Postgraduate Certificate
Robot Planning Algorithms

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Postgraduate Certificate

Robot Planning Algorithms

- Modality: **online**
- Duration: **6 weeks**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/in/engineering/postgraduate-certificate/robot-planning-algorithms**

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01

Introduction

Behind every robot that moves autonomously there is a design work and algorithms that allow the planning of tasks and movements. An exhaustive work that requires advanced knowledge and that, thanks to the high qualification of the professionals, has raised the robotics sector to the top. This is why this 100% online program was created, which seeks as its main objective the development and progress of the engineering professional in this field. The specialized teaching team and the multimedia content that make up this teaching will favor the most updated learning in a sector that is currently expanding.

A university degree that will allow you to solve the main problems of Robotics Planning. Enroll now”

This Diploma is aimed at engineering professionals who wish to prosper in the field of robotics under the guidance of a specialized teaching team with a long history in this sector, which is currently on the rise. A teaching in which he will particularly delve into the algorithms used for robot planning.

A program where students, thanks to the extensive didactic material, can delve into the planning of tasks and movements that allow robots or groups of robots to use this information to achieve their goals. Starting from classical planning algorithms, the engineering professional will begin by means of a practical approach to solve the basic problems faced by any robot that wishes to be autonomous in structured and unstructured environments.

This teaching will allow you to plan coordinated movements between groups of robots, establish the most appropriate strategies to assign pending tasks or the activation of sensors that facilitate the perception of the environment by the machines. All this with a university degree in a completely online mode, which will allow you to access from the first day to the full agenda.

An opportunity provided by TECH Technological University to professionals who wish to advance their careers while acquiring advanced learning. They only need a cell phone, a computer or laptop with an Internet connection to access all the multimedia content. In this way, without fixed schedules, and with a Relearning learning system, students will acquire an agile and enjoyable knowledge, which will help them to prosper in a booming industry.

This **Postgraduate Certificate in Robots Planning Algorithms** contains the most complete and up-to-date educational program on the market. Its most outstanding features are:

- 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
- The availability of access to the contents from any fixed or portable device with an internet connection

Get 24-hour access to the most up-to-date multimedia material on the robotics industry and learn how to plan with algorithms now”

Develop with this program the most advanced techniques for environment modeling in robotics. Enroll now"

A 100% online teaching that will allow you to make the most appropriate decisions in the application of Robotics Planning Techniques.

Enroll now in a degree that will allow you to progress in the field of robotics, thanks to the specialized team that teaches it.

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.

Its 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 education programmed to learn in real situations.

The design of this program focuses on Problem-Based Learning, by means of which the professional must try to solve the different professional practice situations that are presented throughout the academic course. This will be done with the help of an innovative system of interactive videos made by renowned experts.

02

Objectives

The main goal of this Diploma is that, during the 6 weeks of duration of this degree, the engineering professional reaches a more specialized knowledge in the area of algorithms used in the planning of robots. An education will allow you to make the most appropriate decisions in the complexity of robotic movements, to correctly identify the different elements in the decision theory and to solve any problem by means of learning algorithms. The teaching team that makes up this teaching will accompany the students to achieve their objectives.

TECH Technological University
Relearning system reduces study time and promotes progressive knowledge"

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

Enroll in a Diploma Course where you will learn how to pose and solve problems by Optimal Sampling"

Specific Objectives

- Establish the different types of planning algorithms
- Analyze the complexity of motion planning in robotics
- Develop techniques for environment modeling
- Examine the pros and cons of different planning techniques
- Analyze centralized and distributed algorithms for robot coordination
- Identify the different elements in decision theory
- Propose learning algorithms for solving decision problems

03

Course Management

The course management and the teaching staff of this university degree have experience in Robotics and Engineering projects and in teaching at the highest level. His experience and deep knowledge in the field of Robot Planning Algorithms will be poured into this Diploma. Likewise, their human quality and closeness will facilitate the resolution of any doubts that the students may have during the course of this teaching. All this will favor students who wish to specialize in a sector that increasingly demands highly qualified personnel.

