Hybrid Master's Degree

Precision Oncology: Genomics and Big Data

tech global university

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Hybrid Master's Degree

Precision Oncology: Genomics and Big Data

Modality: **Hybrid (Online + Clinical Internship)**

Duration: **12 months**

Certificate: **TECH Global University**

60 + 5 ECTS Credits

Website: **www.techtitute.com/us/medicine/hybrid-master-degree/hybrid-master-degree-precision-oncology-genomics-big-data**

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Introduction

Scientific and technological advances in medicine today, starting with the sequencing of human DNA, have enabled the emergence of increasingly personalized treatments. Even for treating different types of cancer, oncologists have a unique opportunity to interpret genetic data, compare them, establish therapeutics and provide follow-up. That is why Big Data and Artificial Intelligence have become valuable allies for these specialists who must remain up to date on their advances. To help them, TECH has designed a degree, pioneering in its mode of study. On the one hand, it promotes 100% online and theoretical learning. On the other hand, it is accompanied by a 3-week intensive face-to-face stay in a renowned hospital center.

Enroll now and don't miss the opportunity to achieve professional excellence as a precision oncologist through this Hybrid Master's Degree"

For several years, science and technology have advanced in the search for predictive methods for complex diseases such as cancer. The sequencing of the human genome and with it the rise of Precision Medicine have made it possible for doctors to now have better strategies for assessing the response of genes to certain lifestyle habits and when a tumor will or will not appear. At the same time, the high volume of information generated by these inquiries can only be reviewed through powerful Artificial Intelligence and Big Data technologies. However, managing all these advances can be a challenging learning experience for specialists.

TECH, aware of this, proposes that the oncologist soak up the new trends in their specialty through this very complete program. The Hybrid Master's Degree in Precision Oncology: Genomics and Big Data delves into all these aspects through a novel modality. On the one hand, it promotes 100% online and interactive study, from a platform with multiple features. In addition to the conventional materials, in this educational moment, the physician will handle multimedia resources such as infographics and videos of great didactic value. The entire academic process will last 1,500 hours, which the student will be able to distribute according to his or her schedule, needs or personal improvement interests.

Likewise, in the second part, there will be a clinical practice of maximum rigor and demand. For its realization, the medical professional will move to a state-of-the-art hospital center, equipped with the most advanced technological resources and assistance in the field of Precision Oncology. The stay, face-to-face and intensive, will last 3 weeks, to be completed in 8-hour days, from Monday to Friday. Also during this period, there will be constant exchange with experienced experts and an assistant tutor will supervise all academic progress. At the end of the program, the graduate will have achieved the necessary preparation to expand his or her medical practice according to the most complex international standards and the latest scientific evidence.

This **Hybrid Master's Degree in Precision Oncology: Genomics and Big Data** contains the most complete and up-to-date scientific program on the market. The most important features include:

- Development of more than 100 clinical cases presented by professionals with high knowledge about Precision Oncology, based on Genomics and Big Data
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Comprehensive systematized action plans for the main oncological pathologies
- Presentation of practical workshops on procedures diagnosis, and treatment techniques
- An algorithm-based interactive learning system for decision-making in the clinical situations presented throughout the course
- Practical clinical guides on approaching different pathologies
- All of this will be complemented by theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments.
- Content that is available from any fixed or portable device with an Internet connection
- Furthermore, you will be able to carry out a clinical internship at one of the best centers on the international scene

Throughout this Hybrid Master's Degree, you will dedicate 1,500 hours of theoretical learning about the main advances in Precision Oncology"

In just 3 weeks, you will achieve an exhaustive and intensive mastery of the technological tools and programming languages that allow you to interpret and compare biological data in greater detail today"

This program is all you need to know in depth the new applications of Bioinformatics in scientific and technological research against cancer.

With the intensive and practical training provided by TECH, you will achieve the most requested skills from the point of view of the daily practice in Precision Oncology.

In this proposed Hybrid Master's Degree, the program is aimed at updating professionals in oncological medicine, who require a high level of qualification. The contents are based on the latest scientific evidence, and oriented in a didactic way to integrate theoretical knowledge in the practice of care, and the theoretical-practical elements will facilitate the updating of knowledge and allow decision making in patient management.

Thanks to its multimedia content elaborated with the latest educational technology, they will allow the medical professional to obtain situated and contextual learning, that is to say, a simulated environment that will provide immersive learning programmed to train in real situations. This program is designed around Problem-Based Learning, whereby the physician 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 experts.

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Why Study this Hybrid Master's Degree?

In a very short time, scientific advances such as human DNA sequencing have changed medicine forever. Through this line of research, valuable tools and protocols for diagnosis and treatment have appeared, which every day make it possible to tackle complex pathologies such as cancer and even prevent its appearance by modifying unhealthy lifestyles. Keeping up to date with all these elements, the physician has this degree in his hands. Through this

The main innovations in the sector can be learned in a theoretical way, on a 100% online study platform. They will then develop its multiple applications in a face-to-face, practical and immersive stay in a renowned hospital center.

TECH is a pioneer in the pedagogical panorama by offering you a degree that explains the most current concepts of Precision Oncology in a theoretical way and shows you how to apply them in your daily activity through an intensive on-site study stay"

1. Updating from the latest technology available

Computer advances in relation to Artificial Intelligence and Big Data have revolutionized oncology like no other technological breakthrough. From them, the physician can complete a more comprehensive diagnosis and even predict the appearance of tumor tissues. The proper handling of all these tools will be within the reach of the specialists who take this program, through a novel academic modality.

2. Gaining In-Depth Knowledge from the Experience of Top Specialists

For this study model, TECH has brought together teams of experts with extensive knowledge in the field of Precision Oncology. Thus, it has formed a teaching staff of the highest level and prestige. In addition, during the clinical practice, distinguished specialists will collaborate with the student's learning in situ, transmitting experiences and results of maximum rigor.

3. Entering First-Class Clinical Environments

TECH aspires to provide each of its graduates with the best practical training. Therefore, it provides them with access to hospital facilities equipped with the latest technologies in the field of Precision Oncology. In this way, and together with experts with extensive experience, doctors will be able to improve their skills and be in line with a comprehensive and competitive healthcare scenario.

4. Combining the Best Theory with State-of-the-Art Practice

The academic market, saturated by degrees with a high theoretical load, often overlooks the practical training of the oncologist. TECH has proposed to reverse this scenario with a degree that, in addition to contemplating the didactic learning of Genomic and Big Data applications in precision cancer medicine, has a practical, face-to-face and intensive stay of maximum rigor and demand.

5. Expanding the Boundaries of Knowledge

TECH has a wide network of international agreements and collaborations, through which it has coordinated the clinical practices of this Hybrid Master's Degree. Thus, it has been able to facilitate the access of specialists to prestigious hospital facilities, located in different cities and countries.

Delves into the most relevant theory in this field, subsequently applying it in a real work environment"

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Objectives

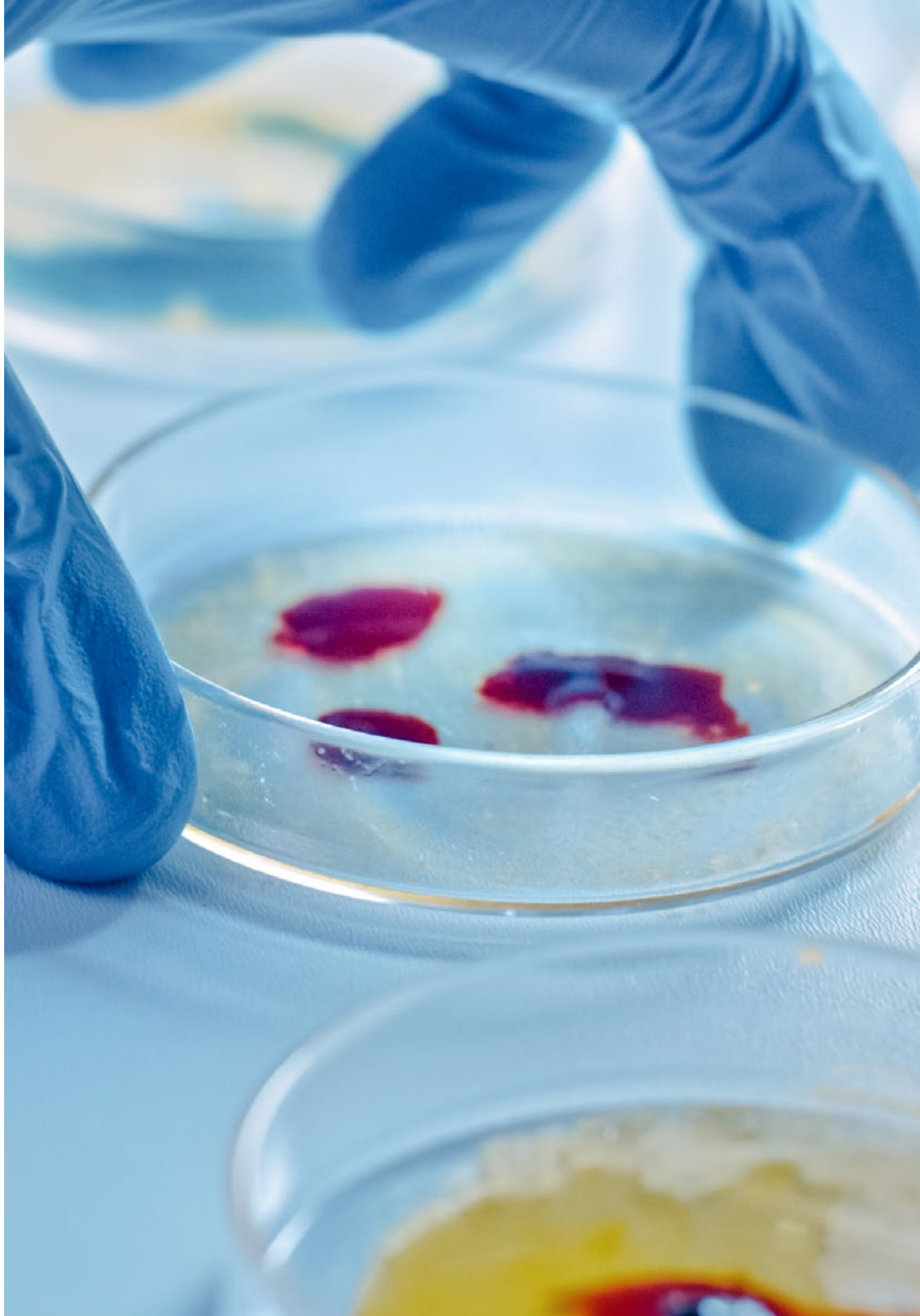
This program has been designed for the student to acquire the most advanced knowledge in relation to Precision Oncology. For this purpose, TECH has implemented an innovative study modality that gives equal importance to theoretical and practical learning. Thus, it consists of a 100% online learning phase, followed by a face-to-face, practical and intensive stay in a state-of-the-art hospital center. From both didactic moments, the specialist will obtain the necessary training to broaden their healthcare activity according to the most updated scientific evidence of the moment.

