

Postgraduate Diploma  
Bioinformatics and Big Data  
In Medicine



## Postgraduate Diploma Bioinformatics and Big Data in Medicine

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Credits: 18 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/nursing/postgraduate-diploma/postgraduate-diploma-bioinformatics-big-data-medicine](http://www.techtute.com/us/nursing/postgraduate-diploma/postgraduate-diploma-bioinformatics-big-data-medicine)

# Index

01

Introduction

---

*p. 4*

02

Objectives

---

*p. 8*

03

Course Management

---

*p. 14*

04

Structure and Content

---

*p. 18*

05

Methodology

---

*p. 24*

06

Certificate

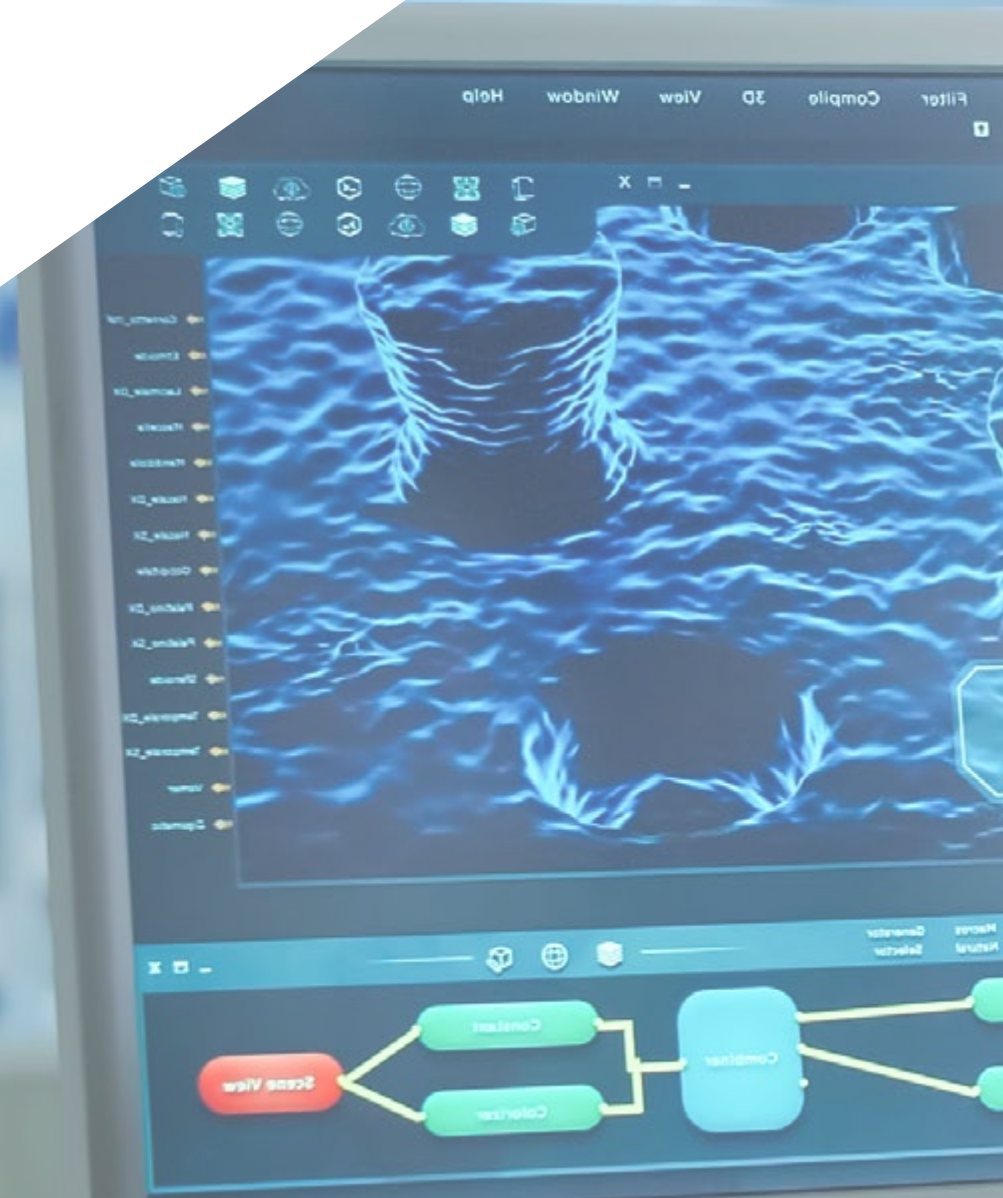
---

*p. 32*

01

# Introduction

Bioinformatics has opened up a range of possibilities in the healthcare field. This discipline encompasses the management, simulation, data mining and analysis of information generated in the human genome. Additionally, it can accelerate research processes in protein structure prediction, sequence studies and other activities related to biology research. Mastering biological creation is undoubtedly one of the desires of scientists and human beings in general, and technological science is one of the dominant elements in obtaining it. For this reason, TECH Global University has designed a program that will instruct its students to face projects of bioinformatics participation and cooperation in biomedical treatments, through a 100% online learning. In addition, the specialists will have downloadable audiovisual content, which they will be able to consult on their device for daily clinical practice.





“

*Thanks to TECH Global University, you will learn the mininvasive development of clinical practices in only 6 months of academic instruction"*



The incorporation of bioinformatics in the health field is an advance that acts in parallel with Big Data and, with COVID, it was fundamental for the knowledge and interpretation of data at a global level. These disciplines enable the management of the enormous volume of data generated by new omics technologies. Bioinformatics is a high-level approach to mutation in biology, which is why it has gained importance over the years and its scientific evidence.

Currently, controlling the mutation of epidemiological diseases is the main reason for the increase in bioinformatics studies. If possible, the vaccine would have been unique and it would not be necessary to look for alternatives according to the variation of the disease. For this reason, TECH Global University offers a Postgraduate Diploma in Bioinformatics and Big Data in Medicine, aimed at graduates in Nursing to expand and update the knowledge of these professionals so that they are able to apply it in their daily work.