Engineering experts with professional experience will accompany you in this degree to help you reach the top in the field of Robotics"

Management

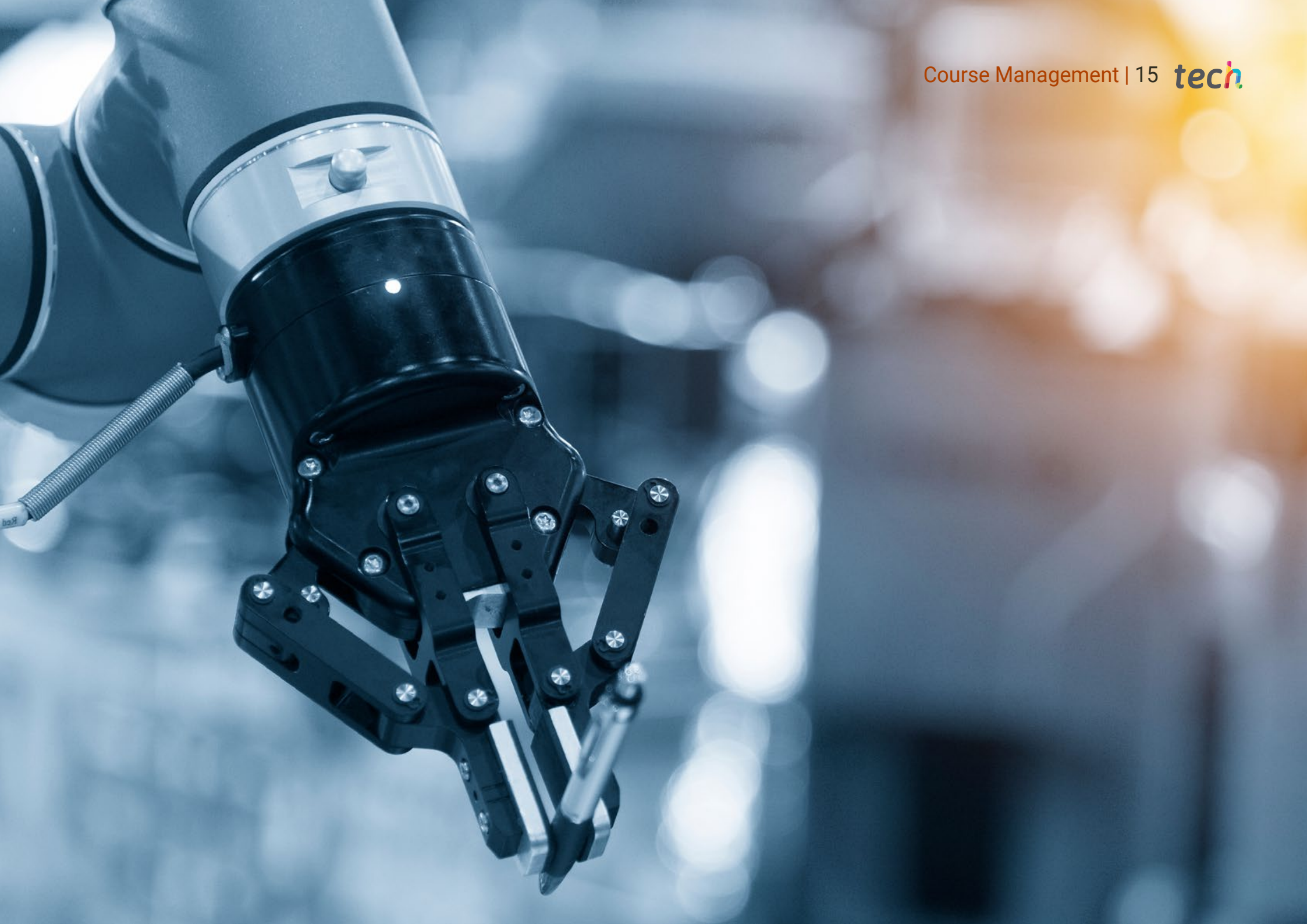
Dr. Ramón Fabresse, Felipe

- 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. Alejo Teissière, David

- Telecommunications Engineer.with Specialization in Robotics
- Postdoctoral Researcher in the European projects SIAR and NIx ATEX at Pablo de Olavide University
- Systems Developer at Aertec
- PhD in Automation, Robotics and Telematics at the University of Seville
- Graduated in Telecommunication Engineering at the University of Seville
- Master's Degree in Automation, Robotics and Telematics from the University of Seville



04

Structure and Content

The syllabus of this Postgraduate Certificate has been elaborated strict Stated of the teaching team that taught this degree at TECH Technological University. Thus, the engineering professional who accesses this degree will have at his disposal video summaries, specialized readings and real case studies that will provide him with a wide knowledge about Robot Planning Algorithms. In this way, it will delve into the main trajectory problems in mobile robots, planning in high-dimensional robots, robot coordination, planning by decision and by reinforcement learning. Educational material that can be accessed 24 hours a day and from any device with an internet connection.

