Postgraduate Diploma

Biomedical Image Analysis and Big Data in E-Health

tech technological university

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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/us/nursing/postgraduate-diploma/postgraduate-diploma-biomedical-image-analysis-big-data-e-health**

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01

Introduction

Big Data is currently an opportunity to streamline procedures in telemedicine. The COVID reflected on the importance of having a global data processing that would provide a glimpse into the changing data of this disease. Additionally, the public administration has shown great interest in simplifying health care processes. All of this is focused on personalized and individualized health care. For this reason, the specialists of the present and the future must master strategies in biomedical imaging and, in addition, in Big Data. In order to transmit to this sector all the knowledge needed to develop their clinical work, TECH has developed a complete and rigorous program around data automation. This is a program designed in a 100% online format, so that wherever they are, nursing graduates can optimize the care of their service, acquiring knowledge in e-health.

A program that will train you in the field of biomedical image analysis and the control of socio-health data, with the goal of optimizing medical care"

One of the most outstanding advantages that biomedical imaging offers to the clinical branch is to minimize surgical intervention in patients. This will not only improve medical processes in the area of surgery, but will also protect those affected who, due to parallel problems, cannot be operated on. Additionally, the incorporation of Big Data has made it possible to contrast heterogeneous information from different clinical centers, which has been very useful on a global level with COVID. Given the growing demand in the health care labor market for professionals who can adapt to new advances and know how to manage changes in primary and secondary care, specialists have been faced with the need to extend their field of action towards telemedicine.

In response to this professional demand, TECH has developed a comprehensive program in Biomedical Image Analysis and Big Data in E-health aimed at graduates in Nursing. In this way, students who receive the program will have a Relearning methodology that will avoid long hours of study and will enable them to assimilate the concepts in a simple and progressive way.

TECH has also called on a team of experts who will not only transmit the theoretical knowledge of this program to the graduates, but will also be able to share with them their experiences in the sector and the real scenario of action. Thanks to their collaboration, students will have at their disposal a direct communication channel through which they will be able to solve all their doubts regarding the syllabus. This is a brand new academic experience for professionals who are looking for excellence and adapted instruction with experts in telemedicine.

This **Postgraduate Diploma in Biomedical Image Analysis and Big Data in E-Health** contains the most complete and up-to-date scientific 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

Sign up to learn about the advantages of nano-robots in identifying and fighting cancer cells"

Thanks to TECH, you will learn more about in radiology and the tools such as SPECT and PET that intervene in medicine"

Delve into the telemedicine paradigm and understand the benefits in the care of patients with infectious diseases.

Delve into the intricacies of Big Data in public health to address risk prediction and personalized medicine.

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.

02

Objectives

This program in Biomedical Image Analysis and Big Data in E-Health has been developed with the goal of expanding and updating the knowledge of graduates in Nursing, so that they can face the emerging changes in the health care environment. In this way nurses can learn in detail about medical imaging and the applications of artificial intelligence and the Internet of Things (IoT) in telemedicine. All this, focused on the latest technology and overturned in a downloadable reference guide with which students will be able to consult the contents at any time, once they have saved it on their device.

A program designed for you to analyze ultrasound, clinical applications and physical fundamentals that are integrated into modern nursing"

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 eHealth
- 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 eHealth
- 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

