Postgraduate Diploma
Bioinformatics and Big Data in Medicine

tech technological university

tech technological university

Postgraduate Diploma
Bioinformatics and Big Data in Medicine

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

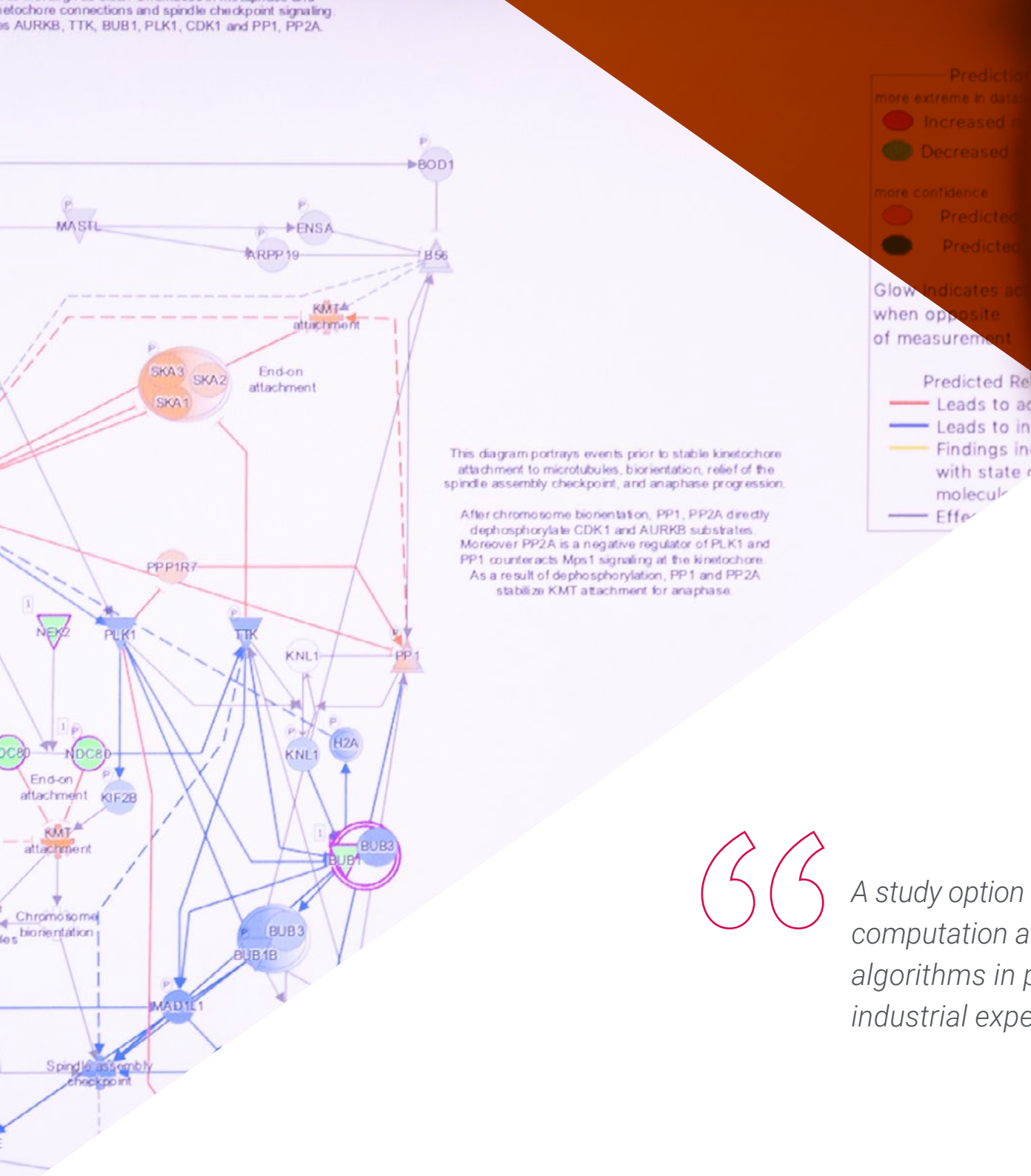
Website: **www.techtitute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-bioinformatics-big-data-medicine**

