Postgraduate Certificate

Advanced Digital Image Processing in Computer Vision

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Postgraduate Certificate
Advanced Digital Image Processing in Computer Vision

- Modality: **online**
- Duration: **12 weeks**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/in/information-technology/postgraduate-certificate/advanced-digital-image-processing-computer-vision

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01

Introduction

Digital image processing is the basic task used by computer vision to analyze the optical information received by a given device or machine. For this reason, it is a vitally important area in this field and requires highly specialized professionals who are up to date with the latest developments. Therefore, this program offers computer scientists the most innovative knowledge, delving into aspects such as masks and convolution, pattern search or image compression. All this, following an online learning system that will allow you to balance your professional career with your studies.

Become an expert in digital image processing applied to computer vision thanks to this Postgarduate Certificate"

Computer vision is composed of several areas and specialties that combine to make it work. One of these areas is digital image processing, which is a fundamental element, since without this processing AI would not be able to unravel the optical information captured. For this reason, performing this task properly is indispensable for the success of any kind of computer vision project.

This Postgraduate Certificate in Advanced Digital Image Processing in Computer Vision has been commissioned, therefore, to bring together the most profound and innovative knowledge in this field, so that computer scientists can delve into aspects such as morphological operations, contour detection, image calibration or video processing, among many others.

And all this will be achieved using a 100% online teaching methodology that adapts to the circumstances of each student, allowing them to choose the time and place to study. In addition, this program provides access to a highly qualified teaching staff, experts in this field, and to multimedia contents of great educational value.

This **Postgraduate Certificate in Advanced Digital Image Processing in 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 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

Big computer vision companies need digital image processing specialists: you could be one of them"

Learn the best image processing techniques thanks to this program, which will provide you with the latest knowledge so that you can apply it to your work immediately"

Machine learning and AI are fundamental in today's technological world. Specialize in digital image processing for computer vision and achieve professional success.

In the technological field, specialization is the key: complete this Postgraduate Certificate and get access to an artificial intelligence company quickly.

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.

02

Objectives

The main objective of this Postgraduate Certificate in Advanced Digital Image Processing in Computer Vision is to offer professionals the best tools to be able to perform their work according to the latest developments in artificial intelligence, which is a technological field in constant transformation. Therefore, this program is perfect for engineers and computer scientists who wish to experience a professional improvement, since it makes them specialists in this field.

You will be a great expert: complete this Postgraduate Certificate now and work on innovative artificial intelligence projects"

General Objectives

- Analyze advanced image processing techniques
- Develop tools that combine different computer vision techniques
- Establish problem analysis rules
- Demonstrate how functional solutions can be created to address industrial, commercial, and other problems
- Examine the different digital image processing libraries available on the market
- Establish a solid foundation in the understanding of digital image processing algorithms and techniques
- Examine filtering algorithms, morphology, pixel modification, etc.
- Assess fundamental computer vision techniques

If you are ambitious and always looking to improve, this educational program is perfect for you: don't wait any longer and enroll"

Specific Objectives

- Examine commercial and open-source digital image processing libraries
- Determine what a digital image is and evaluate the fundamental operations to be able to work with them
- Introduce image filters
- Analyze the importance and use of histograms
- Present tools to modify images pixel by pixel
- Propose image segmentation tools
- Analyze morphological operations and their applications
- Determine the methodology in image calibration
- Evaluate methods for segmenting images with conventional vision
- Examine advanced digital image processing filters
- Determine contour extraction and analysis tools
- Analyze object search algorithms
- Demonstrate how to work with calibrated images
- Analyze mathematical techniques for geometry analysis
- Evaluate different options in image compositing
- Develop user interface

