Postgraduate Certificate

Computer Vision, Applications and the State of the Art

tech global university

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Postgraduate Certificate

Computer Vision, Applications and the State of the Art

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Credits: **12 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/pk/artificial-intelligence/postgraduate-certificate/computer-vision-applications-state-art**

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01

Introduction

One of the technologies that has evolved the most in recent years within Artificial Intelligence is Computer Vision. Belonging to Industry 4.0, this area makes it possible for industrial equipment to acquire capabilities such as visualization, image processing and management to improve goods or services. For example, these systems are used to automate logistics processes ranging from package labeling to vehicle fleet management. In this way, such procedures contribute to improving efficiency, quality and security in institutions. Aware of this, TECH launches a pioneering program that will focus on the current state of this technological discipline and delve into its many applications. All in a complete digital format.

You will master the Digital Cameras to follow the movement of objects in real time and perform facial recognition thanks to this Postgraduate Certificate 100% online"

The pandemic caused by COVID-19 prompted significant advances in the field of Machine Vision. These include the development of contact-tracking applications and the use of drones equipped with high-resolution cameras to monitor compliance with social distancing measures and other safety regulations in public areas. In this context, scientists continue to be immersed in both research and development in this field to improve global health through the advanced systems provided by Artificial Intelligence.

To contribute to this important work, TECH has implemented the most updated and complete program in Computer Vision in the academic market. Aimed at professionals, the program will offer the most innovative tools in fields such as Image Capture Systems, Augmented Reality or Collaborative Robots. To this end, the study plan will delve into the fundamental principles of computer vision, with emphasis on the composition of digital images. Students will learn the keys to the correct use of high-speed cameras to analyze dynamic processes in real time (such as deformation of materials or fluid movement). Likewise, the syllabus will focus on the State of the Art of Artificial Intelligence so that graduates will be aware of how to use them in applications such as the study of space, industrial robotics or for content analysis.

Regarding the methodology of the program, TECH is committed to a 100% online format so that students can enjoy flexible learning while being compatible with the rest of their daily activities. In addition, it is based on the revolutionary *Relearning* teaching method, which consists of the continuous reiteration of key content so that students can consolidate the concepts in a natural, progressive and simpler way.

This **Postgraduate Certificate in Computer Vision, Applications and the State of the Art** 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

You will effectively handle 3D Capture Systems, thus capturing the three-dimensional geometry of the physical world and converting it into digital data"

You will delve into the medical applications of Machine Vision and make advances in the analysis of radiographs"

Are you looking to get the most out of Cloud Computing platforms? Get it through this program in just 12 weeks.

With the revolutionary Relearning method, you will quickly grasp the key concepts offered by this university education.

