Advanced Master's Degree
Virtual Reality and Computer Vision

tech global university

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Advanced Master's Degree
Virtual Reality and
Computer Vision

- » Modality: **online**
- » Duration: **2 years**
- » Certificate: **TECH Global University**
- » Credits: **120 ECTS**
- » Schedule: **at your own pace**
- » Exams: **online**

Website: **www.techtitute.com/us/information-technology/advanced-master-degree/advanced-master-degree-virtual-reality-computer-vision**

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01
Introduction

Virtual Reality and Computer Vision seemed to be distant technologies, but the truth is that they have evolved rapidly, occupying more and more fields, from video games to architecture or education, among others. They have multiple applications, from the operation of machines and robots to scientific and medical research. Therefore, there is no doubt that the future of this technology is promising. For this reason, it is essential that IT professionals know how to master and keep abreast of all the advances in these disruptive technologies. This program will delve into the most important developments in Virtual Reality and Computer Vision, so that the computer professional specializes in a sector with a wide demand and high future growth. State-of-the-art technology tools such as Unreal Engine will be covered, as well as advanced 3D digital image processing techniques that will place the computer scientist at the forefront of his field. All this with a 100% online format that allows you to balance it with all kinds of professional or personal activities.

"*Do not miss the opportunity to specialize with this Advanced Master's Degree and position yourself with an advantage to access the best Virtual Reality development projects*"

The virtual reality and computer vision market is in full expansion, requiring more and more professionals with specific qualifications in this field. In recent years, artificial intelligence, another related technology, has brought about a great revolution in the digital world. Its applications range from computer science to health research and the development of tools such as vehicles, robots or video games.

For this reason, this Advanced Master's Degree of TECH contains everything expected and required for the computer scientist who wants to lead his career towards the creation and virtualization of realistic or fantasy environments. In this program you will develop your most advanced skills in the field of creation and virtualization of 3D models, while perfecting your skills in the most advanced tools in the industry. In this way, you will be able to lead the most ambitious Virtual Reality and Computer Vision projects.

Throughout the program, the computer scientist will also analyze how machines process the visual information received and how this information can be used, either to improve the relationship of the machine itself with its own environment or to collect data efficiently. Deep Learning, a field in continuous development, is approached in the program from an innovative and practical perspective. The computer scientist will know the most important frameworks and hardware in this regard, as well as their application in the different fields of action of computer vision.

In addition, the computer scientists will enjoy TECH's 100% online methodology, specially designed so that they can combine this program with all kinds of jobs or responsibilities, since it adapts to their personal circumstances. This allows you the flexibility to pursue this educational program without fixed schedules or compulsory attendance at physical centers. Therefore, you have the freedom to distribute the educational content according to your own personal obligations, since all the material can be downloaded from any device with internet access.

This **Advanced Master's Degree in Virtual Reality and 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 Virtual Reality and Computer Vision
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where self assessment can be used to improve learning
- Its special emphasis on innovative methodologies in virtual reality, 3D animation and computer vision
- 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

Get ahead of the rest and enroll in this program to become a true expert in the technologies that are changing the world today"

Delve into Artificial Intelligence and Deep Learning to become a reference in the field of Computer Vision, taking advantage of the most advanced technological tools in the sector"

Don't be left behind and get to know all the novelties of Virtual Reality and Computer Vision, taking a decisive step in your professional career by including this Advanced Master's Degree in your CV.

Join the most ambitious projects of consolidated companies such as Valve, Microsoft, Google, Ubisoft or Samsung.

Its teaching staff includes professionals from the field of information technology, who bring to this program the experience of their work, as well as recognized specialists from leading companies 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 an immersive learning experience designed to prepare for real-life situations.

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

02
Objectives

The main objective of this program is to provide the computer scientist with the latest developments in the field of Virtual Reality and Computer Vision, developing and perfecting their professional work with the best tools on the market. Therefore, this program offers a great in-depth knowledge in this field to boost their career towards the best companies in this sector, having a highly versatile and demanded set of knowledge for the most complex projects.