You will combine theory and professional practice through a demanding and rewarding educational approach"

General Objective

- This Hybrid Master's Degree in Precision Oncology: Genomics and Big Data will show the student how to interpret the large volumes of clinical information available more accurately, associated with biological data generated after state-of-the-art bioinformatics analysis. The degree, in addition to pursuing a wide-ranging theoretical mastery by the specialist, strives to provide them with the most important practical skills in the market for this specialty. Thus, the academic goals of this degree will help the graduate to incorporate the most modern and beneficial work methodologies for patients with tumor pathologies into their daily activities

Enroll now in this Hybrid Master's Degree and take advantage of the opportunity to update your knowledge in Precision Oncology through the pioneer academic modality of its kind"



Specific Objectives

Module 1. Molecular Biology

- Update knowledge on the molecular biology of cancer, in relation to different concepts such as genetic heterogeneity or microenvironment reprogramming
- Provide and expand knowledge on immunotherapy as an example of a clear scientific advance in translational research
- Learn about a new approach to the classification of the most frequent tumors based on genomic data available in The Cancer Genome Atlas (TCGA) Research Network

Module 2. Genomic or precision oncology

- Discuss the change in the current landscape with the introduction of genomic data into the biological understanding of tumors
- Explain how genomic classification provides independent information to predict clinical outcomes, and will give the biological basis for an era of personalized cancer treatment
- Learn the new genomic technologies currently used in DNA and RNA sequencing, based on the human genome sequence and made possible since the completion of the Human Genome Project, which has represented an unprecedented expansion of the capabilities of molecular genetics in genetic and clinical diagnostic research
- Discuss the bioinformatics process followed for the interpretation and application of biological data.
- Analyze and interpret biological information at the molecular, cellular and genomic levels

Module 3. Changes in Current Clinical Practice and New Applications With Genomic Oncology

- Discuss and know how to interpret tumor mutational burden (TMB) as a genomic biomarker that has a significant impact on the landscape of cancer immunotherapy
- Learn how liquid biopsy of circulating DNA allows us to understand specifically what kind of molecular changes are happening in the tumor in real time
- Describe the current paradigm for incorporating genomic data into current clinical practice

Module 4. Use of Unix and Linux in Bioinformatics

- Learn about the Linux operating system, which is currently essential in the scientific world both for the interpretation of biological data from sequencing and it also should be for medical text mining when handling large-scale data.
- Provide the basics of accessing a Linux server and how to find and install packages to install software locally
- Describe basic Linux commands for: creating, renaming, moving, and deleting directories; listing, reading, creating, editing, copying, and deleting files
- Understand how permissions work and how to decrypt the most cryptic Linux permissions easily

Module 5. Data analysis in big data projects: R programming language

- Discuss how the adoption of next-generation sequencing (NGS) in a diagnostic context raises numerous questions regarding the identification and reporting of variants in secondary genes for patient pathology
- Get started in the R programming language, which has the advantages of being an open-source programming language and has multiple statistical analysis packages available
- Learn basic R programming concepts such as data types, vector arithmetic and indexing
- Performing operations in R, including sorting, creating or importing data
- Learn how problem solving begins with a modular decomposition and then further decompositions of each module in a process called successive refinement
- Learn the basics of statistical inference to understand and calculate p-values and confidence intervals while analyzing data with R
- Provide examples of R programming in a way that will help make the connection between concepts and their implementation

Module 6. Graphical Environment in R

- Using visualization techniques to explore new datasets and determine the most appropriate approach
- Learn how to visualize data to extract information, better understand data and make more effective decisions
- Teach how to take data that at first glance has little meaning and visually present that data in a form that makes sense for analysis
- Learn how to use the three main graph sources in R: base, lattice and ggplot2
- Know what each graphics package is based on in order to define which one to use and the advantages offered by one or the other

Module 7. Statistical analysis in R

- Describe the most appropriate statistical techniques as an alternative when data do not conform to the assumptions required by the standard approach
- Learn the basics of conducting reproducible research by using R scripts to analyze data

Module 8. Machine Learning in Big Data Analysis

- Rapidly and automatically process and analyze enormous volumes of complex structured, semi-structured and unstructured data in *big data*
- Understand what machine learning is and use some of the techniques for data classification (decision tree, k-NN, Support Vector Machines, neural networks, etc.)
- Learn how to divide data into a test set and a training set and discover the concepts of bias and variance

Module 9. Data Mining Applied to Genomics

- Learn how data mining allows us to find patterns and regularities in databases
- Learn to Learn to apply the principles of data mining to the analysis of large complex datasets (Big Data), including those in very large databases or on web pages
- Explore, analyze and leverage data and convert it into useful and valuable information for clinical practice

Module 10. Techniques for extracting genomic data

- Understand how most scientific data appear in documents such as web pages and PDF files that are difficult to process for further analysis, however, using scraping techniques they can be used to
- Access to many data sources through the web for the implementation of precision medicine by allowing massive extraction of information

Module 11. New techniques in the age of genomics

- Put into practice the knowledge acquired for the interpretation of a genomic study in several cancer cases by extracting useful information that will help in decision making
- Using several algorithms performed with the R language for the extraction of knowledge from Pubmed, DGIdb and Clinical Trials databases based on the search for genetic information in certain tumors

Module 12. Application of Bioinformatics in Genomic Oncology

- Understanding the function of genes with little clinical information based on ontological proximity
- Discover genes involved in a disease based on a massive Pubmed search and graphical representation of the level of scientific evidence

Get up to date on the new applications of Bioinformatics in Genomic Oncology through the most complete program in the educational market, designed by TECH"

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Skills

After completing the two stages that make up this Hybrid Master's Degree, the specialist will be ready to apply the most significant advances in Precision Oncology in their daily activity. This will be possible thanks to the intense theoretical and practical journey through the most complex and current areas within this academic discipline.

You will learn in depth about the latest advances in the organization of biological databases through Big Data during this excellent academic TECH program"

General Skills

- Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
- Apply acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study
- Integrate knowledge and face the complexity of making judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments
- Communicate their conclusions and the ultimate knowledge and rationale behind them to specialized and non-specialized audiences in a clear and unambiguous manner
- Acquire the learning skills that will enable further studying in a largely self-directed or autonomous manner

This degree will broaden your professional horizons and get you to apply the industry's leading innovations as quickly and efficiently as possible"

Specific Skills

- Create a global and updated vision of the topics shown, that will allow the student to acquire useful knowledge and at the same time, generate interest in expanding the information and discovering its application in their daily practice
- Understand the knowledge discovery process, including data selection, cleaning, coding, the use of different statistical and machine learning techniques and the visualization of the generated structures
- Understand how to evaluate the performance of supervised and unsupervised learning algorithms
- Learn how functions normally return only one value to the program unit, unlike procedures that can return zero, one or several values
- Learn the biological databases that have emerged in response to the enormous amount of data generated by DNA sequencing technologies. Data stored in biological databases are organized for optimal analysis and are characterized by being complex, heterogeneous, dynamic and yet inconsistent due to the lack of standards at the ontological level

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Course Management

For this program, TECH has integrated a multidisciplinary team of teachers. The faculty includes physicians, biologists specialized in molecular studies, bioinformaticians, among other experts. All of them have contributed different visions for the approach to Precision Oncology, thus creating an excellent syllabus. In addition, these experts are distinguished in the medical care panorama for their mastery of new technologies and the development of a professional activity, based on these innovations, with extensive results. At all times, they will provide the specialist with the most personalized learning guidance.

All the teachers chosen by TECH for this program apply in their daily professional activity various technological innovations related to Precision Oncology"

Management

Dr. Oruezábal Moreno, Mauro Javier

- Head of the medical Oncology Service at La Paz University Hospital since 2017
- Doctor of Medicine from the Complutense University Madrid (UCM)
- Master's Degree in Bioinformatics and Biostatistics from the Universitat Oberta de Catalunya
- Master's Degree in Bioinformatics Analysis, Pablo de Olavide University
- Research Fellow at University of Southampton
- Graduate in Medicine and Surgery from the Universidad de Navarra
- Member of: Spanish Society of Medical Oncology and the Spanish Group of Digestive Tumors (TTD)

Dr. Krallinger, Martin

- Head of Text Mining at the Barcelona Supercomputing Center (BSC)
- Ex Head of the text mining unit at the Spanish National Cancer Research Center (CNIO)
- Researcher with over 70 publications
- Participated in the development of the first biomedical text annotation meta-server (biocreative metaserver - BCMS) and the BeCalm metaserver
- Organizer of BioCreative community evaluation challenges for the evaluation of natural language processing tools and has participated in the organization of biomedical text mining tasks in various international community challenges, including IberEval and CLEF

Professors

Dr. Alberich Martí, Ricardo

- Specialist in Mathematical Sciences and Computer Science
- Member of the Computational Biology and Bioinformatics Research Group (BIOCOM)
- Professor of Mathematical and Computer Sciences and Computer Science and Artificial Intelligence at the Balearic Islands University (BIU)

Dr. Álvarez Cubero, María Jesús

- Researcher and professor
- Professor of the Department of Biochemistry Molecular Biology and III and Immunology, University of Granada
- Genyo Researcher
- PhD in Biology from the University of Granada
- Degree in Biology from the University of Granada
- Research stay at the North Texas University
- Research stay at the Coimbra University
- Research stay at the Tor Vergata University

D. Andrés León, Eduardo

- Head of the Bioinformatics Unit at the Institute of Parasitology and Biomedicine LopezNeyra - CSIC
- Associate Editor at BMC Genomics
- Academic Editor at Public Library of Science (PLOS One)
- Biostatistician at the Familial Hypercholesterolemia Foundation

- Technician responsible for the Central Unit of Bioinformatics and Computational Biology at the Institute of Biomedicine in Seville
- Degree in Biology and Molecular Biology, Universidad Autónoma de Madrid

Dr. Figueroa Conde-Valvís, Angélica

- Coordinator of the Epithelial Plasticity and Metastasis Group at the Institute of Biomedical Research of A Coruña
- Stays at the National Institute of Health in the USA and in Australia. USA and Australia
- PhD in Molecular Biology from the Autonomous University of Madrid (UAM).
- Degree in Biology from the Complutense University of Madrid (UCM)

Dr. García Casado, Zaida

- Molecular Biologist at the Laboratory of Molecular Biology of the Valencian Institute of Oncology Foundation
- Researcher at the Hospital La Fe University Hospital
- PhD in Molecular Genetics from the Valencia University
- Degree in Biological Sciences from the Valencia University

Dr. García-Foncillas López, Jesús

- Director of the Oncohealth Institute
- Director of the Chair of Individualized Molecular Medicine at the Autonomous University of Madrid
- Director of the Oncology Department at the Fundación Jiménez Díaz University Hospital
- Director of the Division of Translational Oncology of the Institute of Health Research (FJD-UAM)
- Specialist in Oncology
- Professor of Oncology at the Autonomous University of Madrid

Dr. Lage Alfranca, Yolanda

- Specialist in Oncology
- Elective Physician the Oncology Department at the Fundación Jiménez Díaz University Hospital
- Speaker at numerous specialized conferences and congresses.
- Degree in Medicine and Surgery
- Member of: Spanish Society of Medical Oncology

Dr. Ribalta, Teresa

- Pathologist and Neuropathologist at Hospital Clínic de Barcelona and IDIBAPS.
- Specialist in Neuropathology
- Head of the Department of Pathology and Director of the Biobank at Hospital Sant Joan de Déu
- Head of the Pediatric Pathology Section at Hospital Clínic de Barcelona.
- Professor and Professor of Pathological Anatomy, University of Barcelona
- Degree in Medicine from the University of Barcelona