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

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

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

02

Objectives

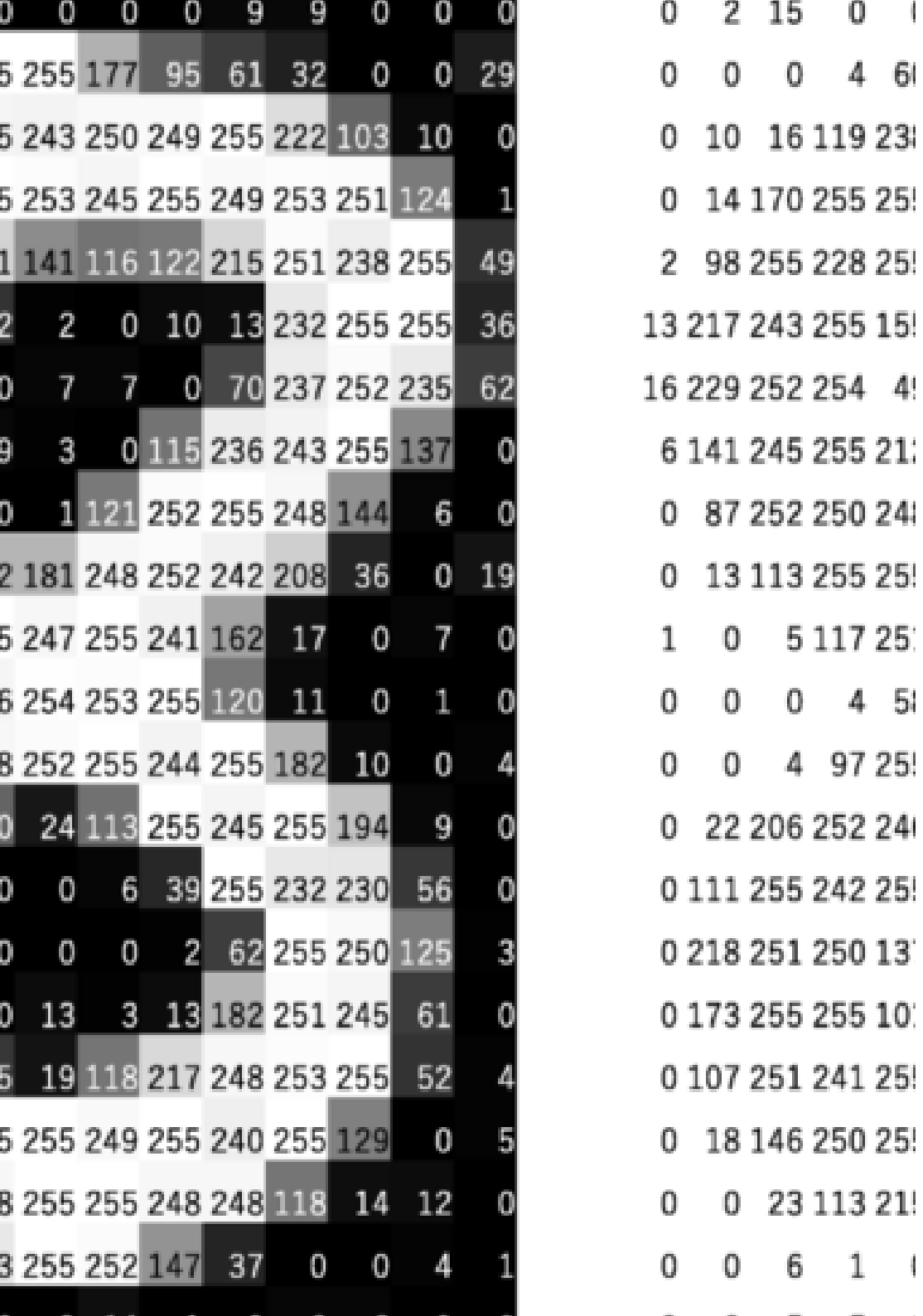
Through this program, graduates will acquire a solid understanding of Machine Vision, one of the most relevant areas of Machine Learning. The experts will enrich their procedures with the most modern tools for image capture. In this way, they will skillfully handle high-resolution cameras, improving both the accuracy of the algorithms and the detection of small objects. Students will have a vast vision of Augmented Reality that will allow them to lead innovative projects in fields such as customer service. In this way, they will propose highly creative solutions with which they will stand out in various business sectors.

A program that prepares you intensively to specialize in Computer Vision, a highly demanded professional profile in the field of health"

General Objectives

- Analyze how the real world is digitized according to the different existing technologies
- Obtain an overview of the devices and hardware used in the computer vision world
- 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

You will have at your fingertips the most avant-garde educational resources, with free access to the Virtual Campus 24 hours a day"