This Diploma will allow you to deepen your knowledge of the Theory of Planning by Decision and to apply the most appropriate techniques"

Module 1. Robot Planning Algorithms

1.1. Classical Planning Algorithms
- 1.1.1. Discrete Planning: State Space
- 1.1.2. Planning Problems in Robotics. Robotic Systems Models
- 1.1.3. Classification of Planners

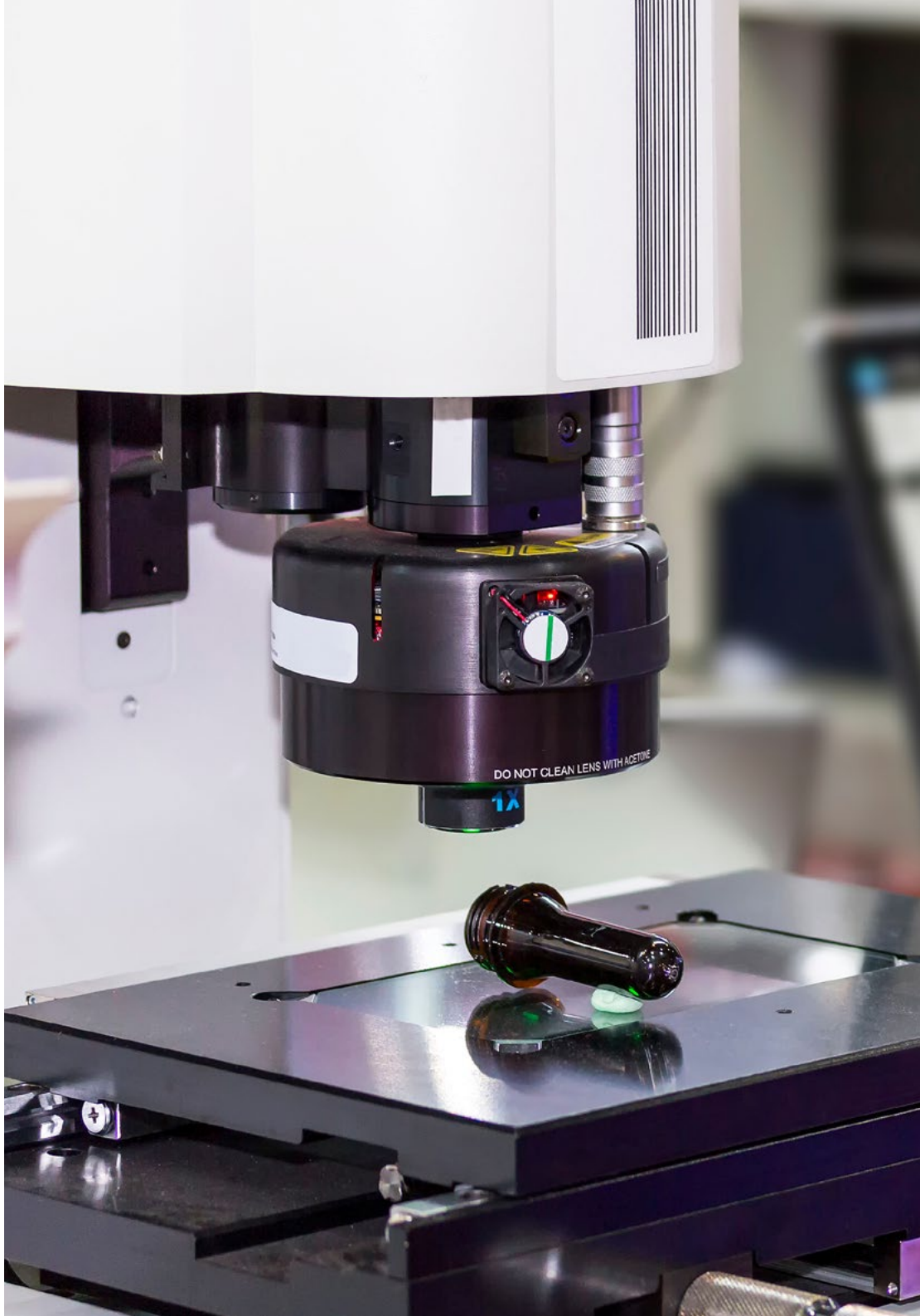
1.2. The Trajectory Planning Problem in Mobile Robots
- 1.2.1. Forms of Environment Representation: Graphs
- 1.2.2. Search Algorithms in Graphs
- 1.2.3. Introduction of Costs in Networks
- 1.2.4. Search Algorithms in Heavy Networks
- 1.2.5. Algorithms with any Angle Approach