Index

01

Introduction

The projection of Big Data in recent years has been fundamental in the management and interpretation of data on SARS-CoV-2. This work has allowed the monitoring and analysis of the mutation of this virus, obtaining improvements for its diagnosis. The imminent emergence of new diseases makes the healthcare market request engineers with expertise in computing and global data analysis. Therefore, TECH offers a program that will instruct its students to face projects of bioinformatics participation and cooperation in biomedical treatments, through online learning. The downloadable audiovisual contents will allow the student to .the enormous volume of data generated by the new omics technologies.



A study option that will qualify you in the field of computation and the use of Machine Learning algorithms in public health, to become an industrial expert in Bioinformatics"

The explosion of Bioinformatics as an indispensable discipline in many fields, such .professionals. The speed with which new diseases adapt to the environment in order to remain is what makes expert qualification necessary for data analytical engineers to respond to emerging changes.

Currently, the COVID-19 viral genome mutation has been one of the reasons why the bioinformatics discipline has come to the forefront of medicine. For this reason, TECH has created a digital learning pathway, which is aimed at instructing engineers in the field of computation and Big Data. The program is proposed with the support of a professional team that is dedicated to the sector and that will be available to carry out a thorough follow-up to the student and solve all their questions about the subject.

This Postgraduate Diploma in Bioinformatics and Big Data in Medicine corresponds to a program with a design adapted to the new media that facilitates student learning, thanks to its 100% online mode and its audiovisual content. In addition, as it has a downloadable syllabus, the user will be able to access the materials without an Internet connection and even when they have already completed the Postgraduate Diploma.

This **Postgraduate Diploma in Bioinformatics and Big Data in Medicine** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- 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 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

Still not familiar with the evolution of Big Data in medicine? Enroll in a program that will not only teach you to understand the importance of databases, but also how to apply them in healthcare centers"

Information is power, enroll in this Postgraduate Diploma to explore data pre-processing techniques using tools such as Gene Ontology and KEGG"

Thanks to TECH, you can interpret extensive data collections and cooperate in research lines and trials.

Develop more effective therapies with fewer side effects on the human body, thanks to the Adverse Drug Reaction (ADR) databases.

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 education programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the course. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

Objectives

The syllabus of this Postgraduate Diploma in Bioinformatics and Big Data in Medicine aims to educate engineers who have a technical background and wish to expand their knowledge of databases. In just six months, the student will gain knowledge in real clinical applications and will understand how databases and computation are involved in biomedical and public health. TECH will provide the best and most advanced teaching tools, which will not only have a positive influence on learning, but will also provide this program with the necessary dynamism to motivate users so that they can get the most out of their educational experience.

A program designed to make you forget about cumbersome studies and prepare you through practical assumptions to participate in health management projects thanks to bioinformatics"

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 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 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

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 bioinformatics computing
- 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
- Perform reports based on large amounts of data
- 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 massive data acquisition techniques in biomedicine
- Analyze the importance of data pre-processing 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

Meet your goal, delve into data analysis methods to become a Big Data expert in biomedical research and public health"

03

Course Management

To master the fundamental informatics processes in biomedical intervention, TECH has called on a professional team working directly in this field. The teachers who teach this Postgraduate Diploma are experts in E-Health and Bioinformatics. In addition, they have experience in participatory projects such as research at the National Microelectronics Center of the Spanish National Research Council (CSIC). It is, therefore, an opportunity for those engineering graduates who want to be educated, guided by professional models who already occupy important positions in the labor market.