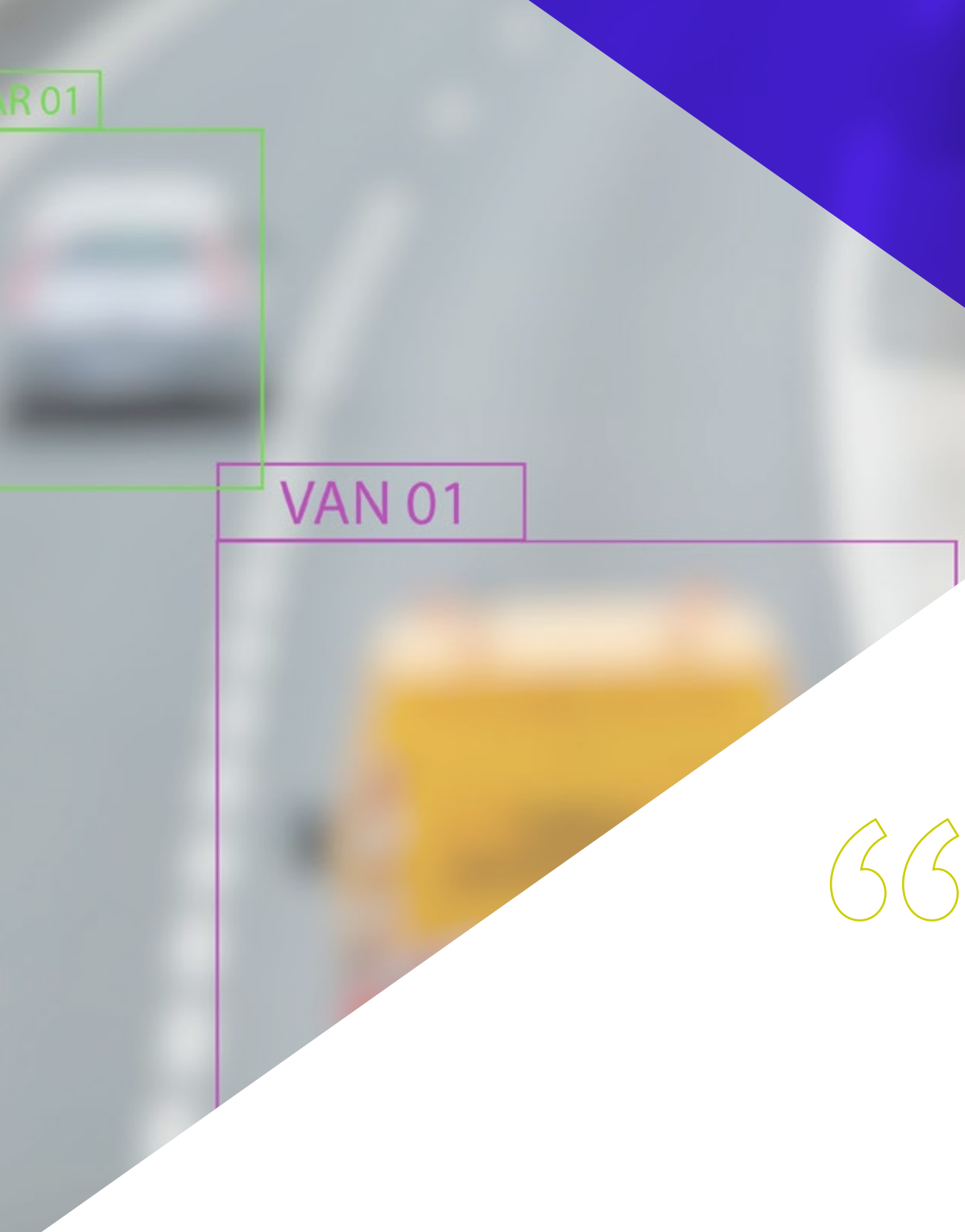
Specific Objectives

- Establish 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 illumination 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
- 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
- Establish what augmented reality is and fields of use
- Analyze the *Cloud Computing* revolution

03

Course Management

In order to maintain intact the excellent quality that defines its university programs, TECH has carefully selected the faculty that makes up this program. These professionals have been selected on the basis of their solid knowledge in Artificial Intelligence, as well as for their extensive professional background in the field of Computer Vision. In this way, they have elaborated high quality didactic materials so that students can learn about the current state of the art in these subjects. In this way, they will be able to incorporate the most advanced procedures into their practice and experience a significant leap in quality.



You will enjoy immersive learning, thanks to the support of a teaching team made up of experts in Computer Vision"

Management

Mr. Redondo Cabanillas, Sergio

- Machine Vision Research and Development Specialist at BCN Vision
- Development and *Backoffice* Team Leader at BCN Vision
- Project Manager and development of computer vision solutions
- Sound Technician at Media Arts Studio
- Specialization in Image and Sound by the Polytechnic University of Catalonia
- Graduate in Political Science and Industry from the Autonomous University of Barcelona
- Higher Level Training Cycle in Sound Villar CP

