Postgraduate Diploma
Computer Vision

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Postgraduate Diploma
Computer Vision

Course Modality: **Online**
Duration: **6 months.**
Certificate: **TECH Technological University**
Official Nº of hours: **450 h.**
Website: www.techtitute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-computer-vision

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01

Introduction

Computer Vision is currently the most demanded specialty in the fields of artificial intelligence and Machine Learning. This area is responsible for image processing by machines and robots, and its importance lies in the large amount of information that can be gathered from it. Therefore, a machine with computer vision, with the right tools, will be able not only to relate spatially to its environment in an appropriate way, but also to systematically collect data from that environment. Because of this, major technology companies are focusing their efforts in this area. Therefore, this program is perfect for computer scientists who wish to progress in this booming sector, enjoying the opportunity to specialize and grow professionally.

Computer Vision is the most demanded field within artificial intelligence and Machine Learning. Don't wait any longer and take advantage of the opportunity to access the latest knowledge in this sector"

Artificial intelligence and associated sectors such as Machine Learning have been the most important areas of the technology industry for only a few years. Therefore, more and more programs and machines are being developed that are capable of learning to perform complex tasks in order to improve existing services. It is therefore not just a matter of automating the performance of tasks, but of being able to go further. Computer vision achieves that goal and offers great solutions to contemporary and future technological challenges.

Computer vision gives robots and machines the ability to process the spatial environment and capture images systematically, obtaining interesting data that can be used in different fields. For this reason, it is such a powerful tool that most technology companies are trying to develop projects in this direction. As such, this Postgraduate Diploma allows the computer scientists to delve into the latest developments in this complex and promising area, so that at the end of the program they will have delved into issues such as visible and non-visible frequencies, digital image composition and image indexing and digital processing, among many others.

In order to enjoy an optimal learning process, TECH Technological University has designed a 100% online teaching methodology that guarantees that computer scientists are able to balance their studies with their professional career without any interruptions. All of this is accompanied by a prestigious teaching staff and high-level multimedia teaching materials such as interactive summaries, practical activities and master classes.

This **Postgraduate Diploma in Computer Vision** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- 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 the latest innovations in Computer Vision and Machine Learning thanks to this Postgraduate Diploma"

Computer Vision is a promising discipline and if you specialize in it, you will become a highly sought-after professional by the major technology companies of the moment"

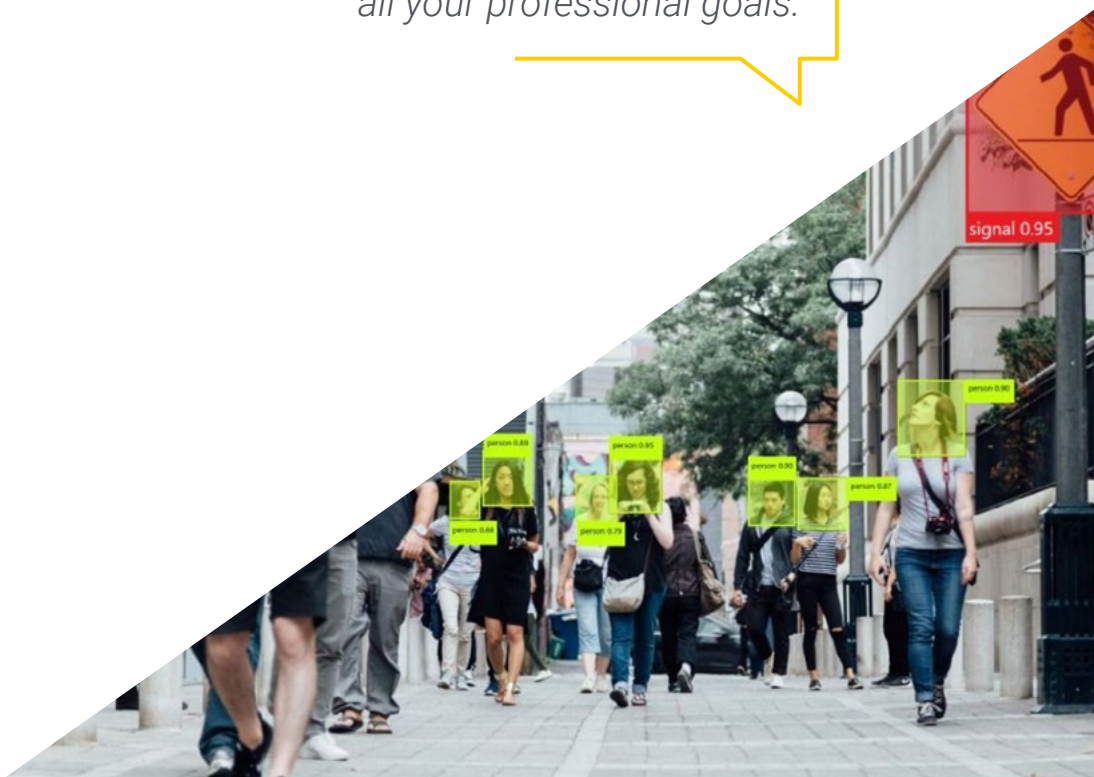
Apply the most innovative Computer Vision techniques to your artificial intelligence projects in a simple and effective way.

Computer Vision is the technology of the present and the future. Enroll and achieve all your professional goals.

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.



