Postgraduate Diploma

Bioinformatics and Big Data in Medicine

tech global university

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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.techtitute.com/us/physiotherapy/postgraduate-diploma/postgraduate-diploma-bioinformatics-big-data-medicine

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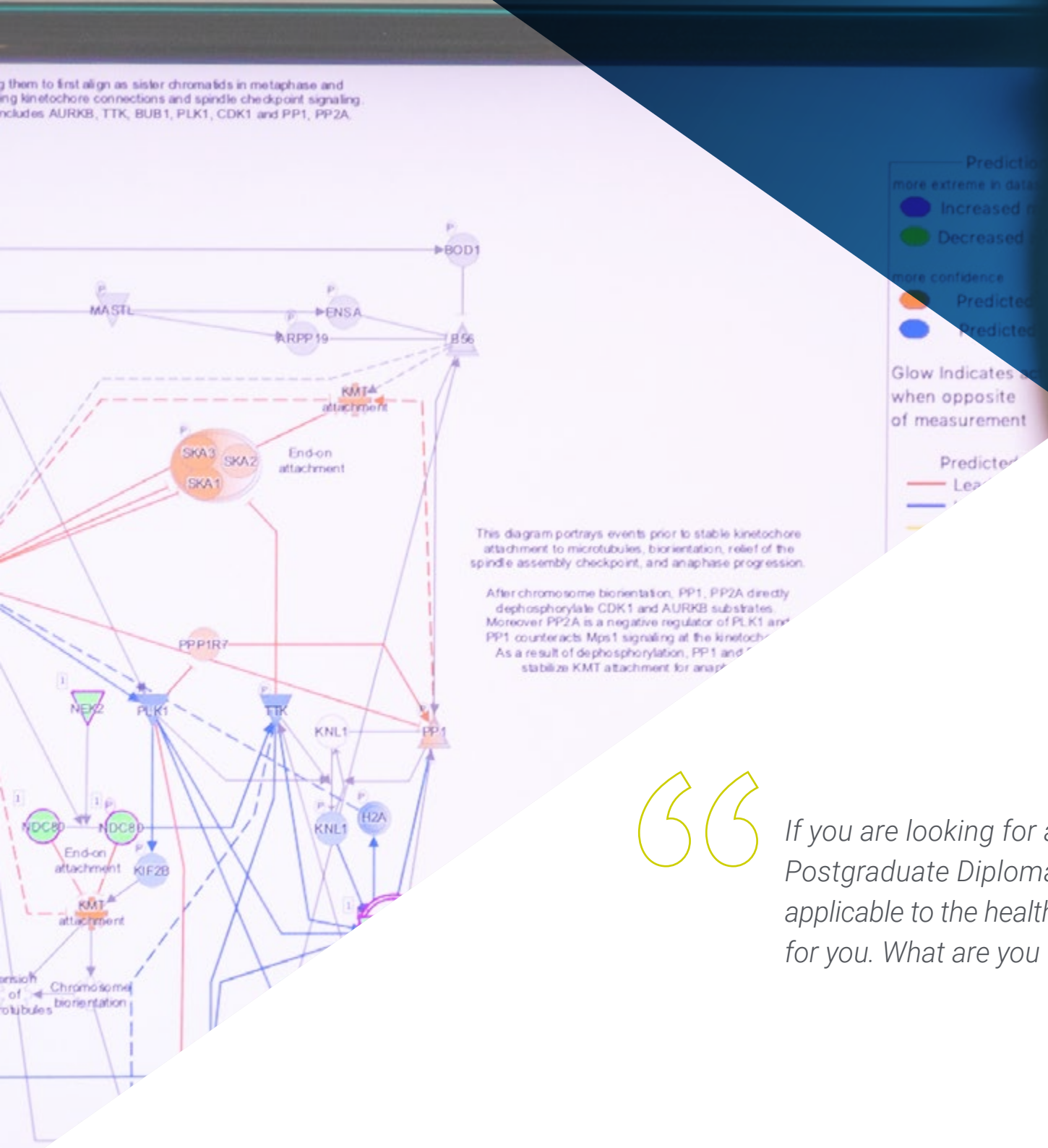
01