This Postgraduate Diploma is supported by an expert teaching team in biomedicine that will transmit not only theoretical knowledge to the students, but will also instruct them based on their own real experience through case simulations. Also, TECH Global University applies the Relearning methodology to offer dynamic instruction that does not require long hours of memorization. Likewise, thanks to its 100% modality and its audiovisual content, students will be able to adapt the pace of study to their personal and professional possibilities.

This **Postgraduate Diploma in Bioinformatics and Big Data in Medicine** 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 bioinformatics 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
- ♦ Practical exercises where the self-assessment 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



*Not proficient in Machine Learning algorithms? Enroll now in a program that will not only teach you to understand public health computing, but will also instruct you in bioinformatics"*

“

*Thanks to TECH Global University, you will be able to understand the ins and outs of bioinformatics and become a much more competent and competitive professional in the job market"*

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. This will be done with the help of an innovative system of interactive videos made by renowned experts.

*Prevention and health diagnosis is in the hands of technology and how the professionals of the future know how to implement it. Update yourself with TECH Global University.*

*Enroll now in this Postgraduate Diploma to deepen in data preprocessing techniques with Gene Ontology and KEGG.*



02

# Objectives

The objective of this Postgraduate Diploma in Bioinformatics and Big Data in Medicine is to educate nurses about new technologies in the clinical setting. In just 6 months, the student will gain knowledge in real clinical applications and will understand how databases and computation intervene in biomedical and public health. Additionally, TECH Global University focuses on the development of the fundamentals of basic and translational scientific methodology, so that they can get the most out of the program and use it as a reference for their day-to-day work environment.



