completes this program will have access to the best multimedia content in the form of case studies, videos, master classes and multimedia summaries, among many other resources. In addition, the most experienced faculty will guide the entire process, ensuring that the professional receives the most up-to-date and practical knowledge.

This **Postgraduate Diploma in Deep Learning Applied to Computer Vision** contains the most complete and up-to-date educational program on the market. The most important features include:

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

Develop powerful computer vision tools from Deep Learning with this innovative and specialized educational program"

You know that artificial intelligence is the present and the future. Do not miss this opportunity to learn about the latest advances in Deep Learning applied to computer vision"

This is the program you were looking for. Enroll now and progress professionally in the technology sector.

The program's teaching staff includes professionals from the sector 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 student will be assisted by an innovative interactive video system created by renowned and experienced experts.

The best IT and technology companies are focusing all their efforts in these areas. Don't get left behind.

02

Objectives

The main objective of this Postgraduate Diploma in Deep Learning Applied to Computer Vision is to provide the computer scientists with the latest tools in this field, so that they can face their professional practice with the best knowledge. Thus, at the end of this program, you will be in a position to develop all types of computer vision projects based on Deep Learning, which will place you as a reference in artificial intelligence in your environment.

Your career goals are now within reach thanks to this high level qualification"

General Objectives

- Generate specialized knowledge about Deep Learning and analyze, why now?
- Introduce neural networks and examine how they work
- Analyze metrics for proper learning
- Understanding the mathematics behind neural networks
- Develop convolutional neural networks.
- Analyze existing metrics and tools
- Examine the pipeline of an image classification network
- Propose inference methods
- Generate specialized knowledge about object detection neural networks and their metrics
- Identify the different architectures
- Establish use cases
- Examine tracking algorithms and their metrics

Specific Objectives

Module 1. Deep Learning

- Analyze the families that make up the artificial intelligence world.
- Compile the main Frameworks of Deep Learning
- Define neural networks
- Present the learning methods of neural networks
- Fundamentals of cost functions
- Establish the most important activation functions
- Examine regularization and normalization techniques
- Develop optimization methods
- Introduce initialization methods

Module 2. Convolutional Neural Networks and Image Classification

- Generate specialized knowledge on convolutional neural networks
- Establish evaluation metrics
- Analyze the performance of CNNs for image classification
- Evaluate Data Augmentation
- Propose techniques to avoid Overfitting
- Examine different architectures
- Compile inference methods

Module 3. Object Detection

- Analyze how object detection networks work
- Examine traditional methods
- Determine evaluation metrics
- Identify the main datasets used in the marketplace
- Propose architectures of the Two Stage Object Detector type
- Analyze Fine Tuning Methods
- Examine different Single Shoot architectures
- Establish object tracking algorithms
- Apply detection and tracking of people

Access the best career opportunities in the Deep Learning field thanks to this program"

03

Course Management

The most experienced and expert faculty in computer vision and Deep Learning provide the computer scientist with all the keys to these disciplines, ensuring that learning is effective and useful. Thus, the usefulness of this teaching is its strong point, since the teaching staff focuses its efforts so that professionals can immediately apply everything they have learned in their daily work practice.

Learn all the secrets of computer vision and Deep Learning from the best teachers"

Management

Mr. Redondo Cabanillas, Sergio

- Head of Bcnvision's R&D Department
- Project and development manager at Bcnvision
- Machine vision applications engineer at Bcnvision
- Technical Engineering in Telecommunications. Specialization in Image and Sound at the Polytechnic University of Catalonia
- Graduate in Telecommunications. Specialization in Image and Sound by the Polytechnic University of Catalonia
- Lecturer in Cognex vision training for Bcnvision customers
- Teacher in internal courses at Bcnvision to the technical department on vision and advanced development in c#

Professors

Dr. Riera i Marín, Meritxell

- Deep Learning developer. Sycai Medical. Barcelona
- Researcher. National Center for Scientific Research (CNRS). Marseille, France
- Software engineer. Zhilabs. Barcelona
- IT Technician, Mobile World Congress
- Software engineer. Avanade. Barcelona
- Telecommunications Engineering at UPC. Barcelona
- PhD. University of Pompeu Fabra (UPF) - Barcelona. Industrial PhD in collaboration with Sycai Medical
- Master of Science: Spécialité Signal, image, systèmes embarqués, automatique (SISEA) at IMT Atlantique. Pays de la Loire - Brest, France
- Master in Telecommunications Engineering at UPC. Barcelona