Participate in collaborative computing projects thanks to the teaching of experts who will be at your disposal 24 hours a day through specialized tutorials"

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 Institute for Health Research Jiménez Díaz Foundation
- 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 biological engineering and bioinformatics. Thanks to their contribution and the incorporation of technological tools, students will have at their disposal audiovisual contents in different formats that will help them in their education addition, the *Relearning* methodology applied by TECH makes students forget about long hours of memorization and assimilate the contents in a gradual and simple way. In this way, the 100% online study will be adapted to your availability, through theoretical and practical exercises that will prepare you for real cases.

Informatics is part of us, now you can make information flows optimal to enhance clinical outreach"

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. Statistical Errors: 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
- 2.6.1. 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

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-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

Take the step to get up to date on the latest developments in Bioinformatics and Big Data in 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.

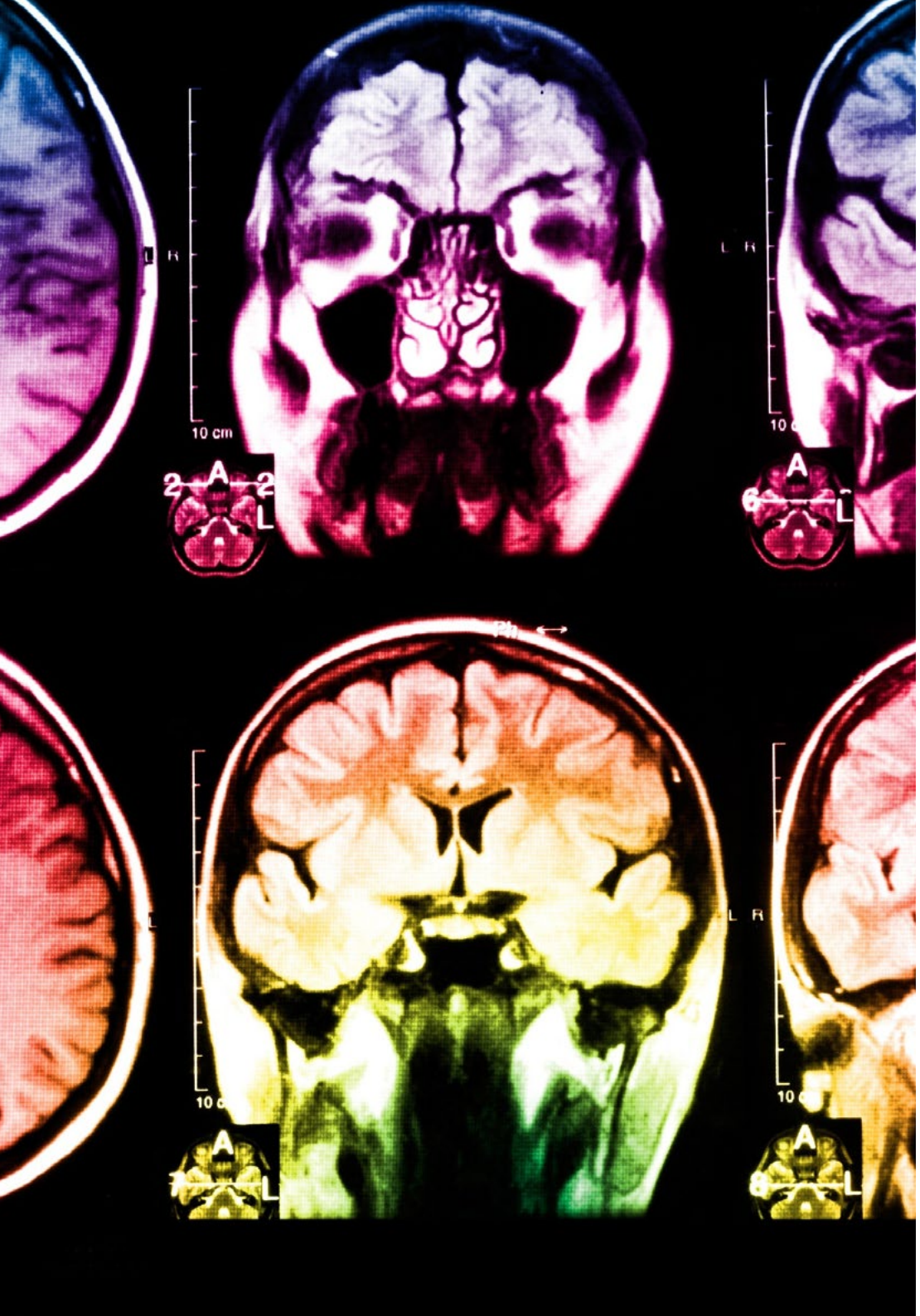
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