1.3. Planning in High Dimensional Robotic Systems
- 1.3.1. High Dimensionality Robotics Problems: Manipulators
- 1.3.2. Direct/Inverse Kinematic Model
- 1.3.3. Sampling Planning Algorithms PRM and RRT
- 1.3.4. Planning Under Dynamic Constraints

1.4. Optimal Sampling Planning
- 1.4.1. Problem of Sampling-Based Planners
- 1.4.2. RRT* Probabilistic Optimality Concept
- 1.4.3. Reconnection Step: Dynamic Constraints
- 1.4.4. CForest. Parallelizing Planning

1.5. Real Implementation of a Motion Planning System
- 1.5.1. Global Planning Problem. Dynamic Environments
- 1.5.2. Cycle of Action, Sensorization. Acquisition of Information from the Environment
- 1.5.3. Local and Global Planning

1.6. Coordination in Multi-Robot Systems I: Centralized System
- 1.6.1. Multirobot Coordination Problem
- 1.6.2. Collision Detection and Resolution: Trajectory Modification with Genetic Algorithms
- 1.6.3. Other Bio-Inspired Algorithms: Particle Swarm and Fireworks
- 1.6.4. Collision Avoidance by Choice of Maneuver Algorithm



1.7. Coordination in Multi-Robot Systems II: Distributed Approaches I
- 1.7.1. Use of Complex Objective Functions
- 1.7.2. Pareto Front
- 1.7.3. Multi-Objective Evolutionary Algorithms

1.8. Coordination in Multi-Robot Systems III: Distributed Approaches II
- 1.8.1. Order 1 Planning Systems
- 1.8.2. ORCA Algorithm
- 1.8.3. Addition of Kinematic and Dynamic Constraints in ORCA

1.9. Decision Planning Theory
- 1.9.1. Decision Theory
- 1.9.2. Sequential Decision Systems
- 1.9.3. Sensors and Information Spaces
- 1.9.4. Planning for Uncertainty in Sensing and Actuation

1.10. Reinforcement Learning Planning Systems
- 1.10.1. Obtaining the Expected Reward of a System
- 1.10.2. Mean Reward Learning Techniques
- 1.10.3. Inverse Reinforcement Learning

Take the plunge and be the next creator of the mobile robot capable of reaching and performing tasks where humans cannot. Enroll now”

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 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.