D. Gomila Salas, Juan Gabriel

- Chief Executive Officer and Co-Founder at Frogames
- Principal CEO at Flyleaf Studios
- Professor Mathematical and Computer Sciences and Computer Science and Artificial Intelligence at the Balearic Islands University (BIU)
- New Technologies Instructor at Udemy
- Game Producer & Project Manager at Playspace
- Bachelor in Mathematics at the Balearic Islands University

Dr. Astudillo González, Aurora

- Doctor of Medicine and former Scientific Director of the Principality of Asturias Biobank
- Former Professor of Pathological Anatomy at the University of Oviedo
- Professor at the University of Oviedo and linked to the Central University Hospital of Asturias
- TEDx Talks Speaker
- European Board of Neuropathology
- European Board of Pathology

Dr. Burón Fernández, María del Rosario

- Medical Director Internal Medicine Department, Infanta Cristina University Hospital
- Specialist in Internal Medicine
- Degree in Medicine and Surgery

Dr. De la Haba - Rodríguez, Juan

- Specialty in Medical Oncology at the Hospital Universitario Reina Sofia.
- Specialist in Oncology Physician at San Juan de Dios Hospital
- Researcher at IMIBIC
- Professor of Oncology at the Cordoba University.
- Doctor of Medicine, Cordoba University
- Member of the New Cancer Therapies Group at the Maimonides Biomedical Research Institute of Cordoba (IMIBIC).
- Honors: Averroes de Oro City of Cordoba Award in Medical Sciences, Special Mention in the Al-Andalus Awards and the Andalusian Flag for Human Values

Dr. Carmona Bayonas, Alberto

- Medical Oncology Service, Morales Meseguer University Hospital, Murcia Murcia, Spain
- Medical Hematology and Oncology Service, Morales Meseguer University Hospital. Murcia, Spain

Dr. Ciruelos Gil, Eva Maria

- Coordinator of the Breast Cancer Unit of HM Hospitals
- Medical Oncologist at the 12 de Octubre University Hospital
- Professor of the Department of Medicine at the Complutense University of Madrid
- Degree in Medicine and Surgery from the Autonomous University of Madrid
- Specialist in Medical Oncology from the 12 de Octubre University Hospital
- Member of: SOLTI Breast Cancer Research Group (President), Breast Pathology Working Group of the Breast Cancer Unit of the 12 de Octubre University Hospital, Hospital Pharmacy Commission of the 12 de Octubre University Hospital and ANEP.

Dr. De Andrés Galiana, Enrique

- PhD in Mathematics and Computer Engineering
- Associate Professor in Computer in the others Department of the University of Oviedo
- ITM automation at CSC
- Analyst Programmer at OMVESA
- Doctor in others and Statistics, University of Oviedo
- Computer Engineer from the Pontifical University of Salamanca.
- Master's Degree in Data Analysis Intelligence and Business Intelligence from the University of Oviedo

Dr. Hoyos Simón, Sergio

- Associate Physician of the Medical Oncology Department of the San Carlos Clinical Hospital
- Assistant Physician of the Medical Oncology Department, Jaen University Hospital.
- Assistant Physician of the Medical Oncology Department, Jaen University Hospital.
- Assistant Physician of the Medical Oncology Department, Octubre University Hospital
- Volunteering in a Health Campaign in Cameroon with ONGD Zerca y Lejos
- Degree in Medicine. from the Complutense University of Madrid (UCM)

Mr. Paramio Gonzalez, Jesús María

- Head Division Manager of the Molecular Oncology Unit
- Head of Division of the Molecular Oncology Unit at the Energy, Environmental and Technological Research Center (CIEMAT)
- Researcher at the Biomedical Research Instituto of the Hospital Universitario 12 de Octubre
- Specialist in Cell Biology at the Energy, Environmental and Technological Research Center (CIEMAT)

Dr. González Gomáriz, José

- Healthcare researcher at the Instituto de Investigación Sanitaria La Navarra (IdisNA)
- Health Care Trainer
- Master's Degree in Bioinformatics, University of Murcia

Dr. Intxaurrondo, Ander

- Data Architect at Accenture
- Data Scientist at Pragsis Bidoop
- Technical Researcher at Barcelona Supercomputing Center

- Technical Researcher at Dinycon Systems
- Researcher at IXA PNL Research Group
- Graphic Designer at Akimu Proyectos Turísticos
- PhD in Natural Language Processing at the University of the Basque Country/ Euskal Herriko Unibertsitatea (UPV/EHU)
- Graduate in Management Informatics at Albert-Ludwig University (Albert-Ludwig University)
- Master in Language Analysis and Processing at the University of the Basque Country/Euskal Herriko Unibertsitatea (UPV/EHU)

D. Olivas Varela, Jose Ángel

- Director of the Soft Management of Internet and Learning (SMILe) Research Group
- Research Collaborator at the Berkeley Initiative in Soft Computing (BISC) of the University of California, Berkeley, California
- Research Collaborator at the Artificial Intelligence Center at SRI International, Stanford University
- Research Collaborator of the Aerospace Engineering and Services Group (INSA-NASA)
- Director of the IT Department at Project & Portfolio Management (PPM)
- Consultant in Intelligent Systems for companies such as Southco, Danone or ATT
- Member of the Spanish Association for Artificial Intelligence Computer Management

Dr. López López, Rafael

- Head of the Medical Oncology Department, Complex. Hospitalario Universitaria de Santiago de Compostela
- Director of the Translational Medical Oncology Group at the Santiago de Compostela Health Research Institute
- Creator of the Medical Oncology Service at the Txagorritxu Hospital Vitoria, Spain
- Research Physician at the Oncology Department of the Free University Hospital. Amsterdam
- Principal Investigator of more than 100 clinical trials, highlighting the field of Translational Research in Solid Tumors
- Author of 200 articles in national and international journals of great prestige
- Founding Partner of Nasasbiotech Company
- Degree in Medicine from the Autonomous University Madrid
- Permanent Member of the Royal Academy of La Medicine and Surgery of Galicia
- Member of: European Society for Medical Oncology (ESMO), Sociedad Española de Oncología Médica (SEOM), American Society for Clinical Oncology (ASCO) and American Association for Cancer Research (AACR).

Dr. Martínez Iglesias, Olaia

- Director of the Medical Epigenetics Laboratory at EuroEspes
- Researcher and professor at the Alberto Sols Institute of Biomedical Research
- Leader of the Epithelial Research Plasticity and Metastasis Group at the Institute of Biomedical Research of A Coruña.(INIBIC)
- Doctorate in Biomedicine from the Autonomous University Madrid
- Degree in Biology from the from A Coruña

Dr. JiménezFonseca, Paula

- Medical Oncologist in the Digestive and Endocrine Tumors Section at the Central University Hospital of Asturias
- PhD in Medicine from the University of Oviedo
- Researcher and Coordinator of scientific studies for the Spanish Group of Neuroendocrine and Endocrine Tumors (GETNE)

- Researcher and Coordinator of scientific studies for the Spanish Society of Medical Oncology (SEOM)
- Coordinator of the ICARO Registry of Adrenocortical Cancer in the Spanish Society of Endocrinology and Nutrition (SEEN)
- President of the AGAMENON Gastric Cancer Research Group of the Spanish Society of Medical Oncology (SEOM)
- Member of: Spanish Society of Endocrinology and Nutrition (SEEN), Spanish Society of Medical Oncology (SEOM) TTD (Board of Directors)

Dr. Pascual Martínez, Tomás

- Medical Specialist in Oncology at the Hospital Clínic de Barcelona
- CSO at SOLTI
- Assistant Physician in Oncology at the Institut d'Investigacions Biomèdiques August Pi i Sunyer
- Oncologist at the University Hospital of La Princesa
- Oncologist at the 12 de Octubre University Hospital

Dr. López Guerrero, José Antonio

- Clinical Head of the Molecular Biology Laboratory of the Medical Oncology Service
- Clinical Head of the Molecular Biology Laboratory of the Medical Oncology Service at the Valenciano Institute de Oncología (IVO).
- PhD in Biology

Segura Ruiz, Víctor

- CIMA University of Navarra (Bioinformatics Platform
- Director of the Unit

Dr. Martínez González, Luis Javier

- Head of the Genomics Unit of the Genomics and Oncology Research Center (GENYO)
- Researcher of the genetic identification project of Christopher Columbus and his relatives
- PhD with extraordinary award in the Area of Biomedicine from the Granada University
- Degree in Biological Sciences from the University of Granada
- Professor of Marketing and Market Research at the University Rey Juan Carlos IDegree in Biotechnology from the National Distance Education University

Dr. Pérez Gutiérrez, Ana María

- Bioinformatician and Genomics Specialist
- Researcher at the Center for Genomics and Oncological Research
- Bioinformatics at the Virgen del Rocío University Hospital
- Master's Degree in Biotechnology, Pablo de Olavide University
- Professional Master's Degree in Biomedicine from the University of Granada.

Soares, Felipe

- Artificial Intelligence and Machine Learning Engineer at Apple
- Text Mining Research Engineer at the National Supercomputing Center in Barcelona Barcelona
- Engineer with Machine Learning Focus
- PhD in Engineering from the Federal University of Rio Grande do Sul
- Master's Degree in Industrial Engineering from Universidade Federal do Rio Grande do Sul
- Master's Degree in Computer Science from Universidade Federal do Rio Grande do Sul

D. Sánchez Rubio, Javier

- Area Specialist at the Getafe University Hospital
- Postgraduate Diploma in Health Technology Assessment, Pompeu Fabra University (UPF)
- Master in Pharmaceutical Sciences, Complutense University of Madrid (UCM).

Dr. Mir Torres, Arnau

- Collaborator of the Soft Computing and Image Processing and Aggregation Research Group (SCOPIA)
- Ph.D. from the Barcelona University
- Degree in Mathematical Sciences and Computer Science
- Full Professor in Mathematical Sciences and Computer Science, Computer Science and Artificial Intelligence

Vázquez García, Miguel

- Genome Informatics Group Leader at Barcelona Supercomputing Center
- Academic Researcher
- Degree in Life Sciences and Genome Informatics
- Teacher

D. Fernández Martínez, Juan Luis

- CEO and Co-Founder of StockFink
- Co-Founder of DeepBioInsights
- Professor of Applied Mathematics
- Director of the Inverse Problems, Optimization and Machine Learning Group at the Department of Mathematics, Oviedo University

Dr. Rueda Fernández, Daniel

- Head of the Biomarker Discovery and Pharmacogenomics Unit at PharmaMar.
- Head of Genetic Studies in Hereditary Cancer at 12 de Octubre University Hospital.
- Molecular Biologist at Gemolab S.L.
- Research Scientist at Sylentis
- PhD in Biochemistry and Molecular Biology from Complutense University of Madrid (UCM)
- Degree in Biochemistry from the Complutense University of Madrid (UCM)

Velastegui Ordoñez, Alejandro

- Medical Oncologist at the Hospital of King Juan Carlos University. Spain BORRAR
- Rotation at the Digestive Tumors Clinical Research Unit at the Spanish National Cancer Research Center (CNIO)
- Specialty in Clinical Immunology at the Hospital General Universitario Gregorio Marañon
- Specialty in Medical Oncology at the Hospital Universitario Fundación Alcorcón.
- Degree in Medicine from the Catholic University of Santiago de Guayaquil

The most prestigious professionals will show you the main innovations that Genomics and Big Data have brought about in the field of Precision Oncology"

06

Educational Plan

The ambitious syllabus of this degree includes the main advances in Precision Oncology in terms of clinical practice and the introduction of new technologies. The program examines the main computer programs that enable the settlement, interpretation and comparison of data extracted from the genomic analysis of patients with cancer or a possible history of the disease. In particular, it explores the applications of Big Data and Artificial Intelligence in this growing discipline. To support the assimilation of these theoretical contents, this Hybrid Master's Degree is supported by a varied number of multimedia resources, including videos, infographics and interactive summaries.