Introduction

The development of Bioinformatics has favored the creation of computational technological tools that simplify and reduce time in the analysis and classification of clinical data. Thanks to this, the automation of diagnostic technologies has become a reality for many professionals in the health sector, including specialists in Physiotherapy. Based on this, having a broad and up-to-date knowledge of massive data processing techniques, such as Clustering, promotes and facilitates research and innovation in health, which is why this program has become a widely demanded opportunity. In just 6 months, graduates will be able to work in depth on new developments related to Big Data and the healthcare field, 100% online and through an educational experience designed with their needs and those of the sector in mind.



If you are looking for a program with which to obtain a Postgraduate Diploma in Bioinformatics and Big Data applicable to the healthcare field, this program is perfect for you. What are you waiting for? Enroll now!"

The improvement in the management of biological data that the specialties related to the health sciences have experienced with the development of bioinformatics is incalculable. Thanks to the evolution of Big Data strategies, web 3.0 and digital technology, it is now possible to carry out a massive analysis of clinical information in a very short time, optimizing the interpretation and application processes and facilitating the professional's decision-making when dealing with a patient.

Areas such as Physiotherapy have implemented the most innovative techniques related to specialized computing in their daily work, which has helped them to establish more effective and specialized therapeutic guidelines, which corresponds to one of the main objectives of Bionformatics. And in order to bring the physiotherapist closer to the latest developments in this sector, TECH has decided to release this Postgraduate Diploma, a 100% online program designed by and for those versed in the area.

It is an innovative and intensive educational experience through which the specialist will be able to get up to date with the latest advances in the creation and management of different databases, the use of the most sophisticated and complex search engines or the management of the most effective statistical techniques applicable to computing. It will also delve into the massive processing of information through techniques such as structural genomics, functional genomics and transcriptomics, among others.

For this purpose, 450 hours of the best theoretical, practical and additional material will be available, the latter presented in different formats: detailed videos, research articles, complementary readings, dynamic summaries and much more. Everything will be available from the beginning of the educational activity and can be downloaded to any device with an Internet connection. In this way, graduates will have the opportunity to organize this experience in a totally personalized way and adapted to their absolute availability.

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

Would you like to delve into the latest developments in bioinformatics computing? Choose this program that TECH offers you 100% online and update your knowledge in just 6 months"

Thanks to the exhaustiveness with which this syllabus has been designed, you will be able to implement the most effective and innovative strategies for the massive processing of clinical data in your professional practice"