Relearning Methodology

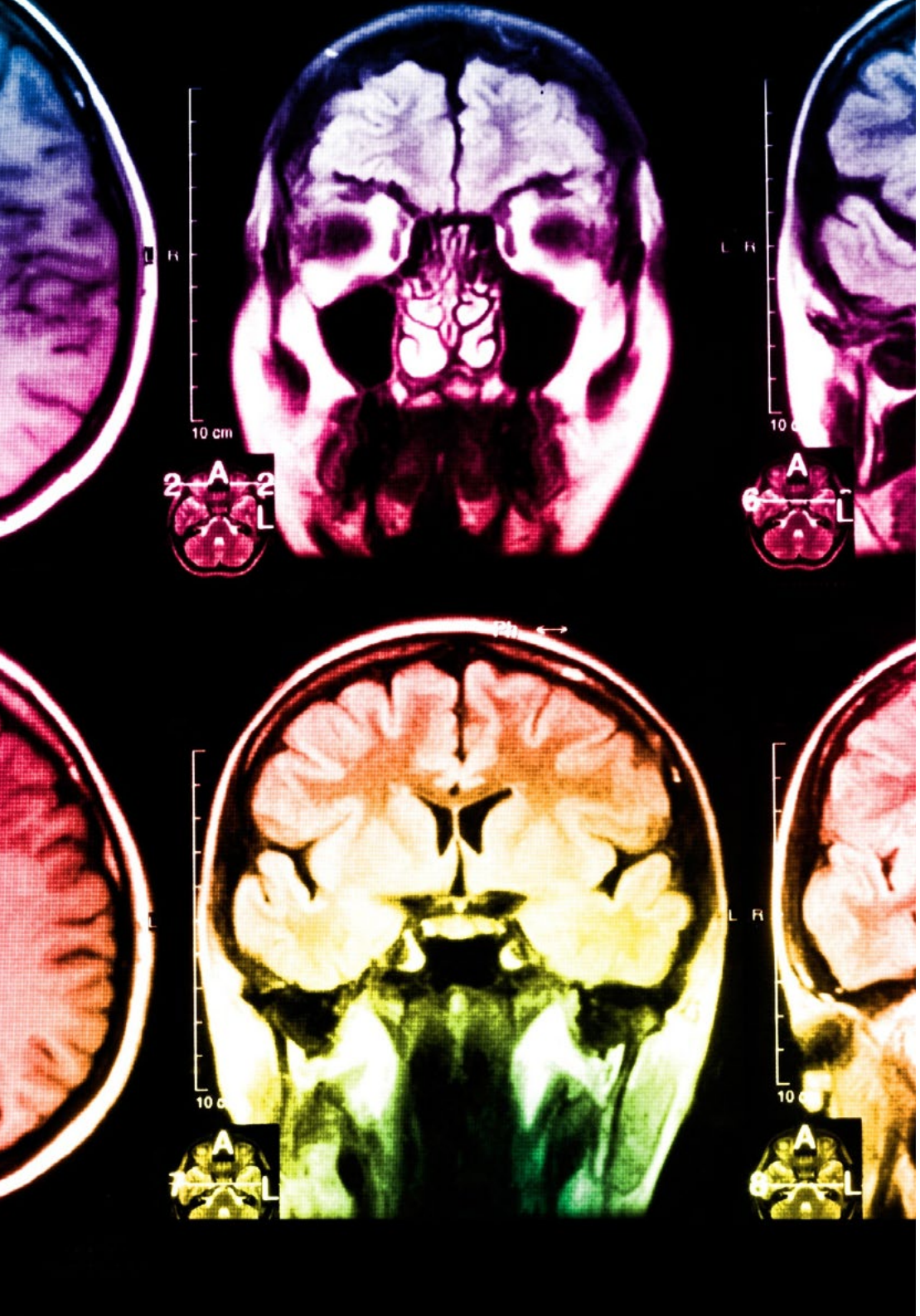
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.



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.