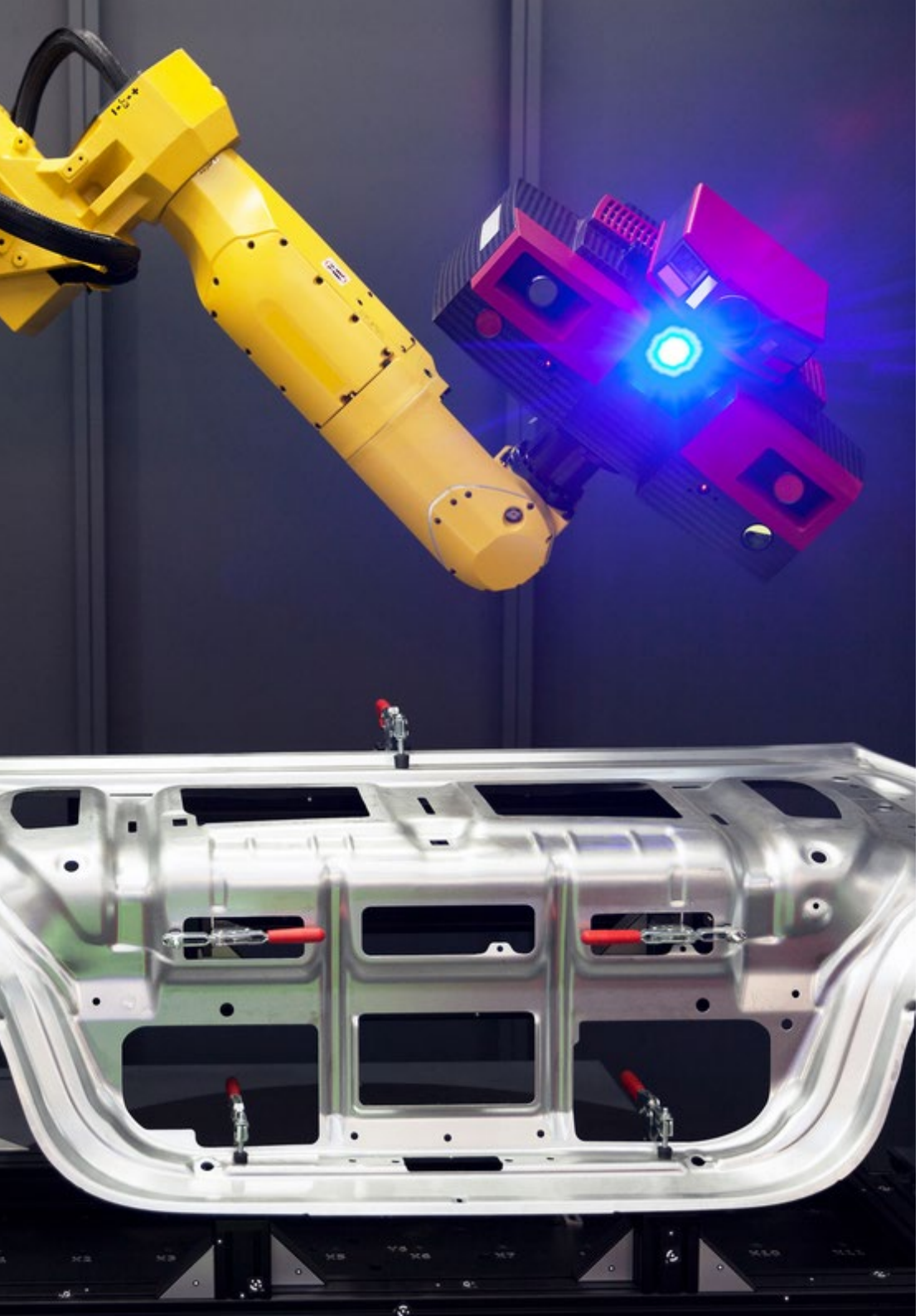
Professors

Mr. Gutiérrez Olabarría, José Ángel

- Project management, software analysis and design and C programming of quality control and industrial computing applications
- Engineer specialized in Computer Vision and sensors
- Market manager for the iron and steel sector, performing customer contact, contracting, market plans and strategic accounts functions
- Computer Engineer from the University of Deusto
- Master's Degree in Robotics and Automation by ETSII/IT of Bilbao
- Diploma in Advanced Studies of the PhD program in Automation and Electronics by ETSII/IT of Bilbao

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)



Take the opportunity to learn about the latest advances in this field in order to apply it to your daily practice"

04

Structure and Content

This Postgraduate Certificate will provide students with a comprehensive approach to Machine Vision, Applications and State of the Art. To this end, the didactic materials will delve into the advances that have been made in image capture systems. Likewise, the syllabus will provide the keys to properly handle digital cameras and integrate them to intelligent devices such as drones. On the other hand, the program will delve into the management of the main *Cloud Computing* platforms to ensure that graduates store and process data efficiently.

You will delve into the multiple applications of Computer Vision and develop the most innovative projects thanks to this program"

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. Chronicle of the 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 Capture 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

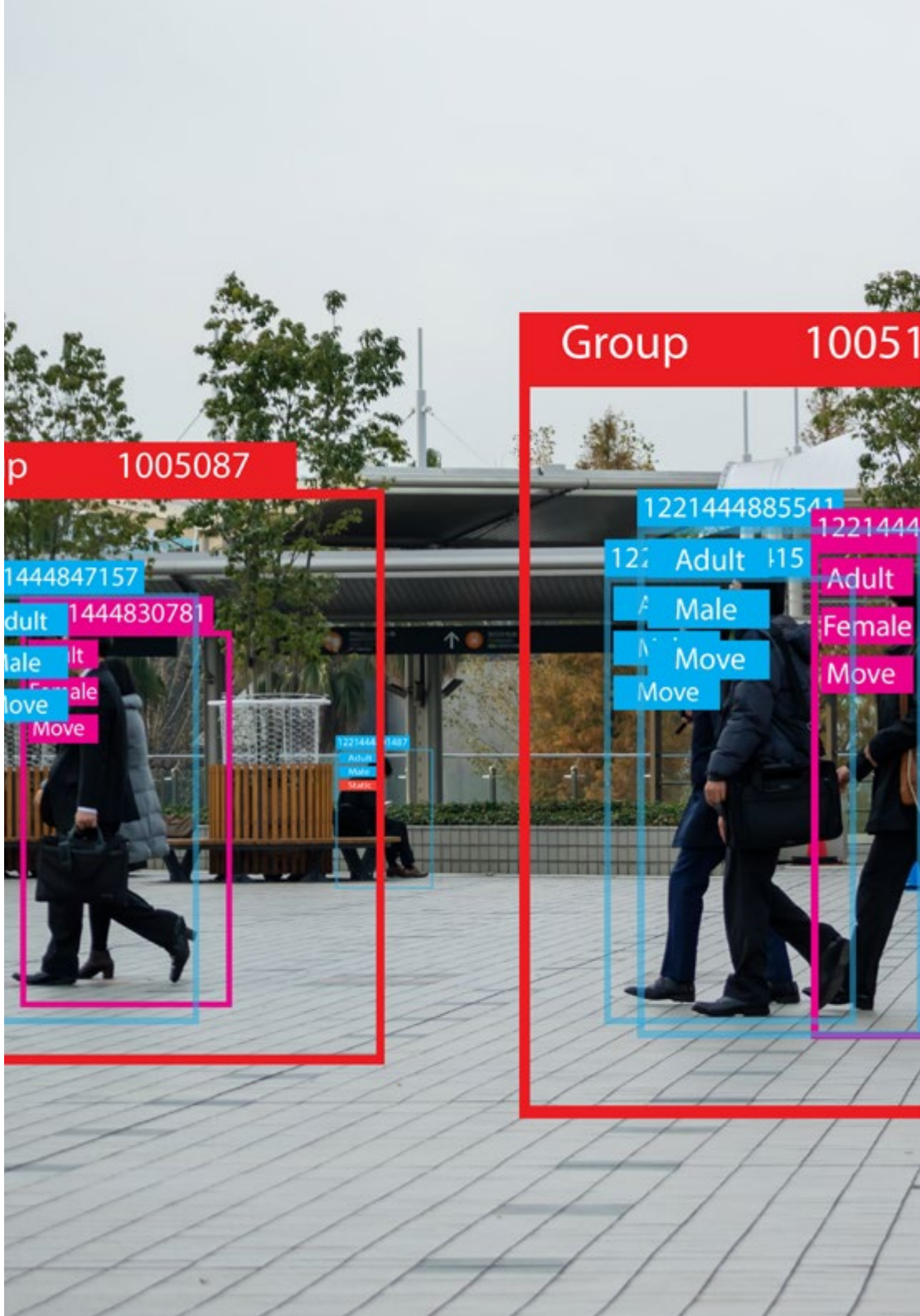
Module 2. Applications and State-of-the-Art