03

Course Management

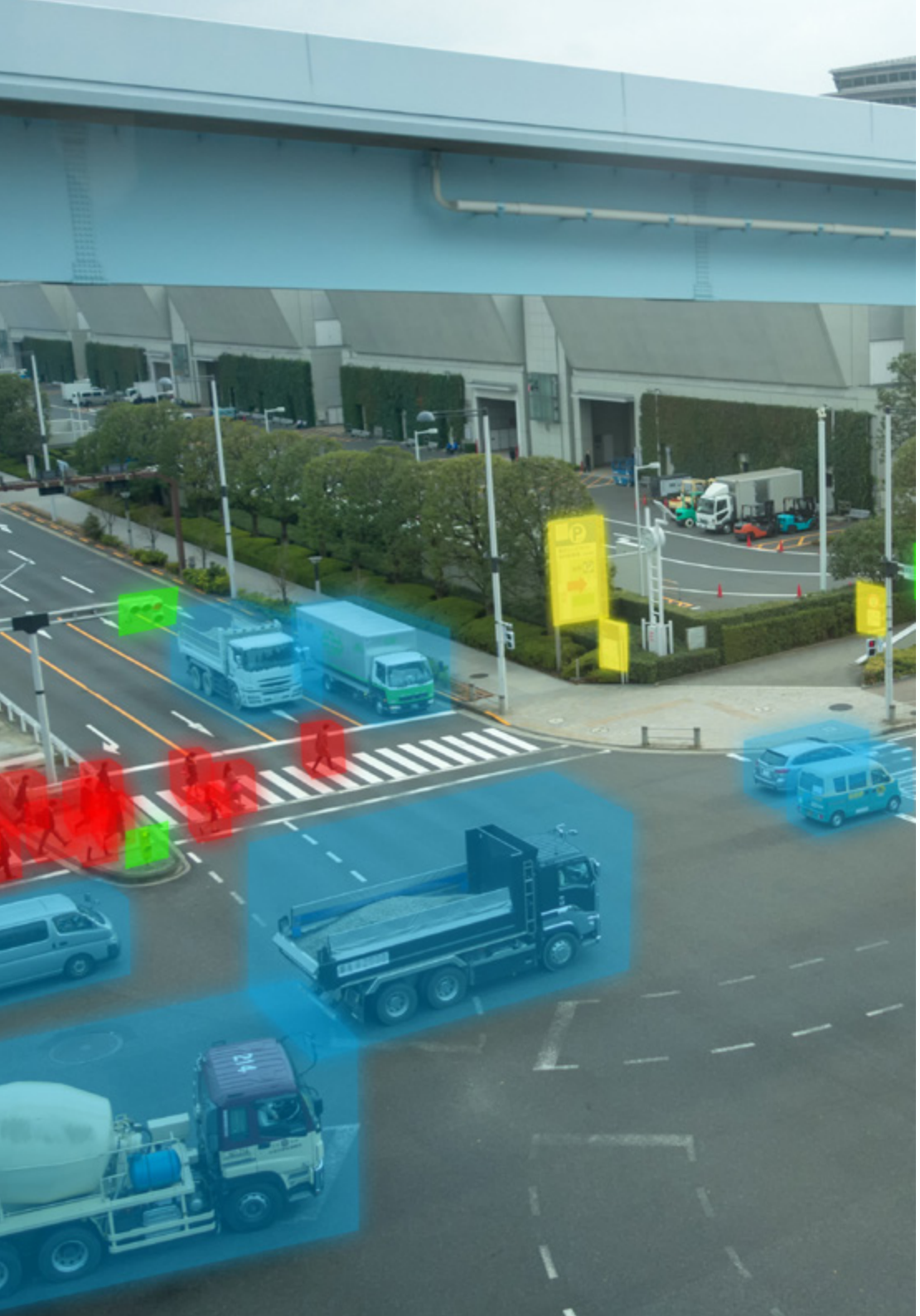
To offer students the best learning process, it is not enough to have the best content and an elite teaching system. It is also necessary to have an expert teaching staff that develops their professional career in the field of computer vision. For this reason, TECH provides students with the best teaching staff composed of true specialists in digital image processing, which will make the experience in this program very profitable.

The best teachers for the most demanding professional. Don't think twice. Here is your future"

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

Mr. Enrich Llopart, Jordi

- Technical Director Bcnvision. Computer Vision
- Project and application engineer. Bcnvision. Computer Vision
- Project and application engineer. PICVISA Machine Vision
- Graduated in Telecommunications Technical Engineering. Specialization in Image and Sound by the University School of Engineering of Terrassa (EET) / Polytechnic University of Catalonia (UPC)
- MPM - Master's Degree in Project Management. La Salle University - Ramon Llull University
- Lecturer in programming training for Cognex computer vision systems