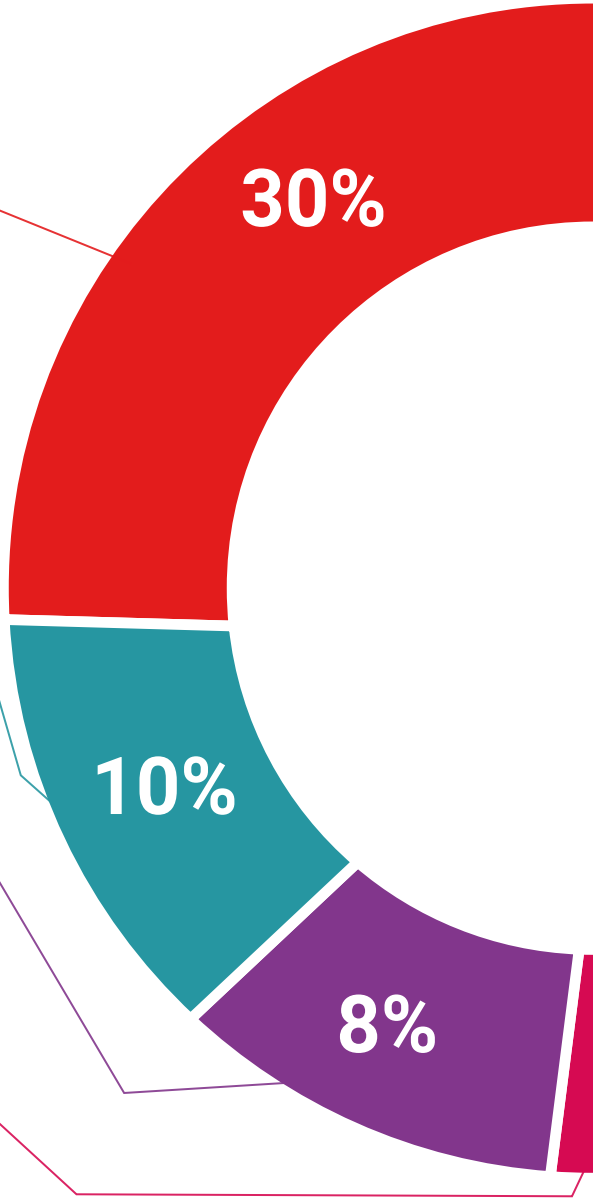
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