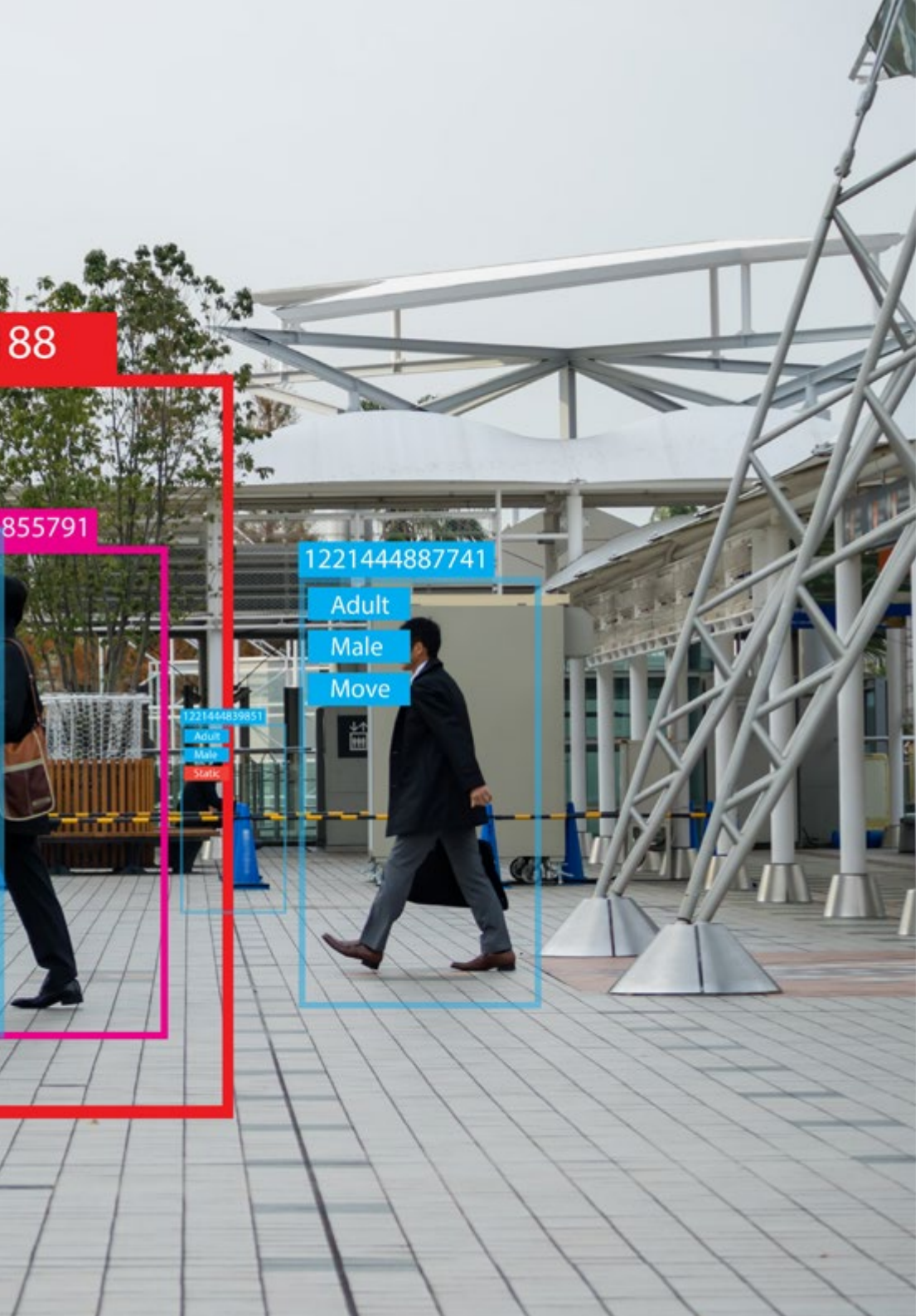
2.1. Industrial Applications
- 2.1.1. Machine Vision Libraries
- 2.1.2. Compact Cameras
- 2.1.3. PC-Based Systems
- 2.1.4. Industrial Robotics
- 2.1.5. *Pick and Place* 2D
- 2.1.6. *Bin Picking*
- 2.1.7. Quality Control
- 2.1.8. Presence Absence of Components
- 2.1.9. Dimensional Control
- 2.1.10 Labeling 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 given the Covid19
- 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