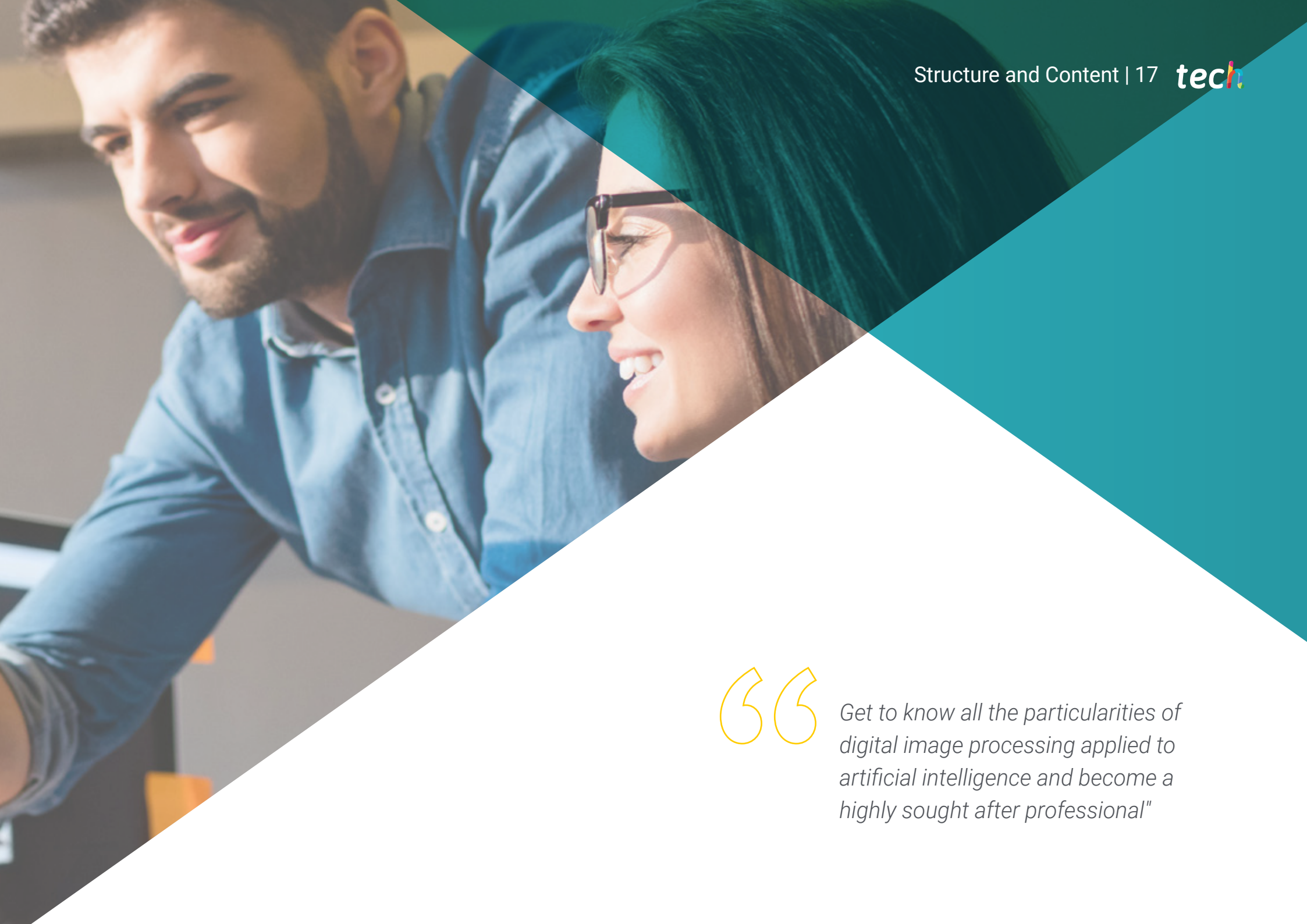
Mr. Bigata Casademunt, Antoni

- Perception Engineer at Computer Vision Center (CVC)
- Machine Learning Engineer at Visium SA, Switzerland
- Degree in Microtechnology from Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland
- Master's degree in Robotics from the Ecole Polytechnique Fédérale de Lausanne (EPFL)

04

Structure and Content

This Postgraduate Certificate in Advanced Digital Image Processing in Computer Vision is composed of 2 specialized modules, which will detail the latest techniques in this complex work in the field of computer vision. In this way, the educational program will delve into issues such as visualization tools, the relationship between pixels, linear and nonlinear filtering, 1D and 2D codes and facial recognition.