You will reach the best professional positions thanks to the most advanced tools and knowledge in Virtual Reality and Computer Vision provided by this Advanced Master's Degree"

General Objectives

- Obtain an overview of the devices and hardware used in the computer vision world
- Analyze the different fields in which vision is applied
- Identify where the technological advances in vision are at the moment
- Assess what is being researched and what the next few years hold
- Establish a solid foundation in the understanding of digital image processing algorithms and techniques
- Assess fundamental computer vision techniques
- Analyze advanced image processing techniques
- Introducing the open 3D library
- Analyze the advantages and difficulties of working in 3D instead of 2D
- Introduce neural networks and examine how they work
- Analyze metrics for proper learning
- Analyze existing metrics and tools
- Examine the pipeline of an image classification network
- Analyze semantic segmentation neural networks and their metrics
- Analyze the virtual reality and video game industry
- Develop the most advanced technology to create computer-generated content
- Promote the student's autonomy in the field of video game design
- Study the most avant-garde techniques focused on 3D modeling
- Develop an advanced level of specialization to fit in any animation team

- Broaden specialized knowledge for project management from start to finish
- Analyze the production processes of a video game and its importance for the final product
- Be able to successfully carry out VR projects
- Develop specialized knowledge about the video game industry and its intricacies
- Apply the concepts acquired for the implementation of video games in virtual reality
- Develop specialized knowledge in professional video game programming
- Provide an integrated vision of the production process
- Master the advanced techniques of character creation for video games
- Achieve success during the different development phases of a virtual reality-based video game
- Provide students with technical resources to implement in their developments and productions
- Provide a different vision to the production to make it unique and differentiated
- Obtain the most updated knowledge of the market in reference to virtual reality
- Determine the process of creating virtual reality projects
- Apply virtual reality in different sectors
- Develop virtual reality applications
- Analyze the market to understand what the public demands
- Tackle any virtual reality project for both web and VR devices

Specific Objectives

Module 1. Computer Vision

- 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

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

Module 4. Advanced Digital Image Processing

- 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

Module 5. 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 6. Deep Learning

- Analyze the families that make up the artificial intelligence world
- Compile the main Frameworks of Deep Learning
- Define neural networks
- Present the learning methods of neural networks
- Fundamentals of cost functions
- Establish the most important activation functions
- Examine regularization and normalization techniques
- Develop optimization methods
- Introduce initialization methods
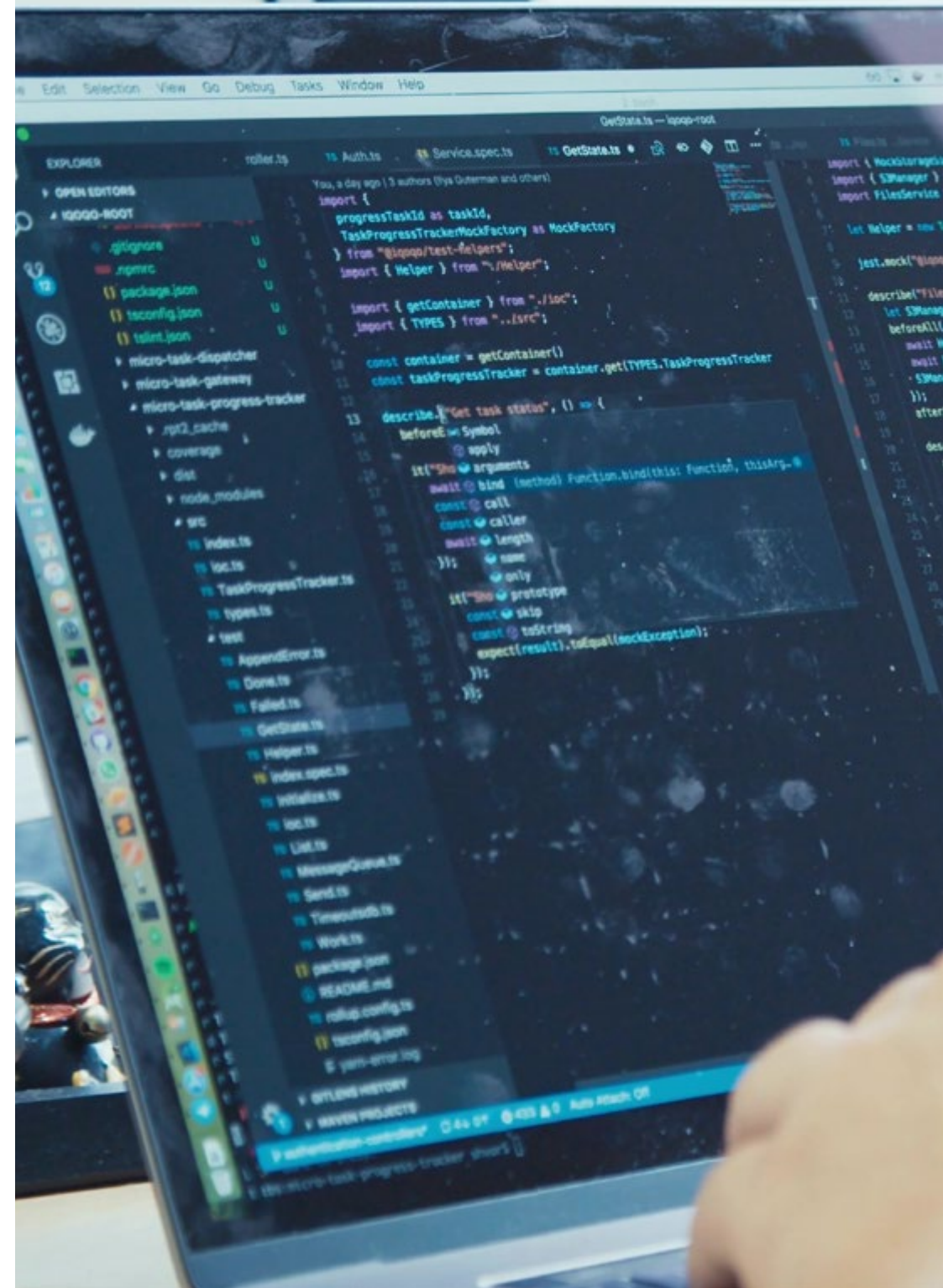
Module 7. Convolutional Neural Networks and Image Classification

