Postgraduate Certificate

Visual SLAM: Robot Localization and Simultaneous Mapping Using Computer Vision

tech global university

Postgraduate Certificate
Visual SLAM: Robot Localization
and Simultaneous Mapping
Using Computer Vision

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

Website: **www.techtitute.com/us/engineering/postgraduate-certificate/visual-slam-robot-localization-simultaneous-mapping-using-computer-vision**

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01
Introduction

Virtual Reality, Augmented Reality or the localization of systems in unknown environments would not have reached a great development without the application of the so-called SLAM. An advanced technology that enables accurate map generation. An advance that has led to a boom in an industry that increasingly calls for more qualified professionals. This is the reason for the creation of this fully online program, which offers engineers the opportunity to advance in their careers. A program with updated multimedia content, which includes the most commonly used techniques and tools in the sector, thanks to the contribution of the teaching team specialized in Robotics, which makes up this program.

" *A 100% university program that allows you to combine your personal responsibilities with quality education. Enroll now"*

In the quest for robot autonomy, professionals are faced with the problem of movement and localization. SLAM allows the implementation of systems, from the simplest to the most complex, to obtain high accuracy in map generation and localization. This Postgraduate Certificate, aimed at engineering professionals, provides advanced knowledge in this field from a highly qualified teaching team with experience in the field of robotics.

A 100% online program in which students will delve into this technology in the algorithms developed in different theoretical frameworks such as Gaussian Filters, Graphs, Optimization, which will allow students to develop those systems that best align with their knowledge. In addition, the faculty will provide the tools currently in use that will enable the engineering professional to decide which of the visual SLAM approaches will work best in different environments and circumstances. For this purpose, different theoretical frameworks, parameterizations and sensors will be analyzed. In addition, real case studies will provide students with a basis for direct application in their day-to-day work in the robotics sector.

A good opportunity for the professional looking to progress in an industry that has shown significant growth in recent years, due to the benefits it brings to commercial or financial sectors. Thus, this Postgraduate Certificate allows you not only to grow, but also to combine your personal responsibilities with quality teaching, with multimedia content that can be accessed at any time of the day and with a device with an Internet connection.

This **Postgraduate Certificate in Visual SLAM: Robot Localization and Simultaneous Mapping using Computer Vision** contains the most complete and up-to-date program on the market. The most important features include:

- Case studies presented by experts in robotic engineering
- 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
- 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

A university program that allows you to learn about the limits and capabilities of visual SLAM from experts in the field of Robotics"

"

An online teaching that will allow you to configure visual SLAM algorithms in a simple way thanks to multimedia content"

Deepen in an agile way in this Postgraduate Certificate in the basis of projective and epipolar geometry.

Access the resource library and the complete syllabus of this program from day one.

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

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

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

02
Objectives

This Postgraduate Certificate aims to enable students to thrive in an up-and-coming robotics sector. Thus, the engineering professional at the end of this program will be able to know in detail the operation of the main visual SLAM algorithms, make adjustments and parameterization, which will allow him to create his own projects from scratch. All this with a Relearning learning system, based on the reiteration of content, which allows you to advance naturally and progressively in this program.

"

Acquire advanced learning in simultaneous mapping and advance your career in the field of Robotics"

General Objectives

- Develop the theoretical and practical foundations necessary to carry out a robot design and modeling project

- Provide the graduates with an exhaustive knowledge of the automation of industrial processes that will allow them to develop their own strategies

- Acquire the professional skills of an expert in automatic control systems in Robotics

Access the most advanced knowledge in Gaussian filter settings and parameterization and improve object detection"

Specific Objectives

♦ Specify the basic structure of a Simultaneous Localization and Mapping (SLAM) system

♦ Identify the basic sensors used in Simultaneous Localization and Mapping (visual SLAM)

♦ Establish the boundaries and capabilities of visual SLAM

♦ Compile the basic notions of projective and epipolar geometry to understand imaging projection processes

♦ Identify the main visual SLAM technologies: Gaussian filtering, Optimization and loop closure detection

♦ Describe in detail the operation of the main visual SLAM algorithms

♦ Analyze how to carry out the tuning and parameterization of SLAM algorithms

03
Course Management

TECH remains committed to offering students an elite and affordable education. To this end, it rigorously selects the faculty that teaches the programs. On this occasion, the engineering professional has a management and teaching team with extensive experience in the robotics sector and in teaching at the highest level. Their proximity and human quality will allow students to count on specialists who will answer any questions they may have about the syllabus of this Postgraduate Certificate.