Get to know all the particularities of digital image processing applied to artificial intelligence and become a highly sought after professional"

Module 1. Digital Image Processing

1.1. Computer Vision Development Environment
- 1.1.1. Computer Vision Libraries
- 1.1.2. Programming Environment
- 1.1.3. Visualization Tools

1.2. Digital image Processing
- 1.2.1. Relationships Between Pixels
- 1.2.2. Image Operations
- 1.2.3. Geometric Transformations

1.3. Pixel Operations
- 1.3.1. Histogram
- 1.3.2. Histogram Transformations
- 1.3.3. Operations on Color Images

1.4. Logical and Arithmetic Operations
- 1.4.1. Addition and Subtraction
- 1.4.2. Product and Division
- 1.4.3. And/Nand
- 1.4.4. Or/Nor
- 1.4.5. Xor/Xnor

1.5. Filters
- 1.5.1. Masks and Convolution
- 1.5.2. Linear Filtering
- 1.5.3. Non-Linear Filtering
- 1.5.4. Fourier Analysis

1.6. Morphological Operations
- 1.6.1. Erosion and Dilation
- 1.6.2. Closing and Opening
- 1.6.3. Top_hat and Black hat
- 1.6.4. Contour Detection
- 1.6.5. Skeleton
- 1.6.6. Hole Filling
- 1.6.7. Convex Hull

1.7. Image Analysis Tools
- 1.7.1. Edge Detection
- 1.7.2. Detection of Blobs
- 1.7.3. Dimensional Control
- 1.7.4. Color Inspection

1.8. Object Segmentation
- 1.8.1. Image Segmentation
- 1.8.2. Classical Segmentation Techniques
- 1.8.3. Real Applications

1.9. Image Calibration
- 1.9.1. Image Calibration
- 1.9.2. Methods of Calibration
- 1.9.3. Calibration Process in a 2D Camera/Robot System

1.10. Image Processing in a Real Environment
- 1.10.1. Problem Analysis
- 1.10.2. Image Processing
- 1.10.3. Feature Extraction
- 1.10.4. Final Results

Module 2. Advanced Digital Image Processing

2.1. Optical Character Recognition (OCR)
- 2.1.1. Image Pre-Processing
- 2.1.2. Text Detection
- 2.1.3. Text Recognition

2.2. Code Reading
- 2.2.1. 1D Codes
- 2.2.2. 2D Codes
- 2.2.3. Applications

2.3. Pattern Search
- 2.3.1. Pattern Search
- 2.3.2. Patterns Based on Gray Level
- 2.3.3. Patterns Based on Contours
- 2.3.4. Patterns Based on Geometric Shapes
- 2.3.5. Other Techniques

2.4. Object Tracking with Conventional Vision
- 2.4.1. Background Extraction
- 2.4.2. Meanshift
- 2.4.3. Camshift
- 2.4.4. Optical Flow

2.5. Facial Recognition
- 2.5.1. Facial Landmark Detection
- 2.5.2. Applications
- 2.5.3. Facial Recognition
- 2.5.4. Emotion Recognition

2.6. Panoramic and Alignment
- 2.6.1. Stitching
- 2.6.2. Image Composition
- 2.6.3. Photomontage

2.7. High Dynamic Range (HDR) and Photometric Stereo
- 2.7.1. Increasing the Dynamic Range
- 2.7.2. Image Compositing for Contour Enhancement
- 2.7.3. Techniques for the Use of Dynamic Applications

2.8. Image Compression
- 2.8.1. Image Compression
- 2.8.2. Types of Compressors
- 2.8.3. Image Compression Techniques

2.9. Video Processing
- 2.9.1. Image Sequences
- 2.9.2. Video Formats and Codecs
- 2.9.3. Reading a Video
- 2.9.4. Frame Processing

2.10. Real Application of Image Processing
- 2.10.1. Problem Analysis
- 2.10.2. Image Processing
- 2.10.3. Feature Extraction
- 2.10.4. Final Results