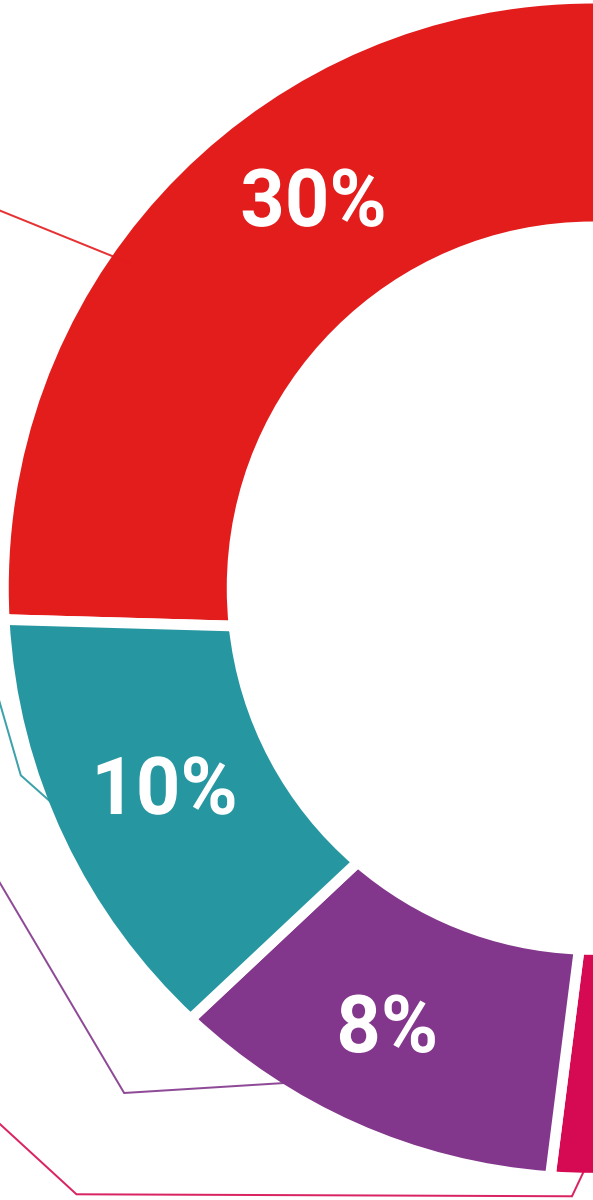
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

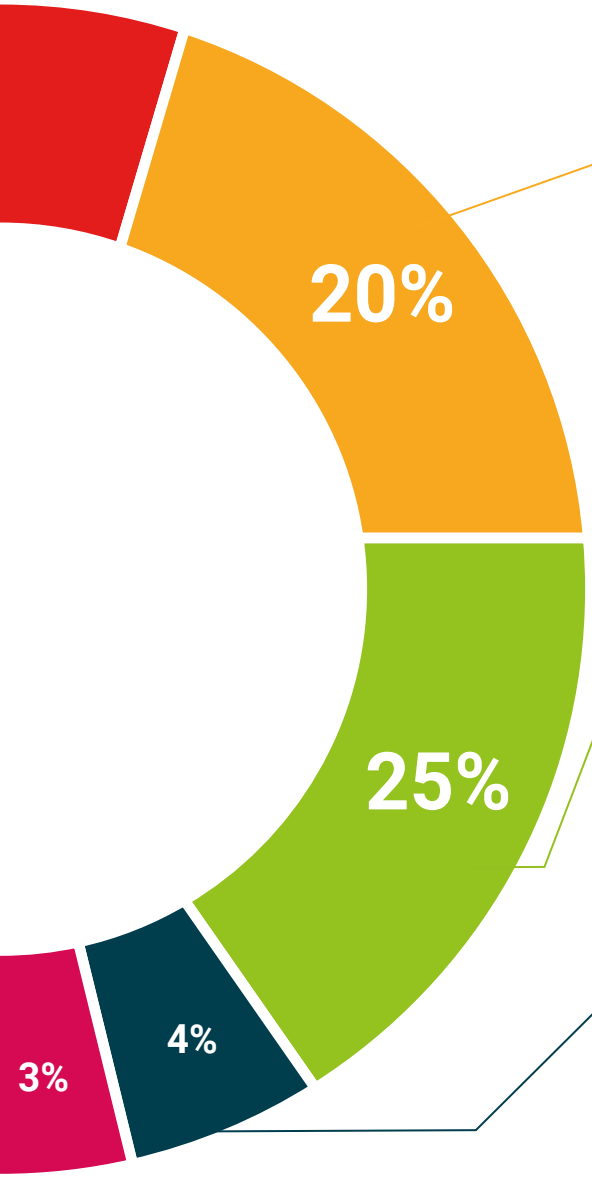
Practising Skills and Abilities

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 Robot Planning Algorithms guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This **Postgraduate Certificate in Robot Planning Algorithms** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Certificate** issued by **TECH Technological University** via tracked delivery*.

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

Title: **Postgraduate Certificate in Robot Planning Algorithms**

Official Nº of Hours: **150 h.**

tech technological university

Awards the following

CERTIFICATE

to

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

For having passed and accredited the following program

POSTGRADUATE CERTIFICATE

in

Robot Planning Algorithms

This is a qualification awarded by this University, equivalent to 150 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro

Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

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

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