

# Postgraduate Diploma Advanced Web-Based Computer Vision Techniques



## Postgraduate Diploma Advanced Web-Based Computer Vision Techniques

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

Website: [www.techtute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-advanced-web-based-computer-vision-techniques](http://www.techtute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-advanced-web-based-computer-vision-techniques)

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# 01

# Introduction

Computer vision is one of the most important branches of machine vision, since it is responsible for processing the optical information received. This program provides advanced techniques in this discipline to offer the computer scientist the latest advances in this sub-specialty of artificial intelligence. Therefore, this program will delve into issues such as geometry and feature extraction, triangulation, segmentation methods or semantic segmentation applied to *deep learning*, among many others. And all this, following an innovative teaching methodology 100% online that will allow the professional to combine their work with their studies.







*Learn about the most advanced computer vision techniques thanks to this Postgraduate Diploma, which prepares you to successfully face all future challenges in the field of machine vision"*

Computer vision is a complex and expanding field that is constantly adding new applications and utilities. Therefore, in order to get the most out of computer vision tools, it is important to master the most advanced and innovative techniques in this area. Accordingly, this Postgraduate Diploma in Advanced Web-Based Computer Vision Techniques responds to this challenge, providing the professional with the most recent procedural and technological advances in this field.

In this program, therefore, computer scientists will be able to study aspects such as 2D image depth maps, depth measurement, 3D object recognition, semantic segmentation in medicine or point cloud segmentation, among many others, in depth. In this way, the engineer will have been able to access numerous new and high-level contents in this area.

And this will be achieved thanks to a specialized and very experienced teaching staff that knows all the keys to the discipline, in addition to the large number of multimedia resources available in this program, such as interactive summaries, practical exercises, master classes or videos of techniques and procedures.

This **Postgraduate Diploma in Advanced Techniques Web-Based Computer Vision** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of case studies presented by experts in 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 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



*Learn about new computer vision procedures and incorporate them into your work immediately with this educational program"*

“*Develop great computer vision projects thanks to everything you will learn in this Postgraduate Diploma*”

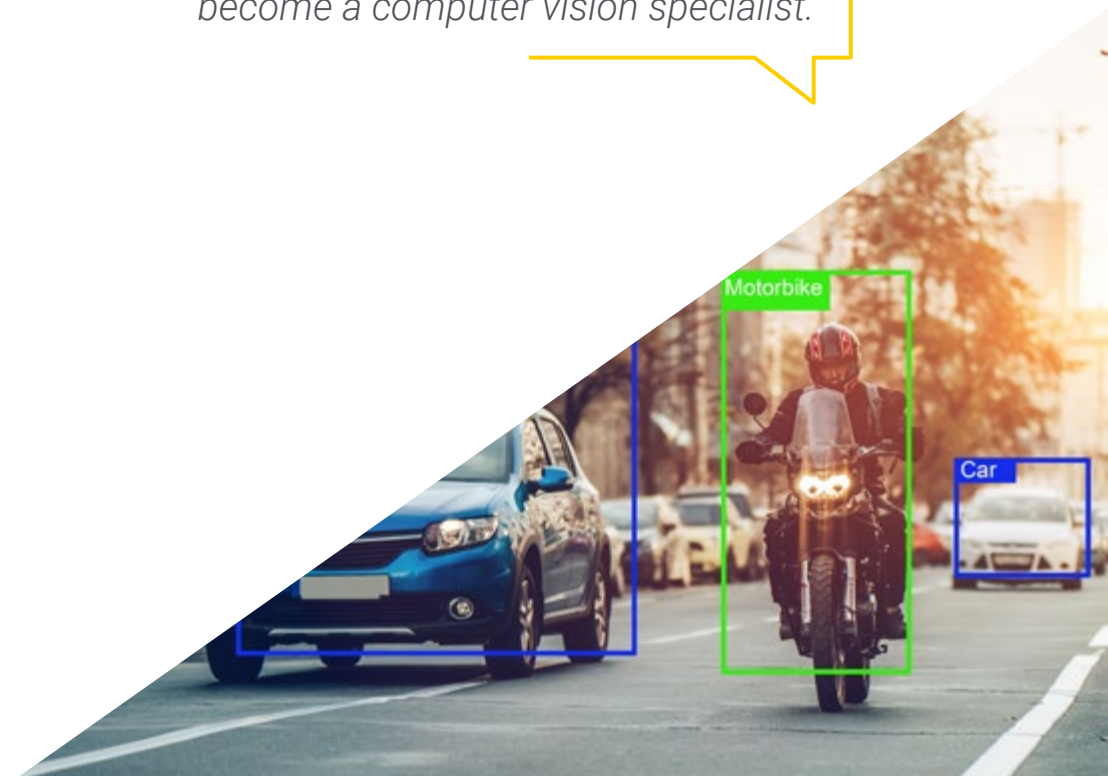
The program's teaching staff includes professionals from sector who contribute their work experience to this program, as well as renowned specialists from leading societies and prestigious universities.