“

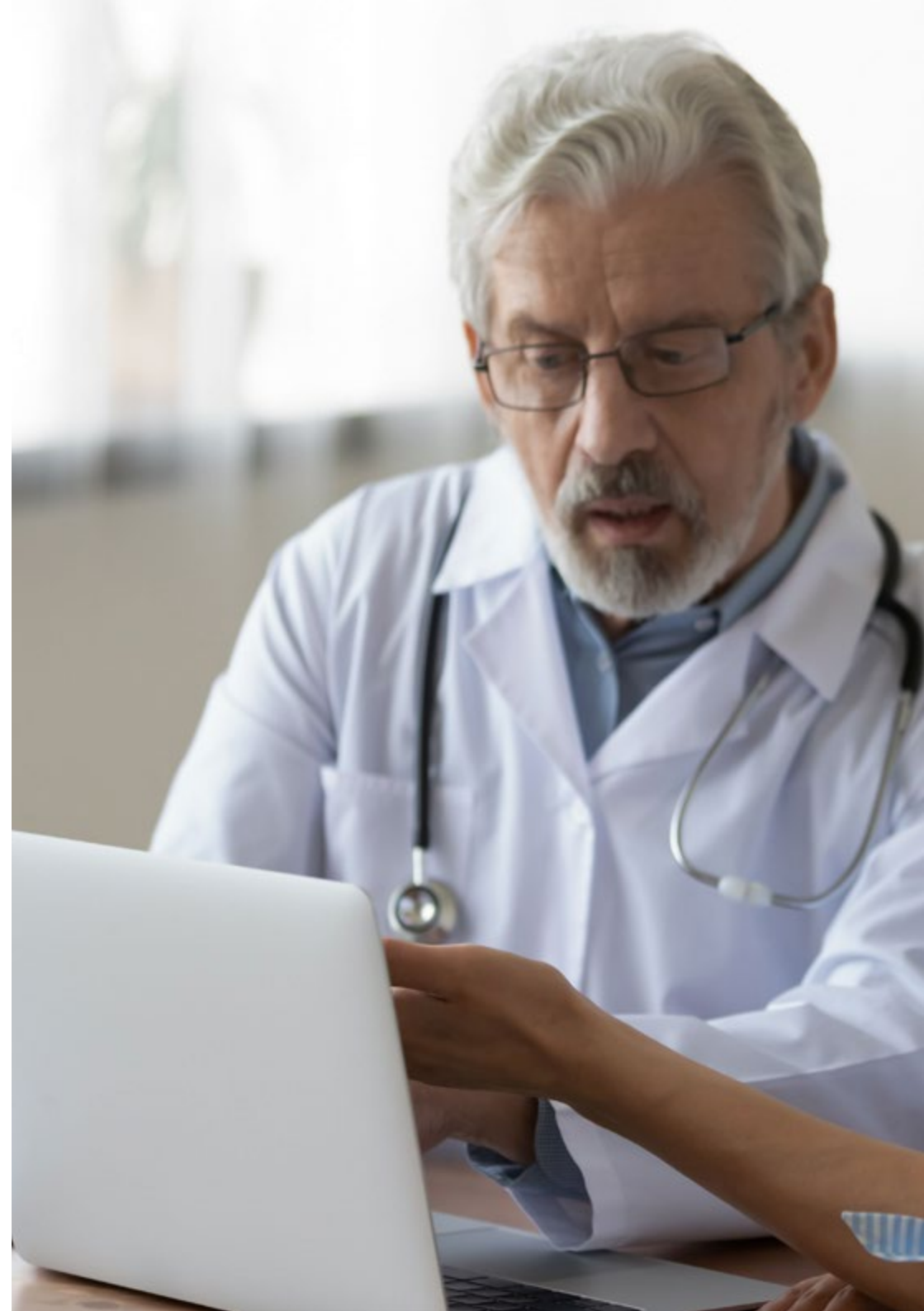
*Learn about metrics and tools in health processes  
and become a key professional for your workplace”*



## General Objectives

---

- ♦ Develop key concepts of medicine that will serve as a vehicle for the understanding of 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 healthcare 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 eHealth success stories and mistakes to avoid
- ◆ Apply the knowledge acquired to an original business idea



## Specific Objectives

---

### Module 1. Computation in Bioinformatics

- ◆ Understand the concept of computation
- ◆ Break down a computer system into its various parts
- ◆ Distinguish between the concepts of computational biology and computation in bioinformatics
- ◆ Master the most commonly used tools in the field
- ◆ Determine future trends in computing
- ◆ Analyze biomedical datasets using Big Data techniques