"A teaching team specialized in Robotics will show you the recent advances in localization and mapping with Artificial Vision"

International Guest Director

Seshu Motamarri is an expert in automation and robotics with more than 20 years of experience in various industries such as e-commerce, automotive, oil and gas, food and pharmaceutical. Throughout his career, he has specialized in engineering management and innovation and in the implementation of new technologies, always looking for scalable and efficient solutions. He has also made important contributions in the introduction of products and solutions that optimize both safety and productivity in complex industrial environments.

He has also held key positions, including Senior Director of Automation and Robotics at 3M, where he leads cross-functional teams to develop and implement advanced automation solutions. At Amazon, his role as Technical Lead led him to manage projects that significantly improved the global supply chain, such as the "SmartPac" semi-automated bagging system and the robotic smart picking and stowage solution. His skills in project management, operational planning and product development have enabled him to generate great results in large-scale projects.

Internationally, he is recognized for his achievements in IT. He has been awarded the prestigious Amazon Door Desk Award by Jeff Bezos, and has received the Excellence in Manufacturing Safety Award, reflecting his hands-on engineering approach. In addition, he has been a "Bar Raiser" at Amazon, participating in over 100 interviews as an objective evaluator in the hiring process.

In addition, he has several patents and publications in electrical engineering and functional safety, reinforcing his impact on the development of advanced technologies. His projects have been implemented globally, with highlights in regions such as North America, Europe, Japan and India, where he has driven the adoption of sustainable solutions in the industrial and e-commerce sectors.

Mr. Motamarri, Seshu

- Senior Director of Global Manufacturing Technology at 3M, Arkansas, United States
- Director of Automation and Robotics at Tyson Foods
- Hardware Development Manager III at Amazon
- Automation Leader at Corning Incorporated
- Founder and member of Quest Automation LLC
- Master of Science (MS), Electrical and Electronics Engineering at University of Houston
- Bachelor of Engineering (B.E.), Electrical and Electronics Engineering, University of Andhra
- Certification in Machinery, TÜV Rheinland Group

" *Thanks to TECH, you will be able to learn with the best professionals in the world"*

Management

Dr. Felipe Ramón Fabresse

- Senior Software Engineer at Acurable
- NLP Software Engineer at Intel Corporation
- Software Engineer in CATEC, Indisys
- Researcher in Aerial Robotics at the University of Seville
- PhD Cum Laude in Robotics, Autonomous Systems and Telerobotics at the University of Seville
- Degree in Computer Engineering at the University of Seville
- Master's Degree in Robotics, Automation and Telematics at the University of Seville

Professors

Dr. Caballero Benítez, Fernando

- Researcher in the European projects COMETS, AWARE, ARCAS and SIAR
- Degree in Telecommunications Engineering from the University of Seville
- PhD in Telecommunications Engineering at the University of Seville
- Full Professor of Systems Engineering and Automatics at the University of Seville
- Associate editor of the journal Robotics and Automation Letters