02

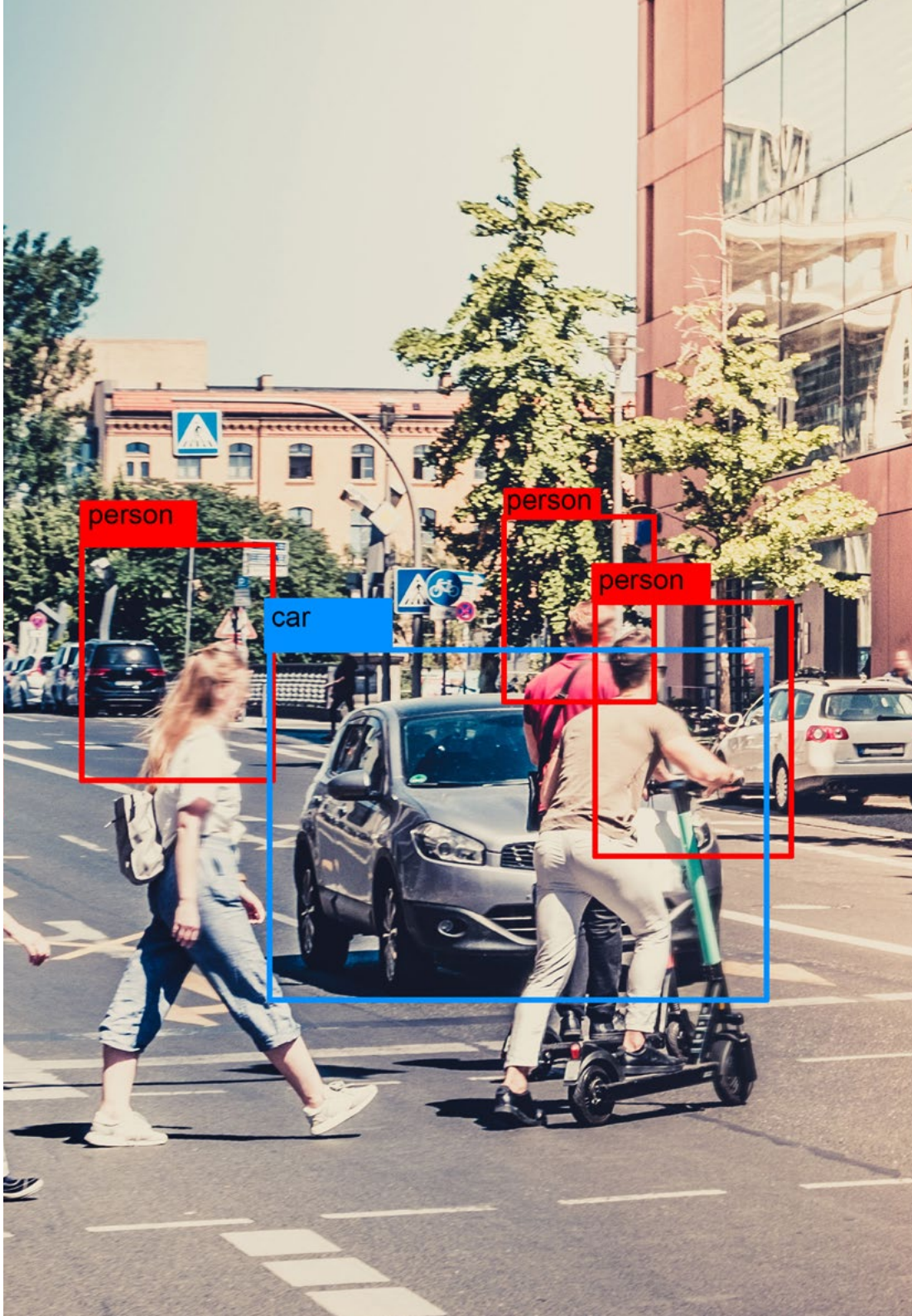
Objectives

The main objective of this Postgraduate Diploma in Computer Vision is to offer the computer scientist the latest developments in this complex and exciting technological field, so that they can apply them to their daily work immediately. With this program, the professional will be able to learn about all the advances in this area, thus being able to position himself as a specialist in computer vision in his work environment, guaranteeing him, in addition, a bright future in the industry.

Computer Vision is here to stay and the computer scientist who is able to specialize and update in this field will have great professional opportunities"

General Objectives

- Analyze how the real world is digitized according to the different existing technologies
- Obtain a global vision of the devices and hardware used in the world of Computer Vision
- Develop the systems that are changing the world of vision and their functionalities
- Assessing the acquisition techniques to obtain the optimal image
- Analyze the different fields in which vision is applied
- Examine use cases
- Identify where the technological advances in vision are at the moment
- Assess what is being researched and what the next few years will bring
- 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



Specific Objectives

Module 1. Computer Vision

- Establishing how the human vision system works and how an image is digitized
- Analyze the evolution of computer vision
- Evaluate image acquisition techniques
- Generate specialized knowledge about lighting systems as an important factor when processing an image
- Specify what optical systems exist and evaluate their use
- Examine the 3D vision systems and how these systems provide depth to images
- Develop the different existing systems outside the field visible to the human eye

Module 2. Applications and State-of-the-Art

- Analyze the use of computer vision in industrial applications
- Determine how vision is applied in the autonomous vehicle revolution
- Analyze images in content analysis
- Develop Deep Learning algorithms for medical analysis and Machine Learning algorithms for operating room assistance
- Analyze the use of vision in commercial applications
- Determine how robots have eyes thanks to computer vision and how it is applied in space travel
- Establish what augmented reality is and fields of use
- Analyze the Cloud Computing revolution
- Present the state of the art and what the coming years have in store for us

Module 3. Digital Image Processing

- 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

Achieve all your goals by specializing in Computer Vision"

03

Course Management

Ensure that the learning process is of the highest level, TECH has assembled a specialized teaching staff in Computer Vision composed of working professionals. Thus, the computer scientist who takes this educational program will have access to the latest information in this field, all this from the hand of professors who know this discipline to perfection and who will provide all their experience to the student throughout the development of the program.