### Module 2. Biomedical Databases

- ◆ Understand the concept of biomedical information databases
- ◆ Examine the different types of biomedical information databases
- ◆ Study data analysis methods in depth
- ◆ Compile models that are useful in predicting outcomes
- ◆ Analyze patient data and organize it logically
- ◆ Report on large amounts of information
- ◆ Determine the main lines of research and testing
- ◆ Utilize tools for bioprocess engineering







### **Module 3. Big Data in Medicine: Massive Medical Data Processing**

- ◆ Gain specialized knowledge of mass data collection techniques in biomedicine
- ◆ Analyze the importance of data preprocessing in Big Data
- ◆ Determine the differences that exist between the data of the different techniques of massive data collection, as well as their special characteristics in terms of preprocessing and processing
- ◆ 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

“*Don't wait any longer, delve into the role of Big Data in biomedical trends and public health with TECH Global University*”



# 03

# Course Management

To deliver a fully specific program in Big Data and its application in healthcare processes, TECH Global University has relied on a team versed in biomedical engineering and modern nursing. Thanks to their collaboration, students will not only gain rigorous knowledge to learn about the advantages of bioinformatics in healthcare procedures, but they will also benefit from the experiences of experts in the field of action. This teaching disposition, added to the to the incorporation of technology in the pedagogical process, guarantee the correct instruction of the graduate in Nursing and, therefore, their personal and professional development.





“

*Be supported by biomedical experts who participate in collaborative computing projects in the area in which you will develop as a professional"*

## 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 Healthcare and Medical Technology Companies



## Professors

### Mr. Piró Cristobal, Miguel

- ◆ E-Health Support Manager at ERN Transplantchild
- ◆ Electromedical Technician. Electromedical Business Group GEE
- ◆ Data and Analysis Specialist - Data and Analysis Team. BABEL
- ◆ Biomedical Engineer at MEDIC LAB. UAM
- ◆ Director of External Affairs CEEIBIS
- ◆ Degree in Biomedical Engineering, Carlos III University of Madrid
- ◆ Master's Degree in Clinical Engineering Carlos III University of Madrid
- ◆ Master's Degree in Financial Technologies: Fintech Carlos III University of Madrid
- ◆ Training in Data Analysis in Biomedical Research. La Paz University Hospital

### Ms. Ruiz de la Bastida, Fátima

- ◆ Data Scientist at IQVIA
- ◆ Specialist in the Bioinformatics Unit of the Jiménez Díaz Health Research Institute
- ◆ Oncology Researcher at the La Paz University Hospital
- ◆ Graduate in Biotechnology, University of Cadiz
- ◆ Master's Degree in Bioinformatics and Computational Biology, Autonomous University of Madrid
- ◆ Specialist in Artificial Intelligence and Data Analysis at the University of Chicago



# 04

## Structure and Content

The syllabus of this Postgraduate Diploma in Bioinformatics and Big Data in Medicine has been designed in detail by professionals working in the field of bioinformatics and biomedicine, among other disciplines of Health Sciences. It is a 100% online program that streamlines the educational process around knowledge in computing, biomedical databases and Big Data in medicine. TECH Global University achieves this thanks to the innovative Relearning methodology. With it, students will not have to invest long hours of memorization, but will be able to assimilate the contents gradually and steadily. In this way, the study will be adapted with total flexibility to their availability, obtaining a personalized academic experience in line with their professional and personal obligations.





