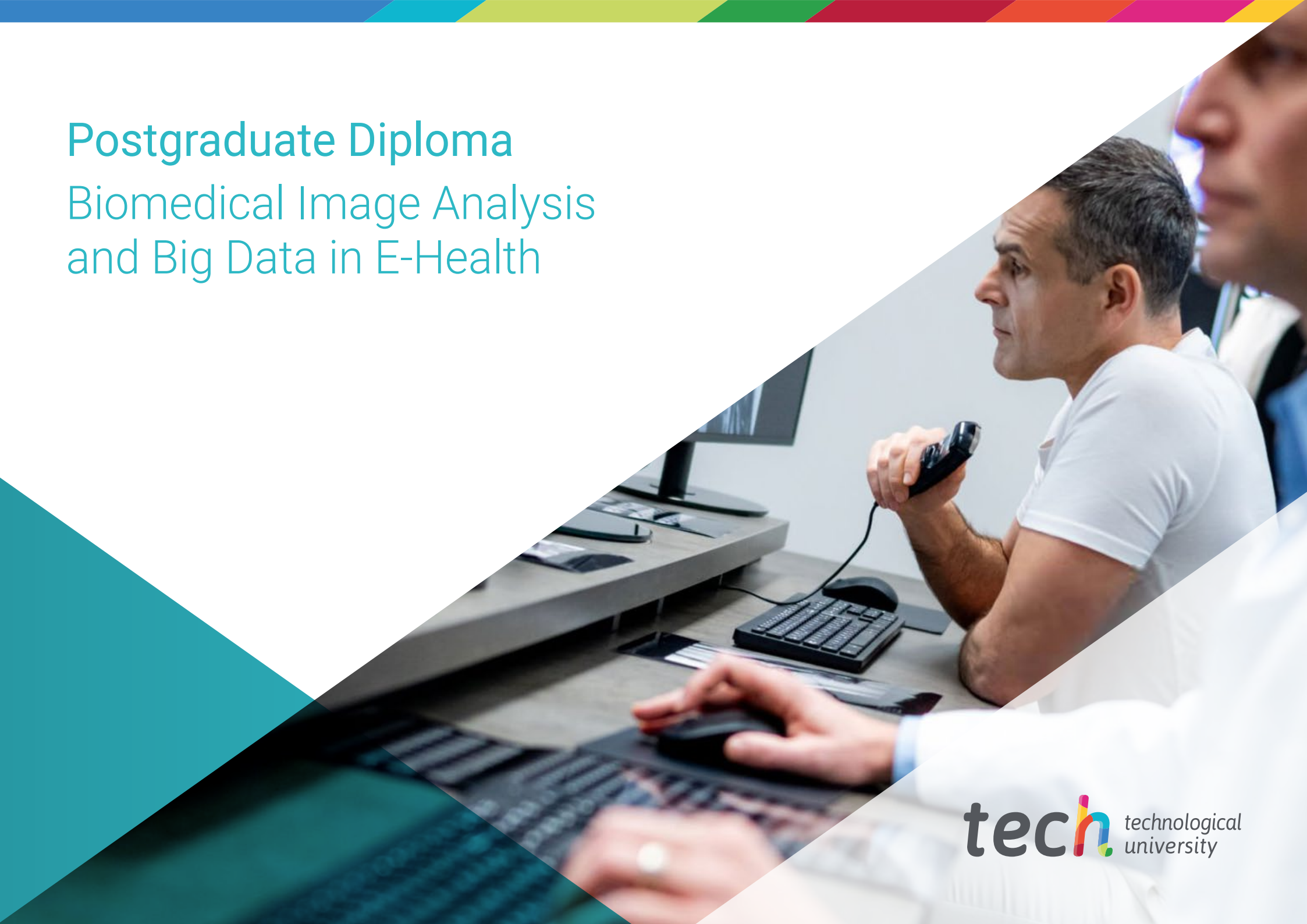
Postgraduate Diploma

Biomedical Image Analysis and Big Data in E-Health



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Postgraduate Diploma

Biomedical Image Analysis and Big Data in E-Health

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

Website: www.techtitute.com/pk/computer-science/postgraduate-diploma/postgraduate-diploma-biomedical-image-analysis-big-data-ehealth

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01

Introduction

The development of artificial intelligence and *Big Data* applied to the field of medicine has made it possible to implement increasingly specific and specialized functions and formulas in clinical practice, based on the massive analysis of information, the optimization of resources and the establishment of increasingly effective treatments. However, one of the techniques that has benefited the most is diagnostic imaging, so that areas such as radiology or pathological anatomy can now use strategies at the forefront of technology. Based on this, there is a very large demand for IT professionals who master this sector, in order to continue developing guidelines for its application, as well as for its correct maintenance. Therefore, this 100% online program offered by TECH arises as a new opportunity for all those graduates who want to specialize in this area, implementing to their praxis the innovations related to recognition and intervention techniques through biomedical imaging, *Big Data*, artificial intelligence and IoT.