You will not find better teachers with whom to learn the keys to Computer Vision"

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#

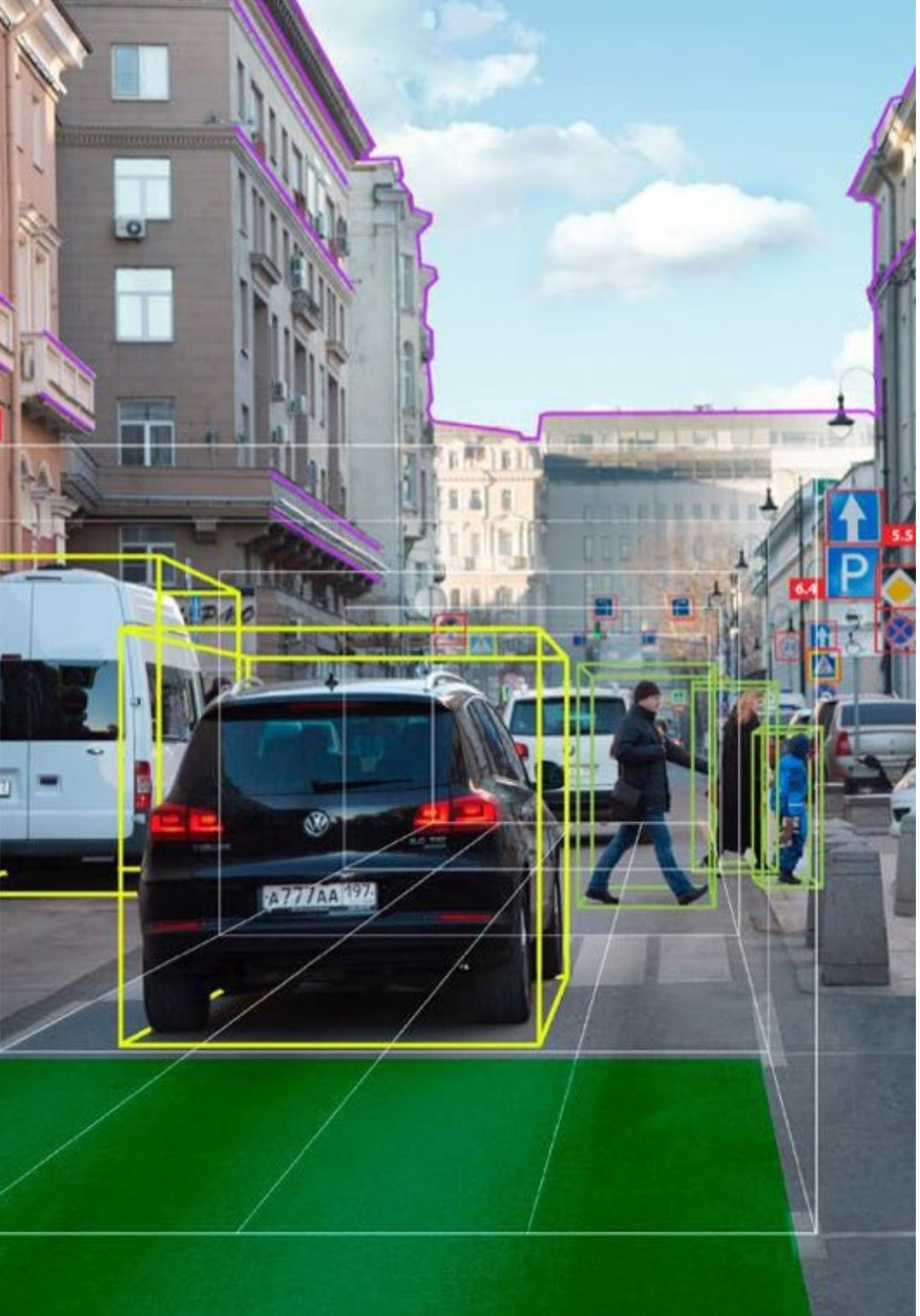
Professors

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 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)