“

*Develop molecular biology and computation in parallel to witness its multiple advantages. This is the only way you will be part of the evolution in Health"*

## Module 1. Computation in Bioinformatics

- 1.1. Central Tenet in Bioinformatics and Computing. Current State
  - 1.1.1. The Ideal Application in Bioinformatics
  - 1.1.2. Parallel Developments in Molecular Biology and Computing
  - 1.1.3. Dogma in Biology and Information Theory
  - 1.1.4. Information Flows
- 1.2. Databases for Bioinformatics Computing
  - 1.2.1. Database
  - 1.2.2. Data management
  - 1.2.3. Data Life Cycle in Bioinformatics
    - 1.2.3.1. Use
    - 1.2.3.2. Modifications
    - 1.2.3.3. Archive
    - 1.2.3.4. Reuse
    - 1.2.3.5. Discarded
  - 1.2.4. Database Technology in Bioinformatics
    - 1.2.4.1. Architecture
    - 1.2.4.2. Database Management
  - 1.2.5. Interfaces for Bioinformatics Databases
- 1.3. Networks for Bioinformatics Computing
  - 1.3.1. Communication Models. LAN, WAN, MAN and PAN Networks
  - 1.3.2. Protocols and Data Transmission
  - 1.3.3. Network Topologies
  - 1.3.4. Datacenter Hardware for Computing
  - 1.3.5. Security, Management and Implementation
- 1.4. Search Engines in Bioinformatics
  - 1.4.1. Search Engines in Bioinformatics
  - 1.4.2. Search Engine Processes and Technologies in Bioinformatics
  - 1.4.3. Computational Models: Search and Approximation Algorithms
- 1.5. Data Display in Bioinformatics
  - 1.5.1. Displaying Biological Sequences
  - 1.5.2. Displaying Biological Structures
    - 1.5.2.1. Visualization Tools
    - 1.5.2.2. Rendering Tools
  - 1.5.3. User Interface in Bioinformatics Applications
  - 1.5.4. Information Architectures for Displays in Bioinformatics
- 1.6. Statistics for Computing
  - 1.6.1. Statistical Concepts for Computing in Bioinformatics
  - 1.6.2. Use Case: MARN Microarrays
  - 1.6.3. Imperfect Data. Errors in statistics: Randomness, Approximation, Noise and Assumptions
  - 1.6.4. Error Quantification: Precision and Sensitivity
  - 1.6.5. Clustering and Classification
- 1.7. Data Mining
  - 1.7.1. Mining and Data Computing Methods
  - 1.7.2. Infrastructure for Data Mining and Computing
  - 1.7.3. Pattern Discovery and Recognition
  - 1.7.4. Machine Learning and New Tools
- 1.8. Genetic Pattern Matching
  - 1.8.1. Genetic Pattern Matching
  - 1.8.2. Computational Methods for Sequence Alignments
  - 1.8.3. Pattern Matching Tools
- 1.9. Modelling and Simulation
  - 1.9.1. Use in the Pharmaceutical Field: Drug Discovery
  - 1.9.2. Protein Structure and Systems Biology
  - 1.9.3. Available Tools and Future
- 1.10. Collaboration and Online Computing Projects
  - 1.10.1. Grid Computing
  - 1.10.2. Standards and Rules Uniformity, Consistency and Interoperability
  - 1.10.3. Collaborative Computing Projects

## Module 2. Biomedical Databases

- 2.1. Biomedical Databases
  - 2.1.1. Biomedical Databases
  - 2.1.2. Primary and Secondary Databases
  - 2.1.3. Major Databases
- 2.2. DNA Databases
  - 2.2.1. Genome Databases
  - 2.2.2. Gene Databases
  - 2.2.3. Mutations and Polymorphisms Databases
- 2.3. Protein Databases
  - 2.3.1. Primary Sequence Databases
  - 2.3.2. Secondary Sequence and Domain Databases
  - 2.3.3. Macromolecular Structure Databases
- 2.4. Omics Projects Databases
  - 2.4.1. Genomics Studies Databases
  - 2.4.2. Transcriptomics Studies Databases
  - 2.4.3. Proteomics Studies Databases
- 2.5. Genetic Diseases Databases. Personalized and Precision Medicine
  - 2.5.1. Genetic Diseases Databases
  - 2.5.2. Precision Medicine. The Need to Integrate Genetic Data
  - 2.5.3. Extracting Data from OMIM
- 2.6. Self-Reported Patient Repositories
  - 2.2.1. Secondary Data Use
  - 2.6.2. Patients' Role in Deposited Data Management
  - 2.6.3. Repositories of Self-Reported Questionnaires. Examples:
- 2.7. Elixir Open Databases
  - 2.7.1. Elixir Open Databases
  - 2.7.2. Databases Collected on the Elixir Platform
  - 2.7.3. Criteria for Choosing between Databases
- 2.8. Adverse Drug Reactions (ADRs) Databases
  - 2.8.1. Pharmacological Development Processes
  - 2.8.2. Adverse Drug Reaction Reporting
  - 2.8.3. Adverse Reaction Repositories at European and International Levels