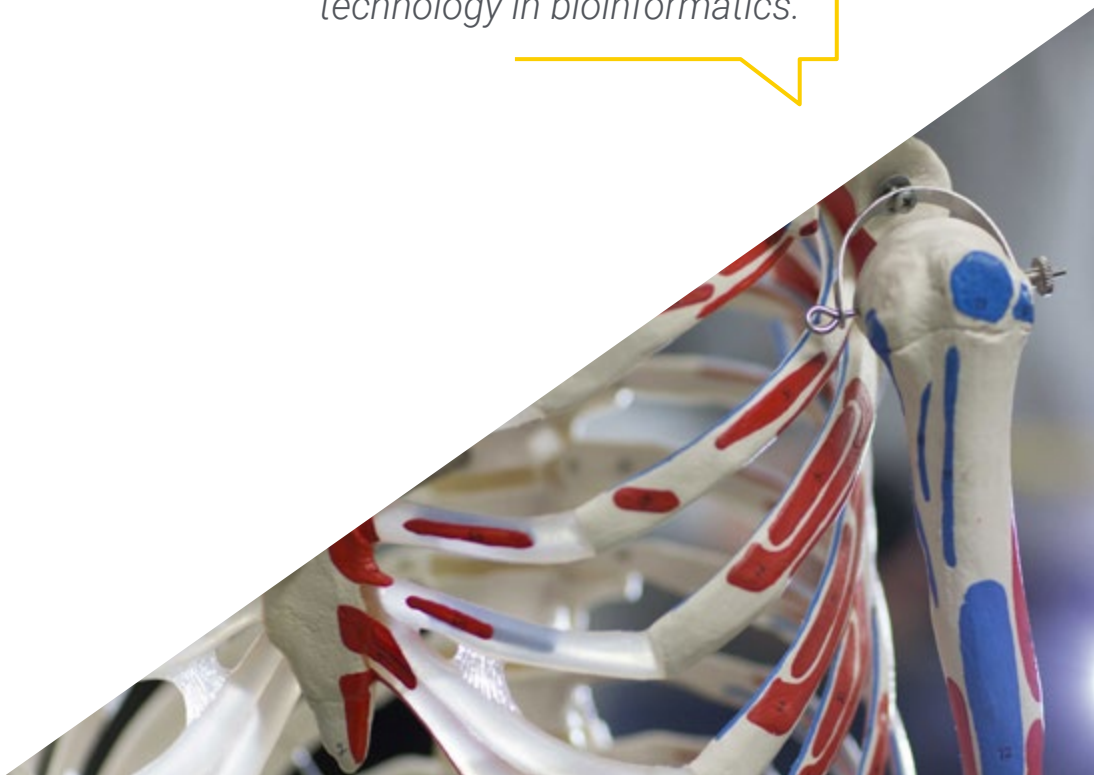
You will delve into the effective creation of ohmic and protein project databases, which will help you to optimize the information you have available in your practice.

A perfect program to learn in detail the latest developments related to database technology in bioinformatics.

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.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide 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 academic year This will be done with the help of an innovative system of interactive videos made by renowned experts.



02

Objectives

The main objective of this Postgraduate Certificate is to provide the Physiotherapy professionals with all the information they need to know in detail the latest developments related to Bioinformatics and Big Data and their application in the health field. Thanks to this, they will be able to implement in their practice the most effective and innovative information management strategies, as well as the techniques for massive data processing that have had the best results so far. All this in a 100% online format and in only 6 months.

A program designed for you to master the most innovative Clustering strategies in only 450 hours and 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 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. Computing in Bioinformatics

- Understand the concept of computing
- 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
- 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 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

The best program in the educational market to get you up to date on the applications of Big Data in public health, with no schedules or on-site classes"

03

Course Management

In order to perfectly master the field of Bioinformatics and Big Data applied to public health, it is necessary that the graduate has, in addition to a complete and comprehensive education, the support of a teaching team versed in the area. For this reason, TECH has selected for this Postgraduate Diploma a group of Biomedical engineers and Biotechnologists with a wide and extensive work experience in the sector. Thanks to the degree of professionalism they have, as well as the professional career that supports them, they are the best example that the graduate can have to get up to date with the latest developments in this field through a program designed by and for specialists.

The teaching team has selected a multitude of real cases so that you can put into practice the strategies developed in this Postgraduate Diploma and improve your skills in a guaranteed way"

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
- Area Specialist, Bioinformatics Unit, Jimenez Diaz Foundation 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 graduate who enrolls in this Postgraduate Diploma will find 450 hours of the best theoretical, practical and additional content. All this will be presented in a convenient and flexible 100% online format, thanks to which you can delve into the latest developments in Bioinformatics and Big Data from wherever you want and whenever you want, without schedules or on-site classes. In addition, all the material will be available from the beginning of the learning activity and can be downloaded to any device with an Internet connection. In this way, the specialists will be able to consult it whenever they need it, even when the educational experience is over.