The best program to specialize in Big Data and its tools applied to the Telemedicine sector and 100% online"

The advances that have been made in the area of Telemedicine have made it possible to implement increasingly specialized and effective diagnostic and treatment strategies in clinical practice, optimizing processes and generating new intervention techniques. This has been possible thanks to the development of *Big Data*, which has favored the massive processing of data and its storage, creating, additionally, algorithms through which computer systems analyze information and automate a series of processes. This not only saves time and costs, but has also favored the emergence of cutting-edge methods related, for example, to the analysis of biomedical images.

The acceptance of this area within E-Health has created a very large labor demand for IT professionals, not only to continue research and development work, but also to ensure optimal and guaranteed maintenance of existing ones. However, in order to carry out these tasks, the professional must have a detailed knowledge of the field in question, which is why this Postgraduate Diploma comes at the best time. This is a comprehensive and cutting-edge program based on the latest developments in Telemedicine. Through 450 hours of training, the graduate will be able to delve into the techniques of recognition and intervention through biomedical images, the application of *Big Data* in Medicine and the adaptation of artificial intelligence and IoT to this sector.

All this over 6 months and through a 100% online program, which, in addition to collecting the latest information, includes additional high quality material: detailed videos, research articles, self-knowledge exercises, complementary readings, dynamic summaries and much more! In this way, the computer scientist will be able to access a program adapted to their needs and those of the current market, and with which they will reach the peak of their professional career in a booming area such as E-Health.

This **Postgraduate Diploma in Biomedical Image Analysis and Big Data in E-Health** contains the most complete and up-to-date educational program on the market. The most important features include:

- The development of practical cases presented by experts in biomedical imaging and databases
- The graphic, schematic, and practical contents with which they are created, provide practical information on the disciplines that are essential for professional practice
- The practical exercises where the self-evaluation process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

Would you like to know in detail the most cutting-edge and specialized medical mass data processing strategies? Enroll in this program and become an Expert in 6 months"

You will have additional diverse material to deepen your knowledge in areas such as magnetic resonance imaging, its clinical applications and its physical foundations so that you can get to know them from the inside and in their entirety"

Thanks to the specificity of the program, you will be able to delve into the current and future applications of artificial intelligence and IoT to Telemedicine.

This Postgraduate Diploma is defined in three words: flexibility, comprehensiveness and avant-garde. Would you like to check it out?

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 allow the professional a situated and contextual learning, that is, a simulated environment that will provide an immersive training programmed to train in real situations.

The design of this program focuses on Problem-Based Learning, in which the professional will have to try to solve the different professional practice situations that will arise throughout the academic course. For this purpose, the student will be assisted by an innovative interactive video system created by renowned experts.

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Objectives

TECH and its team of experts in Telemedicine have developed this program with the goal that the IT professional can know in detail this sector, specifically as it relates to the analysis of biomedical images and the application of *Big Data*. For this purpose, they have selected the necessary information and material that will allow them, in just 6 months, to acquire a broad and specialized knowledge about this area of E-Health in a 100% online way.

Do you want to know in detail the most innovative transcriptomics strategies and their application in Telemedicine? If this is one of your objectives, this program will give you the keys to achieve it in a guaranteed way"