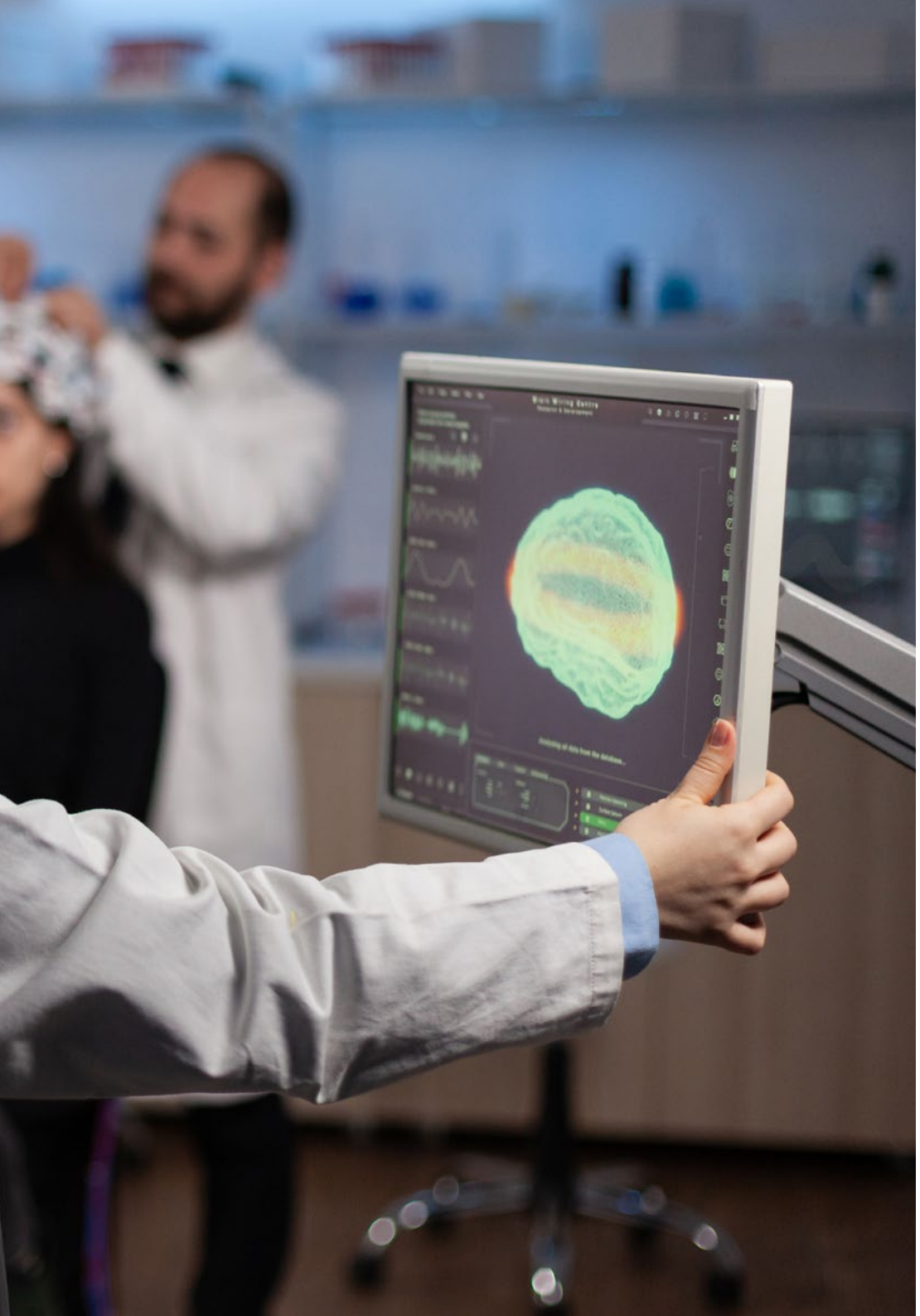
Specific Objectives

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 communication in the IoT as well as its use in eHealth areas
- 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

Don't waste your time, bet on an innovative program that adapts to you and the other responsibilities of your daily life"

03

Course Management

Given the scientific interest in the minimally invasive intervention that biomedical imaging allows and the advantages of Big Data in E-health, TECH has resorted to an experienced teaching team in the area to develop and teach the contents of this program. This teaching team is working in the field of biomedicine, among other areas, which provides guarantees to students, so that they can be instructed under the rigor and quality that TECH pursues. Additionally, students will have a direct communication channel through which they will be able to communicate with teachers and solve any questions that may arise about the subject.