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 student will be assisted by an innovative interactive video system created by renowned and experienced experts.

*Your mastery of computer vision will give you access to numerous career opportunities in the best technology companies in the world.*

*You are looking for a program that will set you apart professionally and this is the perfect one for you, as it will allow you to become a computer vision specialist.*



# 02 Objectives

The objective of this Postgraduate Diploma in Advanced Web-Based Computer Vision Techniques is to provide computer scientists and engineers with the most innovative procedures in computer vision. This way, the professional will have the best tools to successfully perform their work, achieving a great job progress in the technology industry, either in the company itself or in one of the large companies in the sector.







“

*Don't wait any longer. This is the future of technology and artificial intelligence"*



## General Objectives

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- ◆ Analyze semantic segmentation neural networks and their metrics
- ◆ Identify the most common architectures
- ◆ Establish Use Cases
- ◆ Apply correct cost function for learning
- ◆ Analyze public data sources (Datasets)
- ◆ Examine different labeling tools
- ◆ Develop the main phases of a segmentation-based project
- ◆ Determine how a 3D image is formed and its characteristics
- ◆ Introducing the open 3D library
- ◆ Analyze the advantages and difficulties of working in 3D instead of 2D
- ◆ Establish methods for the processing of 3D images



*Become a leading web  
computer vision specialist  
thanks to this program"*





## Specific Objectives

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### Module 1. 3D Image Processing

- ◆ Examine a 3D image
- ◆ Analyze the software used for 3D data processing
- ◆ Developing open3D
- ◆ Determine the relevant data in a 3D image
- ◆ Demonstrate visualization tools
- ◆ Establish denoising filters
- ◆ Propose geometric calculation tools
- ◆ Analyze object detection methodologies
- ◆ Evaluate triangulation and scene reconstruction methods

### Module 2. Image Segmentation with *Deep Learning*

- ◆ Analyze how semantic segmentation networks work
- ◆ Evaluate traditional methods
- ◆ Examine evaluation metrics and different architectures
- ◆ Examine video domains and cloud points
- ◆ Apply theoretical concepts through various examples

### Module 3. Advanced Image Segmentation and Advanced Computer Vision Techniques

- ◆ Generate specialized knowledge on the handling of tools
- ◆ Examine semantic segmentation in medicine
- ◆ Identify the structure of a segmentation project
- ◆ Analyze Autoencoders
- ◆ Develop Generative Adversarial Networks



03

# Course Management

This program is taught by a high-level teaching staff, formed by experienced professionals in the field of computer vision and therefore know the most advanced and innovative techniques in this area. Among all the strengths of this Postgraduate Diploma, its faculty is one of the most important. Therefore, the computer scientist who completes this program will have at his disposal all the procedures and tools to perform in this field with all the guarantees.





“

*You have at your disposal the best teachers in computer vision. Enroll now and access the future of technology”*

## Management



### Mr. Redondo Cabanillas, Sergio

- ◆ Head of Bcvision's R&D Department
- ◆ Project and development manager at Bcvision
- ◆ Machine vision applications engineer at Bcvision
- ◆ 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 Bcvision customers
- ◆ Teacher in internal courses at Bcvision to the technical department on vision and advanced development in c#

## Professors

### Mr. González González, Diego Pedro

- ◆ Software Architect for Artificial Intelligence based systems
- ◆ Deep Learning and Machine Learning Application Developer
- ◆ Software architect for embedded systems for railway safety applications
- ◆ Industrial Engineer by Miguel Hernández University
- ◆ Linux driver developer
- ◆ Systems engineer for railway track equipment
- ◆ Embedded Systems Engineer
- ◆ *Deep Learning* Engineer
- ◆ Official Master's Degree in Artificial Intelligence from the International University of La Rioja (Spain)