The use of the Relearning methodology, as well as the inclusion of hours of high-quality additional material will make the program's course a dynamic, multidisciplinary and entertaining educational experience"

Module 1. Computing in Bioinformatics

1.1. Central Dogma 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 Local, National, 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

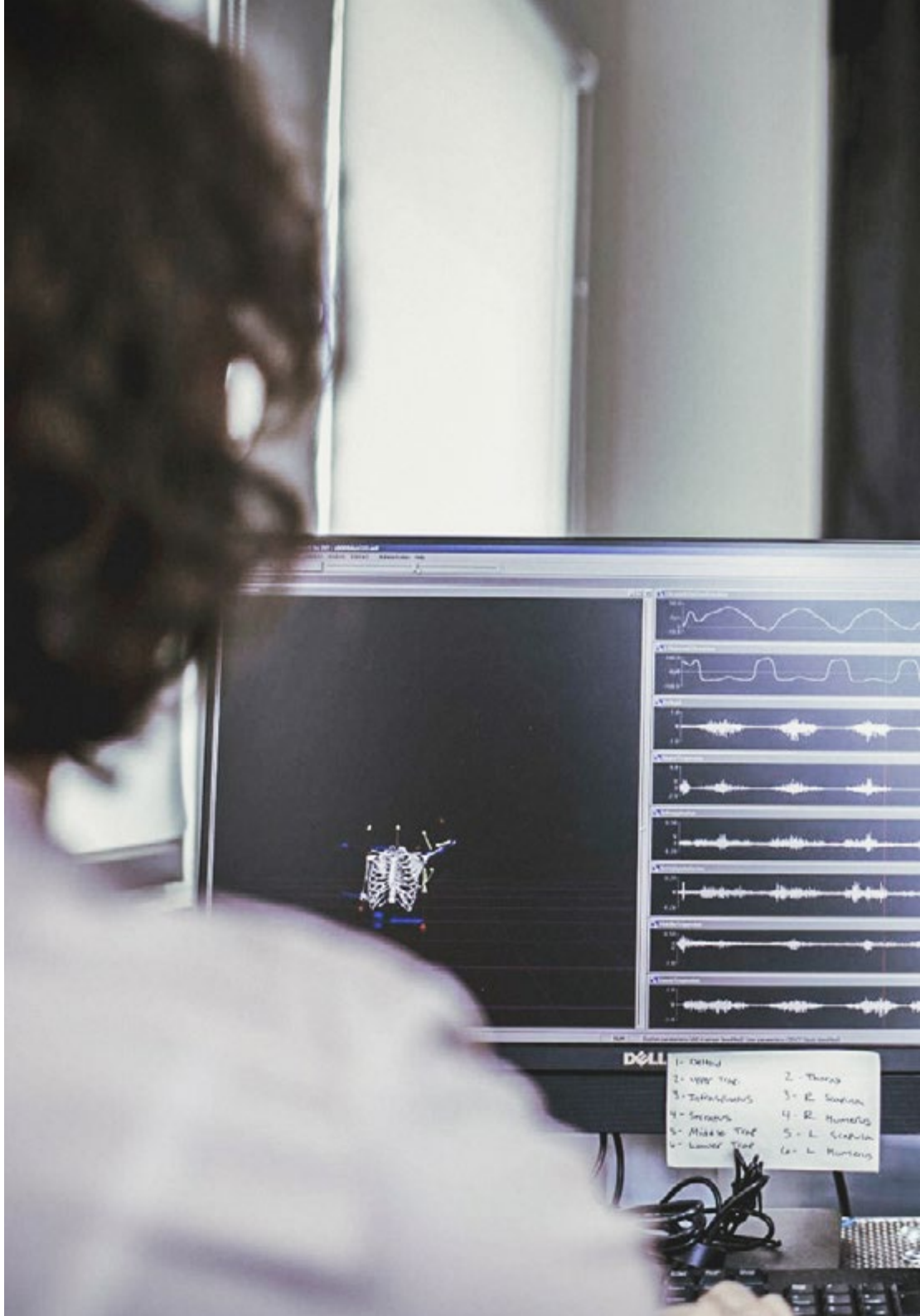
Module 3. Big Data in Medicine: Massive Medical Data Processing