Mr. Higón Martínez, Felipe

- More than 20 years of experience in different branches of electronics, telecommunications and IT
- Validation and prototyping engineer
- Applications Engineer
- Support Engineer
- Degree in Electronic Engineering from the University of Valencia
- Master's Degree in Advanced and Applied Artificial Intelligence. IA3
- Technical Engineer in Telecommunications

Mr. Delgado Gonzalo, Guillem

- Computer Vision and Artificial Intelligence Researcher at Vicomtech
- Computer Vision and Artificial Intelligence Engineer at Gestoos
- Graduate in Audiovisual Systems Engineering at Polytechnic University of Catalunya
- MSc in Computer Vision at Universitat Autónoma de Barcelona

Mr. Solé Gómez, Àlex

- Researcher at Vicomtech in the Intelligent Security Video Analytics department
- MSc in Telecommunications Engineering, mention in Audiovisual Systems by the Polytechnic University of Catalonia
- BSc in Telecommunications Technologies and Services Engineering, mention in Audiovisual Systems by the Polytechnic University of Catalonia

04

Structure and Content

The contents of this Postgraduate Diploma in Deep Learning Applied to Computer Vision have been carefully designed by leading specialists in artificial intelligence. For that reason, this knowledge is the newest and in-depth, and the computer scientist will have the opportunity to delve into the latest innovations in issues such as neural network evaluation metrics, types of CNN layers, learning with regularization or datasets, among many others.

These contents will make you a great specialist in Deep Learning and computer vision"

Module 1. Deep Learning

1.1. Artificial Intelligence
- 1.1.1. Machine Learning
- 1.1.2. Deep Learning
- 1.1.3. The Explosion of Deep Learning Why Now?

1.2. Neural Networks
- 1.2.1. The Neural Network
- 1.2.2. Uses of Neural Networks
- 1.2.3. Linear Regression and Perceptron
- 1.2.4. Forward Propagation
- 1.2.5. Backpropagation
- 1.2.6. Feature Vectors

1.3. Loss Functions
- 1.3.1. Loss Functions
- 1.3.2. Types of Loss Functions
- 1.3.3. Choice of Loss Functions

1.4. Activation Functions
- 1.4.1. Activation Function
- 1.4.2. Linear Functions
- 1.4.3. Non-Linear Functions
- 1.4.4. Output vs. Hidden Layer Activation Functions

1.5. Regularization and Normalization
- 1.5.1. Regularization and Normalization
- 1.5.2. Overfitting and Data Augmentation
- 1.5.3. Regularization Methods: L1, L2 and Dropout
- 1.5.4. Normalization Methods: Batch, Weight, Layer

1.6. Optimization
- 1.6.1. Gradient Descent
- 1.6.2. Stochastic Gradient Descent
- 1.6.3. Mini Batch Gradient Descent
- 1.6.4. Momentum
- 1.6.5. Adam

1.7. Hyperparameter Tuning and Weights
- 1.7.1. Hyperparameters
- 1.7.2. Batch Size vs. Learning Rate vs. Step Decay
- 1.7.3. Weights

1.8. Evaluation Metrics of a Neural Network
- 1.8.1. Accuracy
- 1.8.2. Dice Coefficient
- 1.8.3. Sensitivity Vs. Specificity/Recall Vs. Precision
- 1.8.4. ROC Curve (AUC)
- 1.8.5. F1-Score
- 1.8.6. Matrix Confusion
- 1.8.7. Cross-Validation

1.9. Frameworks and Hardware
- 1.9.1. Tensor Flow
- 1.9.2. Pytorch
- 1.9.3. Caffe
- 1.9.4. Keras
- 1.9.5. Hardware for the Learning Phase

1.10. Creation of a Neural Network-Training and Validation.
- 1.10.1. Dataset
- 1.10.2. Network Construction
- 1.10.3. Training
- 1.10.4. Visualization of Results

Module 2. Convolutional Neural Networks and Image Classification

2.1. Convolutional Neural Networks
- 2.1.1. Introduction
- 2.1.2. Convolution
- 2.1.3. CNN Building Blocks

2.2. Types of CNN Layers
- 2.2.1. Convolutional
- 2.2.2. Activation
- 2.2.3. Batch Normalization
- 2.2.4. Polling
- 2.2.5. Fully Connected