### Ms. García Moll, Clara

- ◆ Computer Vision Engineer. Satellogic
- ◆ Full Stack Developer. Catfons
- ◆ Audiovisual Systems Engineering. Pompeu Fabra University (Barcelona)
- ◆ Master's Degree in Computer Vision. Autonomous University of Barcelona

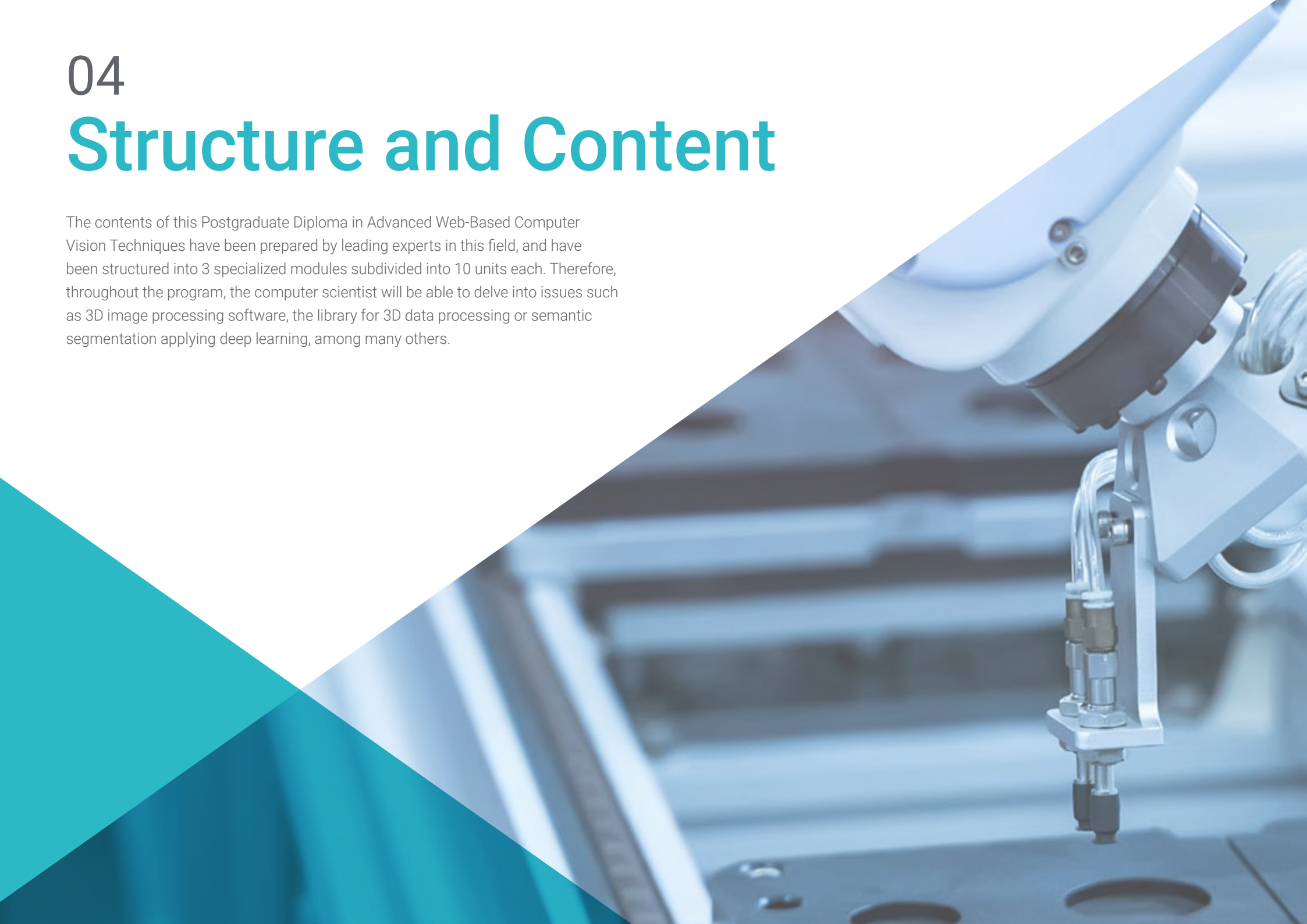




# 04

## Structure and Content

The contents of this Postgraduate Diploma in Advanced Web-Based Computer Vision Techniques have been prepared by leading experts in this field, and have been structured into 3 specialized modules subdivided into 10 units each. Therefore, throughout the program, the computer scientist will be able to delve into issues such as 3D image processing software, the library for 3D data processing or semantic segmentation applying deep learning, among many others.