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

Module 8. Object Detection

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

Module 9. 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 10. 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 Adversarial Generative Networks

Module 11. 3D Computer Graphics

- Perform human-computer interaction according to usability criteria
- Use graphical interfaces for videogame development
- Solve problems in the environment of graphic applications
- Consolidate knowledge and skills that allow the development of computer projects in this field

Module 12. Advanced 3D Modeling

- Master the 3D modeling technique
- Analyze the basics of human and animal anatomy
- Learn the techniques necessary to model any object or character
- Apply textures in an optimal way
- Acquire the necessary skills to work with multidisciplinary teams
- Offer an updated professional vision

Module 13. Advanced Animation and Simulation

- Generate specialized knowledge in key animation programs
- Establish the most relevant aspects of animation
- Control the necessary processes to animate any character
- Enhance the appropriate skills to be able to integrate into any work team
- Develop the fundamental skills for professional animation
- Develop a level of specialization to access the animation industry

Module 14. Creative and Conceptual Development. Project Briefing

- Identify weaknesses in a project in order to address them in time
- Plan and meet deadlines
- Maintaining optimal communication between all parts of the team
- Maintain creativity at the highest level
- Identify project needs
- Achieve a successful launch

Module 15. Video Game Development

- Programming physical behaviors in video games
- Determining the skeleton of a video game
- Control the use of professional engines
- Develop the specific techniques for each type of game
- Handling the most advanced tools to solve any problem
- Develop all types of video games

Module 16. Advanced Unreal Engine
- Generate specialized knowledge on programming techniques
- Develop skills of working in multidisciplinary teams and conflict resolution in development
- Introduce the most popular platforms
- Programming physical behaviors in video games
- Control professional engines
- Determine the specific techniques for each type of game

Module 17. Advanced 3D Unity
- Prioritize the quality of the work
- Prepare any type of realistic animation
- Optimize animations for proper functioning
- Compile the main libraries
- Master animation techniques to manipulate any material
- Solve any incident during the process

Module 18. Creating Cinematics with Sequencer and Niagara
- Bringing cinematic aesthetics to productions
- Add spectacularity to virtual reality productions
- Acquire fluency when producing contents
- Develop specialized knowledge to develop mobile games
- Provide the production team with updated tools
- Integrate the acquired techniques to get the most out of the development

Module 19. Virtual reality
- Develop advanced knowledge of software specialized in virtual reality
- Control the different devices and their utilities
- Examine virtual environments
- Make decisions in real time
- Develop 360º visualizations
- Determine possible applications focused on virtual reality

Module 20. Software for Virtual Reality Development
- Analyze the different VR development softwares
- Determine and meet the specific needs of the VR market
- Apply knowledge of 3D to virtual reality
- Examine augmented reality from the inside

Thanks to this TECH educational program you will achieve all your goals, while becoming a reference computer scientist for the most important companies"

03
Skills

During the course of this Advanced Master's Degree, the computer scientist will be able to develop numerous skills in the fields of Machine Learning, Deep Learning and Artificial Intelligence. Likewise, the professional will be able to develop and create environments, objects and characters in fully digitized spaces. In this way, they will have obtained the best tools to create and carry out complex Virtual Reality and Computer Vision projects, which will undoubtedly have a positive impact on their future professional achievements.