- 2.9. Research Data Management Plans. Data to be Deposited in Public Databases
  - 2.9.1. Data Management Plans
  - 2.9.2. Data Custody in Research
  - 2.9.3. Data Entry in Public Databases
- 2.10. Clinical Databases. Problems with Secondary Use of Health Data
  - 2.10.1. Medical Record Repositories
  - 2.10.2. Data Encryption
  - 2.10.3. Access to Health Data. Legislation

## Module 3. Big Data in Medicine: Massive Medical Data Processing

- 3.1. Big Data in Biomedical Research
  - 3.1.1. Data Generation in Biomedicine
  - 3.1.2. High Performance (High-throughput technology)
  - 3.1.3. Uses of High-Throughput Data. Hypotheses in the Age of Big Data
- 3.2. Data Pre-Processing in Big Data
  - 3.2.1. Data Pre-Processing
  - 3.2.2. Methods and Approaches
  - 3.2.3. Problems with Data Pre-Processing in Big Data
- 3.3. Structural Genomics
  - 3.3.1. Sequencing the Human Genome
  - 3.3.2. Sequencing vs Chips
  - 3.3.3. Variant Discovery
- 3.4. Functional Genomics
  - 3.4.1. Functional Notation
  - 3.4.2. Mutation Risk Predictors
  - 3.4.3. Association Studies in Genomics
- 3.5. Transcriptomics
  - 3.5.1. Techniques to Obtain Massive Data in Transcriptomics: RNA-seq
  - 3.5.2. Data Normalization in Transcriptomics
  - 3.5.3. Differential Expression Studies

- 3.6. Interactomics and Epigenomics
  - 3.6.1. The Role of Chromatin in Gene Expression
  - 3.6.2. High-Throughput Studies in Interactomics
  - 3.6.3. High-Throughput Studies in Epigenetics
- 3.7. Proteomics
  - 3.7.1. Analysis of Mass Spectrometry Data
  - 3.7.2. Post-Translational Modifications Study
  - 3.7.3. Quantitative Proteomics
- 3.8. Enrichment and Clustering Techniques
  - 3.8.1. Contextualizing Results
  - 3.8.2. Clustering Algorithms in Omics Techniques
  - 3.8.3. Repositories for Enrichment: Gene Ontology and KEGG
- 3.9. Applying Big Data to Public Health
  - 3.9.1. Discovery of New Biomarkers and Therapeutic Targets
  - 3.9.2. Risk Predictors
  - 3.9.3. Personalized Medicine
- 3.10. Big Data Applied to Medicine
  - 3.10.1. Potential for Diagnostic and Preventive Assistance
  - 3.10.2. Use of Machine Learning Algorithms in Public Health
  - 3.10.3. The Problem of Privacy



“*A program designed for you to discover new biomarkers and therapeutic targets, thanks to the application of Big Data*”