Innovative study methodologies, such as Relearning, will be at your disposal in this Hybrid Master's Degree, to help you assimilate new concepts quickly and flexibly"

Module 1. Molecular Biology

1.1. Molecular Mechanisms of Cancer
- 1.1.1. Cellular Cycle
- 1.1.2. Detachment of Tumor Cells

1.2. Reprogramming of the Tumor Microenvironment
- 1.2.1. Tumor Microenvironments: An Overview
- 1.2.2. TME as a Prognostic Factor in Lung Cancer
- 1.2.3. TME in the Progression and Metastasis of Lung Cancer
  - 1.2.3.1. Cancer-Associated Fibroblasts (CAF)
  - 1.2.3.2. Endothelial Cells
  - 1.2.3.3. Hypoxia in Lung Cancer
  - 1.2.3.4. Inflammation
  - 1.2.3.5. Immune Cells
- 1.2.4. Contribution of TME to Therapeutic Resistance
  - 1.2.4.1. Contribution of TME to Radiotherapy Resistance
- 1.2.5. TME as a Target Treatment in Lung Cancer
  - 1.2.5.1. Future Directions

1.3. Tumor Immunology: Basis of Cancer Immunotherapy
- 1.3.1. Introduction to the Immune System
- 1.3.2. Tumor Immunology
  - 1.3.2.1. Tumor-Associated Antigens
  - 1.3.2.2. Identification of Tumor-Associated Antigens
  - 1.3.2.3. Types of Tumor-Associated Antigens
- 1.3.3. The Bases of Immunotherapy in Cancer
  - 1.3.3.1. Introduction to the Immunotherapeutic Approaches
  - 1.3.3.2. Monoclonal Antibodies in Cancer Therapy
    - 1.3.3.2.1. Production of Monoclonal Antibodies
    - 1.3.3.2.2. Types of Therapeutic Antibodies
    - 1.3.3.2.3. Mechanisms of Action of Antibodies
    - 1.3.3.2.4. Modified Antibodies

1.3.4. Non-Specific Immune Modulators
1.3.4.1. Bacillus of Calmette-Guérin
1.3.4.2. Interferon-α
1.3.4.3. Interleucina-2
1.3.4.4. Imiquimod
1.3.5. Other Approaches for Immunotherapy
1.3.5.1. Dendritic Cell Vaccines
1.3.5.2. Sipuleucel-T
1.3.5.3. CTLA-4 Blocking
1.3.5.4. Adoptive T-cell Therapy
1.3.5.4.1. Adoptive Cell Therapy With T-cell Clones
1.3.5.4.2. Adoptive Cell Therapy With Tumor-Infiltrating Lymphocytes
1.4. Molecular Mechanisms Involved in the Invasion and Metastasis Process

Module 2. Genomic or Precision Oncology

2.1. Use of Gene Expression Profiling in Cancer
2.2. Molecular Subtypes of Breast Cancer
2.3. Prognostic-Predictive Genomic Platforms in Breast Cancer
2.4. Therapeutic Targets in Non-Small Cell Lung Cancer
2.4.1. Introduction
2.4.2. Molecular Detection Techniques
2.4.3. EGFR Mutation
2.4.4. ALK Translocation
2.4.5. ROS Translocation
2.4.6. BRAF Mutation
2.4.7. NRTK Rearrangements
2.4.8. HER2 Mutation
2.4.9. MET Mutation/Amplification
2.4.10. RET Rearrangements
2.4.11. Other Molecular Targets
2.5. Molecular Classification of Colon Cancer

2.6. Molecular Studies in Gastric Cancer
- 2.6.1. Treatment of Advanced Gastric Cancer
- 2.6.2. HER2 Overexpression in Advanced Gastric Cancer
- 2.6.3. Identification and Interpretation of HER2 Overexpression in Advanced Gastric Cancer
- 2.6.4. Drugs With Activity Against HER2
- 2.6.5. Trastuzumab in the First Line of Advanced Gastric Cancer
  - 2.6.5.1. Treatment of HER2+ Advanced Gastric Cancer After Progression to Trastuzumab-Based Regimens
- 2.6.6. Activity of Other Anti-HER2 Drugs in Advanced Gastric Cancer

2.7. GIST as a Model of Translational Research: 15 Years of Experience
- 2.7.1. Introduction
- 2.7.2. Mutations of KIT and PDGFRA as Major Promoters in GIST
- 2.7.3. Genotype in GIST: Prognostic and Predictive Value
- 2.7.4. Genotype in GIST and Resistance to imatinib
- 2.7.5. Conclusions

2.8. Molecular and Genomic Biomarkers in Melanoma

2.9. Molecular Classification of Brain Tumors

2.10. Molecular and Genomic Biomarkers in Melanoma

2.11. Immunotherapy and Biomarkers
- 2.11.1. Landscape of Immunological Therapies in Cancer Treatment and the Need to Define the Mutational Profile of a Tumor
- 2.11.2. Checkpoint Inhibitor Biomarkers: PD-L1 and Beyond
  - 2.11.2.1. The Role of PD-L1 in Immune Regulation
  - 2.11.2.2. Clinical Trial Data and PD-L1 Biomarker
  - 2.11.2.3. Thresholds and Assays for PD-L1 Expression: a Complex Picture
  - 2.11.2.4. Budding Biomarkers
    - 2.11.2.4.1. Tumor Mutational Burden (TMB)
      - 2.11.2.4.1.1. Quantification of the Tumor Mutational Burden
      - 2.11.2.4.1.2. Evidence of the Tumor Mutational Burden
      - 2.11.2.4.1.3. Tumor Burden as a Predictive Biomarker
      - 2.11.2.4.1.4. Tumor Burden as a Prognostic Biomarker
      - 2.11.2.4.1.5. The Future of the Mutational Burden
    - 2.11.2.4.2. Microsatellite Instability
    - 2.11.2.4.3. Immune Infiltrate Analysis
    - 2.11.2.4.4. Toxicity Markers
- 2.11.3. Immune Checkpoint Drug Development in Cancer
- 2.11.4. Available Drugs

Module 3. Changes in Current Clinical Practice and New Applications With Genomic Oncology

3.1. Liquid Biopsies: Fashion or Future?
- 3.1.1. Introduction
- 3.1.2. Circulating Tumor Cells
- 3.1.3. ctDNA
- 3.1.4. Clinical Applications
- 3.1.5. CtDNA Limitations
- 3.1.6. Conclusions and Future

3.2. Role of the Biobank in Clinical Research
- 3.2.1. Introduction
- 3.2.2. Is it Worth the Effort to Create a Biobank?
- 3.2.3. How to Begin Establishing a Biobank?
- 3.2.4. Informed Consent for the Biobank
- 3.2.5. Collecting Samples for the Biobank
- 3.2.6. Quality Control
- 3.2.7. Access to Samples

3.3. Clinical trials: New Concepts Based on Precision Medicine
- 3.3.1. What Are Clinical Trials? What Sets Them Apart From Other Types of Research?
  - 3.3.1.1. Types of Clinical Trials
    - 3.3.1.1.1. By Their Objectives
    - 3.3.1.1.2. By The Number of Partaking Centers
    - 3.3.1.1.3. By Their Methodology
    - 3.3.1.1.4. By Their Level of Masking
- 3.3.2. Results of Clinical Trials in Thoracic Oncology
  - 3.3.2.1. Related to Survival Time
  - 3.3.2.2. Results Related to the Tumor
  - 3.3.2.3. Results Notified by the Patient
- 3.3.3. Clinical Trials in the New Age of Precision Medicine
  - 3.3.3.1. Precision Medicine
  - 3.3.3.2. Terminology Relate to the Design of Trials in the Era of Precision Medicine

3.4. Incorporation of Actionable Markers in Clinical Practice
3.5. Application of Genomics in Clinical Practice by Type of Tumor
3.6. Decision Support Systems in Oncology Based on Artificial Intelligence

Module 4. Use of Unix and Linux in Bioinformatics

4.1. Introduction to the Linux Operating System
  4.1.1. What is an Operating System?
  4.1.2. The Benefits of Using Linux
4.2. Linux Environment and Installation
  4.2.1. Linux Distributions
  4.2.2. Linux Installation Using a USB Memory
  4.2.3. Linux Installation Using a CD-ROM
  4.2.4. Linux Installation Using an Virtual Machine
4.3. The Command Line
  4.3.1. Introduction
  4.3.2. What is a Command Line?
  4.3.3. Working on the Terminal
  4.3.4. Shell and Bash
4.4. Basic Browsing
  4.4.1. Introduction
  4.4.2. How to Learn the Current Location?
  4.4.3. Absolute and Relative Routes
  4.4.4. How to Navigate in the System?
4.5. File Manipulation
  4.5.1. Introduction
  4.5.2. How to Build a Directory?
  4.5.3. How to Move to a Directory?
  4.5.4. How to Create an Empty File?
  4.5.5. Copying a File and Directory
  4.5.6. Deleting a File and Directory
4.6. VI Text Editor
  4.6.1. Introduction
  4.6.2. How to Save and Exit?
  4.6.3. How to Browse a File in the VI Text Editor?
  4.6.4. Deleting Contents
  4.6.5. The Undo Command
4.7. Wildcards
  4.7.1. Introduction
  4.7.2. What are Wildcards?
  4.7.3. Examples of Wildcards
4.8. Licences
  4.8.1. Introduction
  4.8.2. How to See the Licences of a File?
  4.8.3. How to Change the Licences?
  4.8.4. Licence Configuration
  4.8.5. Licences for Directories
  4.8.6. The “Root” User
4.9. Filters
  4.9.1. Introduction
  4.9.2. *Head*
  4.9.3. *Tail*
  4.9.4. *Sort*
  4.9.5. *nl*
  4.9.6. *wc*
  4.9.7. *Cut*
  4.9.8. *Sed*
  4.9.9. *Uniq*
  4.9.10. *Tac*
  4.9.11. Other Filters
4.10. Grep and Common Expressions
  4.10.1. Introduction
  4.10.2. eGrep
  4.10.3. Common Expressions
  4.10.4. Some Examples

4.11. Pipelines and Redirection
- 4.11.1. Introduction
- 4.11.2. Redirect to a File
- 4.11.3. Save a File
- 4.11.4. Redirect From a File
- 4.11.5. STDERR Redirection
- 4.11.6. Pipelines

4.12. Managing Processes
- 4.12.1. Introduction
- 4.12.2. Active Processes
- 4.12.3. Closing a Corrupt Program
- 4.12.4. Foreground and Background Work

4.13. Bash
- 4.13.1. Introduction
- 4.13.2. Important Points
- 4.13.3. Why "./ "?
- 4.13.4. Variables
- 4.13.5. The Declarations