2.3. Metrics
- 2.3.1. Matrix Confusion
- 2.3.2. Accuracy
- 2.3.3. Precision
- 2.3.4. Recall
- 2.3.5. F1 Score
- 2.3.6. ROC Curve
- 2.3.7. AUC

2.4. Architecture
- 2.4.1. AlexNet
- 2.4.2. VGG
- 2.4.3. Resnet
- 2.4.4. GoogleLeNet

2.5. Image Classification
- 2.5.1. Introduction
- 2.5.2. Analysis of Data
- 2.5.3. Data Preparation
- 2.5.4. Model Training
- 2.5.5. Model Validation

2.6. Practical Considerations for CNN Training
- 2.6.1. Optimizer Selection
- 2.6.2. Learning Rate Scheduler
- 2.6.3. Check Training from Pipeline
- 2.6.4. Training with Regularization

2.7. Best Practices in Deep Learning
- 2.7.1. Transfer Learning
- 2.7.2. Fine Tuning
- 2.7.3. Data Augmentation

2.8. Statistical Data Evaluation
- 2.8.1. Number of Datasets
- 2.8.2. Number of Labels
- 2.8.3. Number of Images
- 2.8.4. Data Balancing

2.9. Deployment
- 2.9.1. Model Saving
- 2.9.2. Onnx
- 2.9.3. Inference

2.10. Case Study: Image Classification
- 2.10.1. Data Analysis and Preparation
- 2.10.2. Testing the Training Pipeline
- 2.10.3. Model Training
- 2.10.4. Model Validation

Module 3. Object Detection

3.1. Object Detection and Tracking
- 3.1.1. Object Detection
- 3.1.2. Use Cases
- 3.1.3. Object Tracking
- 3.1.4. Case Uses
- 3.1.5. Occlusions, Rigid and Non-Rigid Poses

3.2. Evaluation Metrics
- 3.2.1. IOU - Intersection Over Union
- 3.2.2. Confidence Score
- 3.2.3. Recall
- 3.2.4. Precision
- 3.2.5. Recall–Precision Curve
- 3.2.6. Mean Average Precision (mAP)

3.3. Traditional Methods
- 3.3.1. Sliding Window
- 3.3.2. Viola Detector
- 3.3.3. HOG
- 3.3.4. Non-Maximal Suppression (NMS)

3.4. Datasets
- 3.4.1. Pascal VC
- 3.4.2. MS Coco
- 3.4.3. ImageNet (2014)
- 3.4.4. MOTA Challenge

3.5. Two Shot Object Detector
- 3.5.1. R-CNN
- 3.5.2. Fast R-CNN
- 3.5.3. Faster R-CNN
- 3.5.4. Mask R-CNN

3.6. Single Shot Object Detector
- 3.6.1. SSD
- 3.6.2. YOLO
- 3.6.3. RetinaNet
- 3.6.4. CenterNet
- 3.6.5. EfficientDet

3.7. Backbones
- 3.7.1. VGG
- 3.7.2. ResNet
- 3.7.3. Mobilenet
- 3.7.4. Shufflenet
- 3.7.5. Darknet

3.8. Object Tracking
- 3.8.1. Classical Approaches
- 3.8.2. Particulate Filters
- 3.8.3. Kalman
- 3.8.4. Sort Tracker
- 3.8.5. Deep Sort

3.9. Deployment
- 3.9.1. Computing Platform
- 3.9.2. Choice of Backbone
- 3.9.3. Choice of Framework
- 3.9.4. Model Optimization
- 3.9.5. Model Versioning

3.10. Study: Detection and Monitoring People
- 3.10.1. Detection of People
- 3.10.2. Monitoring of People
- 3.10.3. Re-Identification
- 3.10.4. Counting People in Crowds

Don't wait any longer and access to the most specialized contents in these powerful branches of artificial intelligence"