General Objectives

- Develop key concepts of medicine that serve as a vehicle to understand clinical medicine
- Determine the major diseases affecting the human body classified by apparatus or systems, structuring each module into a clear outline of pathophysiology, diagnosis, and treatment
- Determine how to obtain metrics and tools for health care management
- Understand the basics of basic and translational scientific methodology
- Examine the ethical and best practice principles governing the different types of research in health sciences
- Identify and generate the means of funding, assessing and disseminating scientific research
- Identify the real clinical applications of the various techniques
- Develop the key concepts of computational science and theory
- Determine the applications of computation and its implication in bioinformatics
- Provide the necessary resources to practically apply all the concepts in the modules
- Develop the fundamental concepts of databases
- Determine the importance of medical databases
- Delve into the most important techniques in research
- Identify the opportunities offered by the IoT in the field of e-Health
- Provide specialized knowledge of the technologies and methodologies used in the design, development and assessment of telemedicine systems
- Determine the different types and applications of telemedicine
- Delve into the most common ethical aspects and regulatory frameworks of telemedicine
- Analyze the use of medical devices
- Develop the key concepts of entrepreneurship and innovation in e-Health
- Determine what a business model is and the types that exist
- Collect E-Health success stories and mistakes to avoid
- Apply the knowledge acquired to an original business idea

The objective of this program is for you to finish your course having become a true expert in Biomedical Image Analysis and Big Data in E-Health in just 450 hours"

Specific Objectives

Module 1. Techniques, Recognition and Intervention using Biomedical Imaging

- Examine the fundamentals of medical imaging technologies
- Develop expertise in radiology, clinical applications and physical fundamentals
- Analyze ultrasound, clinical applications and physical fundamentals
- Delve into tomography, computed and emission tomography, clinical applications and physical fundamentals
- Determine how to manage magnetic resonance imaging, clinical applications and physical fundamentals
- Generate advanced knowledge of nuclear medicine, differences between PET and SPECT, clinical applications and physical fundamentals
- Discriminate noise in the image, reasons for it and image processing techniques to reduce it
- Present image segmentation technologies and explain their usefulness
- Gain a deeper understanding of the direct relationship between surgical interventions and imaging techniques
- Establish the possibilities offered by artificial intelligence in recognizing patterns in medical images, and thus deepen innovation in the field

Module 2. *Big Data* in Medicine: Massive Medical Data Processing

- Develop specialized knowledge on mass data collection techniques in biomedicine
- Analyze the importance of data preprocessing in *Big Data*
- Determine the differences between the data derived from different massive data collection techniques, as well as their special characteristics in terms of pre-processing and handling
- Provide ways of interpreting results from massive data analysis
- Examine the applications and future trends in the field of *Big Data* in biomedical research and public health

Module 3. Applications of Artificial Intelligence and the Internet of Things (IoT) in Telemedicine

- Propose communication protocols in different scenarios in the health care field
- Analyze IoT communication, as well as its application areas in e-Health
- Substantiate the complexity of artificial intelligence models in its use in health care
- Identify the optimization brought by parallelization in GPU-accelerated applications and its use in health care
- Present all the *Cloud* technologies available to develop E-Health and IoT products, both in computing and communication

03

Course Management

Having the support of a teaching team specialized in the area in which the program is developed gives it a great degree of specialization, which is reflected in the quality of the academic experience and its dynamism. For this reason, for this Postgraduate Diploma TECH has selected a group of professionals in bioengineering and bioinformatics with an extensive career in the field of medicine. It is a faculty that, additionally, has demonstrated its commitment to the growth of the graduates through the investment of hundreds of hours in the development of the best syllabus and the most diverse additional material.

Among the aspects that the teaching team has considered necessary to include in this Postgraduate Diploma is the personalization of the tools of the health service, so that you can carry it out in your daily practice"

Management

Ms. Sirera Pérez, Ángela

- Biomedical Engineer expert in Nuclear Medicine and exoskeleton design
- Designer of specific parts for 3D printing at Technadi
- Technician in the Nuclear Medicine area of the University Clinic of Navarra
- Degree in Biomedical Engineering from the University of Navarra
- MBA and Leadership in Health care and Medical Technology Companies

Professors

Ms. Muñoz Gutiérrez, Rebeca

- Data Scientist at INDITEX
- Firmware Engineer for Clue Technologies
- Graduate in Health Engineering, specializing in Biomedical Engineering, University of Malaga and University of Seville
- Master's Degree in Intelligent Avionics, Clue Technologies, in collaboration with the University of Málaga
- NVIDIA: Fundamentals of Accelerated Computing with CUDA C/C++
- NVIDIA: Accelerating CUDA C++ Applications with Multiple GPUs

04

Structure and Content

In order to offer a widely beneficial academic experience for the professional development of its graduates, TECH has included in this Postgraduate Diploma the latest developments in the Telemedicine sector. Thanks to this, the computer scientist will be able to implement to their knowledge the most innovative applications of artificial intelligence, *Big Data* and IoT to their daily practice: algorithms for biomedical image processing, GPU acceleration tools, *Cloud*technologies, structural genomics and much more! All this in a 100% online way, without schedules, face-to-face classes or access limits.