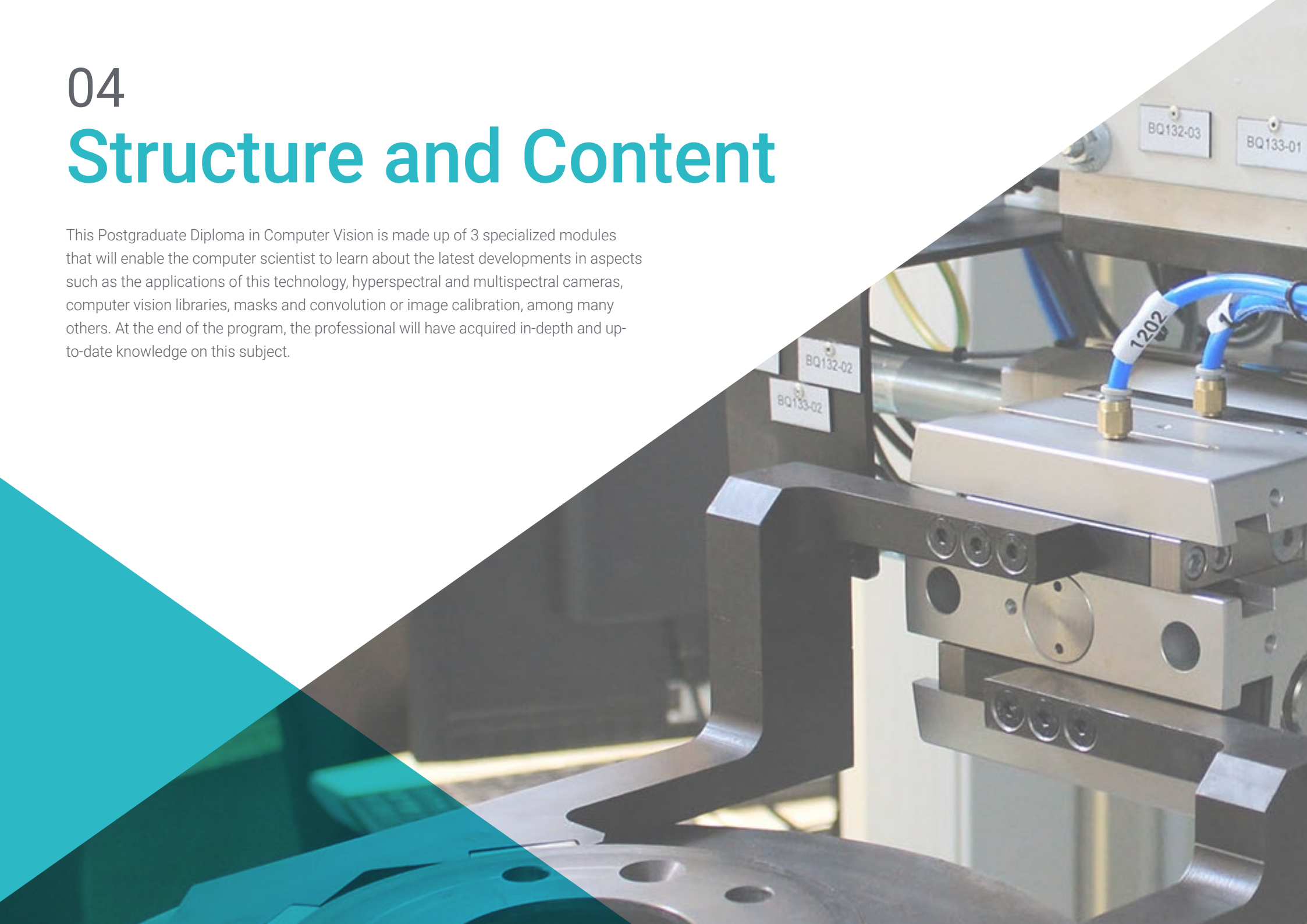
Mr. Gutiérrez Olabarría, José Ángel

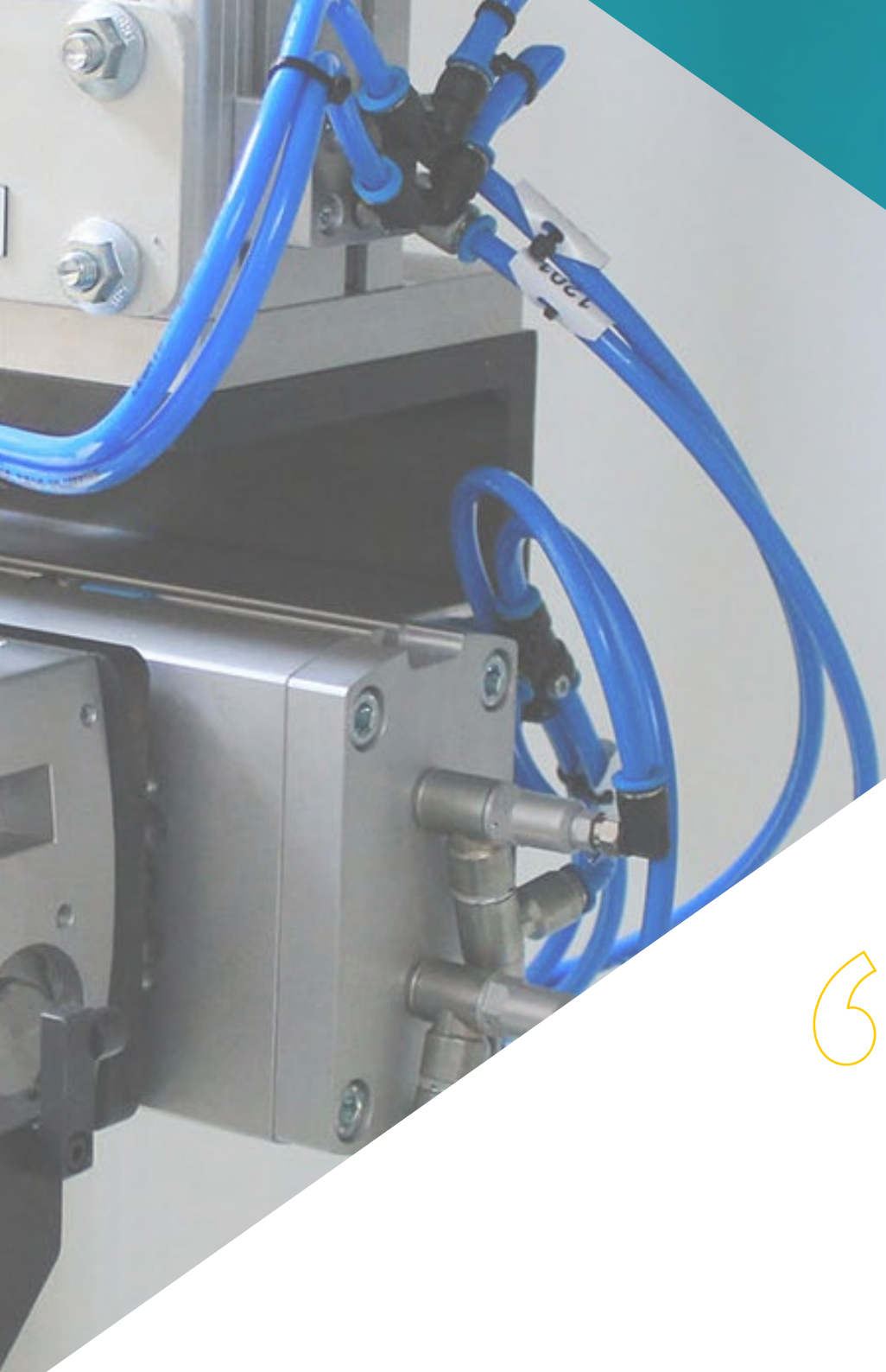
- Principal engineer specialized in computer vision and sensors. Project management, software analysis and design and C programming of quality control and industrial computing applications, customer and supplier management. Tecnalia (formerly Robotiker)
- Market manager for the iron and steel sector, performing customer contact, sourcing, market plans and strategic accounts
- Computer Engineer. Deusto University
- Master in Robotics and Automation. ETSII/IT of Bilbao
- Diploma of Advanced Studies (DEA) of the PhD program in automation and electronics. ETSII/IT of Bilbao
- Professor of the 5th year course Industrial Perception in the Automation and Electronics specialization at the School of Engineering of the University of Deusto (ESIDE)