Module 5. Data analysis in big data projects: R programming language

5.1. Introduction to R programming language
- 5.1.1. What is R?
- 5.1.2. R Installation and La Graphic Interface of R
- 5.1.3. Packages
  - 5.1.3.1. Standard Packages
  - 5.1.3.2. Contributed Packages and CRAN

5.2. Basic Features of R
- 5.2.1. The Environment of R
- 5.2.2. Software and Related Documentation
- 5.2.3. R and Statistics
- 5.2.4. R and the Window System
- 5.2.5. Using R Interactively
- 5.2.6. An Introductory Session
- 5.2.7. Obtaining Help With Functions and Features
- 5.2.8. R Commands, Cap Sensitivity, Etc
- 5.2.9. Recovery and Correction of Previous Commands
- 5.2.10. Execute Commands or Diverting the Output to a File
- 5.2.11. Data Storage and Object Deletion

5.3. Types of Objects in R
- 5.3.1. Simple Manipulations; Numbers and Vectors
  - 5.3.1.1. Vectors and Their Assignment
  - 5.3.1.2. Vector Arithmetic
  - 5.3.1.3. Generating Regular Sequences
  - 5.3.1.4. Logical Vectors
  - 5.3.1.5. Lost Values
  - 5.3.1.6. Character Vectors
  - 5.3.1.7. Index Vectors
    - 5.3.1.7.1. Selecting and Modifying Subsets of a Dataset
  - 5.3.1.8. Other Types of Objects
- 5.3.2. Objects, Their Modes and Attributes
  - 5.3.2.1. Intrinsic Attributes: Mode and Length
  - 5.3.2.2. Changing the Length of an Object
  - 5.3.2.3. Obtaining and Configuring Attributes
  - 5.3.2.4. The Class of an Object
- 5.3.3. Sorted and Unsorted Factors
  - 5.3.3.1. A Specific Example
  - 5.3.3.2. The Tapply () Function and Unequal Matrices
  - 5.3.3.3. Sorted Factors
- 5.3.4. Matrices
  - 5.3.4.1. Matrices
  - 5.3.4.2. Matrix Indexation. The Subsections of a Matrix
  - 5.3.4.3. Index Matrices
  - 5.3.4.4. The Array () Function
  - 5.3.4.5. Mixed Arithmetic of Vectors and Matrices. The Recycling Rule
  - 5.3.4.6. The Outer Product of Two Matrices
  - 5.3.4.7. The General Transposition of a Matrix

5.3.4.8. Matrix Multiplication
5.3.4.9. Eigenvalues and Eigenvectors
5.3.4.10. Decomposition of Singular Values and Determinants
5.3.4.11. Forming Partitioned Matrices, Cbind () and Rbind ()
5.3.4.12. The Concatenation Function, c (), With Matrices
5.3.5. Factor Frequency Tables
5.3.6. Lists
5.3.6.1. Creating and Modifying Lists
5.3.6.2. Concatenation Lists
5.3.7. *DataFrames*
5.3.7.1. How to Create *Dataframes*?
5.3.7.2. Attach () and Separate ()
5.3.7.3. Working With *Dataframes*
5.4. Reading and Writing Data
5.4.1. The Read.Table () Function
5.4.2. The Scan () Function
5.4.3. Access to the Sets of Incorporated Data
5.4.4. Loading Data From Other R Packages
5.4.5. Editing Data
5.5. Grouping, Loops and Conditional Execution
5.5.1. Grouped Expressions
5.5.2. Control Statements
5.5.2.1. Conditional Execution: IF Sentences
5.5.2.2. Repetitive Execution: For Loops, Repetition and Time
5.6. Writing Your Own Functions
5.6.1. Simple Examples
5.6.2. Defining New Binary Operators
5.6.3. Arguments With Name and Default Value
5.6.4. Argument "..."
5.6.5. Assignments Within Functions

Module 6. Graphical Environment in R

6.1. Graphical Procedures
6.1.1. High-Level Plotting Commands
6.1.1.1. The Plot () Function
6.1.1.2. Multivariate Data Visualization
6.1.1.3. Screen Graphics
6.1.1.4. High-Level Plotting Arguments
6.1.2. Low-Level Plotting Commands
6.1.2.1. Mathematical Annotation
6.1.2.2. Hershey Vectorial Sources
6.1.3. Interacting With Graphics
6.1.4. The Use of Graphic Parameters
6.1.4.1. Permanent Changes: the Par () Function
6.1.4.2. Temporal Changes: Arguments to Graphical Functions
6.1.5. List of Graphic Parameters
6.1.5.1. Graphical Elements
6.1.5.2. Axles and Markings
6.1.5.3. Figure Margins
6.1.5.4. Multi-Figure Environment
6.1.6. Descriptive Statistics: Graphical Representations

Module 7. Statistical analysis in R

7.1. Discrete Probability Distributions
7.2. Continuous Probability Distributions
7.3. Introduction to Inference and Sampling (Point Estimate)
7.4. Confidence Intervals
7.5. Hypothesis Testing
7.6. ANOVA of a Factor
7.7. Adjustment Suitability (Chi-Square Test)
7.8. Fitdist Package
7.9. Introduction to Multivariant Statistics

Module 8. *Machine learning* for Analysing *Big Data*

8.1. Introduction to *Machine Learning*
8.2. Presentation of the Problem, Loading Data and Libraries
8.3. Data Cleaning (NAS, Categories, *Dummy* Variables)
8.4. Exploratory Data Analysis (ggplot) + Crossed Validation
8.5. Prediction Algorithms: Multiple Linear Regression, Support Vector Machine, Regression Trees, Random Forest, etc.
8.6. Classification Algorithms: Multiple Linear Regression, Support Vector Machine, Regression Trees, Random Forest, etc.
8.7. Adjustment of the Algorithm's Hyperparameters
8.8. Predicting Data with Different Models
8.9. ROC Curves and Confusion Matrices for Assessing Model Quality

Module 9. Data Mining Applied to Genomics

9.1. Introduction
9.2. Initiation to Variables
9.3. Text Cleaning and Conditioning
9.4. Generating the Word Matrix
  9.4.1. Creating the TDM Word Matrix
  9.4.2. Visualizations on the TDM Word Matrix
9.5. Description of the Word Matrix
  9.5.1. Graphic Representation of the Frequencies
  9.5.2. Creating a Word Cloud
9.6. Creating a *Data Frame* for K-NN
9.7. Creating a Classification Model
9.8. Validating a Classification Model
9.9. Guided Practical Exercise on Data Mining in Cancer Genomics

Module 10. Techniques for extracting genomic data

10.1. Introduction to"*Scraping Data*"
10.2. Importing Spreadsheet Data Files Stored Online
10.3. *Scraping* HTML Text
10.4. *Scraping* Data from an HTML Table
10.5. Using APIs for Data *Scraping*
10.6. Extracting Relevant Information
10.7. Using the Rvest Package of R
10.8. Obtaining Data Distributed Over Multiple Pages
10.9. Extracting Genomic Data from the "My Cancer Genome" Platform
10.10. Extracting Information on Genes from the "HGNC HUGO Gene Nomenclature Committee" Database
10.11. Extracting Pharmacological Data from the "OncoKG" (Precision Oncology Knowledge Base) Database

Module 11. New Techniques in the Age of Genomics

11.1. Understanding the New Technology: Next Generation Sequence (NGS) in clinical practice
  11.1.1. Introduction
  11.1.2. Background
  11.1.3. Problems in the Application of Sanger Sequencing in Oncology
  11.1.4. New Sequencing Techniques
  11.1.5. Advantages of Using NGS in Clinical Practice
  11.1.6. Limitations of Using NGS in Clinical Practice
  11.1.7. Terms and Definitions of Interest
  11.1.8. Types of Studies Depending on Their Size and Depth
    11.1.8.1. Genome
    11.1.8.2. Exomes
    11.1.8.3. Multigenic Panels
  11.1.9. Stages of NGS Sequencing
    11.1.9.1. Preparing Samples and Libraries
    11.1.9.2. Preparing Templates and Sequencing
    11.1.9.3. Bioinformatic Processing
  11.1.10. Annotation and Classification of Variants
    11.1.10.1. Population Databases
    11.1.10.2. Locus-Specific Databases
    11.1.10.3. Bioinformatic Predictors of Functionality

11.2. DNA Sequencing and Bioinformatic Analysis
- 11.2.1. Introduction
- 11.2.2. Software
- 11.2.3. Procedure
  - 11.2.3.1. Extracting Raw Sequences
  - 11.2.3.2. Aligning Sequences
  - 11.2.3.3. Alignment Refinement
  - 11.2.3.4. Variant Call
  - 11.2.3.5. Variant Filtering

11.3. RNA Sequencing and Bioinformatic Analysis
- 11.3.1. Introduction
- 11.3.2. Software
- 11.3.3. Procedure
  - 11.3.3.1. QC Evaluation of Raw Data
  - 11.3.3.2. RNAr Filtering
  - 11.3.3.3. Filtered Quality Control Data
  - 11.3.3.4. Quality Trimming and Adapter Removal
  - 11.3.3.5. Alignment of *Reads* to a Reference
  - 11.3.3.6. Variant Call
  - 11.3.3.7. Differential Gene Expression Analysis

11.4. ChIP-seq Technology
- 11.4.1. Introduction
- 11.4.2. Software
- 11.4.3. Procedure
  - 11.4.3.1. CHIP-seq Data Set Description
  - 11.4.3.2. Obtaining Information About the Experiment Using the GEO and SRA Websites
  - 11.4.3.3. Quality Control of the Sequencing Data
  - 11.4.3.4. Trimming and Filtering Reads
  - 11.4.3.5. *Visualizing Results with the Integrated Genome Browser* (*IGV*)

11.5. *Big Data* Applied to Oncology Genomics
- 11.5.1. The Process of Analysis Data

11.6. Genomic Servers and Databases of Genetic Variants
- 11.6.1. Introduction
- 11.6.2. Online Genomic Servers
- 11.6.3. Genomic Server Architecture
- 11.6.4. Recuperation and Data Analysis
- 11.6.5. Personalization

11.7. Annotation of Genetic Variants
- 11.7.1. Introduction
- 11.7.2. What is Variant Calling?
- 11.7.3. Understanding the VCF Format
- 11.7.4. Variant Identification
- 11.7.5. Variant Analysis
- 11.7.6. Predicting the Effect of the Variation of a Protein's Structure and Function

Module 12. Application of Bioinformatics in Genomic Oncology

12.1. Clinical and Pharmacological Enrichment of Gene Variants
12.2. Mass Search in PubMed for Genomic Information
12.3. Mass Search in DGIdb for Genomic Information
12.4. Mass Search in Clinical Trials for Clinical Trials on Genomic Data
12.5. Gene Similarity Search for the Interpretation of a Gene Panel or Exome
12.6. Mass Search for Genes Connected to a Disease
12.7. Enrich-Gen: Platform for the Clinical and Pharmacological Enrichment of Genes
12.8. Procedure to Produce a Genomic Report in the Age of Precision Oncology

This very complete syllabus gathers the main advances in Precision Oncology in a platform that facilitates 100% online learning"

07

Clinical Internship

At the end of the first stage of this Hybrid Master's Degree, the professional will complete a first level practical and face-to-face stay. From this didactic process, they will be able to put the contents learned in the theoretical phase into practice, acquiring a broader update of their professional practice and in accordance with the most widely used international standards.