Your professional profile will be positioned among the best jobs in the labor market thanks to all the skills you will acquire with this program"

General Skills

- Understand how the real world is being digitized according to the different existing technologies
- Develop the systems that are changing the world of vision and their functionalities
- Master the acquisition techniques to obtain the optimal image
- Know the different digital image processing libraries available on the market
- 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
- Design, model and generate graphic environments
- Create objects or characters using digital software
- Bring 3D modeled characters or objects to life
- Mastering model and texture optimization techniques
- Mastering the different phases of video game development
- Optimize resources and time to obtain quality results
- Create virtual reality applications for different uses
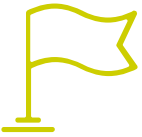
Specific Skills

- Determine how a 3D image is formed and its characteristics

- Establish methods for the processing of 3D images

- Understanding the mathematics behind neural networks

- Propose inference methods

- Generate specialized knowledge about object detection neural networks and their metrics

- Identify the different architectures

- Examine tracking algorithms and their metrics

- Identify the most common architectures

- Apply correct cost function for learning

- Analyze public data sources (Datasets)

- Examine different labeling tools

- Develop the main phases of a segmentation-based project

- Examine filtering algorithms, morphology, pixel modification, etc.

- Generate specialized knowledge about Deep Learning and analyze why now

- Develop convolutional neural networks

- Represent information of diverse nature in a graphical way

- Design characters and objects in 3D environments using tools of diverse nature

- Create quality animation projects with the most innovative tools on the market

- Lead multidisciplinary work teams focused on video game development

- Analyze the anatomy and behavior of characters

- Create immersive 3D and virtual reality environments

- Handle different creation and animation tools and techniques

- Bring to life everything imaginable and transferable to a 3D environment

- Create any type of application for educational use based on gamification

- Optimize VR video game development processes

Do not hesitate to give that extra quality to your resume with the latest knowledge in Virtual Reality and Computer Vision that you will learn in this program"

Course Management

This program has a high level teaching staff made up of active professionals who develop their careers in the field of Virtual Reality and Computer Vision, as well as with extensive experience in 3D design of all types of virtual projects. In this way, the computer scientist who enrolls in this Advanced Master's Degree will be able to access all the keys in this field and apply everything learned directly in their work even before completing the program.

"
You will have the advice of the best teachers, experts in the field, who will transmit all the keys to computer vision in a simple and direct way"

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#

Mr. Horischnik Arbo, Manuel

- CEO at Ibercover Studio
- Director of commercial management and marketing at Corporación CRN Televisión
- Degree in Business Administration and Management
- Master's Degree in 3D Modeling and Animation

Professors

Mr. Gutiérrez Olabarría, José Ángel
- Senior Computer Vision and Sensor Engineer
- Market manager for the iron and steel sector, performing customer contact, contracting, market plans and strategic accounts functions
- Leads projects, analysis and design of software and C programming of quality control and industrial computing applications, customer and supplier management at Tecnalia
- Professor of the subject of Industrial Perception in the specialization of Automation and Electronics at the School of Engineering of the University of Deusto (ESIDE)
- Degree in Computer Engineering from the University of Deusto
- Master in Robotics and Automation. ETSII/IT of Bilbao
- Diploma of Advanced Studies of the PhD program in Automation and Electronics by ETSII/IT of Bilbao

Mr. Enrich Llopart, Jordi
- Technical Director Bcnvision. Computer Vision
- Project and application engineer. Bcnvision. Computer Vision
- Project and application engineer. PICVISA Machine Vision
- Lecturer in programming training for Cognex computer vision systems
- Degree in Telecommunications Technical Engineering. Specialization in Image and Sound by the University School of Engineering of Terrassa / Polytechnic University of Catalonia
- MPM-Master in Project Management. La Salle University - Ramon Llull University

Dr. Riera i Marín, Meritxell
- Deep Learning developer at Sycai Medical
- Researcher at Centre National de la Recherche Scientifique
- Software engineer at Zhilabs
- IT Technician, Mobile World Congress
- Software engineer at Avanade
- Telecommunications Engineering at UPC
- PhD. Pompeu Fabra University (UPF)
- Industrial PhD in collaboration with Sycai Medical
- Master of Science: Spécialité Signal, image, systèmes embarqués, automatique (SISEA) at IMT Atlantique. Pays de la Loire - Brest, France
- Master's Degree in Telecommunications Engineering at UPC

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
- Master's Degree in Artificial Intelligence from the International University of La Rioja

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

Ms. García Moll, Clara
- Computer Vision Engineer. Satellogic
- Full Stack Developer. Catfons
- Audiovisual Systems Engineering from Pompeu Fabra University
- Master's Degree in Computer Vision from the Autonomous University of Barcelona

Mr. Delgado Gonzalo, Guillem
- Computer Vision and Artificial Intelligence Researcher at Vicomtech
- Computer Vision and Artificial Intelligence Engineer at Gestoos
- BSc in Audiovisual Systems Engineering at Polytechnic University of Catalonia
- MSc in Computer Vision at the Autonomous University of Barcelona

