

# Postgraduate Certificate

## Human-Machine Interaction Systems



## Postgraduate Certificate Human-Machine Interaction Systems

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

Website: [www.techtute.com/us/engineering/postgraduate-certificate/human-machine-interaction-systems](http://www.techtute.com/us/engineering/postgraduate-certificate/human-machine-interaction-systems)

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# 01

# Introduction

Working at heights, in places that are dangerous due to their toxicity or depth are just some of the examples applied to the use of robots that base their systems on Virtual and Augmented Reality. The boom in this technology in recent years has driven an industry that increasingly calls for engineering professionals with the most advanced and up-to-date knowledge in this field. Therefore, this 100% online program provides students with comprehensive knowledge through multimedia content at the forefront of the field which helps to enrich learning.





“

*A university degree with enormous practical application within the Robotics field. Enroll now and advance in your professional career”*

With the rapid advancement of technology and the new uses it has within the field of Robotics, there is significant demand for engineering professionals with deep knowledge and creativity to make a change within the Robotics sector. This program is for students who wish to prosper in a growing industry, with the help of a specialized teaching team with a long professional trajectory.

A 100% online program that will allow students to acquire a comprehensive knowledge of Virtual Reality, Augmented Reality and the development of the language that allows human interaction with the robot. Throughout the 12 weeks of this university degree, the engineering professional will learn about the techniques of artificial vision and image synthesis, in addition to finding out more about how to transferring mathematical models from robots to the physical engines commonly found in virtual reality tools.

With this teaching, the student will be able to develop the mechanisms to interact with robots using Natural Language. For this purpose, the most advanced communication interfaces will be analyzed in order to achieve a more friendly interaction with the robot. All this with a curriculum of multimedia didactic resources that can be accessed at any time.

An opportunity offered by TECH to all students who want to make significant progress in their professional careers with a program that allows them to balance their personal responsibilities with a quality education. This flexibility is achieved thanks to the availability of the entire syllabus from day one, the absence of fixed timetable sessions and the ability to download content to be viewed at any time.

This **Postgraduate Certificate in Human-Machine Interaction Systems** 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 degree that allows you to progress in your career whilst bringing your own creations to life in virtual environments”*



*With the most advanced curriculum in the Robotics sector, available 24/7"*

*Explore the possibilities of Deep Learning within this Postgraduate Certificate. Enroll now.*

*Are you interested in building your own business within the e-Health sector? Sign up to learn more about the Lean Start-Up Methodology, and how to do it in a new, more effective way.*

The program's teaching staff includes professionals from the sector who contribute their work experience to this training 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. For this purpose, the student will be assisted by an innovative interactive video system created by renowned experts.