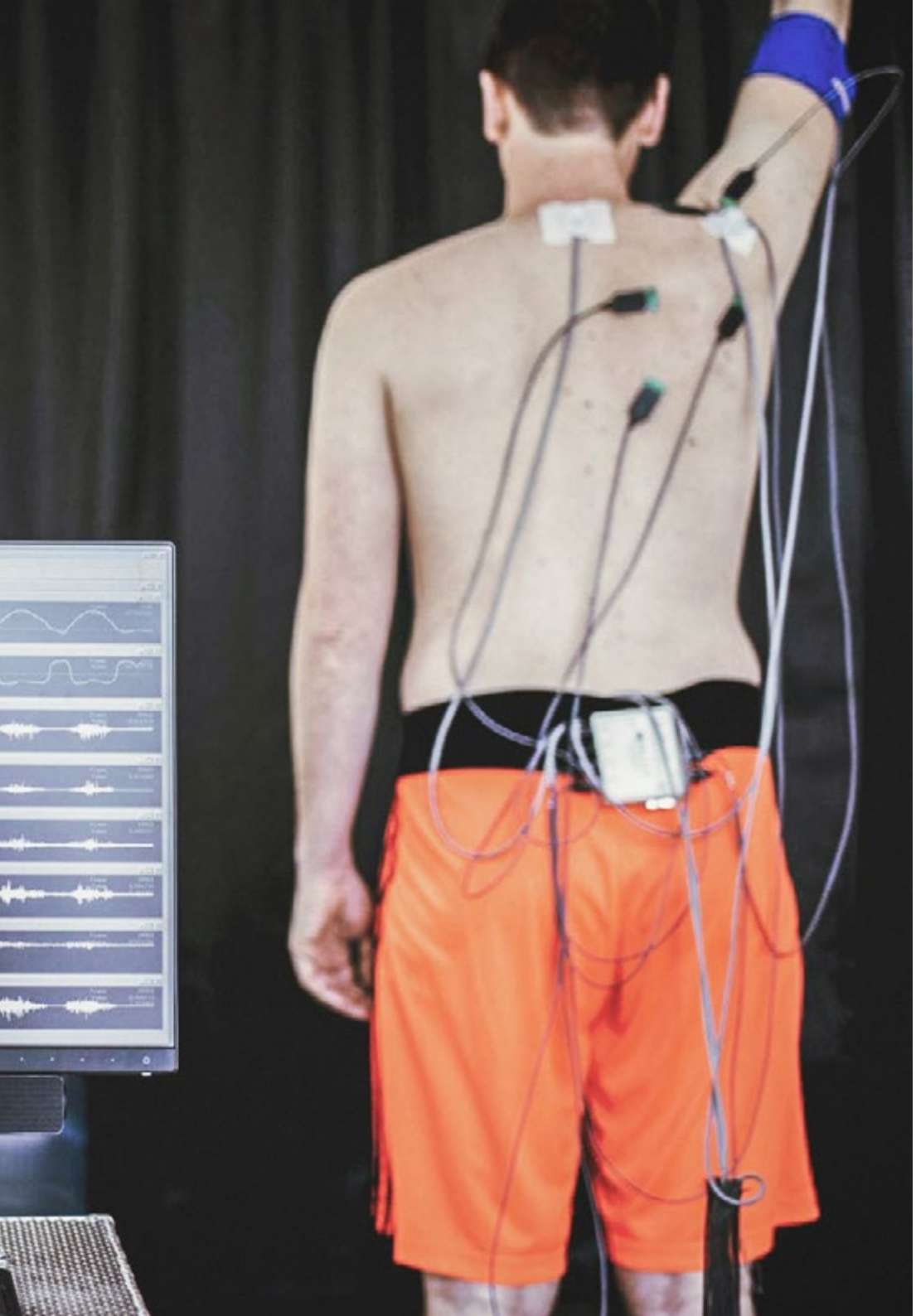
3.1. Big Data in Biomedical Research
- 3.1.1. Data Generation in Biomedicine
- 3.1.2. High-Throughput Technology
- 3.1.3. Uses of High-Throughput Data. Hypotheses in the Age of Big Data

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 Cromatine 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

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 we use the Case Method

What should a professional do in a given situation? 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. Physiotherapists/kinesiologists learn better, faster, and more sustainably over time.