I develop your clinical practices in prestigious hospital institutions where Artificial Intelligence and Big Data technologies of best results for Precision Oncology are used"

The practical training included in this Hybrid Master's Degree has an extension of 120 hours, to be completed in days from Monday to Friday, during 3 weeks. This learning period will allow the specialist to directly manipulate the most advanced devices and software used in Precision Oncology and the genomic study of real patients through Big Data.

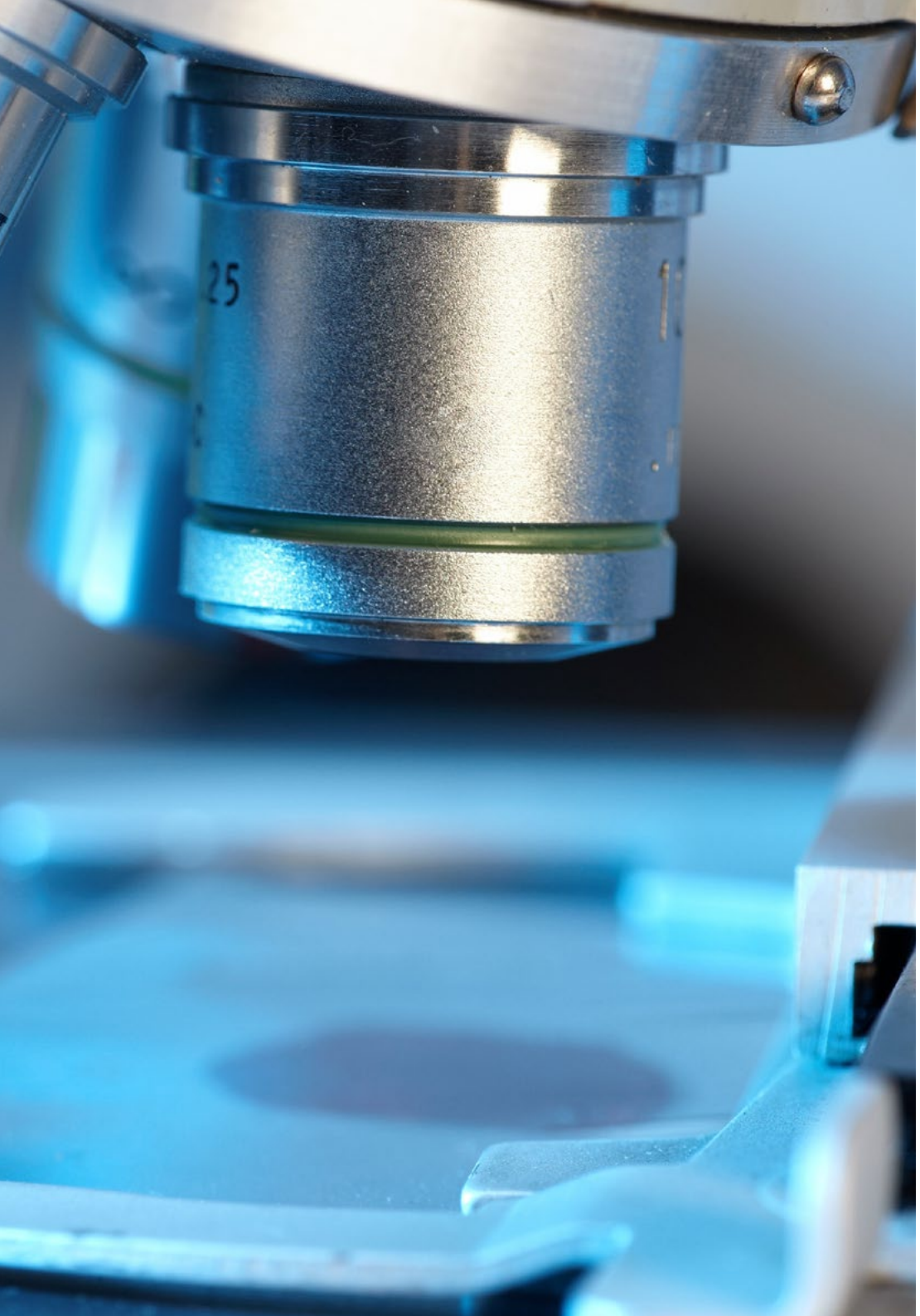
To do so, they will move to a prestigious hospital institution, equipped with the best resources in this scientific and medical field. In addition, you will be able to choose the facility that best suits your academic interests and geographical location. This is possible thanks to TECH which, through a careful selection process, has managed to bring together prestigious centers from different latitudes for this academic modality.

Also during the clinical practice, the medical professional will have access to experts with extensive experience who will share their latest experiences in the field of precision oncology. Likewise, for the development of the most advanced competencies, they will be supported by an assistant tutor, appointed to advise them and check their educational progress.

The practical part will be carried out with the active participation of the student performing the activities and procedures of each area of competence (learning to learn and learning to do), with the accompaniment and guidance of teachers and other fellow trainees who facilitate teamwork and multidisciplinary integration as transversal competences for the praxis of oncological medicine (learning to be and learning to relate).

The procedures described below will form the basis of the practical part of the training, and their implementation is subject to both the suitability of the patients and the availability of the center and its workload, with the proposed activities being as follows:

Through the professional practices of this degree you will acquire a complete mastery of genomics and DNA sequencing technologies applied to cancer research"



Module	Practical Activity
Changes in Current Clinical Practice and New Applications With Genomic Oncology	Detect tumor-specific mutations through a peripheral blood sample or liquid biopsy.
	Reveal mutations in genes, or their possible expression, through genetic or genomic tests to anticipate the onset of cancer or genomic tests in order to anticipate the onset of cancer
	Interpreting genomic biomarkers that have a significant impact on the cancer immunotherapy landscape
	Apply the most recognized therapeutic targets against Lung Cancer derived from the identification of mutations and translocation of specific genes
	Addressing the latency of the HER2 molecule and its relationship to advanced gastric cancer
New applications of Bioinformatics in Genomic Oncology	Handling the Unix system and its command lines for file organization and basic medical history information in the patient under suspicion of oncologic disease
	Incorporate R programming language applications to facilitate the analysis and comparison of diagnostic tests of an oncologic patient and those performed for follow-up
	Perform protein and proteome studies using state-of-the-art bioinformatic tools
	Implement various algorithms performed with the R language for knowledge extraction from the Pubmed, DGIdb and Clinical Trials databases from the search of genetic information in specific tumors
Machine learning for Big Data analysis	Rapidly and automatically analyze huge volumes of complex structured, semi-structured and unstructured medical data in Big Data
	Use Big Data's own techniques for data classification, including the Big Data tree decision tree, k-NN, Support Vector Machines, neural networks, among others
	Apply the principles of data mining to the dissection of large complex medical datasets.
Other genomic data mining techniques and their applications	Extracting pharmacological data from the OncoKB database
	Evaluating genomic data from the My Cancer Genome platform
	Manipulating next-generation sequencing technologies on the market to examine patients´ DNA and RNA
	Employ Artificial Intelligence programs to select specific data from open and broad information with multiple results

Civil Liability Insurance

This institution's main concern is to guarantee the safety of the trainees and other collaborating agents involved in the internship process at the company. Among the measures dedicated to achieve this is the response to any incident that may occur during the entire teaching-learning process.

To this end, this entity commits to purchasing a civil liability insurance policy to cover any eventuality that may arise during the course of the internship at the center.

This liability policy for interns will have broad coverage and will be taken out prior to the start of the practical training period. That way professionals will not have to worry in case of having to face an unexpected situation and will be covered until the end of the program at the center.

General Conditions of the Internship Program

The general terms and conditions of the internship program agreement shall be as follows:

1. TUTOR: During the Hybrid Master's Degree, students will be assigned with two tutors who will accompany them throughout the process, answering any doubts and questions that may arise. On the one hand, there will be a professional tutor belonging to the internship center who will have the purpose of guiding and supporting the student at all times. On the other hand, they will also be assigned with an academic tutor whose mission will be to coordinate and help the students during the whole process, solving doubts and facilitating everything they may need. In this way, the student will be accompanied and will be able to discuss any doubts that may arise, both clinical and academic.

2. DURATION: The internship program will have a duration of three continuous weeks, in 8-hour days, 5 days a week. The days of attendance and the schedule will be the responsibility of the center and the professional will be informed well in advance so that they can make the appropriate arrangements.

3. ABSENCE: If the students does not show up on the start date of the Hybrid Master's Degree, they will lose the right to it, without the possibility of reimbursement or change of dates. Absence for more than two days from the internship, without justification or a medical reason, will result in the professional's withdrawal from the internship, therefore, automatic termination of the internship. Any problems that may arise during the course of the internship must be urgently reported to the academic tutor.

4. CERTIFICATION: Professionals who pass the Hybrid Master's Degree will receive a certificate accrediting their stay at the center.

5. EMPLOYMENT RELATIONSHIP: The Hybrid Master's Degree shall not constitute an employment relationship of any kind.

6. PRIOR EDUCATION: Some centers may require a certificate of prior education for the Hybrid Master's Degree. In these cases, it will be necessary to submit it to the TECH internship department so that the assignment of the chosen center can be confirmed.

7. DOES NOT INCLUDE: The Hybrid Master's Degree will not include any element not described in the present conditions. Therefore, it does not include accommodation, transportation to the city where the internship takes place, visas or any other items not listed

However, students may consult with their academic tutor for any questions or recommendations in this regard. The academic tutor will provide the student with all the necessary information to facilitate the procedures in any case.

08

Where Can I Do the Clinical Internship?

In order to guarantee its graduates access to the most advanced technology in the field of Precision Oncology, TECH has carefully selected the centers where they will carry out their clinical internships. Thus, through agreements and collaborations, it has secured the most prestigious institutions in this field of health. Thus, the specialists enrolled in this Hybrid Master's Degree will have the most modern devices at their disposal and, at the same time, a staff of prestigious experts who will accompany them at all times in their update. Many of these hospital institutions are located in distant geographical locations, giving the professional the opportunity to choose the one that best suits his or her personal location.