04

Structure and Content

This Postgraduate Diploma in Computer Vision is made up of 3 specialized modules that will enable the computer scientist to learn about the latest developments in aspects such as the applications of this technology, hyperspectral and multispectral cameras, computer vision libraries, masks and convolution or image calibration, among many others. At the end of the program, the professional will have acquired in-depth and up-to-date knowledge on this subject.





Deepen in the applications of Computer Vision with this Postgaduate Diploma"

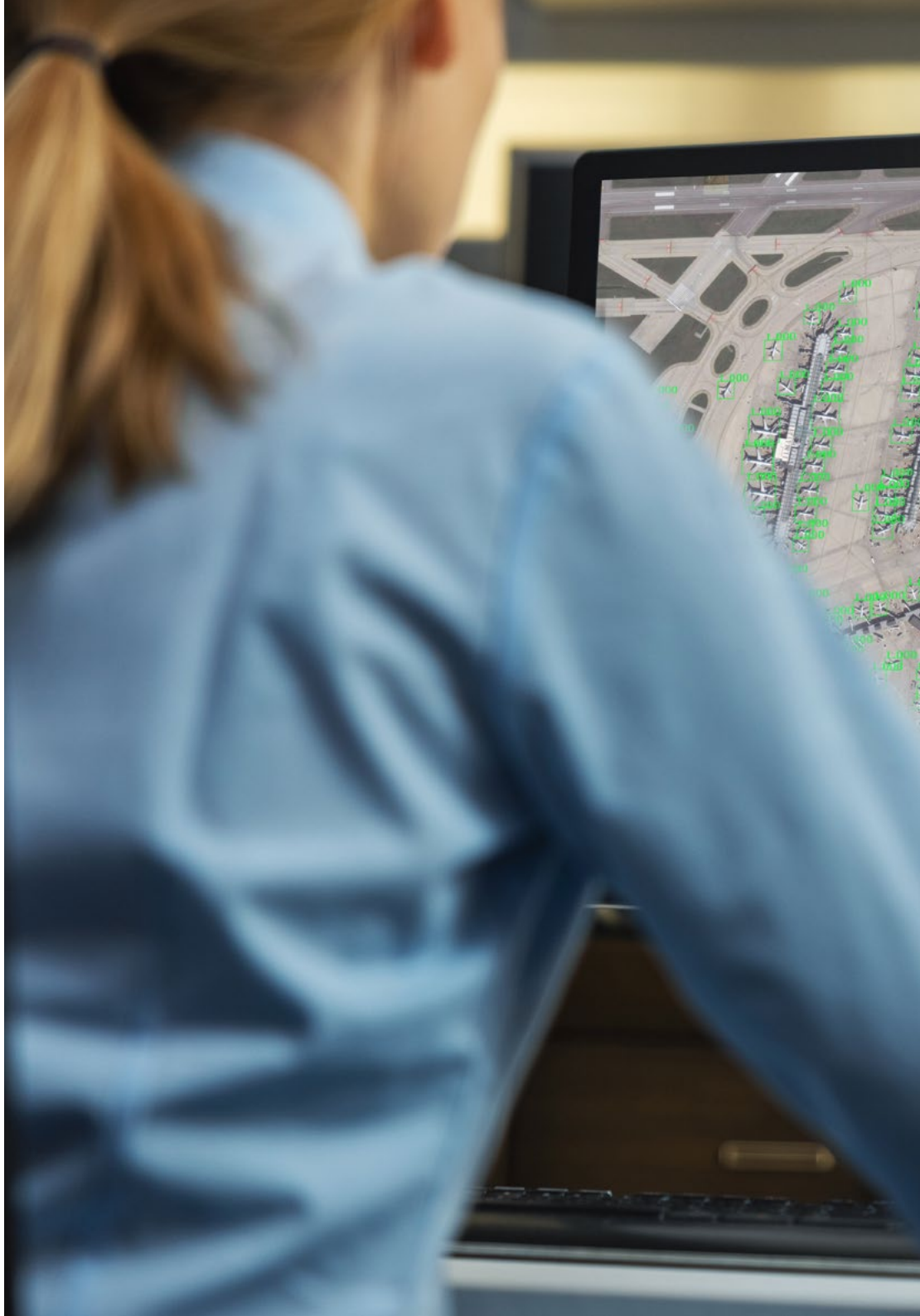
Module 1. Computer Vision

1.1. Human Perception
- 1.1.1. Human Visual System
- 1.1.2. Color
- 1.1.3. Visible and Non-Visible Frequencies

1.2. Summary of Computer Vision
- 1.2.1. Principles
- 1.2.2. Evolution
- 1.2.3. The Importance of Computer Vision

1.3. Digital Image Composition
- 1.3.1. The Digital Image
- 1.3.2. Types of Images
- 1.3.3. Color Spaces
- 1.3.4. RGB
- 1.3.5. HSV and HSL
- 1.3.6. CMY-CMYK
- 1.3.7. YCbCr
- 1.3.8. Indexed Image

1.4. Image Acquisition Systems
- 1.4.1. Operation of a Digital Camera
- 1.4.2. The Correct Exposure for Each Situation
- 1.4.3. Depth of Field
- 1.4.4. Resolution
- 1.4.5. Image Formats
- 1.4.6. HDR Mode
- 1.4.7. High Resolution Cameras
- 1.4.8. High-Speed Cameras



1.5. Optical Systems
- 1.5.1. Optical Principles
- 1.5.2. Conventional Lenses
- 1.5.3. Telecentric Lenses
- 1.5.4. Types of Autofocus Lenses
- 1.5.5. Focal Length
- 1.5.6. Depth of Field
- 1.5.7. Optical Distortion
- 1.5.8. Calibration of an Image

1.6. Illumination Systems
- 1.6.1. Importance of Illumination
- 1.6.2. Frequency Response
- 1.6.3. LED Illumination
- 1.6.4. Outdoor Lighting
- 1.6.5. Types of Lighting for Industrial Applications. Effects

1.7. 3D Acquisition Systems
- 1.7.1. Stereo Vision
- 1.7.2. Triangulation
- 1.7.3. Structured Light
- 1.7.4. Time of Flight
- 1.7.5. Lidar

1.8. Multispectrum
- 1.8.1. Multispectral Cameras