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

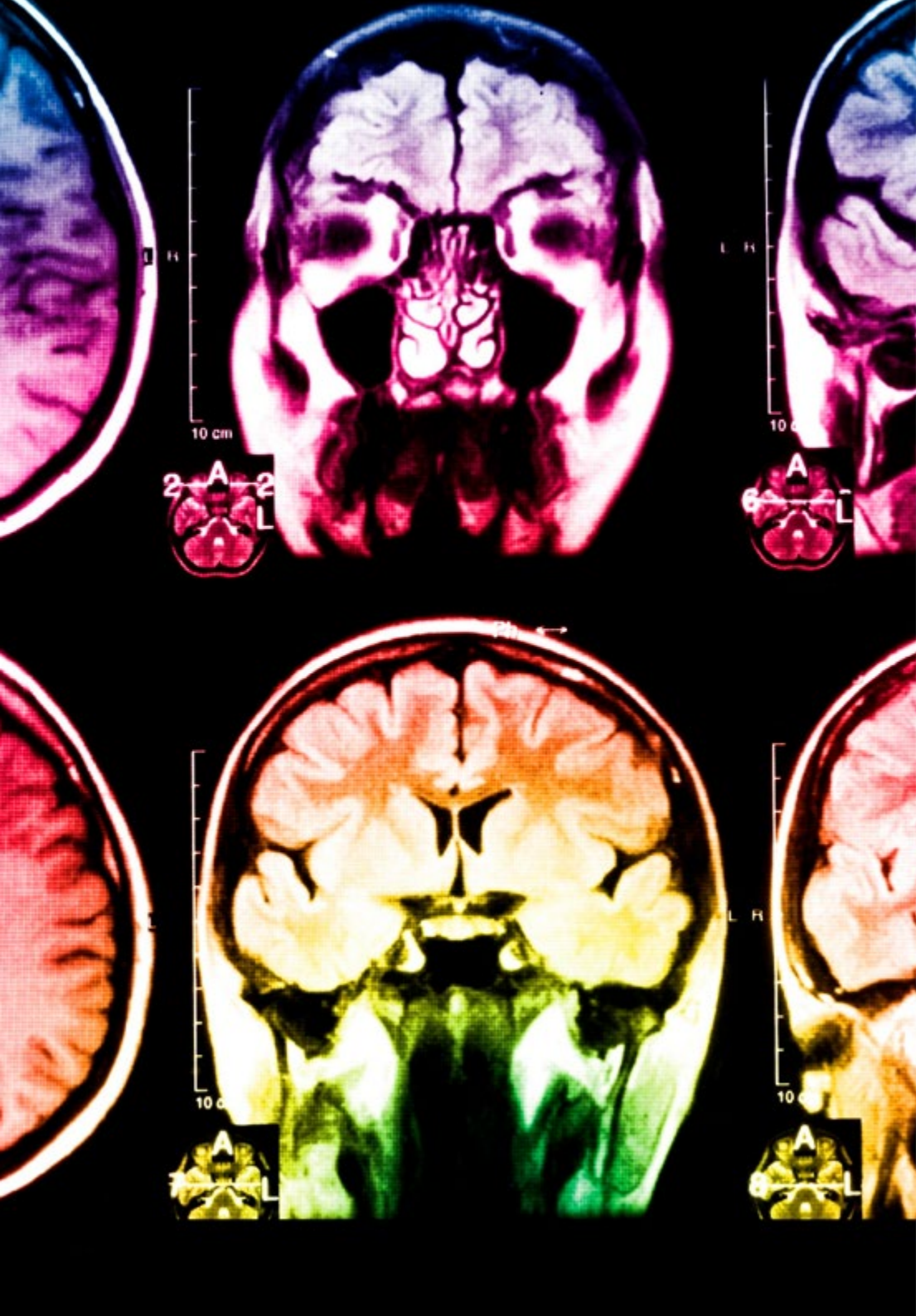
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