Get support from professionals in the health sector to understand the evolution of radiophysics thanks to technological incorporations"

Management

Ms. Sirera Pérez, Ángela

- Nuclear Researcher and Radiophysicist, University Clinic of Navarra, Pamplona, Spain
- Prototyped Parts Designer at Technaid, using 3D printing and CAD Inventor design software
- Biomechanics Professor, Master's Degree in Information and Communication Technologies (ICT) for Biomedical Engineering, TECH
- Degree in Biomedical Engineering from the University of Navarra

Professors

Ms. Muñoz Gutiérrez, Rebeca

- Data Scientist, Returns Department, INDITEX e-Commerce
- 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

This Postgraduate Diploma has been developed jointly with a professional team specialized in the health area, with years of experience in the clinical scenario. It is a program that proposes the simulation of real cases, so that students know how to act in professional practice with the guidance of experts. Additionally, students have 450 hours of theoretical-practical and additional material to make their studies more dynamic. All this has been applied in this program, 100% online so that, in only 6 months, the Nursing specialist can develop their knowledge, being able to work on updating his professional skills. Additionally, TECH applies the Relearning methodology, so that students assimilate the knowledge gradually and do not have to invest long hours of memorization in the subject.

Explore the techniques, recognition and intervention through biomedical imaging, thanks to TECH"

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
- 1.6.4. Principles and Fundamentals of Executive Functions
  - 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-Throughput* Technology
- 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. eHealth Platforms: Personalizing Healthcare Services
- 3.1.1. e-Health Platforms:
- 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 designed for professionals like you, who wish to project their professional career towards future trends in nano-robots"

05

Methodology

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

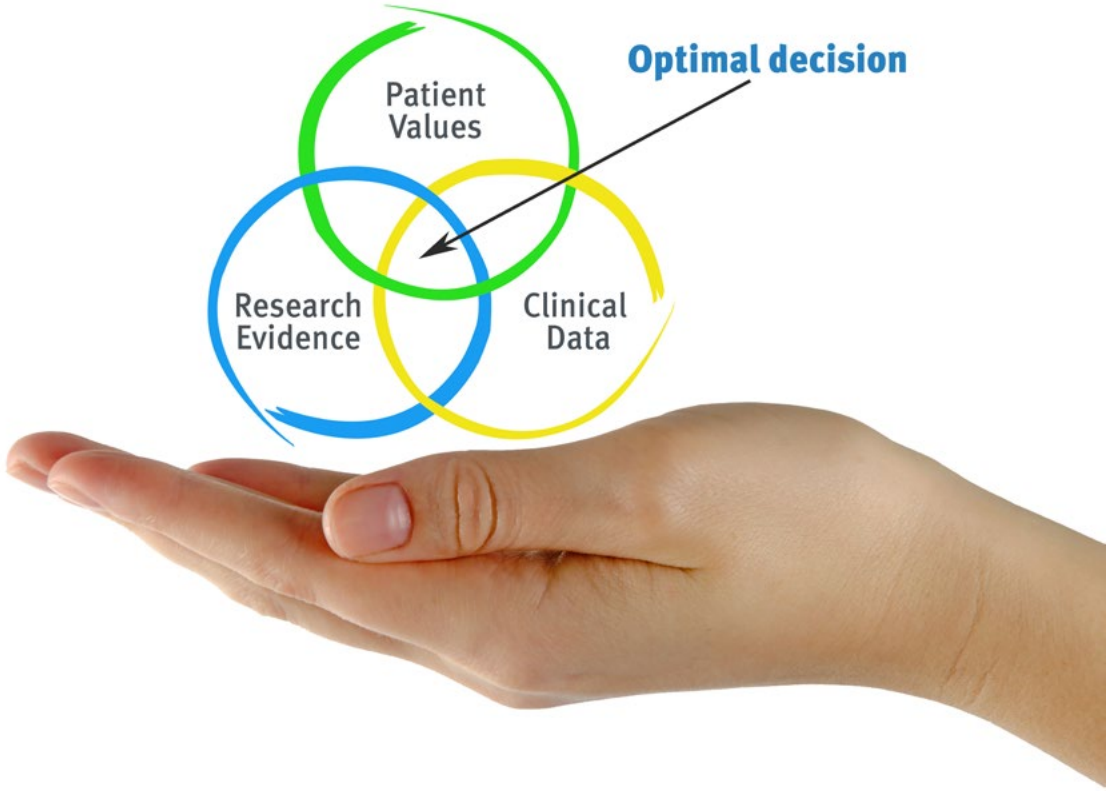
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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"

At TECH Nursing School we use the Case Method

In a given situation, what should a professional do? Throughout the program, students will face multiple simulated clinical cases, based on real patients, in which they will have to do research, establish hypotheses, and ultimately resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Nurses learn better, faster, and more sustainably over time.