- 1.8.2. Hyperspectral Cameras

1.9. Non-Visible Near Spectrum
- 1.9.1. IR Cameras
- 1.9.2. UV Cameras
- 1.9.3. Converting From Non-Visible to Visible by Illumination

1.10. Other Band Spectrums
- 1.10.1. X-Ray
- 1.10.2. Terahertz

Module 2. Applications and State-of-the-Art

2.1. Industrial Applications
- 2.1.1. Machine Vision Libraries
- 2.1.2. Compact Cameras
- 2.1.3. PC-Based Systems
- 2.1.4. Industrial Robotics
- 2.1.5. Pick and Place 2D
- 2.1.6. Bin Picking
- 2.1.7. Quality Control
- 2.1.8. Presence Absence of Components
- 2.1.9. Dimensional Control
- 2.1.10. Labeling Control
- 2.1.11. Traceability

2.2. Autonomous Vehicles
- 2.2.1. Driver Assistance
- 2.2.2. Autonomous Driving

2.3. Computer Vision for Content Analysis
- 2.3.1. Filtering by Content
- 2.3.2. Visual Content Moderation
- 2.3.3. Tracking Systems
- 2.3.4. Brand and Logo Identification
- 2.3.5. Video Labeling and Classification
- 2.3.6. Scene Change Detection
- 2.3.7. Text or Credits Extraction

2.4. Medical Application
- 2.4.1. Disease Detection and Localization
- 2.4.2. Cancer and X-Ray Analysis
- 2.4.3. Advances in Computer Vision Due to Covid-19
- 2.4.4. Assistance in the Operating Room

2.5. Spatial Applications
- 2.5.1. Satellite Image Analysis
- 2.5.2. Computer Vision for the Study of Space
- 2.5.3. Mission to Mars

2.6. Commercial Applications
- 2.6.1. Stock Control
- 2.6.2. Video Surveillance, Home Security
- 2.6.3. Parking Cameras
- 2.6.4. Population Control Cameras
- 2.6.5. Speed Cameras

2.7. Vision Applied to Robotics
- 2.7.1. Drones
- 2.7.2. AGV
- 2.7.3. Vision in Collaborative Robots
- 2.7.4. The Eyes of the Robots

2.8. Augmented Reality
- 2.8.1. Operation
- 2.8.2. Devices
- 2.8.3. Applications in the Industry
- 2.8.4. Commercial Applications

2.9. Cloud Computing
- 2.9.1. Cloud Computing Platforms
- 2.9.2. From Cloud Computing to Production

2.10. Research and State-of-the-Art
- 2.10.1. Commercial Applications
- 2.10.2. What's Cooking?
- 2.10.3. The Future of Computer Vision