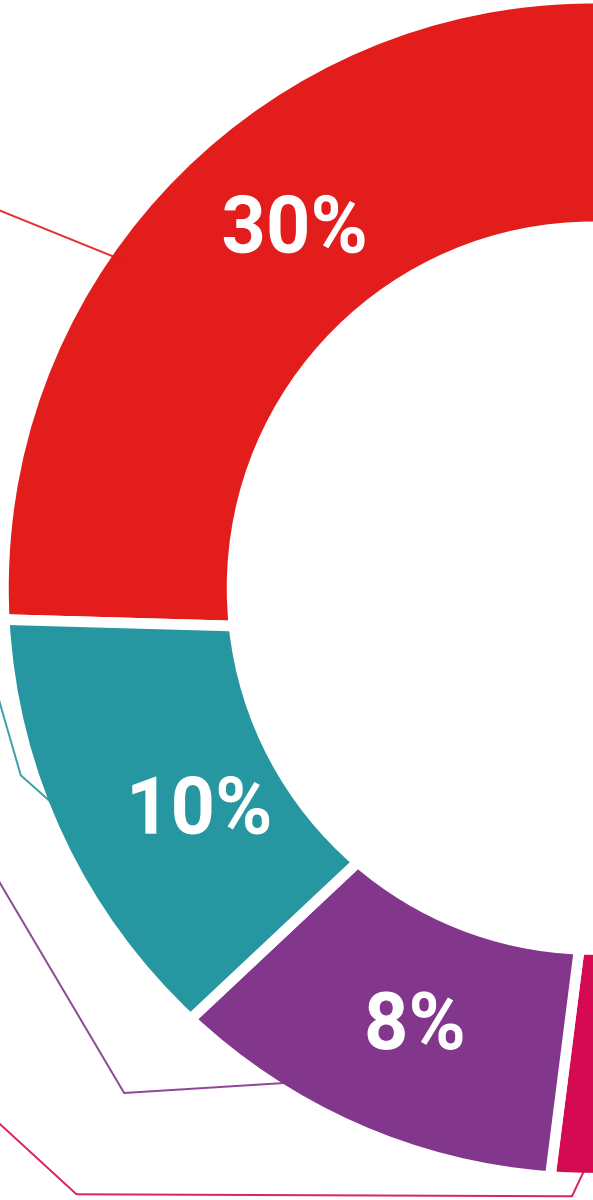
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

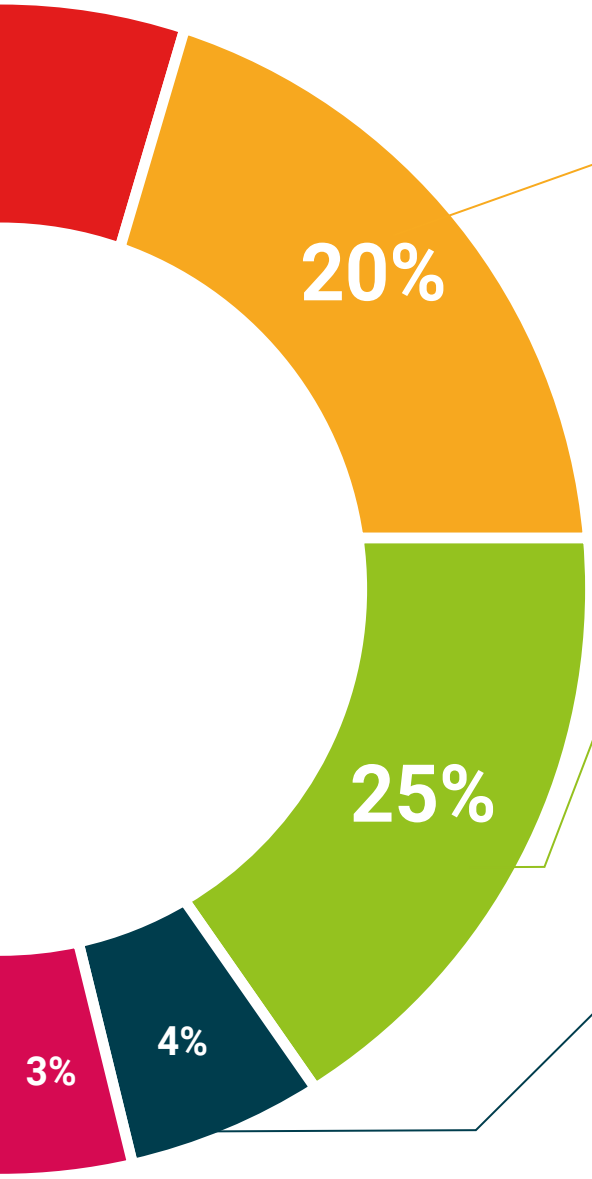
Practising Skills and Abilities

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 Computer Vision, Applications and the State of the Art guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate 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 Certificate in Computer Vision, Applications and the State of the Art** 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 Certificate in Computer Vision, Applications and the State of the Art**