# 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.

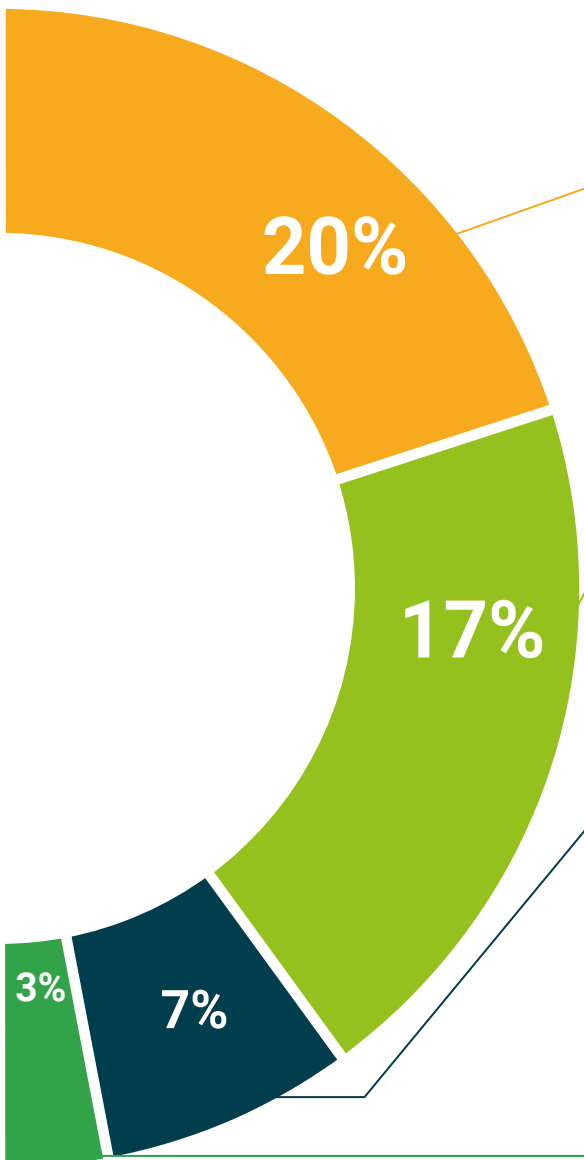
This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



### 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 Certificate in Bioinformatics and Big Data in Medicine guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.



“

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



This program will allow you to obtain your **Postgraduate Diploma in Bioinformatics and Big Data in Medicine** 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.

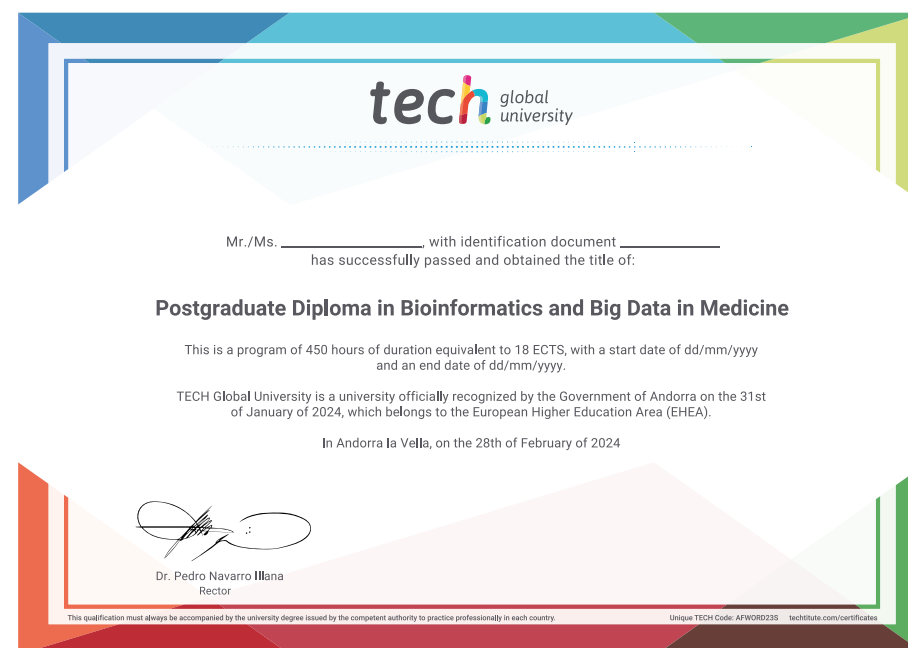
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Diploma in Bioinformatics and Big Data in Medicine**

Modality: **online**

Duration: **6 months**

Accreditation: **18 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 languages  
virtual classroom

**tech** global  
university

**Postgraduate Diploma**  
Bioinformatics and Big Data  
in Medicine

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Credits: 18 ECTS
- » Schedule: at your own pace
- » Exams: online

# Postgraduate Diploma

## Bioinformatics and Big Data in Medicine