With TECH you will experience a way of learning 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, trying to recreate the real conditions of professional physiotherapy 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:

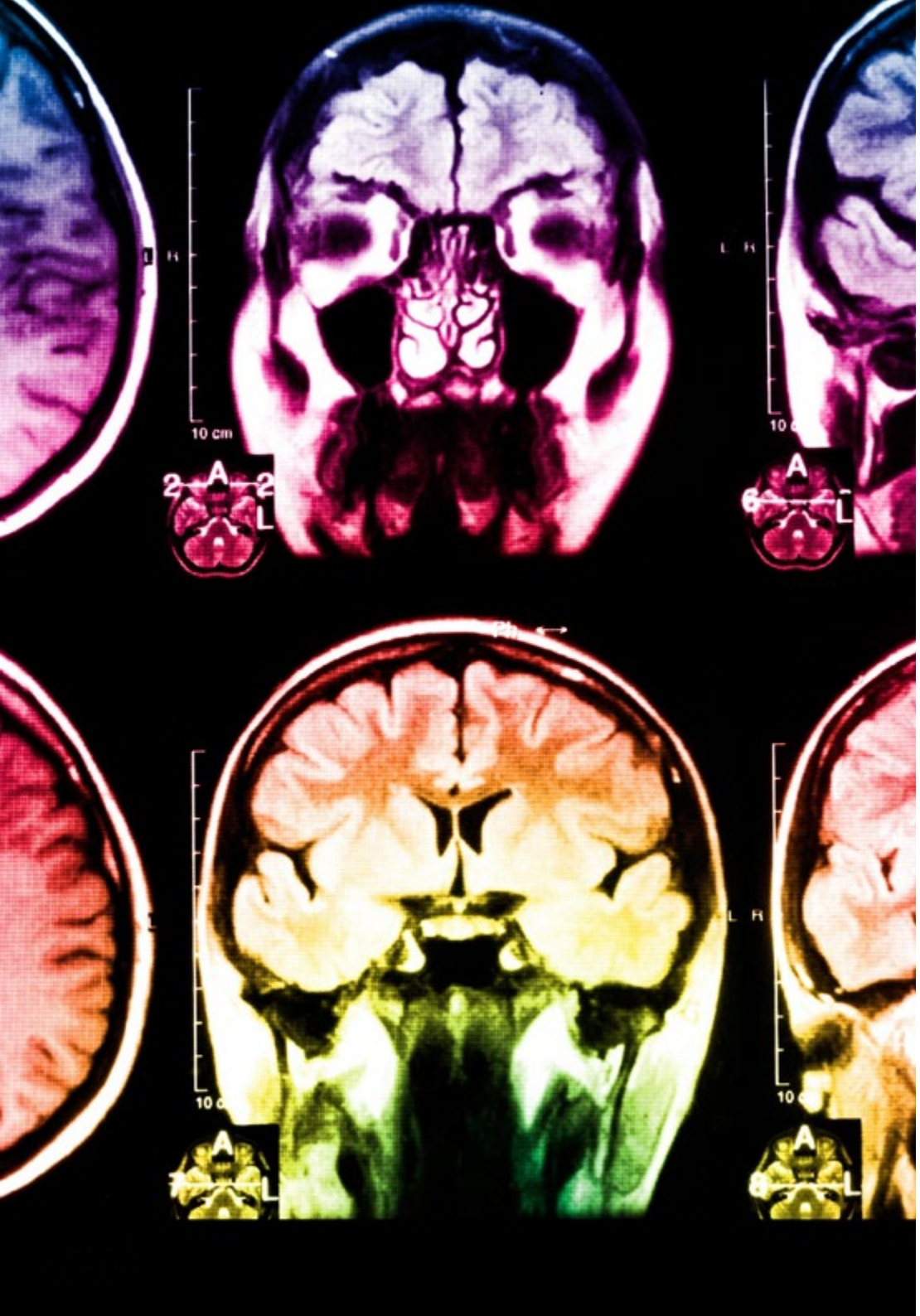
1. Physiotherapists/kinesiologists who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process has a clear focus on practical skills that allow the physiotherapist/kinesiologist to better integrate into the real world.
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 the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.