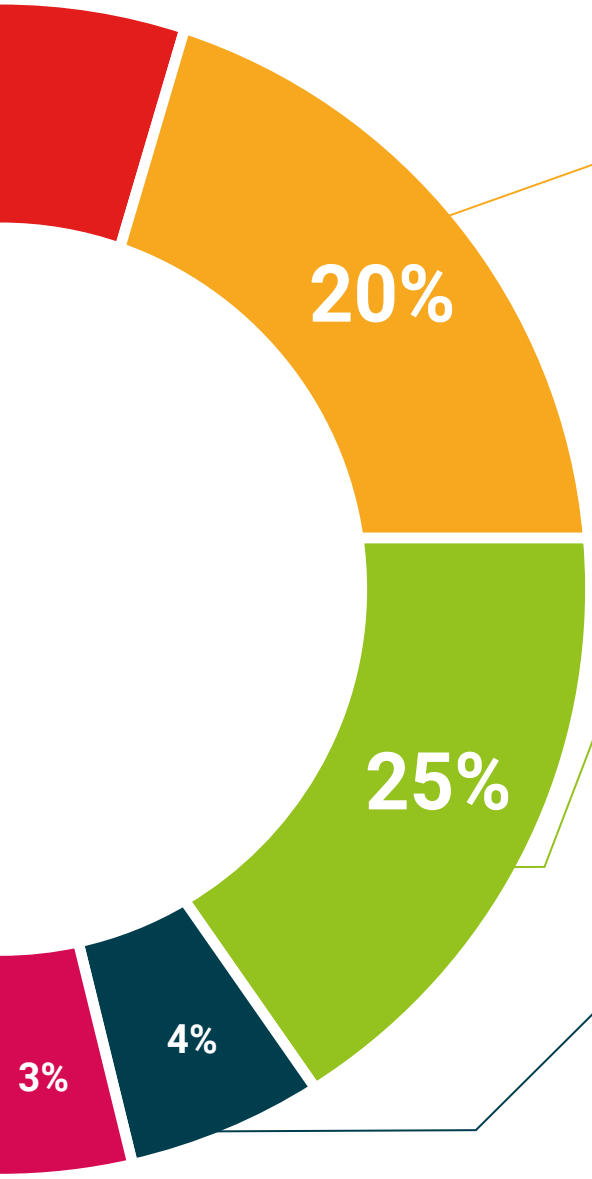
Practising Skills and Abilities

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 Diploma in Bioinformatics and Big Data in Medicine 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"

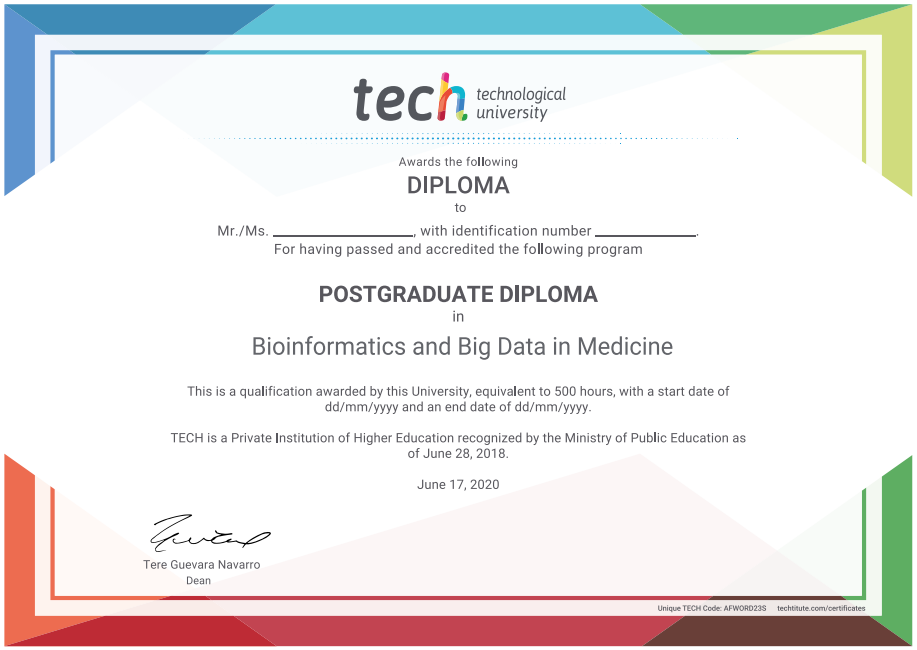
This **Postgraduate Diploma in Bioinformatics and Big Data in Medicine** contains the most complete and up-to-date program on the market.

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

The 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 Bioinformatics and Big Data in Medicine**

Official Nº of Hours: **450 h.**


tech technological university

Awards the following

DIPLOMA

to

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

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Bioinformatics and Big Data in Medicine

This is a qualification awarded by this University, equivalent to 500 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

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.

tech technological university

Postgraduate Diploma
Bioinformatics and Big Data in Medicine

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

Postgraduate Diploma
Bioinformatics and Big Data in Medicine

tech technological university