Thanks to this program you will be able to develop extensively in the development of strategies related to computed tomography and magnetic resonance imaging, something that the medical sector will be grateful for"

Module 1. Techniques, Recognition and Intervention using Biomedical Imaging

1.1. Medical Imaging
- 1.1.1. Modalities in Medical Imaging
- 1.1.2. Objectives in Medical Imaging Systems
- 1.1 3. Medical Imaging Storage Systems

1.2. Radiology
- 1.2.1. Imaging Method
- 1.2.2. Radiology Interpretation
- 1.2.3. Clinical Applications

1.3. Computed Tomography (CT)
- 1.3.1. Principle of Operation
- 1.3.2. Image Generation and Acquisition
- 1.3.3. Computerized Tomography. Typology
- 1.3.4. Clinical Applications

1.4. Magnetic Resonance Imaging (MRI)
- 1.4.1. Principle of Operation
- 1.4.2. Image Generation and Acquisition
- 1.4.3. Clinical Applications

1.5. Ultrasound: Ultrasound and Doppler Sonography
- 1.5.1. Principle of Operation
- 1.5.2. Image Generation and Acquisition
- 1.5.3. Typology
- 1.5.4. Clinical Applications

1.6. Nuclear medicine
- 1.6.1. Physiological Basis in Nuclear Studies. Radiopharmaceuticals and Nuclear Medicine
- 1.6.2. Image Generation and Acquisition
- 1.6.3. Types of Tests
  - 1.6.3.1. Gammagraphy
  - 1.6.3.2. SPECT
  - 1.6.3.3. PET
  - 1.6.3.4. Clinical Applications

1.7. Image-Guided Interventions
- 1.7.1. Interventional Radiology
- 1.7.2. Interventional Radiology Objectives
- 1.7.3. Procedures
- 1.7.4. Advantages and Disadvantages

1.8. Image Quality
- 1.8.1. Technique
- 1.8.2. Contrast
- 1.8.3. Resolution
- 1.8.4. Noise
- 1.8.5. Distortion and Artifacts

1.9. Medical Imaging Tests. Biomedicine
- 1.9.1. Creating 3D Images
- 1.9.2. Biomodels
  - 1.9.2.1. DICOM Standard
  - 1.9.2.2. Clinical Applications

1.10. Radiological Protection
- 1.10.1. European Legislation Applicable to Radiology Services
- 1.10.2. Safety and Action Protocols
- 1.10.3. Radiological Waste Management
- 1.10.4. Radiological Protection
- 1.10.5. Care and Characteristics of Rooms

Module 2. *Big Data* in Medicine: Massive Medical Data Processing

2.1. Big Data in Biomedical Research
- 2.1.1. Data Generation in Biomedicine
- 2.1.2. High Performance (High-throughputtechnology)
- 2.1.3. Uses of High-Throughput Data. Hypotheses in the Age of Big Data

2.2. Data Pre-Processing in Big Data
- 2.2.1. Data Pre-Processing
- 2.2.2. Methods and Approaches
- 2.2.3. Problems with Data Pre-Processing in Big Data

2.3. Structural Genomics
- 2.3.1. Sequencing the Human Genome
- 2.3.2. Sequencing vs. Chips
- 2.3.3. Variant Discovery

2.4. Functional Genomics
- 2.4.1. Functional Notation
- 2.4.2. Mutation Risk Predictors
- 2.4.3. Association Studies in Genomics

2.5. Transcriptomics
- 2.5.1. Techniques to Obtain Massive Data in Transcriptomics: RNA-seq
- 2.5.2. Data Normalization in Transcriptomics
- 2.5.3. Differential Expression Studies

2.6. Interactomics and Epigenomics
- 2.6.1. The Role of Cromatine in Gene Expression
- 2.6.2. High-Throughput Studies in Interactomics
- 2.6.3. High-Throughput Studies in Epigenetics

2.7. Proteomics
- 2.7.1. Analysis of Mass Spectrometry Data
- 2.7.2. Post-Translational Modifications Study
- 2.7.3. Quantitative Proteomics