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

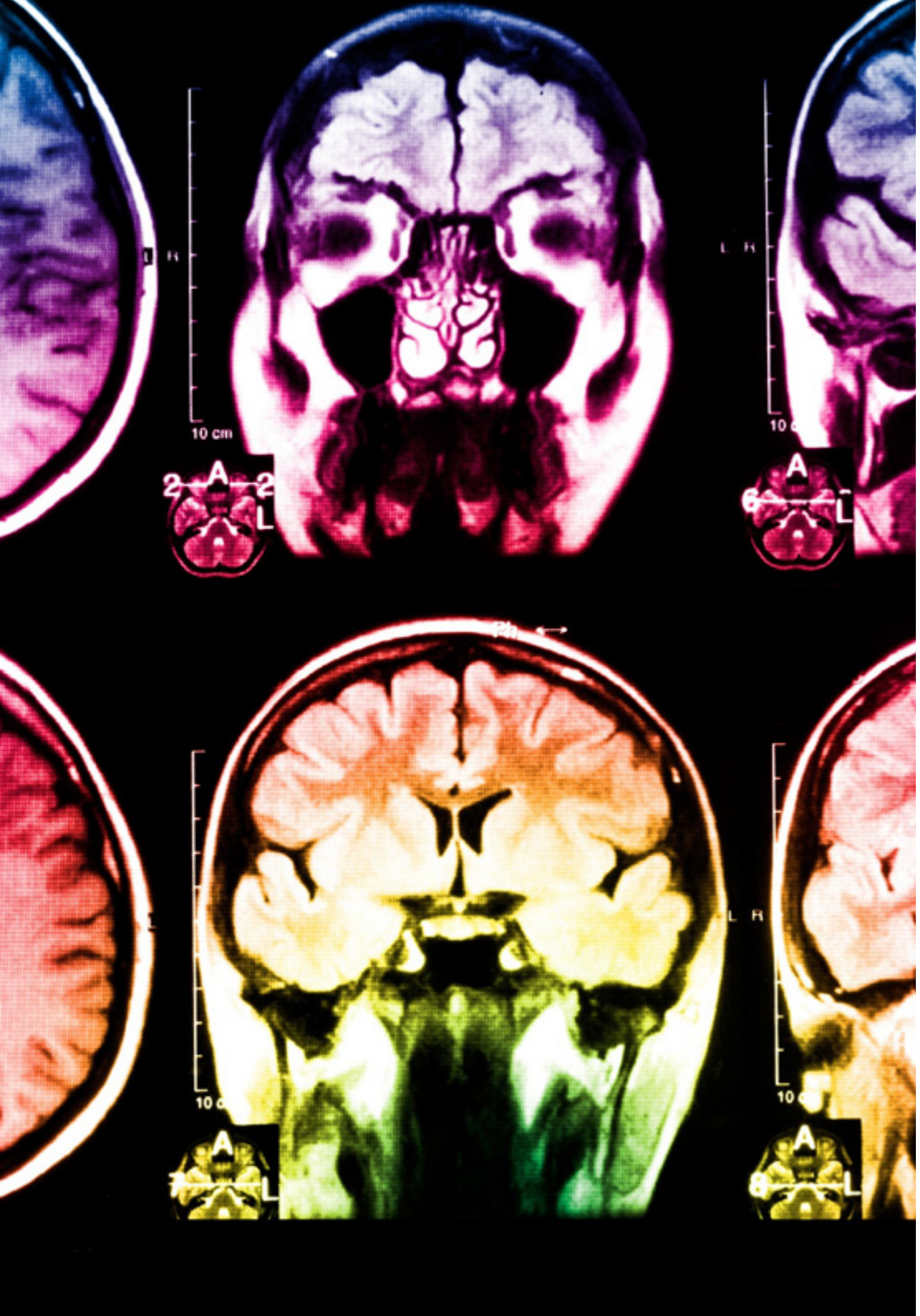
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