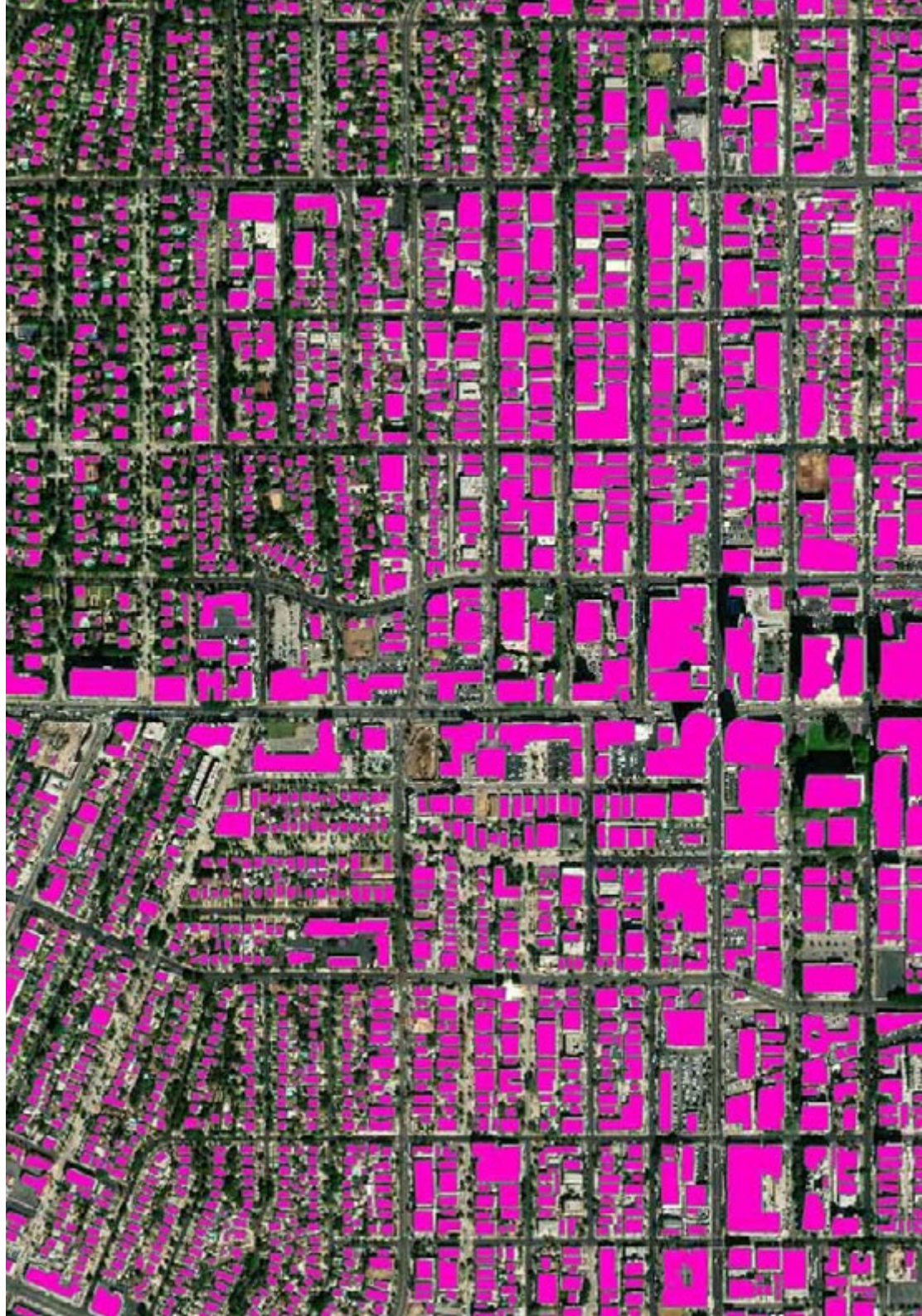
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*You won't find a more cutting-edge syllabus on advanced computer-processed vision techniques"*