With TECH, nurses can experience a learning methodology that is shaking the foundations of traditional universities around the world.



According to Dr. Gérvas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, in an attempt to recreate the real conditions in professional nursing practice.

Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method"

The effectiveness of the method is justified by four fundamental achievements:

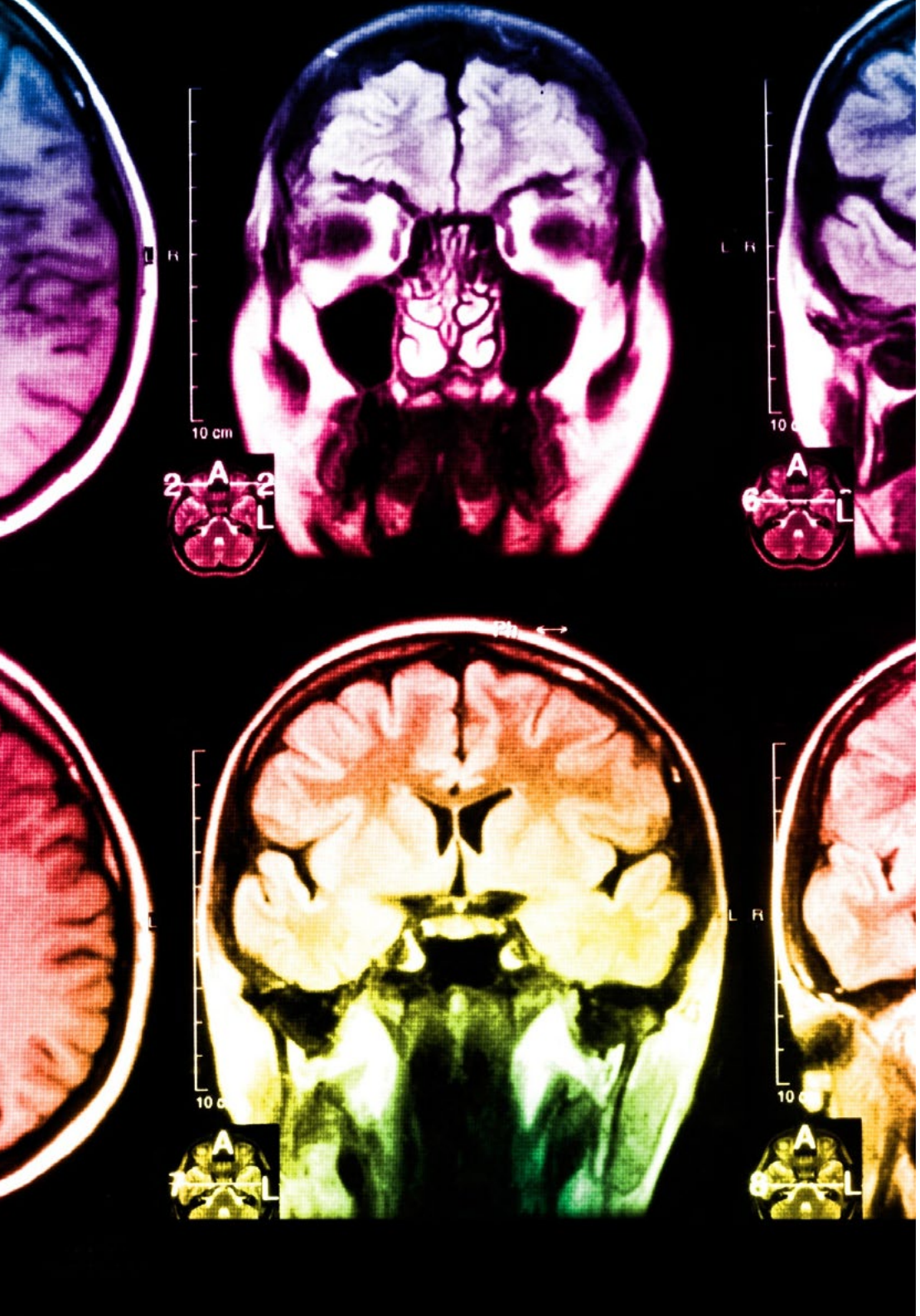
1. Nurses who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process has a clear focus on practical skills that allow the nursing professional to better integrate knowledge acquisition into the hospital setting or primary care.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine case studies with a 100% online learning system based on repetition combining a minimum of 8 different elements in each lesson, which is a real revolution compared to the simple study and analysis of cases.