Module 3. Digital Image Processing

3.1. Computer Vision Development Environment
- 3.1.1. Computer Vision Libraries
- 3.1.2. Programming Environment
- 3.1.3. Visualization Tools

3.2. Digital image Processing
- 3.2.1. Pixel Relationships
- 3.2.2. Image Operations
- 3.2.3. Geometric Transformations

3.3. Pixel Operations
- 3.3.1. Histogram
- 3.3.2. Histogram Transformations
- 3.3.3. Operations on Color Images

3.4. Logical and Arithmetic Operations
- 3.4.1. Addition and Subtraction
- 3.4.2. Product and Division
- 3.4.3. And/Nand
- 3.4.4. Or/Nor
- 3.4.5. Xor/Xnor

3.5. Filters
- 3.5.1. Masks and Convolution
- 3.5.2. Linear Filtering
- 3.5.3. Non-Linear Filtering
- 3.5.4. Fourier Analysis

3.6. Morphological Operations
- 3.6.1. Erosion and Dilation
- 3.6.2. Closing and Opening
- 3.6.3. Top Hat and Black Hat
- 3.6.4. Contour Detection
- 3.6.5. Skeleton
- 3.6.6. Hole Filling
- 3.6.7. Convex Hull

3.7. Image Analysis Tools
- 3.7.1. Edge Detection
- 3.7.2. Detection of Blobs
- 3.7.3. Dimensional Control
- 3.7.4. Color Inspection

3.8. Object Segmentation
- 3.8.1. Image Segmentation
- 3.8.2. Classical Segmentation Techniques
- 3.8.3. Real Applications

3.9. Image Calibration
- 3.9.1. Image Calibration
- 3.9.2. Methods of Calibration
- 3.9.3. Calibration Process in a 2D Camera/Robot System

3.10. Image Processing in a Real Environment
- 3.10.1. Problem Analysis
- 3.10.2. Image Processing
- 3.10.3. Feature Extraction
- 3.10.4. Final Results

You will have access to the best contents in Computer Vision, from the best professors in the field"

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

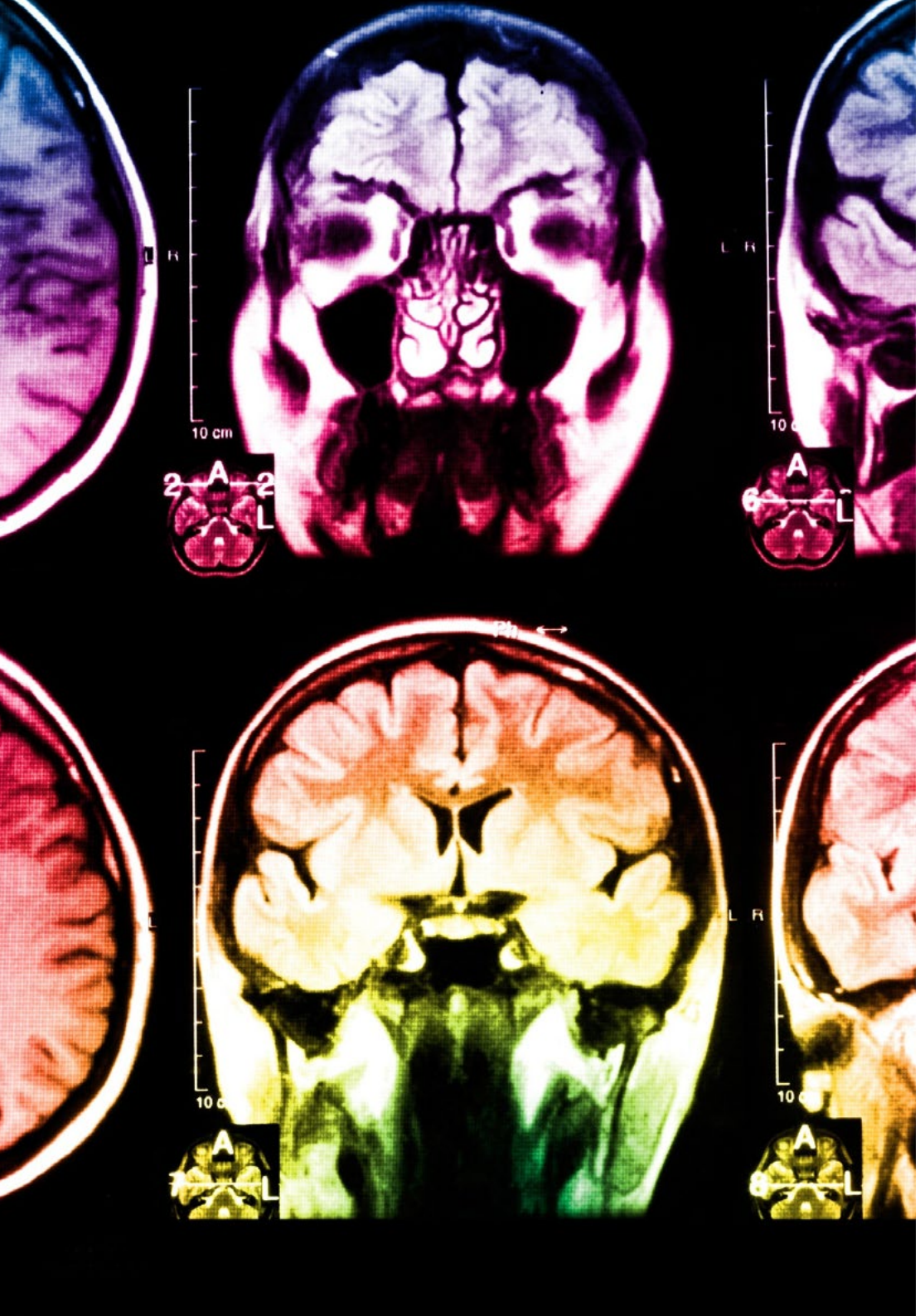
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