## Module 1. 3D Image Processing

- 1.1. 3D Imaging
  - 1.1.1. 3D Imaging
  - 1.1.2. 3D Image Processing Software and Visualizations
  - 1.1.3. Metrology Software
- 1.2. Open 3D
  - 1.2.1. Library for 3D Data Processing
  - 1.2.2. Features
  - 1.2.3. Installation and Use
- 1.3. The Data
  - 1.3.1. Depth Maps in 2D Image
  - 1.3.2. Point Clouds
  - 1.3.3. Normal
  - 1.3.4. Surfaces
- 1.4. Visualization
  - 1.4.1. Data Visualization
  - 1.4.2. Controls
  - 1.4.3. Web Display
- 1.5. Filters
  - 1.5.1. Distance Between Points, Eliminate Outliers
  - 1.5.2. High Pass Filter
  - 1.5.3. Downsampling
- 1.6. Geometry and Feature Extraction
  - 1.6.1. Profile Extraction
  - 1.6.2. Depth Measurement
  - 1.6.3. Volume
  - 1.6.4. 3D Geometric Shapes
  - 1.6.5. Shots
  - 1.6.6. Projection of a Point
  - 1.6.7. Geometric Distances
  - 1.6.8. Kd Tree
  - 1.6.9. 3D Features



- 1.7. Registration and Meshing
  - 1.7.1. Concatenation
  - 1.7.2. ICP
  - 1.7.3. Ransac 3D
- 1.8. 3D Object Recognition
  - 1.8.1. Searching for an Object in the 3D Scene
  - 1.8.2. Segmentation.
  - 1.8.3. Bin Picking
- 1.9. Surface Analysis
  - 1.9.1. Smoothing
  - 1.9.2. Orientable Surfaces
  - 1.9.3. Octree
- 1.10. Triangulation
  - 1.10.1. From Mesh to Point Cloud
  - 1.10.2. Depth Map Triangulation
  - 1.10.3. Triangulation of Unordered Point Clouds

## Module 2. Image Segmentation with Deep Learning

- 2.1. Object Detection and Segmentation
  - 2.1.1. Semantic Segmentation
    - 2.1.1.1. Semantic Segmentation Use Cases
  - 2.1.2. Instantiated Segmentation
    - 2.1.2.1. Instantiated Segmentation Use Cases
- 2.2. Evaluation Metrics
  - 2.2.1. Similarities with Other Methods
  - 2.2.2. Pixel Accuracy
  - 2.2.3. Dice Coefficient (F1 Score)
- 2.3. Cost Functions
  - 2.3.1. Dice Loss
  - 2.3.2. Focal Loss
  - 2.3.3. Tversky Loss
  - 2.3.4. Other Functions

- 2.4. Traditional Segmentation Methods
  - 2.4.1. Threshold Application with Otsu and Riddlen
  - 2.4.2. Self-Organized Maps
  - 2.4.3. GMM-EM Algorithm
- 2.5. Semantic Segmentation Applying Deep Learning: FCN
  - 2.5.1. FCN
  - 2.5.2. Architecture
  - 2.5.3. FCN Applications
- 2.6. Semantic Segmentation Applying Deep Learning: U-NET
  - 2.6.1. U-NET
  - 2.6.2. Architecture
  - 2.6.3. U-NET Application
- 2.7. Semantic Segmentation Applying Deep Learning: Deep Lab
  - 2.7.1. Deep Lab
  - 2.7.2. Architecture
  - 2.7.3. Deep Lab Application
- 2.8. Instantiated Segmentation Applying Deep Learning: Mask RCNN
  - 2.8.1. Mask RCNN
  - 2.8.2. Architecture
  - 2.8.3. Application of a RCNN Mask
- 2.9. Video Segmentation
  - 2.9.1. STFCN
  - 2.9.2. Semantic Video CNNs
  - 2.9.3. Clockwork Convnets
  - 2.9.4. Low-Latency
- 2.10. Point Cloud Segmentation
  - 2.10.1. The Point Cloud
  - 2.10.2. PointNet
  - 2.10.3. A-CNN