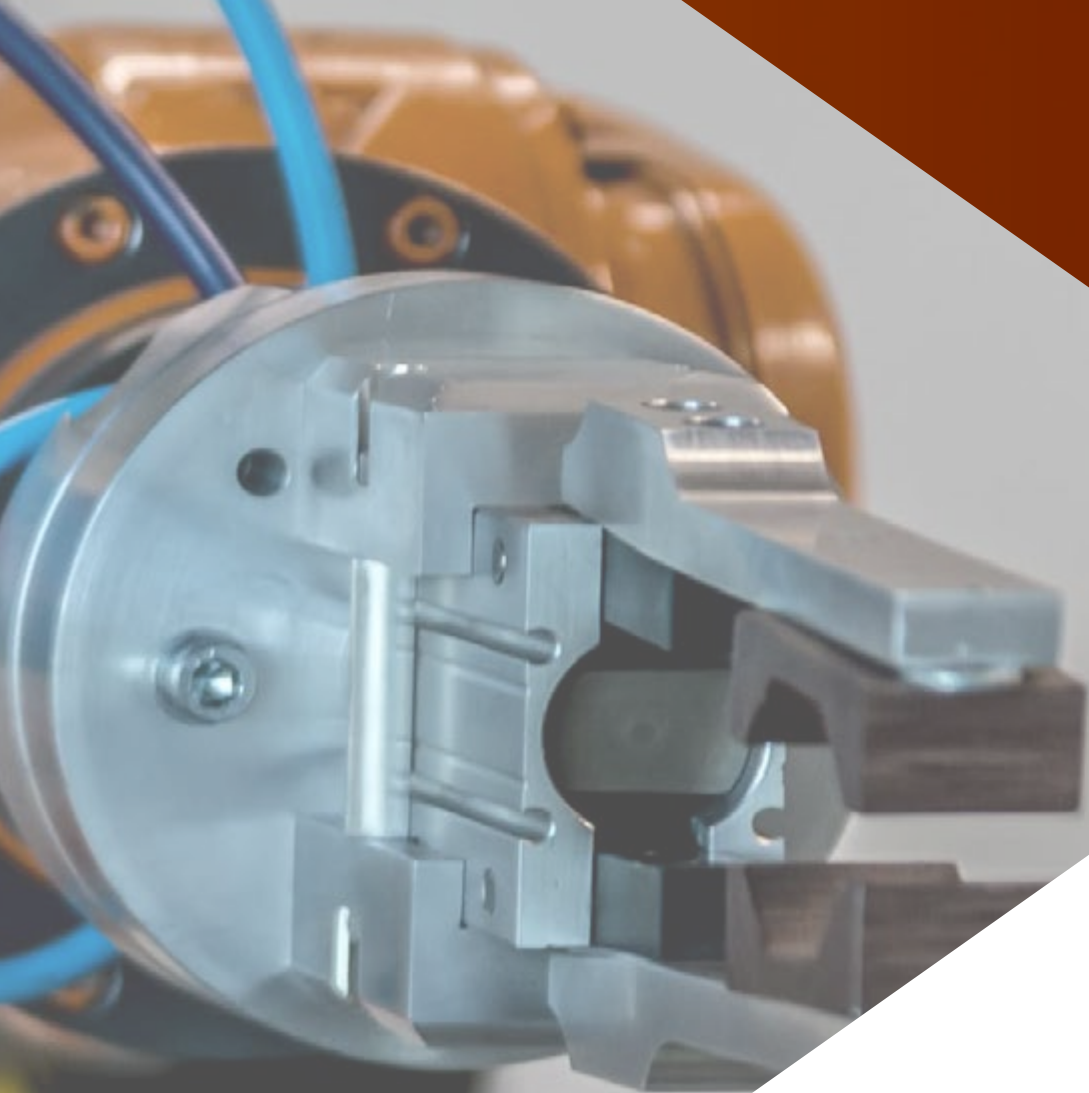
# 02

# Objectives

The main objective of this program is to provide the student with an advanced understanding of the fields of Robots and Human-Machine interactions. In this way, the engineer will gain an in-depth understanding of Virtual and Augmented Reality, in addition to delving into modern strategies natural language processing and the tools that make this possible. The Relearning system, used by TECH in all of its programs, will facilitate the students' learning and progress.







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*Delve into the immersive technologies of Robotics and become an expert with this online degree”*



## General Objectives

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- ◆ 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



*Take the next step forwards in your career, and create the next robot to improve Human-Machine Interaction. Enroll now"*





## Specific Objectives

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### Module 1. Application of Virtual and Augmented Reality Technologies to Robotics

- ◆ Determine the difference among the different types of realities
- ◆ Analyze the current standards for modeling virtual elements
- ◆ Examine the most commonly used peripherals in immersive environments
- ◆ Define geometric models of robots
- ◆ Assess physics engines for dynamic and kinematic modeling of robots
- ◆ Develop Virtual Reality and Augmented Reality projects

### Module 2. Robot Communication and Interaction Systems

- ◆ Analyze current natural language processing strategies: heuristic, stochastic, neural network-based, reinforcement-based learning
- ◆ Assess the benefits and weaknesses of developing cross-cutting, or situation-focused, interaction systems
- ◆ Identify the environmental problems to be solved in order to achieve effective communication with the robot
- ◆ Establish the tools needed to manage the interaction and discern the type of dialogue initiative to be pursued
- ◆ Combine pattern recognition strategies to infer the intentions of the interlocutor and respond in the best way to them
- ◆ Determine the optimal expressiveness of the robot according to its functionality and environment, and apply emotional analysis techniques to adapt its response
- ◆ Propose hybrid strategies for interaction with the robot: vocal, tactile and visual

03

# Course Management

TECH upholds its commitment to offer students a high-quality education, provided by specialized professionals who lead their respective sectors. Thus, the students in this program have a team of professional engineers with extensive experience in the field of Robotics. The knowledge that they acquire during the 150 teaching hours of this program will be extremely useful and practical for those looking to progress their careers in this field.