Get the most sought-after skills and competencies in Precision Oncology from a comprehensive, immersive and face-to-face clinical practice that only TECH can offer"

The student will be able to complete the practical part of this Hybrid Master's Degree at The following centers:

Hospital HM Modelo

Country: Spain
City: La Coruña

Address: Rúa Virrey Osorio, 30, 15011, A Coruña

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Anaesthesiology and Resuscitation
- Palliative Care

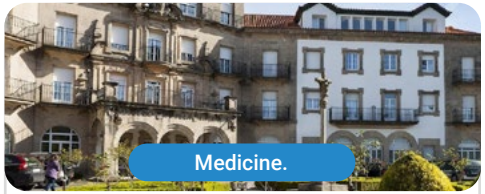
Hospital HM Rosaleda

Country: Spain
City: La Coruña

Address: Rúa de Santiago León de Caracas, 1, 15701, Santiago de Compostela, A Coruña

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Hair Transplantation
- Orthodontics and Dentofacial Orthopedics



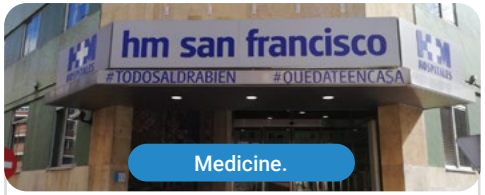
Hospital HM La Esperanza

Country: Spain
City: La Coruña

Address: Av. das Burgas, 2, 15705, Santiago de Compostela, A Coruña

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
Oncology Nursing
- Clinical Ophthalmology



Hospital HM San Francisco

Country: Spain
City: León

Address: C. Marqueses de San Isidro, 11, 24004, León

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Update in Anesthesiology and Resuscitation
Trauma Nursing

Hospital HM Nou Delfos

Country: Spain
City: Barcelona

Address: Avinguda de Vallcarca, 151, 08023 Barcelona

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Aesthetic Medicine
- Clinical Nutrition in Medicine

Hospital HM Madrid

Country: Spain
City: Madrid

Address: Pl. del Conde del Valle de Súchil, 16, 28015, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Palliative Care
- Anaesthesiology and Resuscitation

Hospital HM Montepríncipe

Country: Spain
City: Madrid

Address: Av. de Montepríncipe, 25, 28660, Boadilla del Monte, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Palliative Care
- Aesthetic Medicine

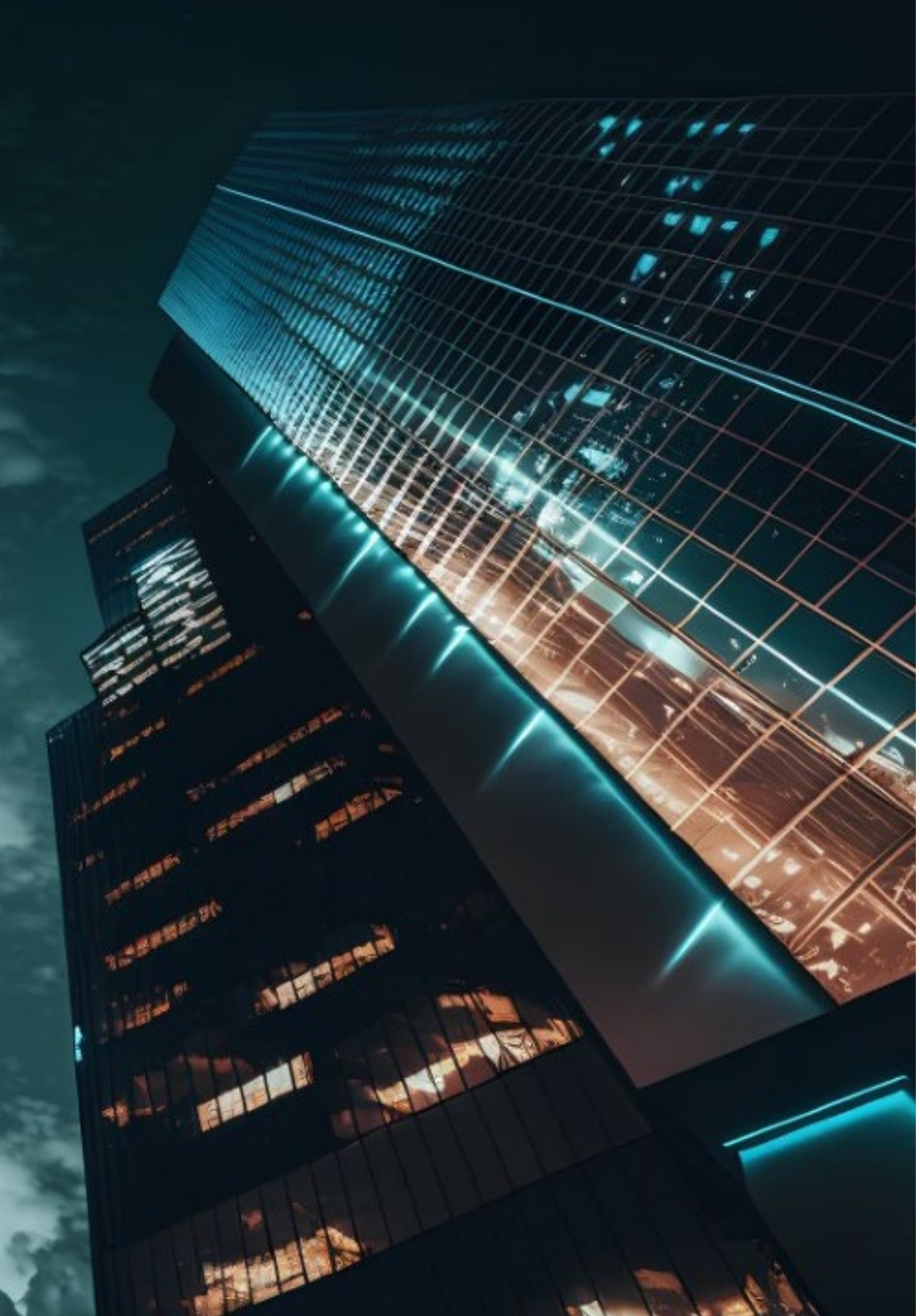
Hospital HM Torrelodones

Country: Spain
City: Madrid

Address: Av. Castillo Olivares, s/n, 28250, Torrelodones, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Anaesthesiology and Resuscitation
- Palliative Care



Hospital HM Sanchinarro

Country: Spain
City: Madrid

Address: Calle de Oña, 10, 28050, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Anaesthesiology and Resuscitation
- Palliative Care

Hospital HM Nuevo Belén

Country: Spain
City: Madrid

Address: Calle José Silva, 7, 28043, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- General and Digestive System Surgery
- Clinical Nutrition in Medicine

Hospital HM Puerta del Sur

Country: Spain
City: Madrid

Address: Av. Carlos V, 70, 28938, Móstoles, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Palliative Care
- Clinical Ophthalmology

Hospital HM Vallés

Country: Spain
City: Madrid

Address: Calle Santiago, 14, 28801, Alcalá de Henares, Madrid

Network of private clinics, hospitals and specialized centers distributed throughout Spain.

Related internship programs:
- Gynecologic Oncology
- Clinical Ophthalmology

09

Methodology

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

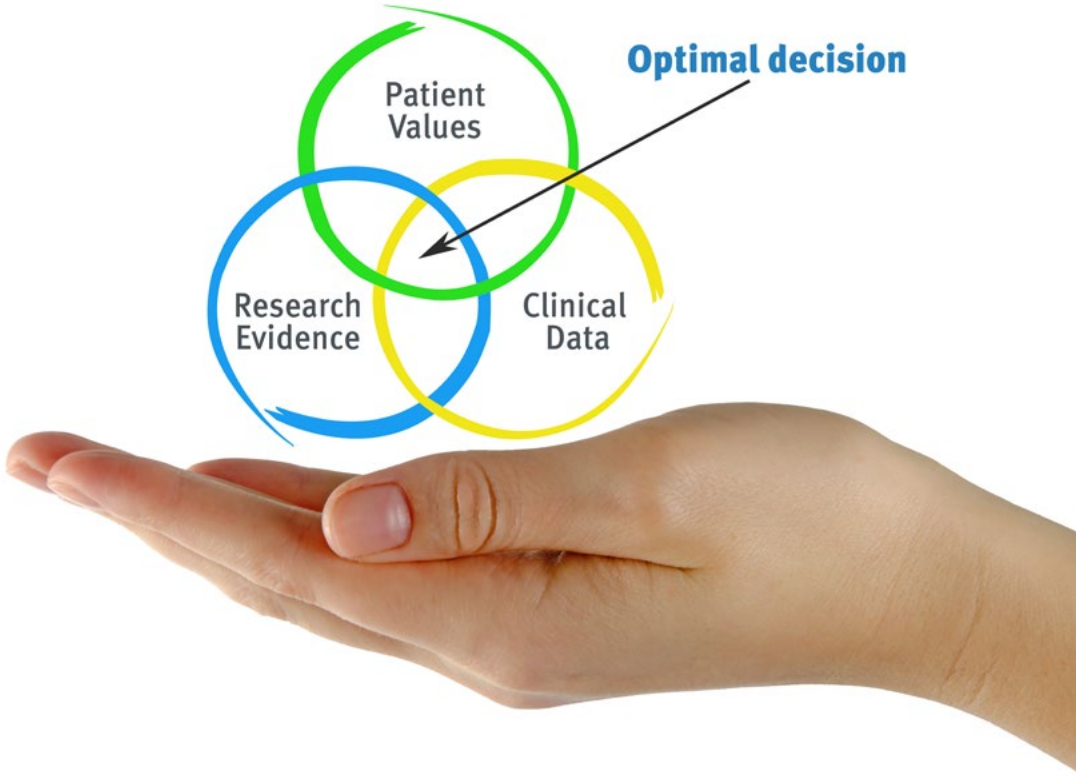
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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. Specialists 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 in the physician's professional 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:

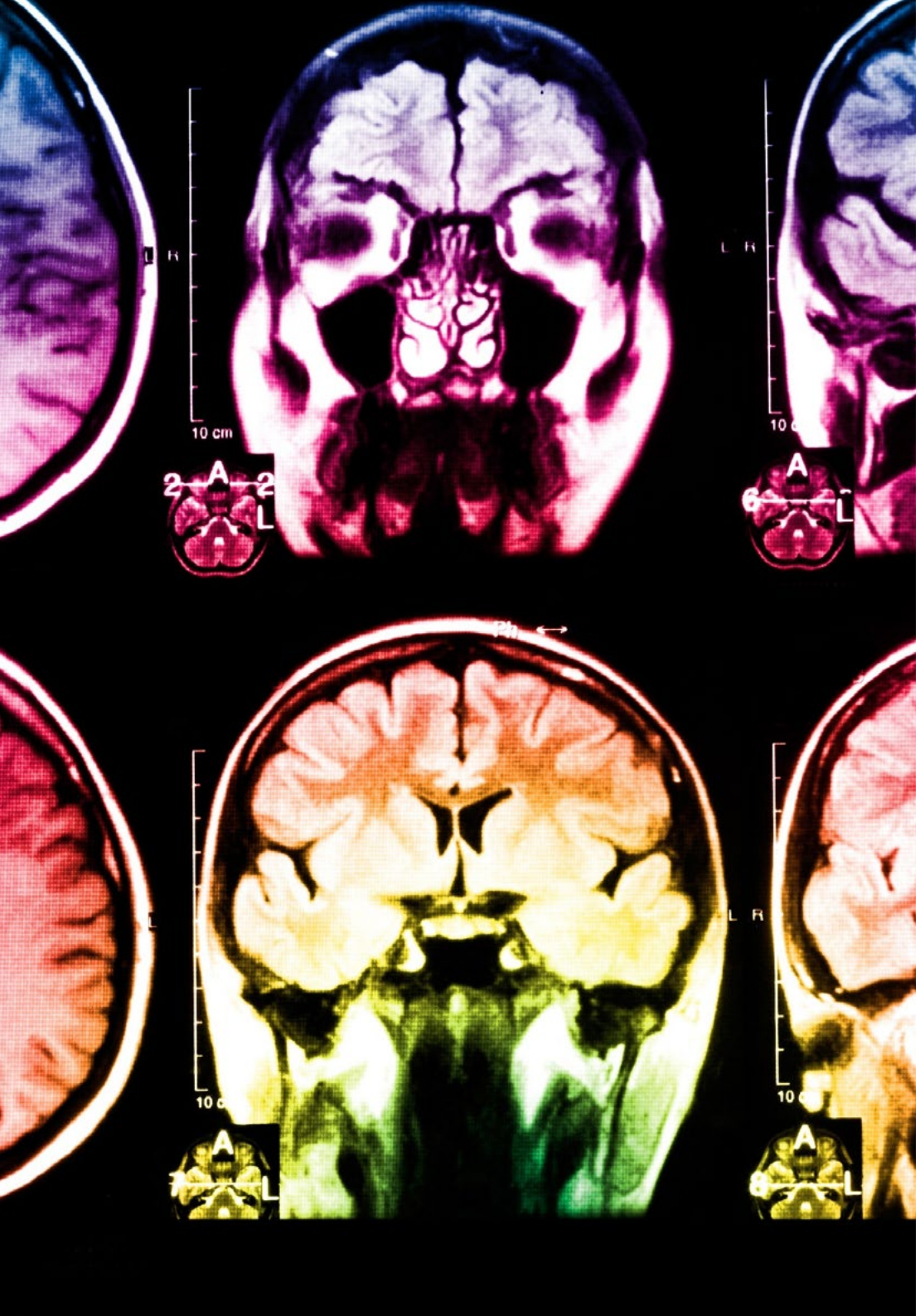
1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better 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.