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

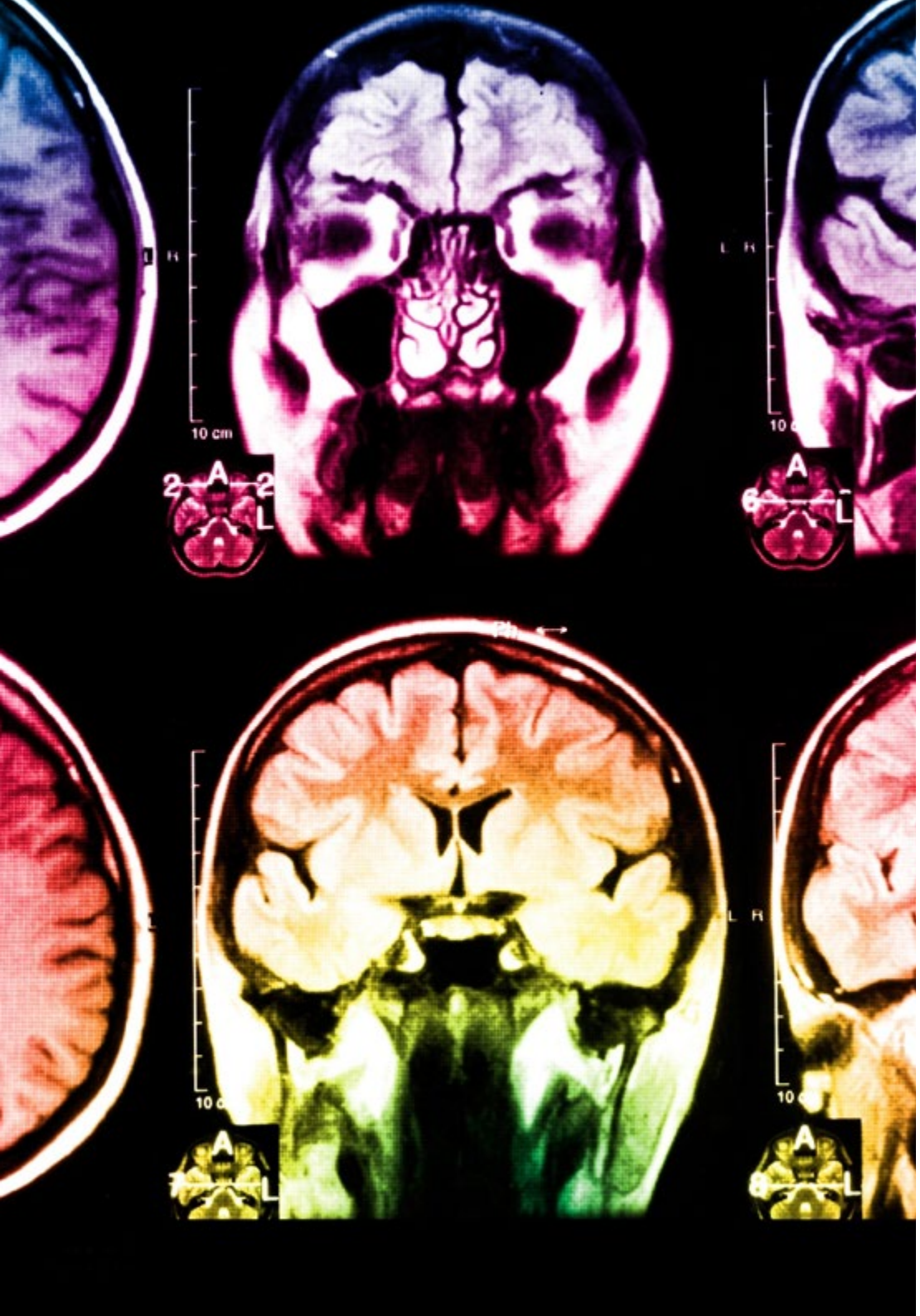
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