The nurse will learn through real cases and by solving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.



At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology we have trained more than 175,000 nurses with unprecedented success in all specialities regardless of practical workload. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

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

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.

The overall score obtained by TECH's learning system is 8.01, according to the highest international standards.

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 really 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.

Nursing Techniques and Procedures on Video

We introduce you to the latest techniques, to the latest educational advances, to the forefront of current medical techniques. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch them as many times as you want.

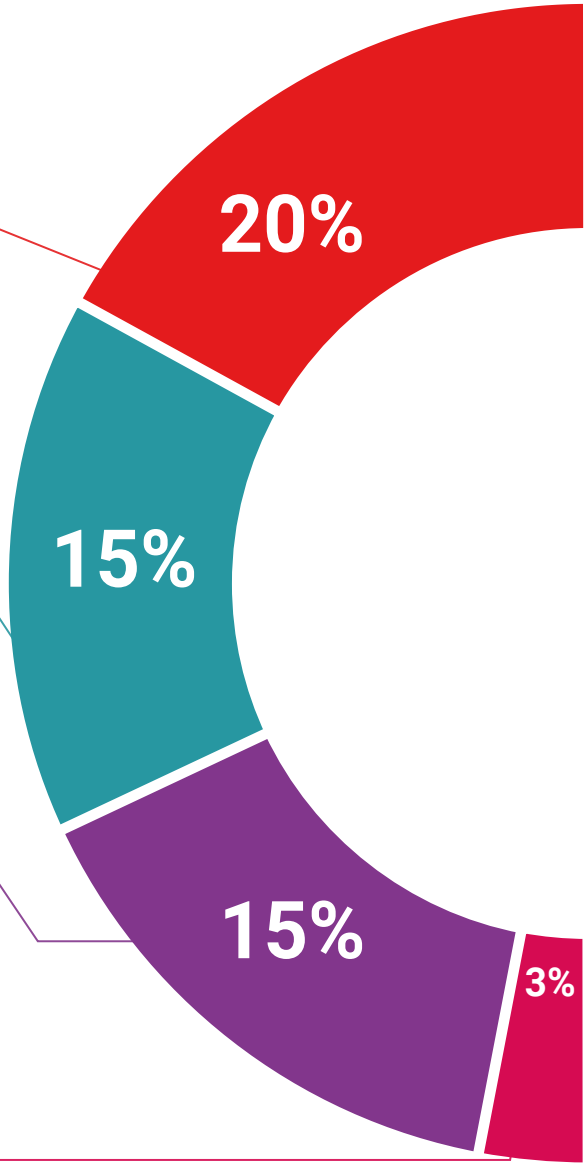
Interactive Summaries

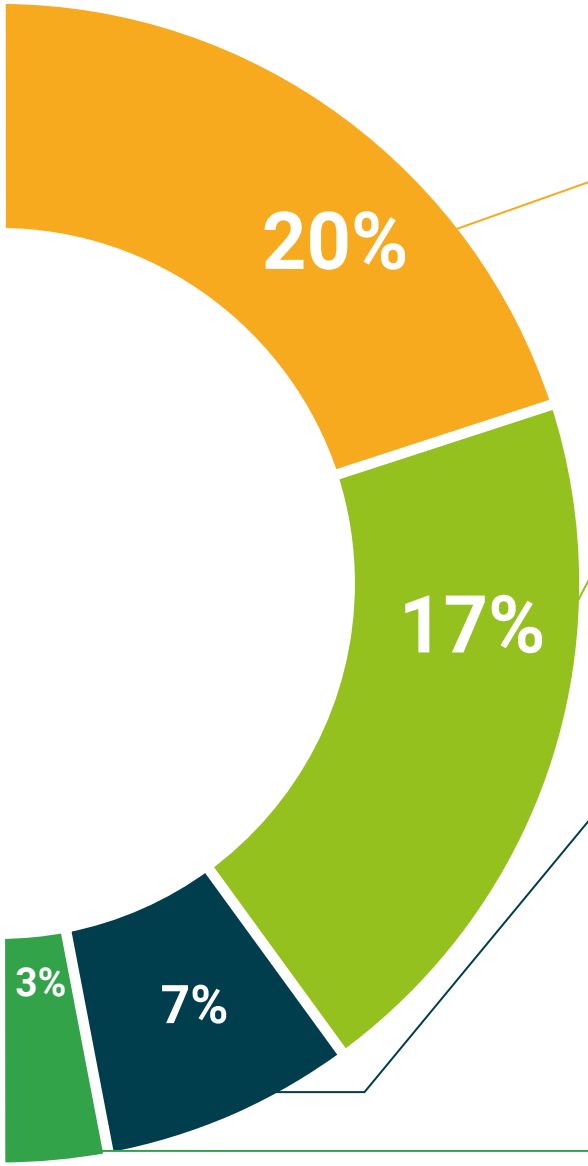
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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