The physiotherapist/kinesiologist 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 trained more than 65,000 physiotherapists/kinesiologists with unprecedented success in all clinical specialties, regardless of the 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 training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for 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 our 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.

Physiotherapy Techniques and Procedures on Video

TECH brings students closer to the latest techniques, the latest educational advances and to the forefront of current Physiotherapy techniques and procedures. 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.

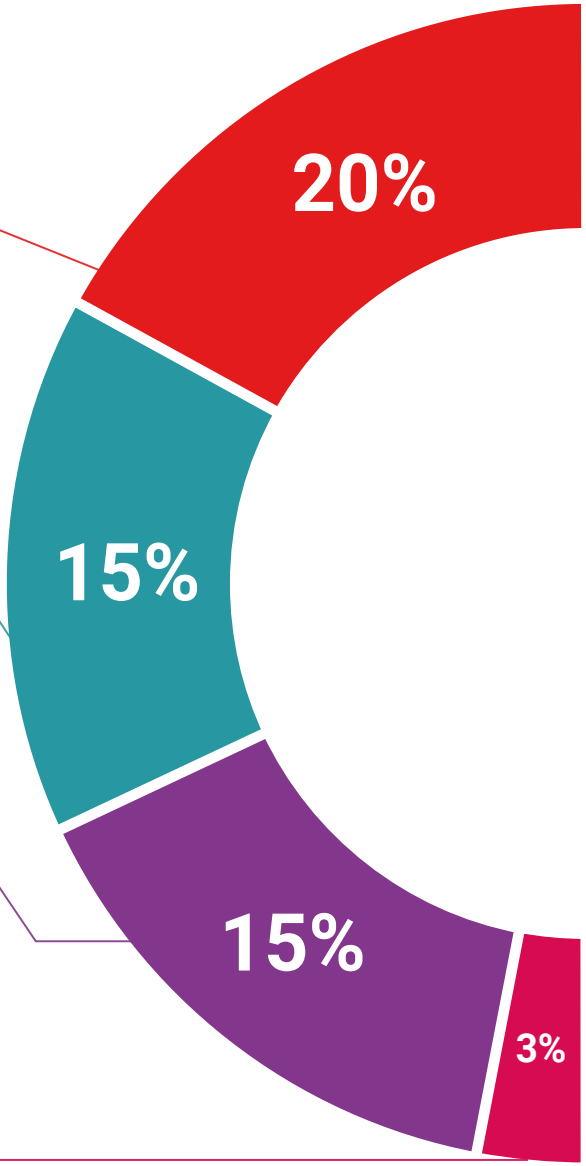
Interactive Summaries

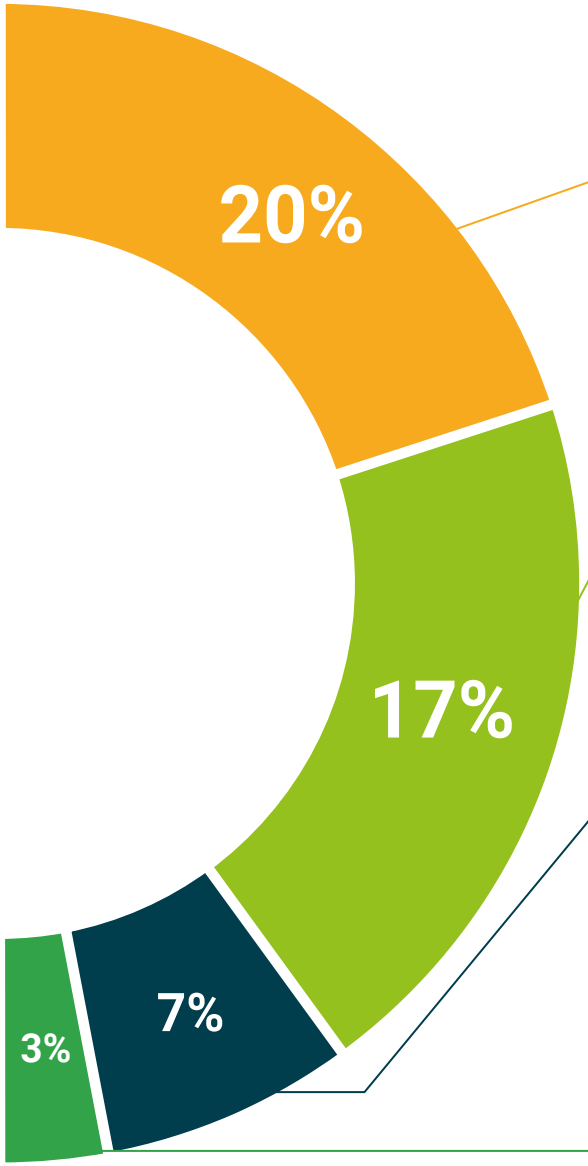