04

Structure and Content

This Postgraduate Certificate consists of 180 teaching hours in which students will find an updated syllabus that gives them the opportunity to progress in their professional career. A curriculum consisting of video summaries, specialized readings and real case examples will provide you with advanced knowledge in the field of simultaneous localization and mapping, the most commonly used techniques and the most direct applications of Visual SLAM today. This educational material can be accessed at any time of the day, without fixed schedules, and from a laptop or tablet with an internet connection.
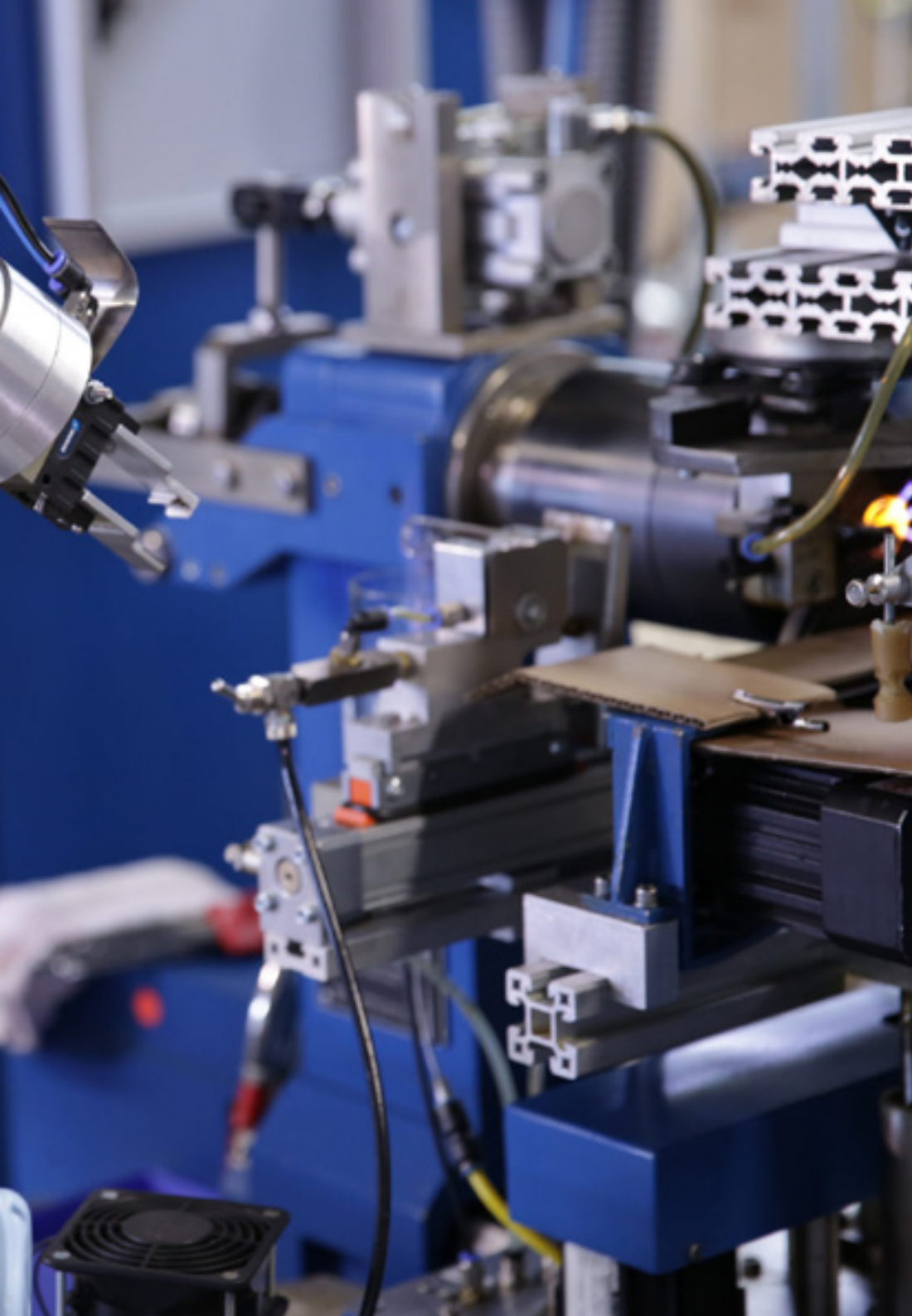
"

This Postgraduate Certificate will deepen the analysis of the Direct Visual SLAM Algorithm with the most updated content"

Module 1. Visual SLAM. Robot Localization and Simultaneous Mapping Using Computer Vision Techniques

A Postgraduate Certificate that will show you the different existing applications of visual SLAM. Click and find out"

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.
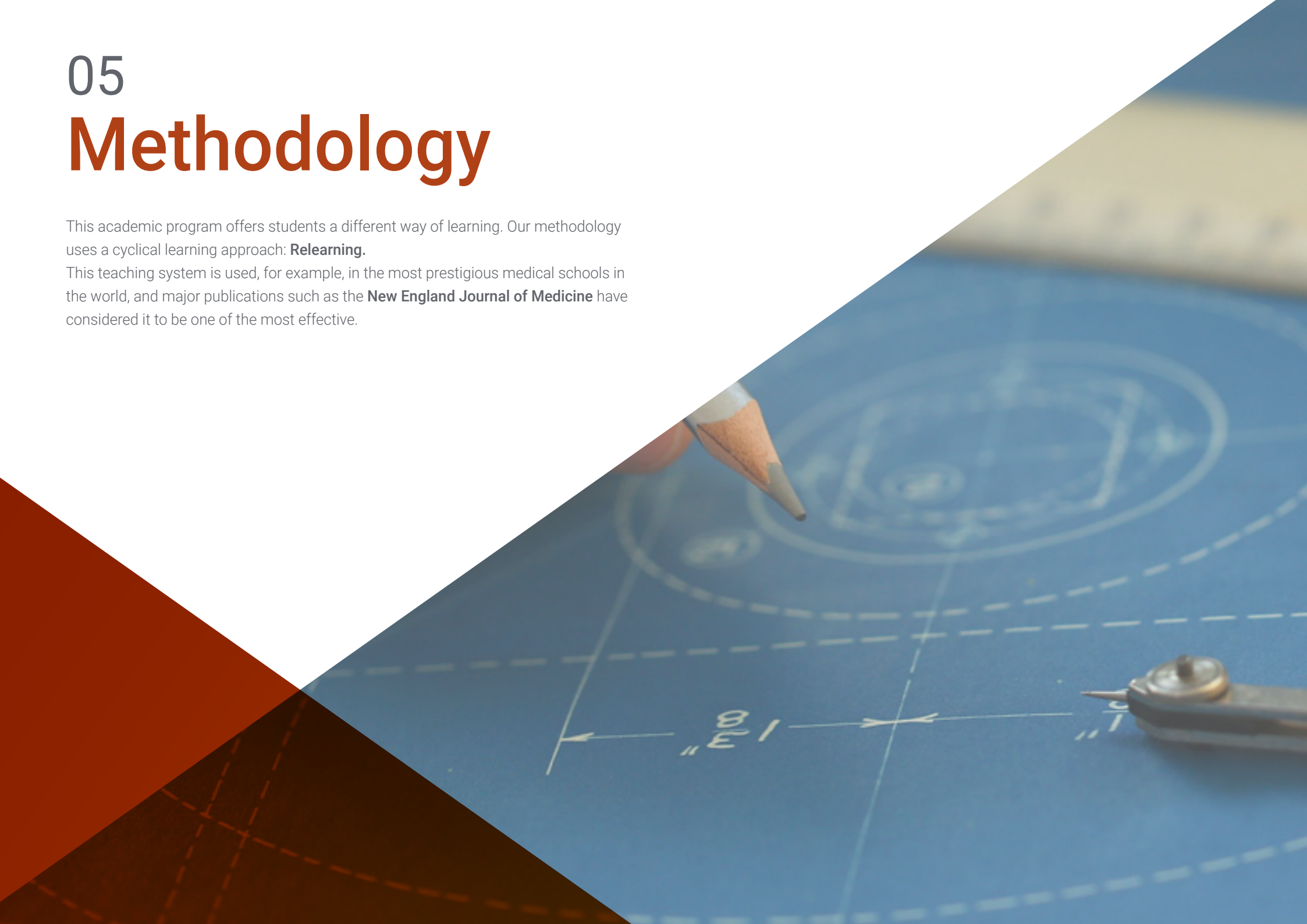
Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