Modality: **online**

Duration: **12 weeks**

Accreditation: **12 ECTS**

tech global university

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

Postgraduate Certificate in Computer Vision, Applications and the State of the Art

This is a program of 360 hours of duration equivalent to 12 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Rector

Unique TECH Code: AFWORD23S techtitute.com/certificates

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

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Postgraduate Certificate

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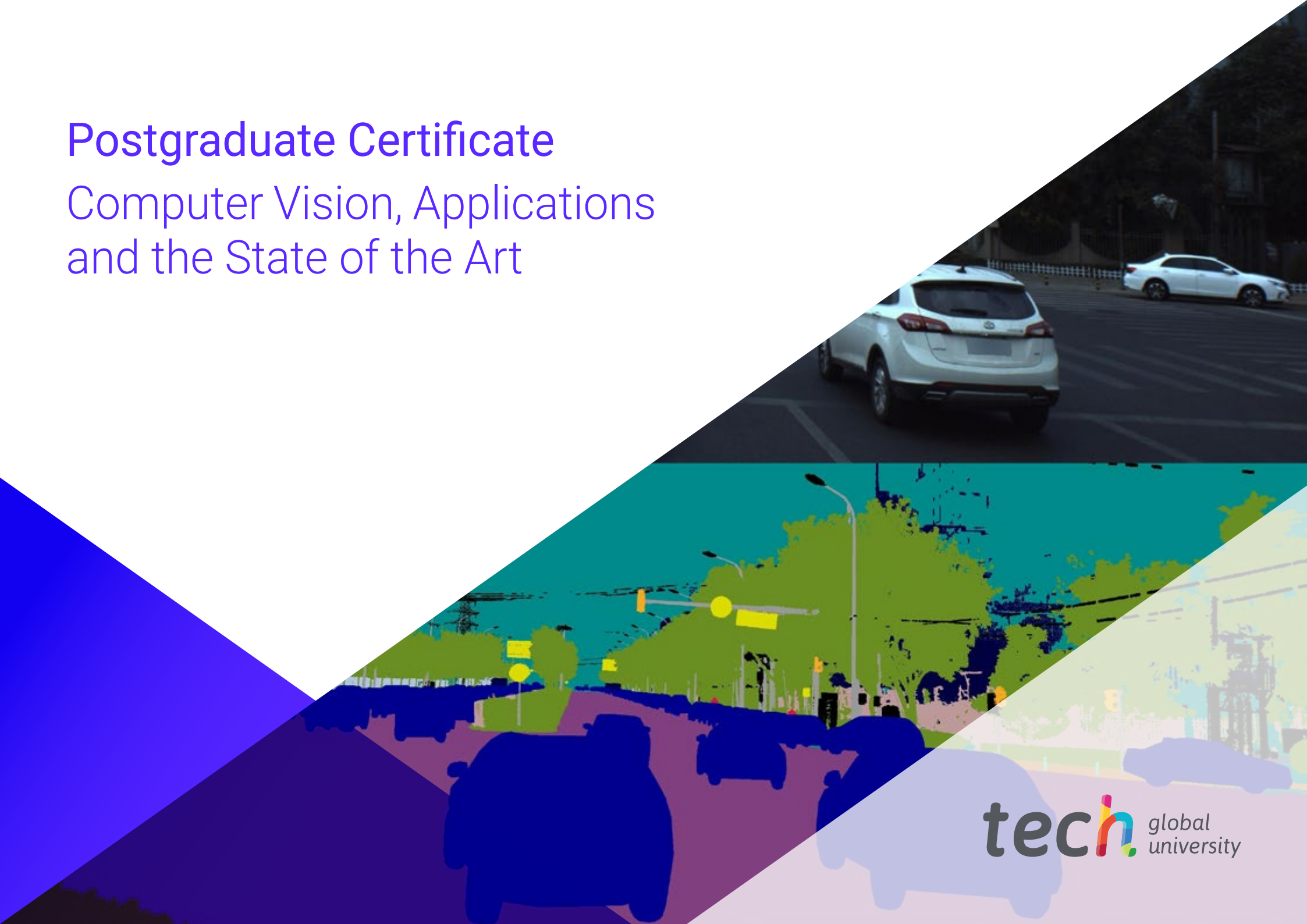

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