Professionals will learn through real cases and by resolving 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, more than 250,000 physicians have been trained with unprecedented success in all clinical specialties regardless of surgical load. 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 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.

Surgical Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances and 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 the videos as many times as you like.

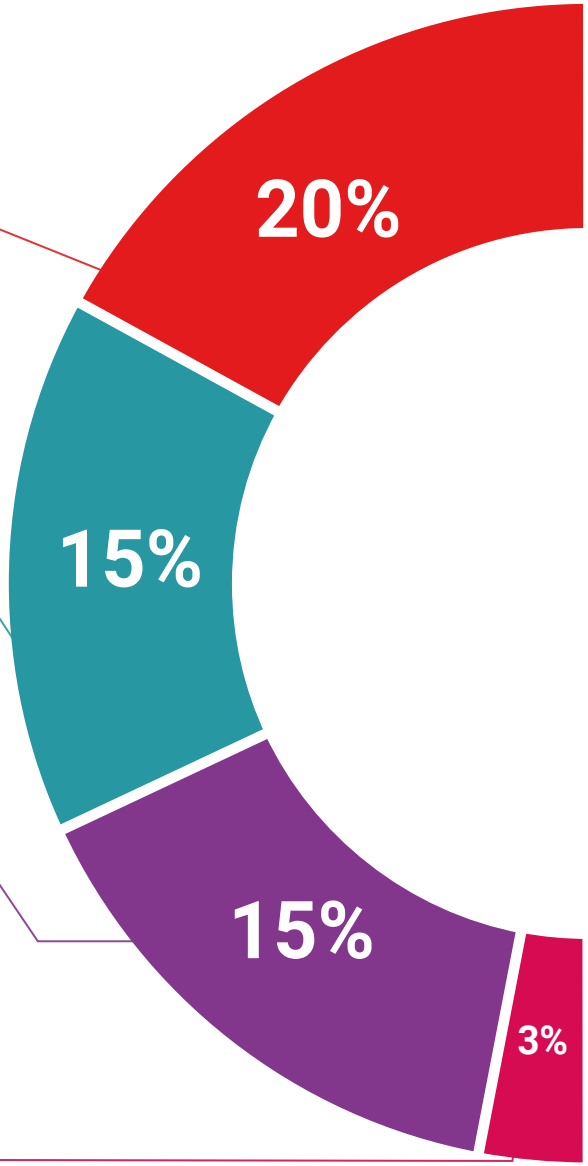
Interactive Summaries

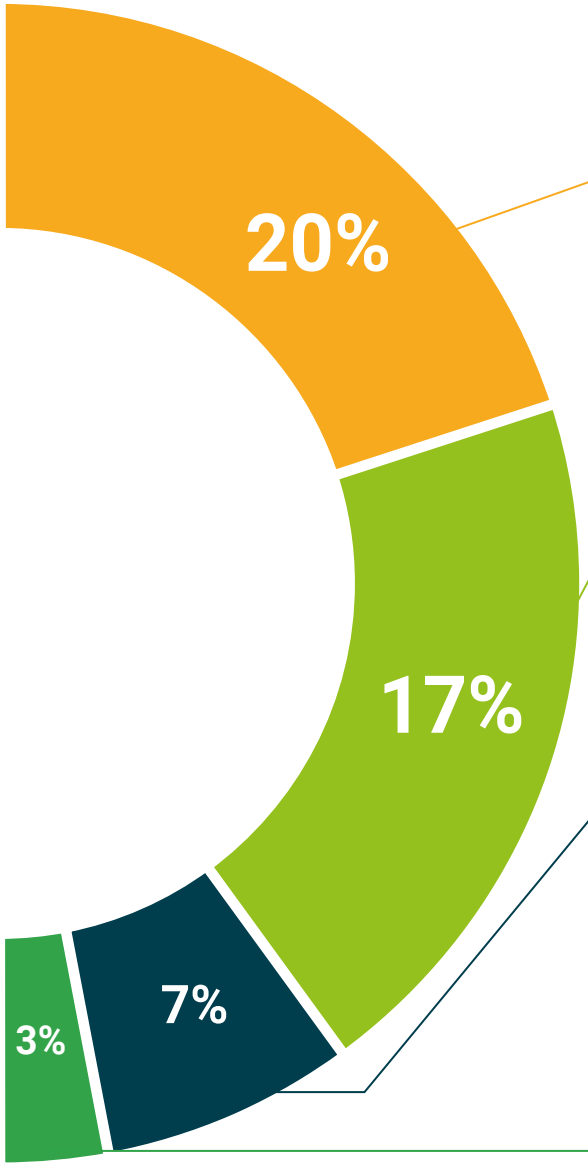
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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 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.

10

Certificate

This Hybrid Master's Degree in Precision Oncology and Big Data guarantees students, in addition to the most rigorous and up-to-date education, access to a Hybrid Master's Degree 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 **Hybrid Master's Degree diploma in Precision Oncology: Genomics and Big Data** 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.

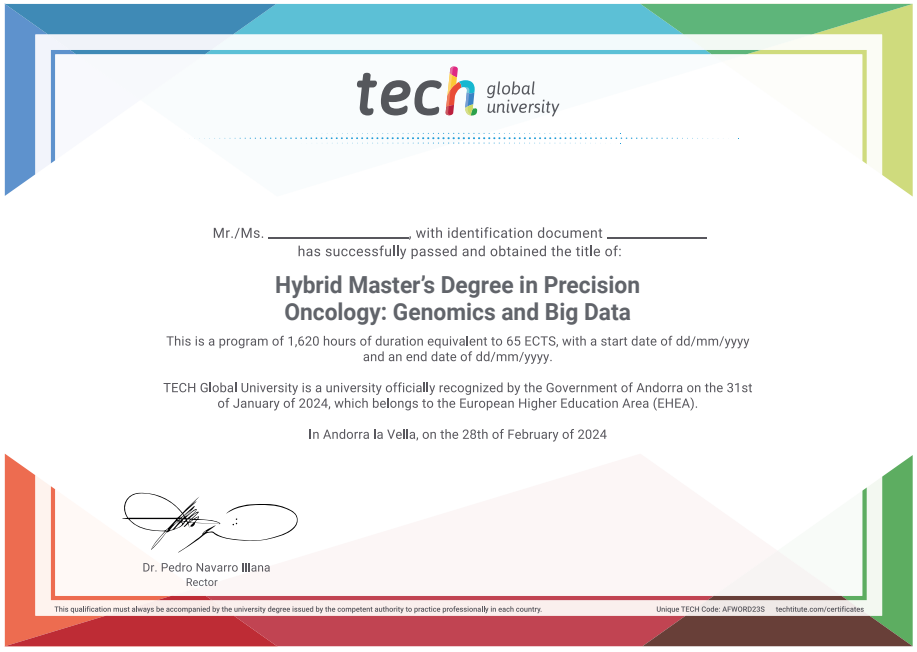
Title: **Hybrid Master's Degree in Precision Oncology: Genomics and Big Data**

Course Modality: **Hybrid (Online + Clinical Internship)**

Duration: **12 months**

Certificate: **TECH Global University**

Recognition: **60 + 5 ECTS Credits**


tech global university

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

Hybrid Master's Degree in Precision Oncology: Genomics and Big Data

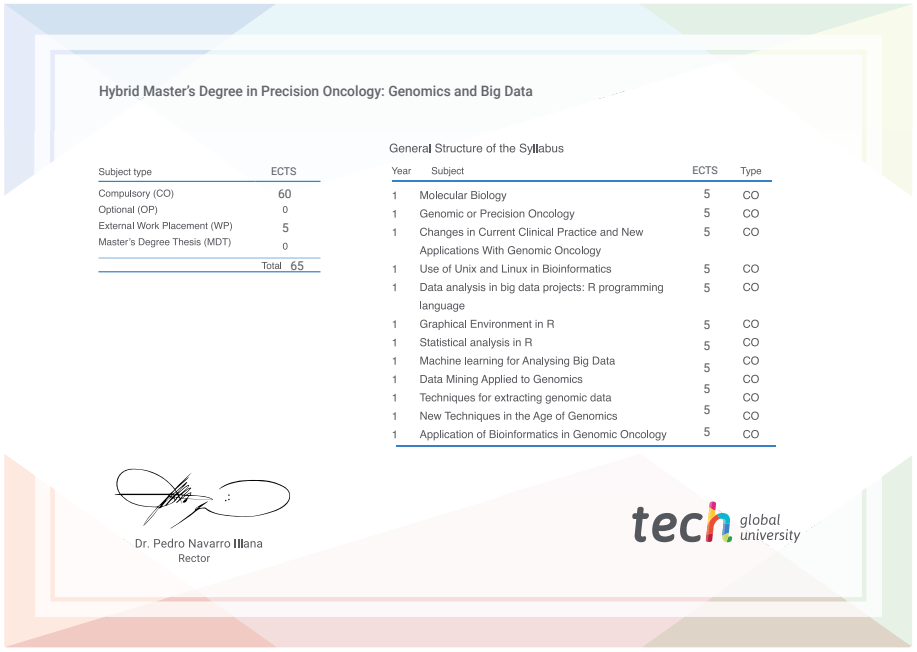
This is a program of 1,620 hours of duration equivalent to 65 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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


Hybrid Master's Degree in Precision Oncology: Genomics and Big Data

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	5
Master's Degree Thesis (MDT)	0
Total	65

General Structure of the Syllabus

Year	Subject	ECTS	Type
1	Molecular Biology	5	CO
1	Genomic or Precision Oncology	5	CO
1	Changes in Current Clinical Practice and New Applications With Genomic Oncology	5	CO
1	Use of Unix and Linux in Bioinformatics	5	CO
1	Data analysis in big data projects: R programming language	5	CO
1	Graphical Environment in R	5	CO
1	Statistical analysis in R	5	CO
1	Machine learning for Analysing Big Data	5	CO
1	Data Mining Applied to Genomics	5	CO
1	Techniques for extracting genomic data	5	CO
1	New Techniques in the Age of Genomics	5	CO
1	Application of Bioinformatics in Genomic Oncology	5	CO

Dr. Pedro Navarro Illana
Rector

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*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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Hybrid Master's Degree

Precision Oncology: Genomics and Big Data

Modality: **Hybrid (Online + Clinical Internship)**

Duration: **12 months**

Certificate: **TECH Global University**

60 + 5 ECTS Credits

Hybrid Master's Degree

Precision Oncology: Genomics and Big Data

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