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.

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 is the most widely used learning system in the best faculties in the world. 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 program, the studies 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.

The student will learn to solve complex situations in real business environments through collaborative activities and real cases.

Relearning Methodology

TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 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.

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.

06

Certificate

The Postgraduate Certificate in Visual SLAM: Robot Localization and Simultaneous Mapping Using Computer Vision 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 Visual SLAM: Robot Localization and Simultaneous Mapping Using 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.
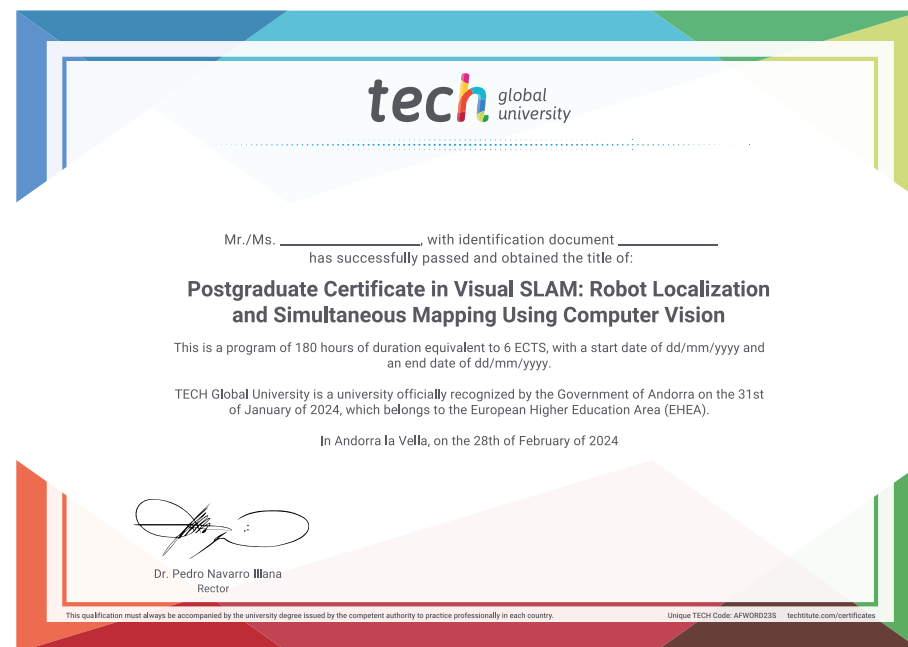
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Visual SLAM: Robot Localization and Simultaneous Mapping Using Computer Vision**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**

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

Postgraduate Certificate in Visual SLAM: Robot Localization and Simultaneous Mapping Using Computer Vision

This is a program of 180 hours of duration equivalent to 6 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

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 Global University will make the necessary arrangements to obtain it, at an additional cost.

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