“

*A teaching team specialized in Robotics will guide you to get the most out of a degree that will pave the way for you in this Industry"*

## 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. Lucas Cuesta, Juan Manuel

- ♦ Senior Software Engineer and Analyst at Indizen– Believe in Talent
- ♦ Senior Software Engineer and Analyst at Krell Consulting and IMAGiNA Artificial Intelligence
- ♦ Software Engineer at Intel Corporation
- ♦ Software Engineer at Intelligent Dialog Systems
- ♦ PhD's Degree in Electronic Systems Engineering for Intelligent Environments at the Polytechnic University of Madrid
- ♦ Graduate in Telecommunications Engineering at the Polytechnic University of Madrid
- ♦ Master's Degree in Electronic Systems Engineering for Intelligent Environments at the Polytechnic University of Madrid



# 04

# Structure and Content

This program has been developed by a specialized teaching team that has divided the syllabus into two specific modules where students will learn advanced knowledge in the field of Augmented, Virtual and Mixed Reality applied to Robotics, as well as Communication and Interaction Systems with Robots. The real case studies and video summaries of each topic will be extremely practical and useful for any student looking to advance within this field.







“

*With this Postgraduate Certificate, you'll have the knowledge necessary to shape and improve how robots perceive emotions and feelings”*

## Module 1. Application to Robotics of Virtual and Augmented Reality Technologies

- 1.1. Immersive Technologies in Robotics
  - 1.1.1. Virtual Reality in Robotics
  - 1.1.2. Augmented Reality in Robotics
  - 1.1.3. Mixed Reality in Robotics
  - 1.1.4. Difference between Realities
- 1.2. Construction of Virtual Environments
  - 1.2.1. Materials and Textures
  - 1.2.2. Lighting
  - 1.2.3. Virtual Sound and Smell
- 1.3. Robot Modeling in Virtual Environments
  - 1.3.1. Geometric Modeling
  - 1.3.2. Physical Modeling
  - 1.3.3. Model Standardization
- 1.4. Modeling of Robot Dynamics and Kinematics: Virtual Physical Engines
  - 1.4.1. Physical Motors: Typology
  - 1.4.2. Configuration of a Physical Engine
  - 1.4.3. Physical Motors in the Industry
- 1.5. Platforms, Peripherals and Tools Most Commonly Used in Virtual Reality
  - 1.5.1. Virtual Reality viewers
  - 1.5.2. Interaction Peripherals
  - 1.5.3. Virtual Sensors
- 1.6. Augmented Reality Systems
  - 1.6.1. Insertion of Virtual Elements into Reality
  - 1.6.2. Types of Visual Markers
  - 1.6.3. Augmented Reality Technologies
- 1.7. Metaverse: Virtual Environments of Intelligent Agents and People
  - 1.7.1. Avatar Creation
  - 1.7.2. Intelligent Agents in Virtual Environments
  - 1.7.3. Construction of Multi-User Environments for VR/AR

- 1.8. Creation of Virtual Reality Projects for Robotics
  - 1.8.1. Phases of Development of a Virtual Reality Project
  - 1.8.2. Deployment of Virtual Reality Systems
  - 1.8.3. Virtual Reality Resources
- 1.9. Creating Augmented Reality Projects for Robotics
  - 1.9.1. Phases of Development of an Augmented Reality Project
  - 1.9.2. Deployment of Augmented Reality Projects
  - 1.9.3. Augmented Reality Resources
- 1.10. Robot Teleoperation with Mobile Devices
  - 1.10.1. Mixed Reality on Mobile Devices
  - 1.10.2. Immersive Systems using Mobile Device Sensors
  - 1.10.3. Examples of Mobile Projects

## Module 2. Robot Communication and Interaction Systems

- 2.1. Speech Recognition: Stochastic Systems
  - 2.1.1. Acoustic Speech Modeling
  - 2.1.2. Hidden Markov Models
  - 2.1.3. Linguistic Speech Modeling: N-Grams, BNF Grammars
- 2.2. Speech Recognition: Deep Learning
  - 2.2.1. Deep Neural Networks
  - 2.2.2. Recurrent Neural Networks
  - 2.2.3. LSTM Cells
- 2.3. Speech Recognition: Prosody and Environmental Effects
  - 2.3.1. Ambient Noise
  - 2.3.2. Multi-Speaker Recognition
  - 2.3.3. Speech Pathologies
- 2.4. Natural Language Understanding: Heuristic and Probabilistic Systems
  - 2.4.1. Syntactic-Semantic Analysis: Linguistic Rules
  - 2.4.2. Comprehension Based on Heuristic Rules
  - 2.4.3. Probabilistic Systems: Logistic Regression and SVM
  - 2.4.4. Understanding Based on Neural Networks