Mr. Bigata Casademunt, Antoni
- Perception Engineer at Computer Vision Center
- Machine Learning Engineer at Visium SA, Switzerland
- Degree in Microtechnology from Ecole Polytechnique Fédérale de Lausanne, Switzerland
- Master's degree in Robotics from Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

Mr. Rodríguez Cabrera, Jonathan

- Design of branding, 3D product, 3D clothing, advertising and production plans for Riding Solutions, Mudwar and Assault Bike Wear
- Character design and development for Ultras City The Game
- Creation and management of the school of new technologies at Tooning 3D School
- Professor in the Master of Video Game Production at the European University of Madrid
- Degree in Industrial Design at the Instituto Europeo di Design (IED)
- Master's Degree in 3D Design and Animation at CICE, Madrid

Mr. Alcalá Zamora, Jorge

- Art Director at Ibercover Studio and Enne Entertainment
- 3D Artist and Video and 3D Projection Technician Scenica
- 3D Artist at Revistronic and Virtual Toys
- Master's Degree in 3D, Animation and Postproduction Discreet
- Master's Degree in Videogames
- Unity 3D and Unreal Engine Expert

Mr. Carmena García-Bermejo, Carlos

- IT specialist in Ibercover Studio
- Bachelor of Fine Arts
- Master's Degree in 3D Modeling with ZBrush
- Master's Degree in 3D Max Design
- Expert in the creation of photorealistic 3D images
- Unreal Engine 4 Expert for Scenario Design

05

Structure and Content

The contents of this Advanced Master's Degree have been designed by leading international experts in the field, guaranteeing computer scientists access to highly specialized and updated knowledge that will place them as a reference in the sector. In this program you will be able to delve into aspects such as computer vision for the study of space and for content analysis, in the search for patterns and codes, as well as in all fields related to animation and 3D computing in virtual reality environments, with topics and subtopics dedicated to the main tools, working methods, digital resources and forms of team organization.

Access a library of high quality content that delves into the wide world of Virtual Reality and Computer Vision with detailed videos, simulated cases and complementary readings"

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 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

Module 4. Advanced Digital Image Processing

Module 5. 3D Image Processing

Module 6. Deep Learning

Module 8. Object Detection

8.1. Object Detection and Tracking
    8.1.1. Object Detection
    8.1.2. Case Uses
    8.1.3. Object Tracking
    8.1.4. Case Uses
    8.1.5. Occlusions, Rigid and Non-Rigid Poses

8.2. Assessment Metrics
    8.2.1. IOU - Intersection Over Union
    8.2.2. Confidence Score
    8.2.3. Recall
    8.2.4. Precision
    8.2.5. Recall-Precisión Curve
    8.2.6. Mean Average Precision (mAP)

8.3. Traditional Methods
    8.3.1. Sliding Window
    8.3.2. Viola Detector
    8.3.3. HOG
    8.3.4. Non Maximal Supresion (NMS)

8.4. Datasets
    8.4.1. Pascal VC
    8.4.2. MS Coco
    8.4.3. ImageNet (2014)
    8.4.4. MOTA Challenge

8.5. Two Shot Object Detector
    8.5.1. R-CNN
    8.5.2. Fast R-CNN
    8.5.3. Faster R-CNN
    8.5.4. Mask R-CNN

8.6. Single Shot Object Detector
    8.6.1. SSD
    8.6.2. YOLO
    8.6.3. RetinaNet
    8.6.4. CenterNet
    8.6.5. EfficientDet

8.7. Backbones
    8.7.1. VGG
    8.7.2. ResNet
    8.7.3. Mobilenet
    8.7.4. Shufflenet
    8.7.5. Darknet

8.8. Object Tracking
    8.8.1. Classical Approaches
    8.8.2. Particulate Filters
    8.8.3. Kalman
    8.8.4. Sort Tracker
    8.8.5. Deep Sort

8.9. Deployment
    8.9.1. Computing Platform
    8.9.2. Choice of Backbone
    8.9.3. Choice of Framework
    8.9.4. Model Optimization
    8.9.5. Model Versioning

8.10. Study: People Detection and Tracking
    8.10.1. Detection of People
    8.10.2. Monitoring of People
    8.10.3. Re-Identification
    8.10.4. Counting People in Crowds