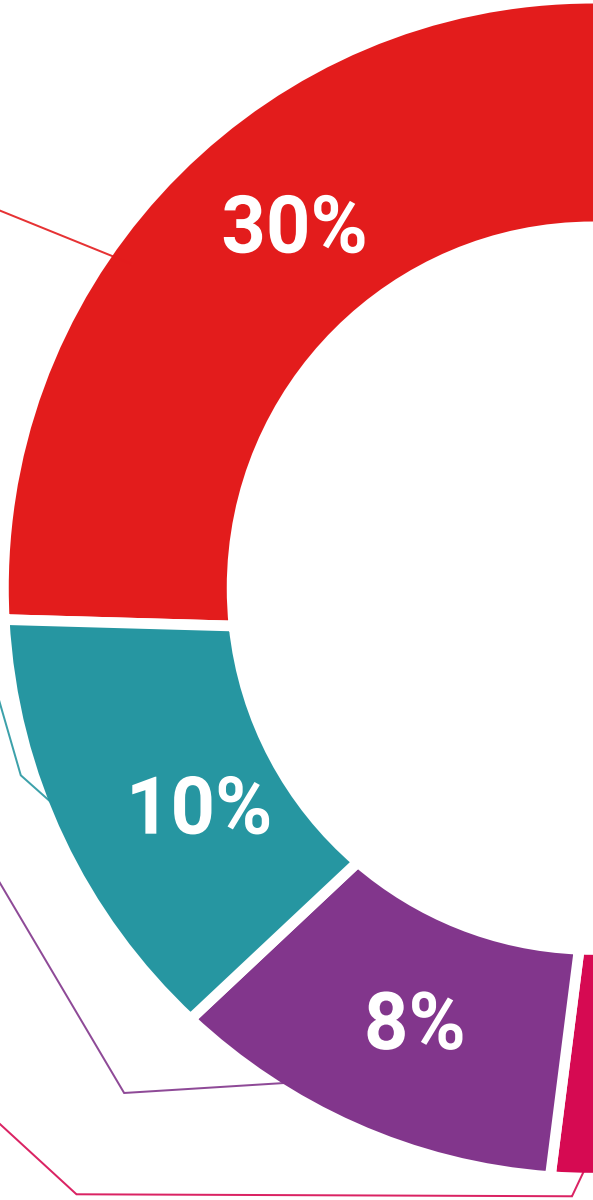
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

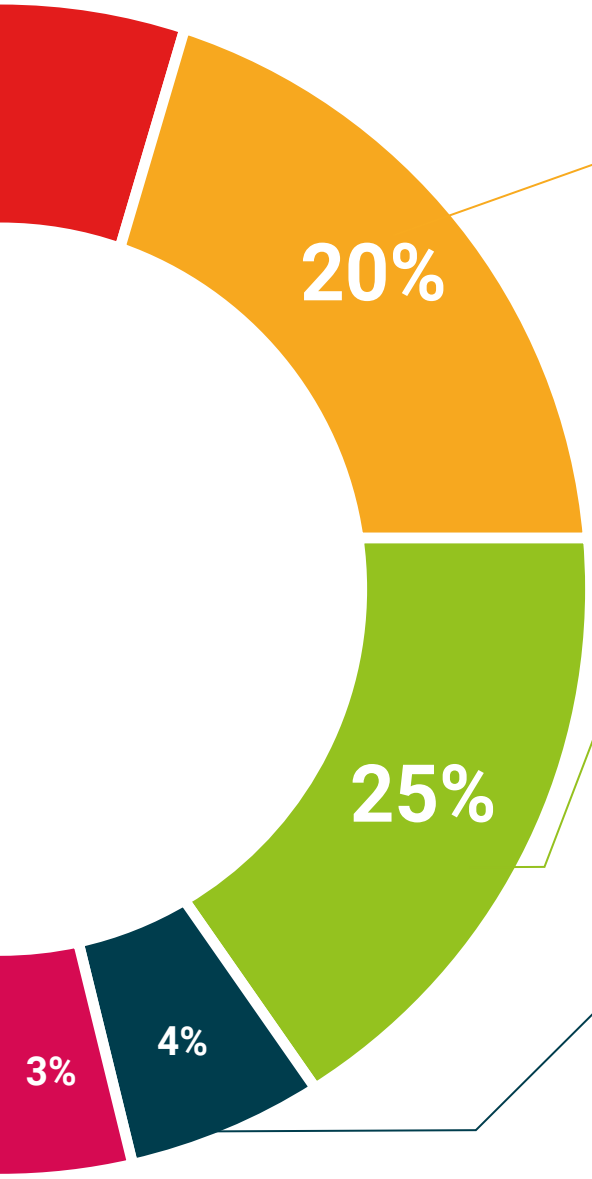
Practising Skills and Abilities

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

Title: **Postgraduate Diploma in Computer Vision**

Official Nº of hours: **450 h.**


tech technological university

Awards the following

DIPLOMA

to

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

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

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 diploma issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

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