- 2.5. Dialogue Management: Heuristic/Probabilistic Strategies
  - 2.5.1. Interlocutor's Intention
  - 2.5.2. Template-Based Dialog
  - 2.5.3. Stochastic Dialog Management: Bayesian Networks
- 2.6. Dialogue Management: Advanced Strategies
  - 2.6.1. Reinforcement-Based Learning Systems
  - 2.6.2. Neural Network-Based Systems
  - 2.6.3. From Speech to Intention in a Single Network
- 2.7. Response Generation and Speech Synthesis
  - 2.7.1. Response Generation: From Idea to Coherent Text
  - 2.7.2. Speech Synthesis by Concatenation
  - 2.7.3. Stochastic Speech Synthesis
- 2.8. Dialogue Adaptation and Contextualization
  - 2.8.1. Dialogue Initiative
  - 2.8.2. Adaptation to the Speaker
  - 2.8.3. Adaptation to the Context of the Dialogue
- 2.9. Robots and Social Interactions: Emotion Recognition, Synthesis and Expression
  - 2.9.1. Artificial Voice Paradigms: Robotic Voice and Natural Voice
  - 2.9.2. Emotion Recognition and Sentiment Analysis
  - 2.9.3. Emotional Voice Synthesis
- 2.10. Robots and Social Interactions: Advanced Multimodal Interfaces
  - 2.10.1. Combination of Vocal and Tactile Interfaces
  - 2.10.2. Sign Language Recognition and Translation
  - 2.10.3. Visual Avatars: Voice to Sign Language Translation

“ *A degree that will give you the keys to the Marketplace so that you can project your business in the business paradigm of technology applied to medicine* ”

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 Human-Machine Interaction Systems guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.



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*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 Human-Machine Interaction Systems** 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.

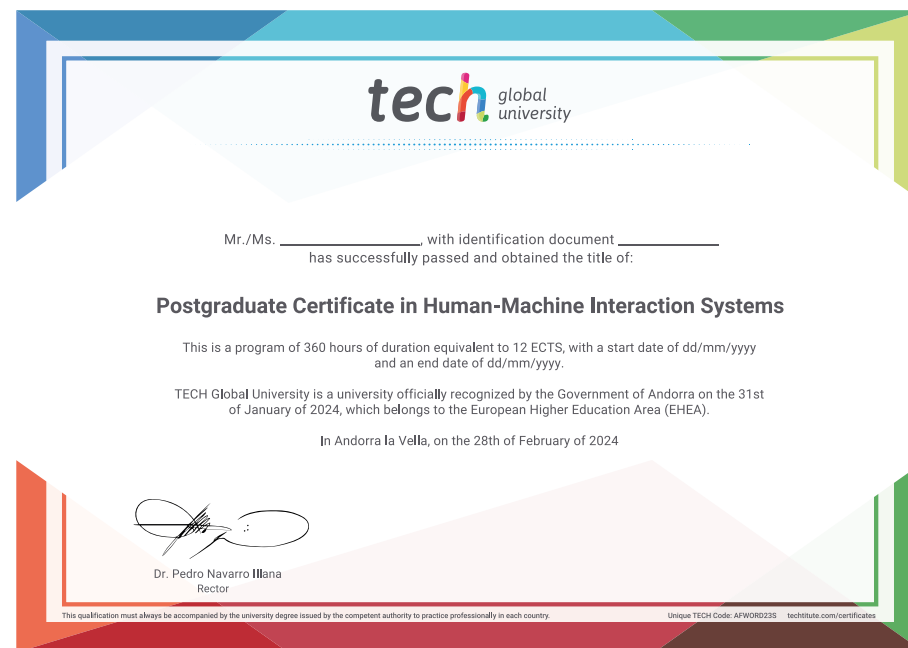
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Human-Machine Interaction Systems**

Modality: **online**

Duration: **12 weeks**

Accreditation: **12 ECTS**



\*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.

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present  
development language  
virtual classroom

**tech** global  
university

**Postgraduate Certificate**  
Human-Machine  
Interaction Systems

- » Modality: online
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