Module 9. Image Segmentation with Deep Learning

9.1.   Object Detection and Segmentation
   9.1.1.   Semantic Segmentation
      9.1.1.1. Semantic Segmentation Use Cases
   9.1.2.   Instantiated Segmentation
      9.1.2.1. Instantiated Segmentation Use Cases
9.2.   Evaluation Metrics
   9.2.1.   Similarities with Other Methods
   9.2.2.   Pixel Accuracy
   9.2.3.   Dice Coefficient (F1 Score)
9.3.   Cost Functions
   9.3.1.   Dice Loss
   9.3.2.   Focal Loss
   9.3.3.   Tversky Loss
   9.3.4.   Other Functions
9.4.   Traditional Segmentation Methods
   9.4.1.   Threshold Application with Otsu and Riddlen
   9.4.2.   Self-Organized Maps
   9.4.3.   GMM-EM Algorithm
9.5.   Semantic Segmentation Applying Deep Learning: FCN
   9.5.1.   FCN
   9.5.2.   Architecture
   9.5.3.   FCN Applications
9.6.   Semantic Segmentation Applying Deep Learning: U-NET
   9.6.1.   U-NET
   9.6.2.   Architecture
   9.6.3.   U-NET Application
9.7.   Semantic Segmentation Applying Deep Learning: Deep Lab
   9.7.1.   Deep Lab
   9.7.2.   Architecture
   9.7.3.   Deep Lab Application

9.8.   Instantiated Segmentation Applying Deep Learning: Mask RCNN
   9.8.1.   Mask RCNN
   9.8.2.   Architecture
   9.8.3.   Application of a Mask RCNN
9.9.   Video Segmentation
   9.9.1.   STFCN
   9.9.2.   Semantic Video CNNs
   9.9.3.   Clockwork Convnets
   9.9.4.   Low-Latency
9.10.   Point Cloud Segmentation
   9.10.1.   The Point Cloud
   9.10.2.   PointNet
   9.10.3.   A-CNN

Module 10. Advanced Image Segmentation and Advanced Computer Vision Techniques

10.1.   Database for General Segmentation Problems
   10.1.1.   Pascal Context
   10.1.2.   CelebAMask-HQ
   10.1.3.   Cityscapes Dataset
   10.1.4.   CCP Dataset
10.2.   Semantic Segmentation in Medicine
   10.2.1.   Semantic Segmentation in Medicine
   10.2.2.   Datasets for Medical Problems
   10.2.3.   Practical Applications
10.3.   Annotation Tools
   10.3.1.   Computer Vision Annotation Tool
   10.3.2.   LabelMe
   10.3.3.   Other Tools

Module 11. 3D Computer Graphics

Module 12. Advanced 3D Modeling

Module 13. Advanced Animation and Simulation

13.1. Software Operation
    13.1.1. Information Management and Work Methodology
    13.1.2. Animation
    13.1.3. Timing and Weighting
    13.1.4. Animation With Basic Objects

13.2. Direct and Inverse Kinematics
    13.2.1. Inverse Kinematics
    13.2.2. Kinematic Chain

13.3. Anatomy. Biped Vs. Quadruped
    13.3.1. Biped. Simplicity and Utility
    13.3.2. Quadruped. Simplicity and Utility
    13.3.3. Walking Cycle
    13.3.4. Running Cycle

13.4. Rig facial and Morpher
    13.4.1. Facial Language. Lip-Sync, Eyes, Focuses of Attention.
    13.4.2. Sequence Editing

13.5. Applied Animation
    13.5.1. 3D Animation for Cinema and Television
    13.5.2. Animation for Video Games
    13.5.3. Animation for Other Applications

13.6. Motion Capture with Kinect
    13.6.1. Motion Capture for Animation
    13.6.2. Sequence of Movements
    13.6.3. Integration in Blender

13.7. Skeleton, Skinning and Setup
    13.7.1. Interaction Between Skeleton and Geometry
    13.7.2. Mesh Interpolation
    13.7.3. Animation Weights

13.8. Acting
    13.8.1. Body Language
    13.8.2. Poses
    13.8.3. Sequence Editing

13.9. The Shot
    13.9.1. The Camera and the Environment
    13.9.2. Composition of the Shot and the Characters
    13.9.3. Finishes

13.10. Visual Effects
    13.10.1. Visual Effects and Animation
    13.10.2. Types of Optical Effects
    13.10.3. 3D VFX L

Module 14. Creative and Conceptual Development. Project Briefing

14.1. Development of the Idea
    14.1.1. General Idea
    14.1.2. SWOT (Strengths, Weaknesses, Opportunities, Threats and Opportunities)
    14.1.3. Anticipation of Problems, Solutions and Project Needs

14.2. Scenarios and Assets
    14.2.1. Scenario Design
    14.2.2. Design of Assets
    14.2.3. Interaction with Levels
    14.2.4. Production Planning

14.3. Characters
    14.3.1. Character Design
    14.3.2. Design of All Character Assets
    14.3.3. Interaction with Levels
    14.3.4. Production Planning