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This unique multimedia content presentation training system 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 on the usefulness of learning by observing experts. The system known as 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 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 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.

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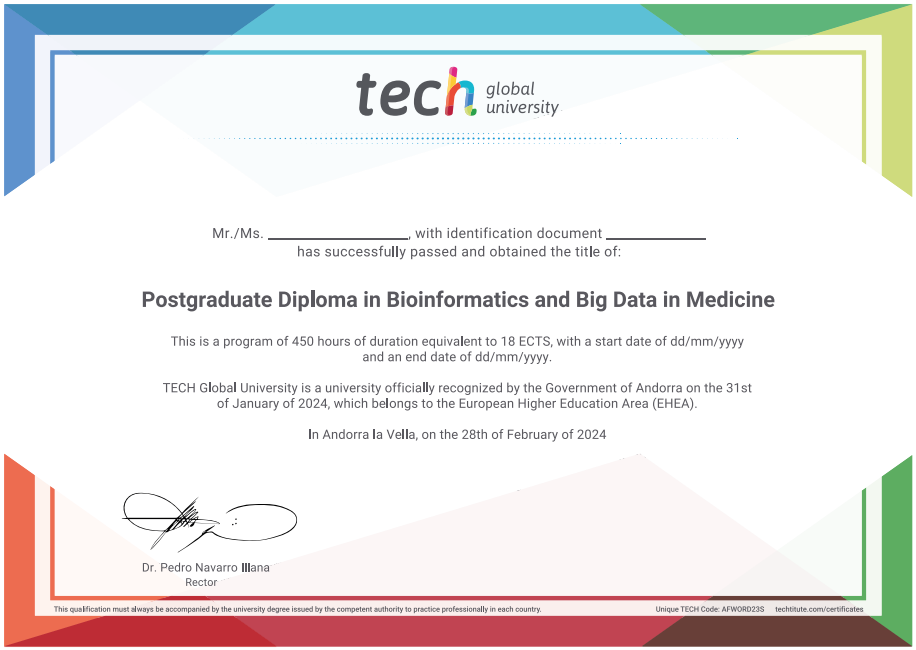
tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Postgraduate Diploma in Bioinformatics and Big Data in Medicine

This is a program of 450 hours of duration equivalent to 18 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Rector

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 Global University will make the necessary arrangements to obtain it, at an additional cost.

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