### Module 3. Advanced Image Segmentation and Advanced Computer Vision Techniques

- 3.1. Database for General Segmentation Problems
  - 3.1.1. Pascal Context
  - 3.1.2. CelebAMask-HQ
  - 3.1.3. Cityscapes Dataset
  - 3.1.4. CCP Dataset
- 3.2. Semantic Segmentation in Medicine
  - 3.2.1. Semantic Segmentation in Medicine
  - 3.2.2. Datasets for Medical Problems
  - 3.2.3. Practical Applications
- 3.3. Annotation Tools
  - 3.3.1. Computer Vision Annotation Tool
  - 3.3.2. LabelMe
  - 3.3.3. Other Tools
- 3.4. Segmentation Tools Using Different Frameworks
  - 3.4.1. Keras
  - 3.4.2. Tensorflow v2
  - 3.4.3. Pytorch
  - 3.4.4. Others
- 3.5. Semantic Segmentation Project. The Data, Phase 1
  - 3.5.1. Problem Analysis
  - 3.5.2. Input Source for Data
  - 3.5.3. Data Analysis
  - 3.5.4. Data Preparation
- 3.6. Semantic Segmentation Project. Training, Phase 2
  - 3.6.1. Algorithm Selection
  - 3.6.2. Training
  - 3.6.3. Assessment
- 3.7. Semantic Segmentation Project. Results, Phase 3
  - 3.7.1. Fine Tuning
  - 3.7.2. Presentation of The Solution
  - 3.7.3. Conclusions







- 3.8. Autoencoders
  - 3.8.1. Autoencoders
  - 3.8.2. Architecture of an Autoencoder
  - 3.8.3. Noise Removal Autoencoders
  - 3.8.4. Automatic Coloring Autoencoder
- 3.9. Generative Adversarial Networks (GANs)
  - 3.9.1. Generative Adversarial Networks (GANs)
  - 3.9.2. DCGAN Architecture
  - 3.9.3. Conditional GAN Architecture
- 3.10. Enhanced Generative Adversarial Networks
  - 3.10.1. Overview of the Problem
  - 3.10.2. WGAN
  - 3.10.3. LSGAN
  - 3.10.4. ACGAN

“ *The most complete and up-to-date computer vision syllabus on the market is here. Do not miss this great opportunity”*

# 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 Advanced Web-Based Computer Vision Techniques guarantees students, in addition to the most rigorous and up-to-date education, access to a qualification 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 Advanced Web-Based Computer Vision Techniques** 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.

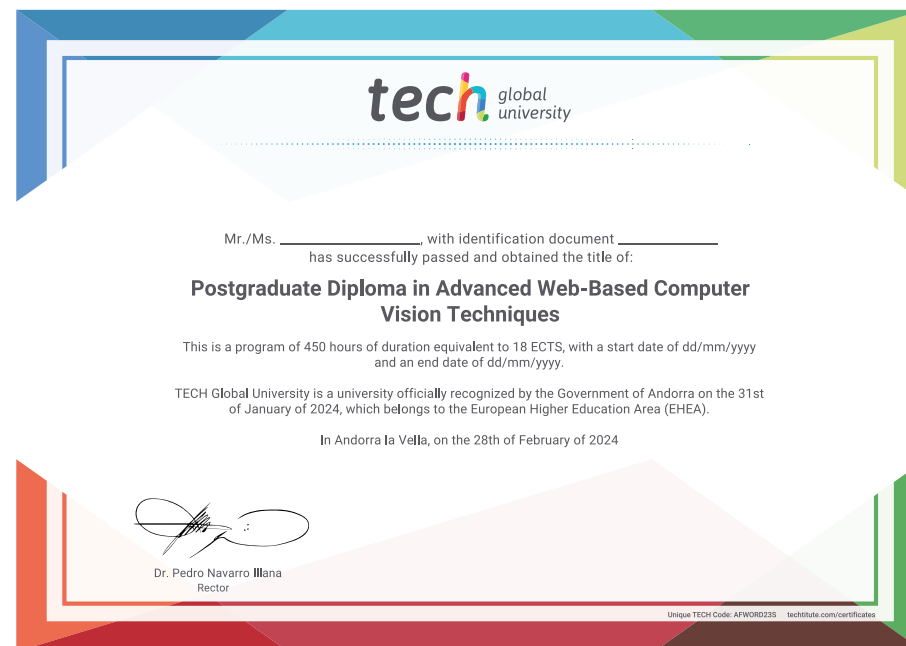
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Diploma in Advanced Web-Based Computer Vision Techniques**

Modality: **online**

Duration: **6 months**

Accreditation: **18 ECTS**



\*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.



future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present  
development language  
virtual classroom



**Postgraduate Diploma**  
Advanced Web-Based  
Computer Vision  
Techniques

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

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