14.4. Plot Development
    14.4.1. General Description of the Game/App
    14.4.2. Assignment of Objectives by Levels
    14.4.3. Creation of the Bible and Briefing for Developers

Module 15. Video Game Development

Module 17. Unity 3D Advanced

17.1. Technical Process
    17.1.1. Character Creation and Optimization
    17.1.2. Application of Advanced Rhetopologies
    17.1.3. High Polygonization Transfers
    17.1.4. Photometry

17.2. Character Design
    17.2.1. Skills
    17.2.2. Anatomy Techniques
    17.2.3. Creation and Behavior

17.3. Exporting Skeletal Meshes and Importing into Unreal
    17.3.1. Exporting Skeletal Meshes from the 3D Software
    17.3.2. Importing Skeletal Meshes in Unreal
    17.3.3. Optimization

17.4. Importing Animations
    17.4.1. Animation Preparation
    17.4.2. Importing Animations
    17.4.3. Troubleshooting Import Errors

17.5. Animation Editor
    17.5.1. Creating Blend Spaces
    17.5.2. Creating Animation Montage
    17.5.3. Creating Notifies to Generate Events in an Animation
    17.5.4. Creating Shokets for Linking to Objects or Particles

17.6. Physics Applied to a Character or Object
    17.6.1. 3D Physics in Unity
    17.6.2. Endowing Realism to the Character
    17.6.3. The Laws of Physics

17.7. Creation and Simulation of a Physx Ragdoll
    17.7.1. Configuration of a Ragdoll
    17.7.2. Ragdoll to an Animation Graph
    17.7.3. Simulation of a Ragdoll

17.8. Resources for Character Creation
    17.8.1. Libraries
    17.8.2. Importing and Exporting Library Materials
    17.8.3. Handling of Materials

17.9. Work Teams
    17.9.1. Channeling of Resources
    17.9.2. Asset Processor
    17.9.3. Resource Generator

17.10. Requirements for Successful Development
    17.10.1. Production for Success
    17.10.2. Optimal Development
    17.10.3. Essential Requirements

Module 18. Creating Cinematics with Sequencer and Niagara

18.1. The Cameras
    18.1.1. Overview of a Scene
    18.1.2. Specific View and Details of a Scene
    18.1.3. Scene Approach

18.2. Unreal Engine Sequencer Tool
    18.2.1. Sequencer
    18.2.2. Kinematics Generation
    18.2.3. Types of Cameras

18.3. Creating Cinematics with Sequencer
    18.3.1. Animation of Cinematic Cameras
    18.3.2. Creating and Editing Shots
    18.3.3. Playback of Sequenced Animations

18.4. Animated In-Game Objects
    18.4.1. Animating Objects in Unreal with Sequencer
    18.4.2. Types of Animation
    18.4.3. Creating a Turntable

18.5. Particle System with Niagara
    18.5.1. Types of Particle Systems
    18.5.2. Creating Particle Systems

Module 20. Software for Virtual Reality Development

20.1. Advanced Virtual Reality Applications

   20.1.1. Creation of Advanced VR Applications for Mobiles

   20.1.2. Creation of Advanced VR Standalone Applications

   20.1.3. Creating Advanced VR Applications for PCs

20.2. Virtual Reality with Unreal Engine

   20.2.1. Bidirectionality

   20.2.2. Content Organization

   20.2.3. Application Development

20.3. Virtual Reality with Unity

   20.3.1. Bidirectionality

   20.3.2. Content Organization

   20.3.3. Application Development

20.4. Virtual Reality Design Coordination

   20.4.1. General Aspects to be Taken into Account

   20.4.2. Workflows

   20.4.3. Data Science

20.5. Extended Reality

   20.5.1. Extended Reality

   20.5.2. Contextualization

   20.5.3. Implementation.

20.6. Mixed Reality

   20.6.1. Mixed Reality

   20.6.2. Uses of Mixed Reality

   20.6.3. Types of Mixed Reality Applications

20.7. Mixed Reality Software

   20.7.1. Mixed Reality with Unity

   20.7.2. Mixed Reality with Unreal Engine

   20.7.3. Mixed Reality Devices

20.8. Augmented Reality

   20.8.1. Augmented Reality

   20.8.2. Creation of Augmented Reality Experiences

   20.8.3. Augmented Reality Applications

20.9. Creating Augmented Reality Applications

   20.9.1. Augmented Reality with Unity

   20.9.2. Augmented Reality with Vuforia

   20.9.3. Augmented Reality with Unreal Engine

20.10. Implementation of Virtual Reality

   20.10.1. Uses of Virtual Reality

   20.10.2. Educational and Training Applications of Virtual Reality

   20.10.3. Creating a Useful Virtual Reality Application

   20.10.4. Sales Strategy for a Virtual Reality Application

With the advanced knowledge you will acquire in this Advanced Master's Degree you will be able to access jobs in the best video game and 3D design companies"

06
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.