2.8. Enrichment and Clustering Techniques
- 2.8.1. Contextualizing Results
- 2.8.2. Clustering Algorithms in Omics Techniques
- 2.8.3. Repositories for Enrichment: Gene Ontology and KEGG

2.9. Applying Big Data to Public Health
- 2.9.1. Discovery of New Biomarkers and Therapeutic Targets
- 2.9.2. Risk Predictors
- 2.9.3. Personalized Medicine

2.10. Big Data Applied to Medicine
- 2.10.1. Potential for Diagnostic and Preventive Assistance
- 2.10.2. Use of Machine Learning Algorithms in Public Health
- 2.10.3. The Problem of Privacy

Module 3. Applications of Artificial Intelligence and the Internet of Things (IoT) in Telemedicine

3.1. E-Health Platforms. Personalizing Healthcare Services
- 3.1.1. E-Health Platform
- 3.1.2. Resources for E-Health Platforms
- 3.1.3. Digital Europe Program. Digital Europe-4-Health and Horizon Europe

3.2. Artificial Intelligence in Healthcare I: New Solutions in Computer Applications
- 3.2.1. Remote Analysis of Results
- 3.2.2. Chatbox
- 3.2.3. Prevention and Real-Time Monitoring
- 3.2.4. Preventive and Personalized Medicine in Oncology

3.3. Artificial Intelligence in Healthcare II:
- 3.3.1. Monitoring Patients with Reduced Mobility
- 3.3.2. Cardiac Monitoring, Diabetes, Asthma
- 3.3.3. Health and Wellness Apps
  - 3.3.3.1. Heart Rate Monitors
  - 3.3.3.2. Blood Pressure Bracelets
- 3.3.4. Ethical Use of AI in the Medical Field. Data Protection

3.4. Artificial Intelligence Algorithms for Image Processing
- 3.4.1. Artificial Intelligence Algorithms for Image Handling
- 3.4.2. Image Diagnosis and Monitoring in Telemedicine
  - 3.4.2.1. Melanoma Diagnosis
- 3.4.3. Limitations and Challenges in Image Processing in Telemedicine

3.5. Application Acceleration using Graphics Processing Units (GPU) in Medicine
- 3.5.1. Program Parallelization
- 3.5.2. GPU Operations
- 3.5.3. Application Acceleration using GPU in Medicine

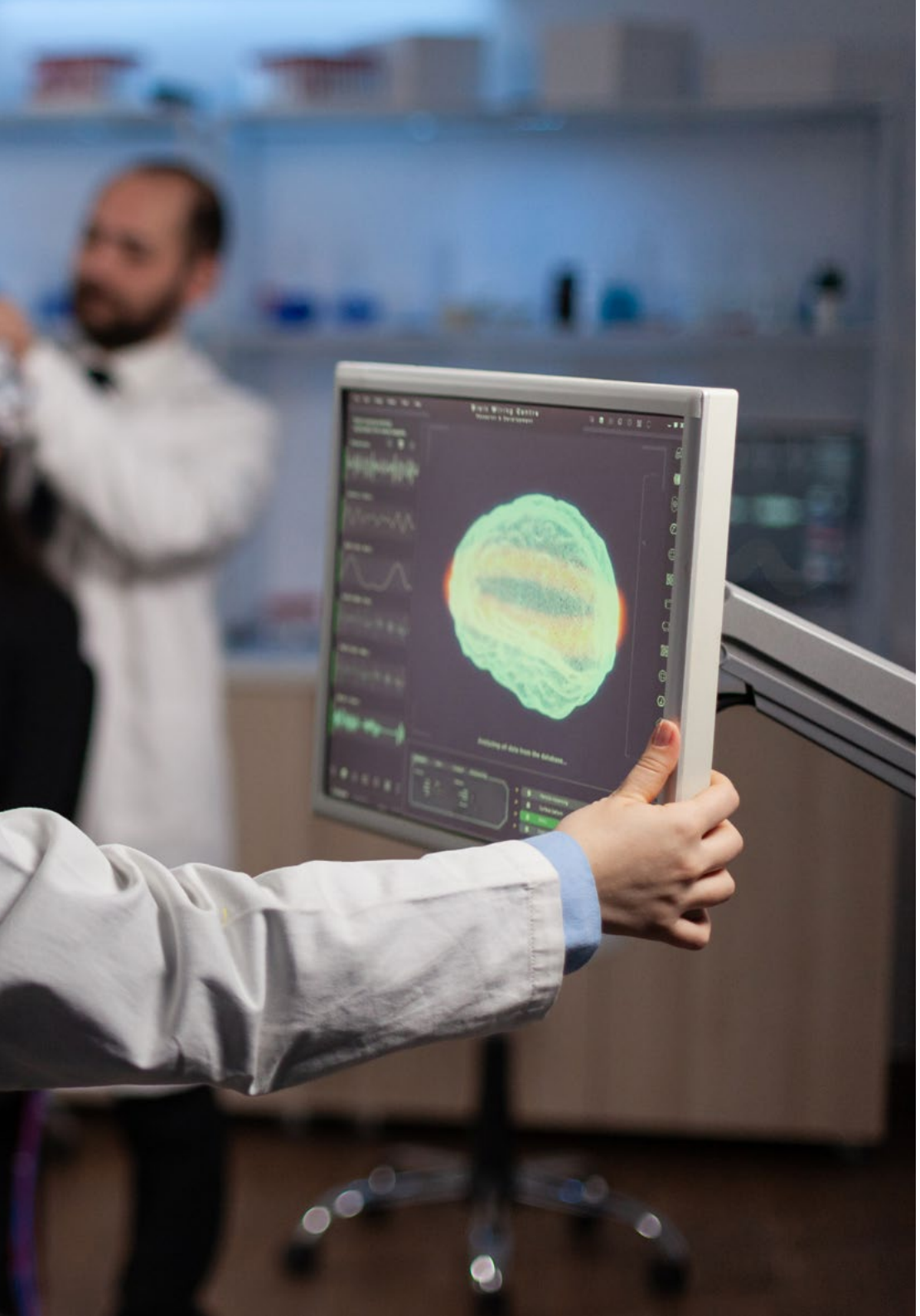
3.6. Natural Language Processing (NLP) in Telemedicine
- 3.6.1. Text Processing in the Medical Field. Methodology
- 3.6.2. Natural Language Processing in Therapy and Medical Records
- 3.6.3. Limitations and Challenges in Natural Language Processing in Telemedicine