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.





Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.

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.

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.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.

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"

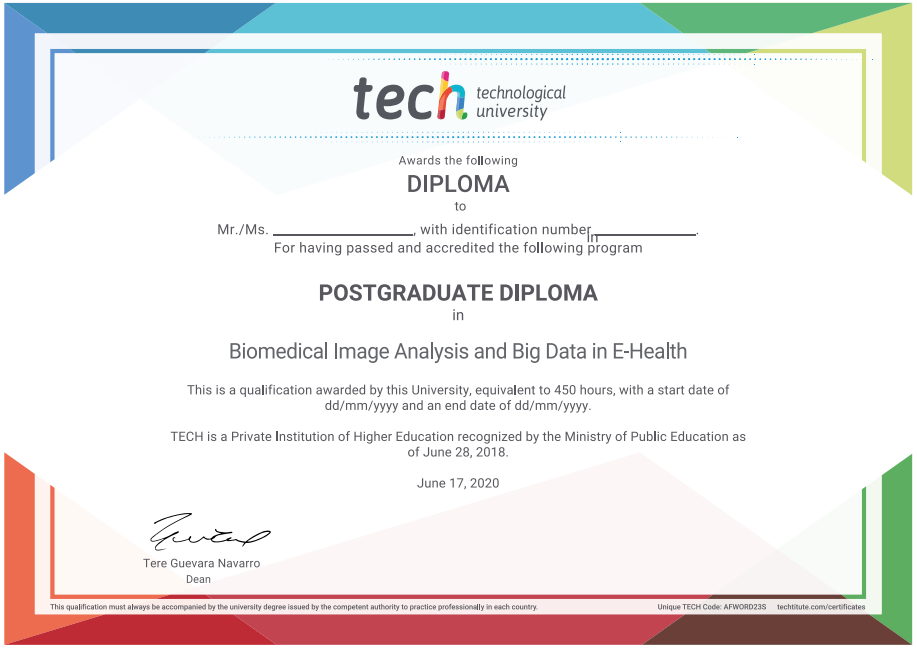
This **Postgraduate Diploma in Biomedical Image Analysis and Big Data in E-Health** contains the most complete and up-to-date scientific on the market.

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

The diploma 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 following

DIPLOMA

to

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

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Biomedical Image Analysis and Big Data in E-Health

This is a qualification awarded by this University, equivalent to 450 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 diploma issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.additional cost.

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