01 learning from evidence

02 relearning from evidence

03 testing

04 learning from an expert

05 neurocognitive context dependent learning

06 Von-Restorff effect

07 case based learning through storytelling

08 competencies testing (retesting)

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.

30%

10%

8%

20%

25%

4%

3%

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.

07

Certificate

The Advanced Master's Degree in Virtual Reality and Computer Vision guarantees students, in addition to the most rigorous and up to date education, access to a 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 **Advanced Master's Degree diploma in Virtual Reality and Computer Vision** 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.
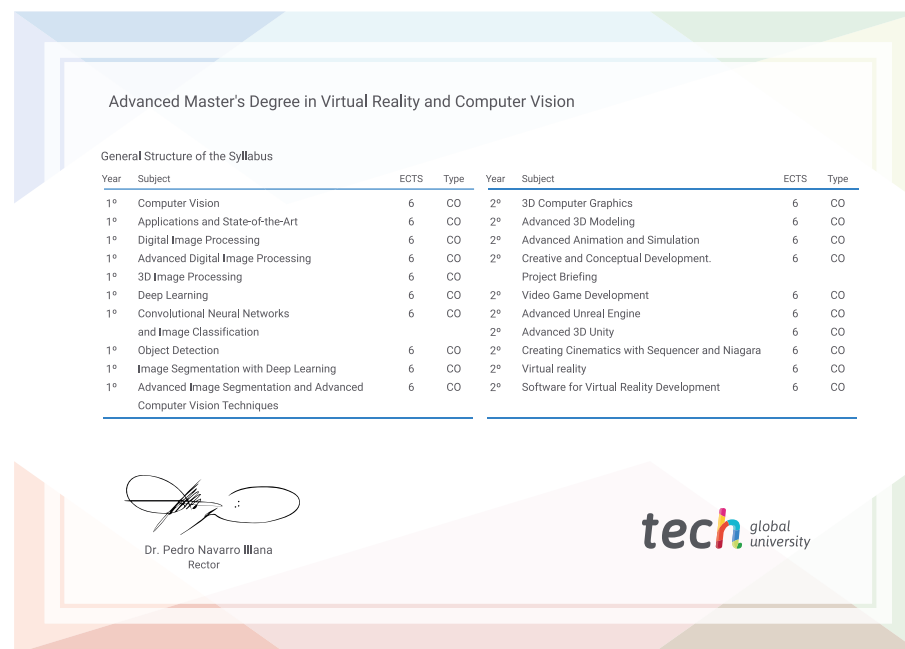
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Advanced Master's Degree in Virtual Reality and Computer Vision**

Modality: **online**

Duration: **2 years**

Accreditation: **120 ECTS**

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tech global university

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

Advanced Master's Degree in Virtual Reality and Computer Vision

This is a program of 3,000 hours of duration equivalent to 120 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

Advanced Master's Degree in Virtual Reality and Computer Vision

General Structure of the Syllabus

Year	Subject	ECTS	Type	Year	Subject	ECTS	Type
1º	Computer Vision	6	CO	2º	3D Computer Graphics	6	CO
1º	Applications and State-of-the-Art	6	CO	2º	Advanced 3D Modeling	6	CO
1º	Digital Image Processing	6	CO	2º	Advanced Animation and Simulation	6	CO
1º	Advanced Digital Image Processing	6	CO	2º	Creative and Conceptual Development.	6	CO
1º	3D Image Processing	6	CO		Project Briefing		
1º	Deep Learning	6	CO	2º	Video Game Development	6	CO
1º	Convolutional Neural Networks	6	CO	2º	Advanced Unreal Engine	6	CO
	and Image Classification			2º	Advanced 3D Unity	6	CO
1º	Object Detection	6	CO	2º	Creating Cinematics with Sequencer and Niagara	6	CO
1º	Image Segmentation with Deep Learning	6	CO	2º	Virtual reality	6	CO
1º	Advanced Image Segmentation and Advanced	6	CO	2º	Software for Virtual Reality Development	6	CO
	Computer Vision Techniques						

Dr. Pedro Navarro Illana
Rector

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*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.

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Advanced Master's Degree
Virtual Reality and Computer Vision

- » Modality: **online**
- » Duration: **2 years**
- » Certificate: **TECH Global University**
- » Credits: **120 ECTS**
- » Schedule: **at your own pace**
- » Exams: **online**

Advanced Master's Degree
Virtual Reality and
Computer Vision

3 Seater Sofa
W180 x H82 x D65

Color:

tech global university