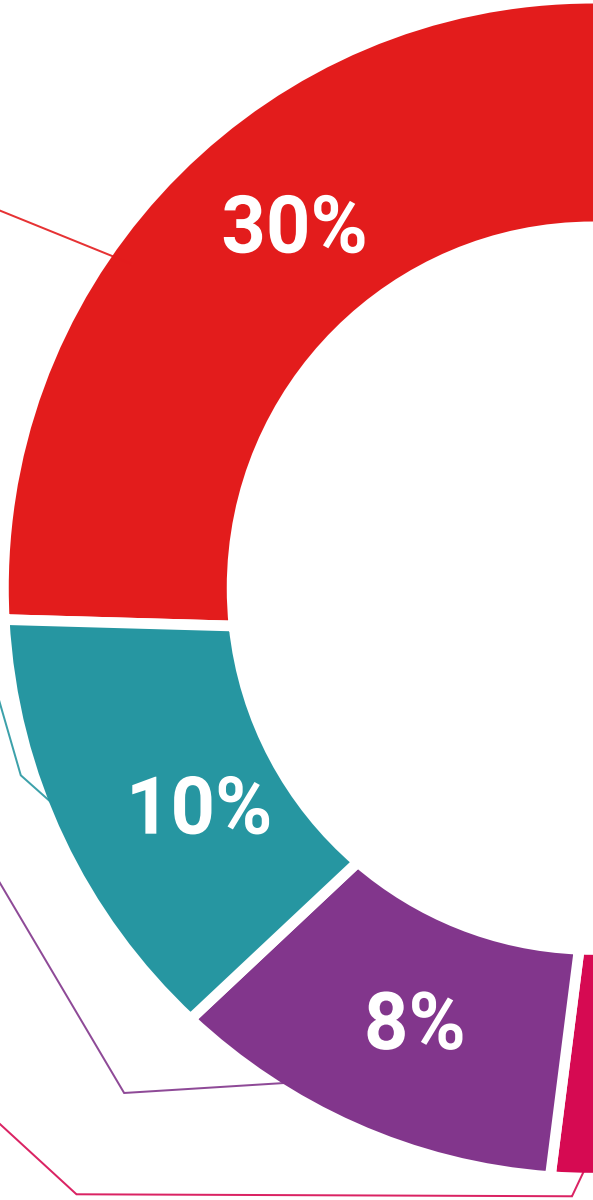
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

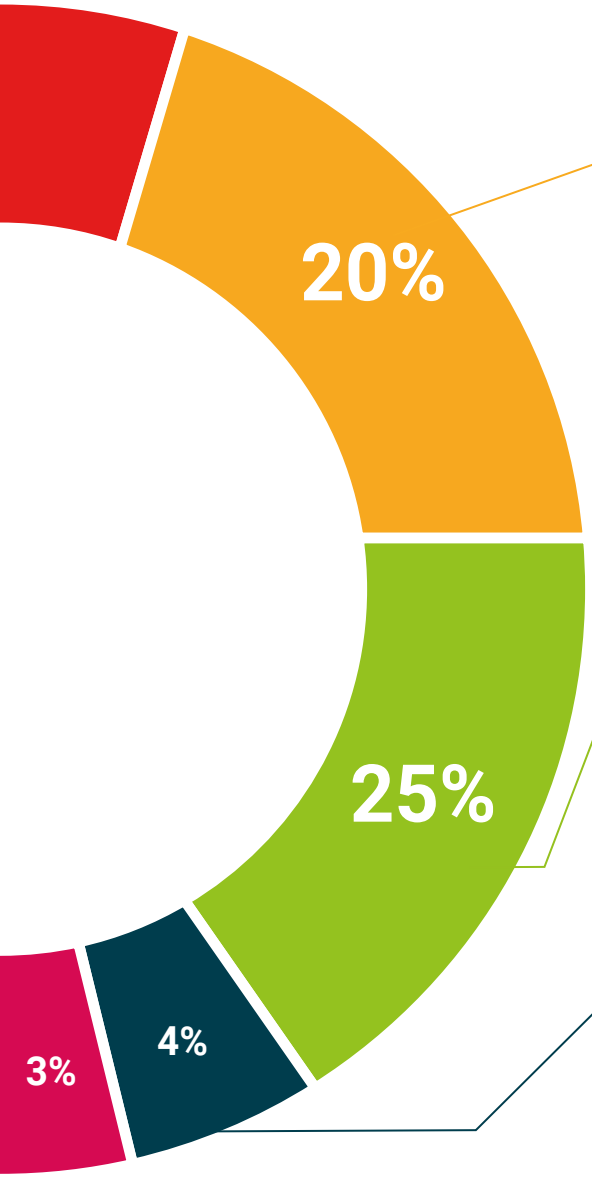
Practising Skills and Abilities

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 Certificate in Advanced Digital Image Processing in Computer Vision guarantees students, in addition to the most rigorous and up to date education, access to a Postgraduate Certificate 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 Certificate in Advanced Digital Image Processing in 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 Certificate** issued by **TECH Technological University** via tracked delivery*.

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

Title: **Postgraduate Certificate in Advanced Digital Image Processing in Computer Vision**
Official Nº of hours: **300 h.**

tech technological university

Awards the following

CERTIFICATE

to

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

For having passed and accredited the following program

POSTGRADUATE CERTIFICATE

in

Advanced Digital Image Processing in Computer Vision

This is a qualification awarded by this University, equivalent to 300 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 Certificate
Advanced Digital Image Processing in Computer Vision

- Modality: **online**
- Duration: **12 weeks**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
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