3.7. The Internet of Things (IoT) in Telemedicine. Applications
- 3.7.1. Monitoring Vital Signs. Wearables
  - 3.7.1.1. Blood Pressure, Temperature, and Heart Rate
- 3.7.2. The IoT and Cloud Technology
  - 3.7.2.1. Data Transmission to the Cloud
- 3.7.3. Self-Service Terminals

3.8. IoT in Patient Monitoring and Care
- 3.8.1. IoT Applications for Emergency Detection
- 3.8.2. The Internet of Things in Patient Rehabilitation
- 3.8.3. Artificial Intelligence Support in Victim Recognition and Rescue

3.9. Nano-Robots. Typology
- 3.9.1. Nanotechnology
- 3.9.2. Types of Nano-Robots
  - 3.9.2.1. Assemblers. Applications
  - 3.9.2.2. Self-Replicating. Applications

3.10. Artificial Intelligence in COVID-19 Control
- 3.10.1. COVID-19 and Telemedicine
- 3.10.2. Management and Communication of Breakthroughs and Outbreaks
- 3.10.3. Outbreak Prediction in Artificial Intelligence



A program that will guarantee you a successful working future within a booming area committed to citizenship such as Telemedicine. Will you join the progress of bioinformatics?"

05

Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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

Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world"

You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.

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

A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

> *Our program prepares you to face new challenges in uncertain environments and achieve success in your career"*

The case method has been the most widely used learning system among the world's leading Information Technology schools for as long as they have existed. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the course, students will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