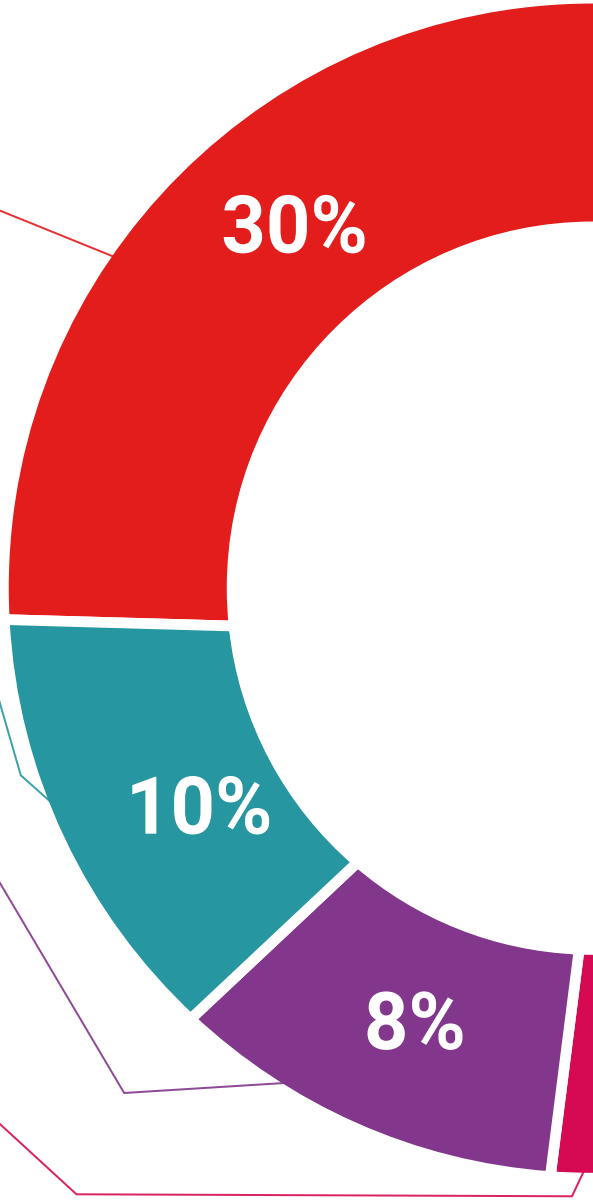
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

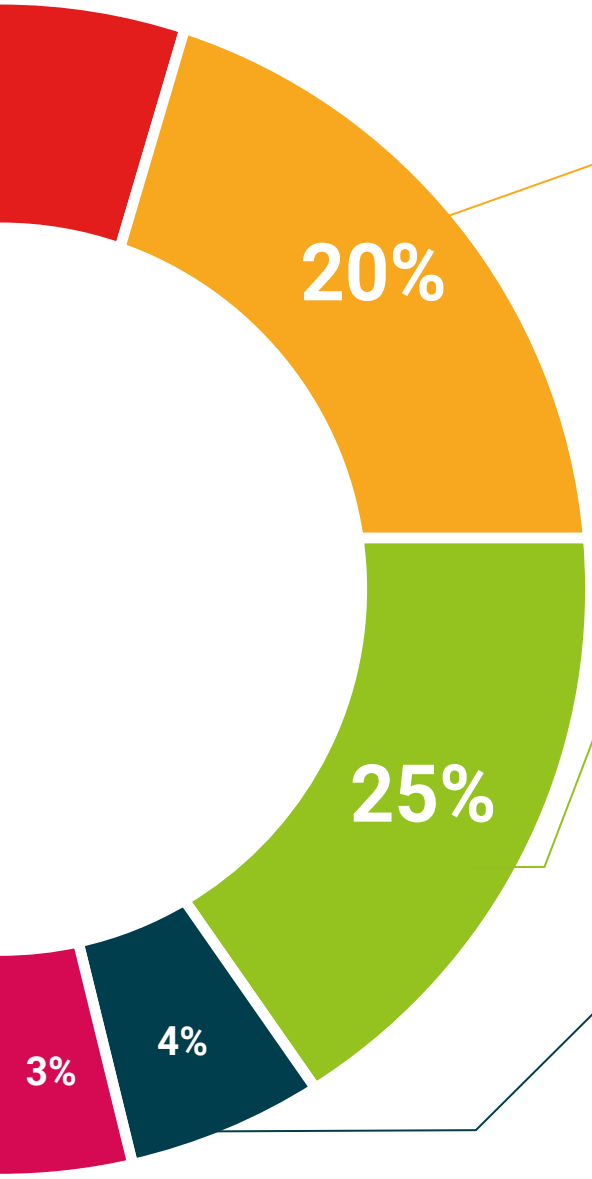
Practising Skills and Abilities

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 Deep Learning Applied to Computer Vision guarantees students, in addition to the most rigorous and up to date education, access to a Postgraduate Diploma issued by TECH Technological University.

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

This **Postgraduate Diploma in Deep Learning Applied to Computer Vision** contains the most complete and up to date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Diploma** issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the **Postgraduate Diploma**, and meets the requirements commonly required by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Postgraduate Diploma in Deep Learning Applied to Computer Vision**

Official Nº of hours: **450 h.**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Deep Learning Applied to Computer Vision

This is a qualification awarded by this University, equivalent to 450 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

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

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

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Postgraduate Diploma
Deep Learning Applied to Computer Vision

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Postgraduate Diploma

Deep Learning Applied to Computer Vision

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