Relearning Methodology

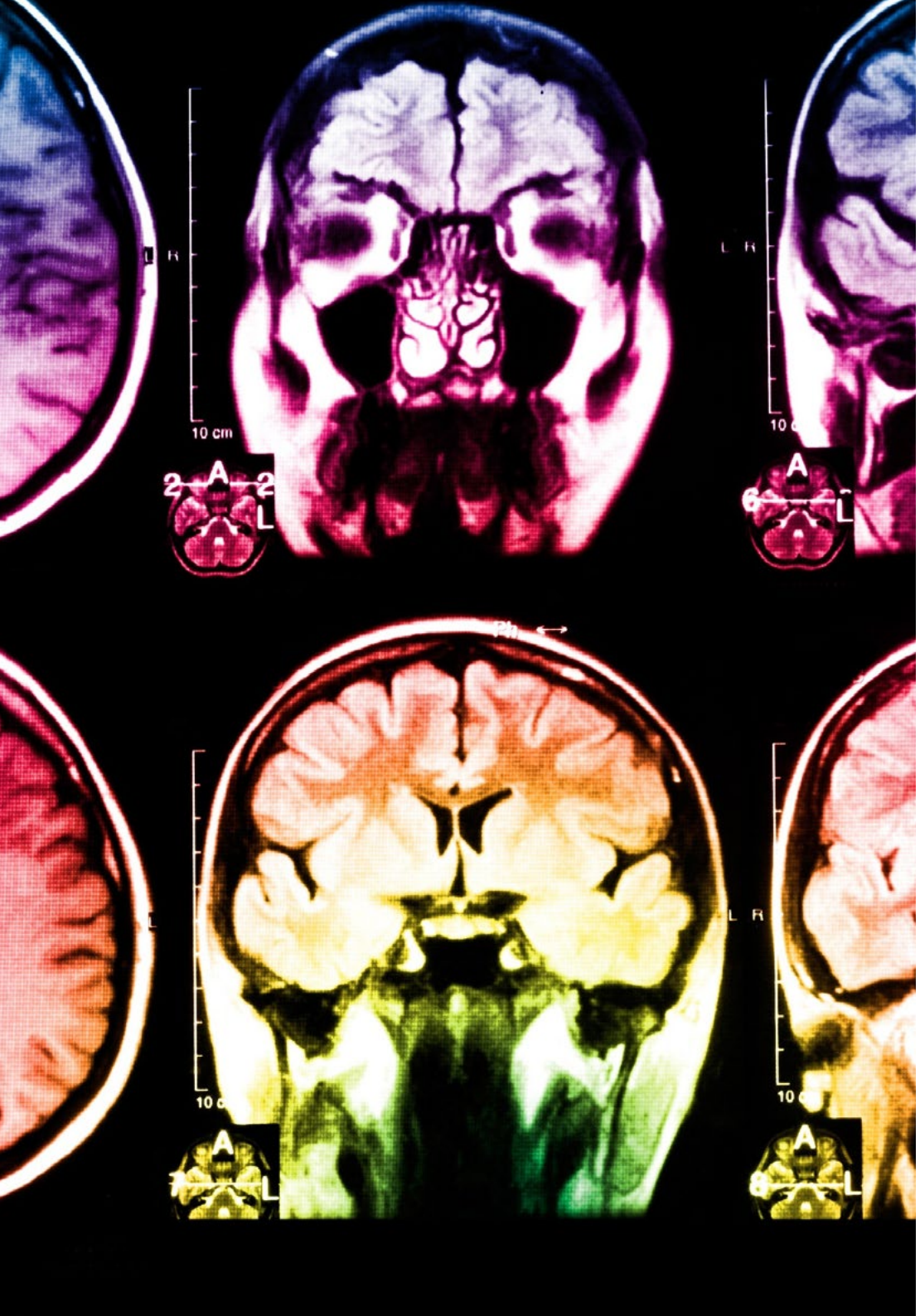
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

In 2019, we obtained the best learning results of all online universities in the world.

At TECH you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

This program offers the best educational material, prepared with professionals in mind:

Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

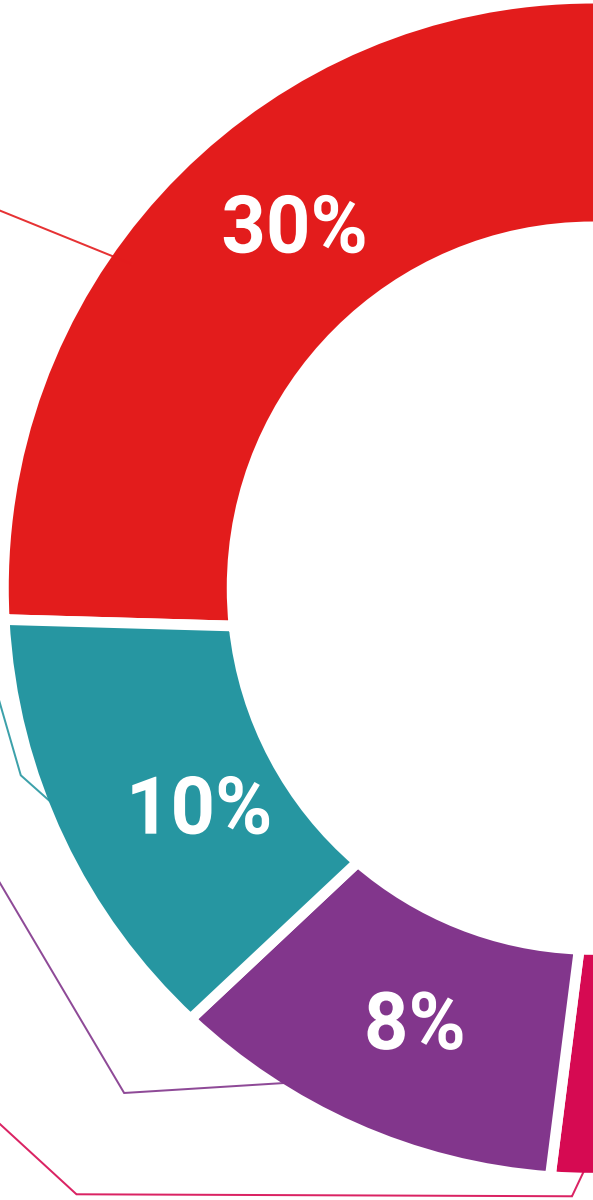
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

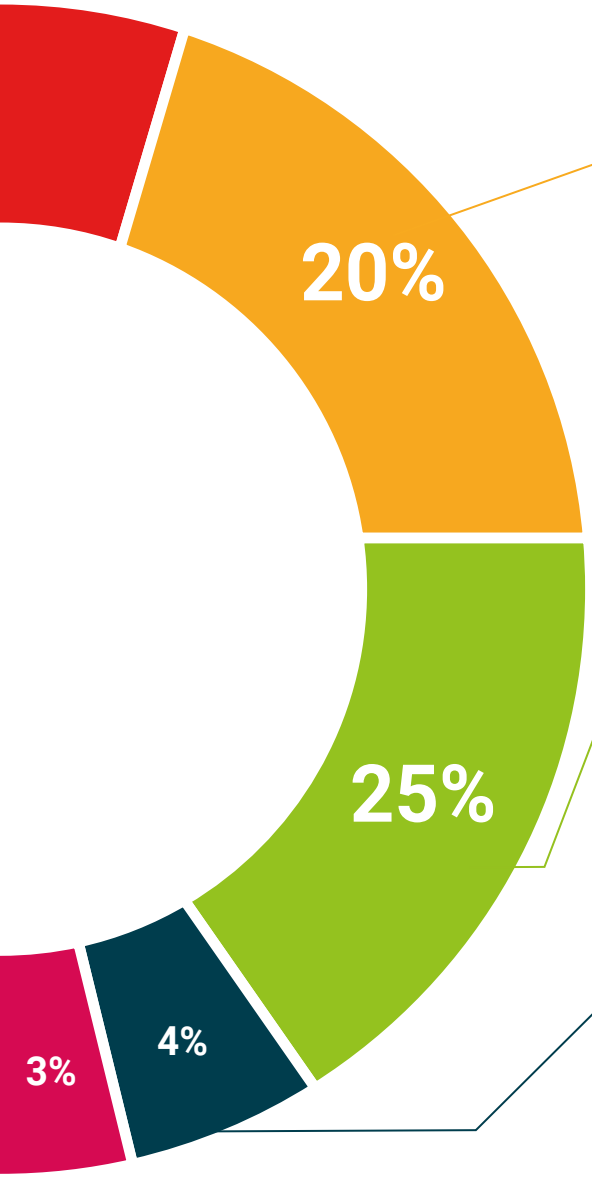
Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.

Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.

Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

06

Certificate

The Postgraduate Diploma in Biomedical Image Analysis and Big Data in E-Health guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma 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 Diploma in Biomedical Image Analysis and Big Data in E-Health** 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 Diploma** issued by **TECH Technological University** via tracked delivery*.

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

Title: **Postgraduate Diploma in Biomedical Image Analysis and Big Data in E-Health**

Official No. of Hours: **450 h.**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Awards the followi ng

CERTIFICATE

to

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

For having passed and accredited the following progra m

POSTGRADUATE DIPLOMA

in

Biomedical Image Analysis and Big Data in E-Health

This is a qualification awarded by this University, equivalent to 450 h, 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

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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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