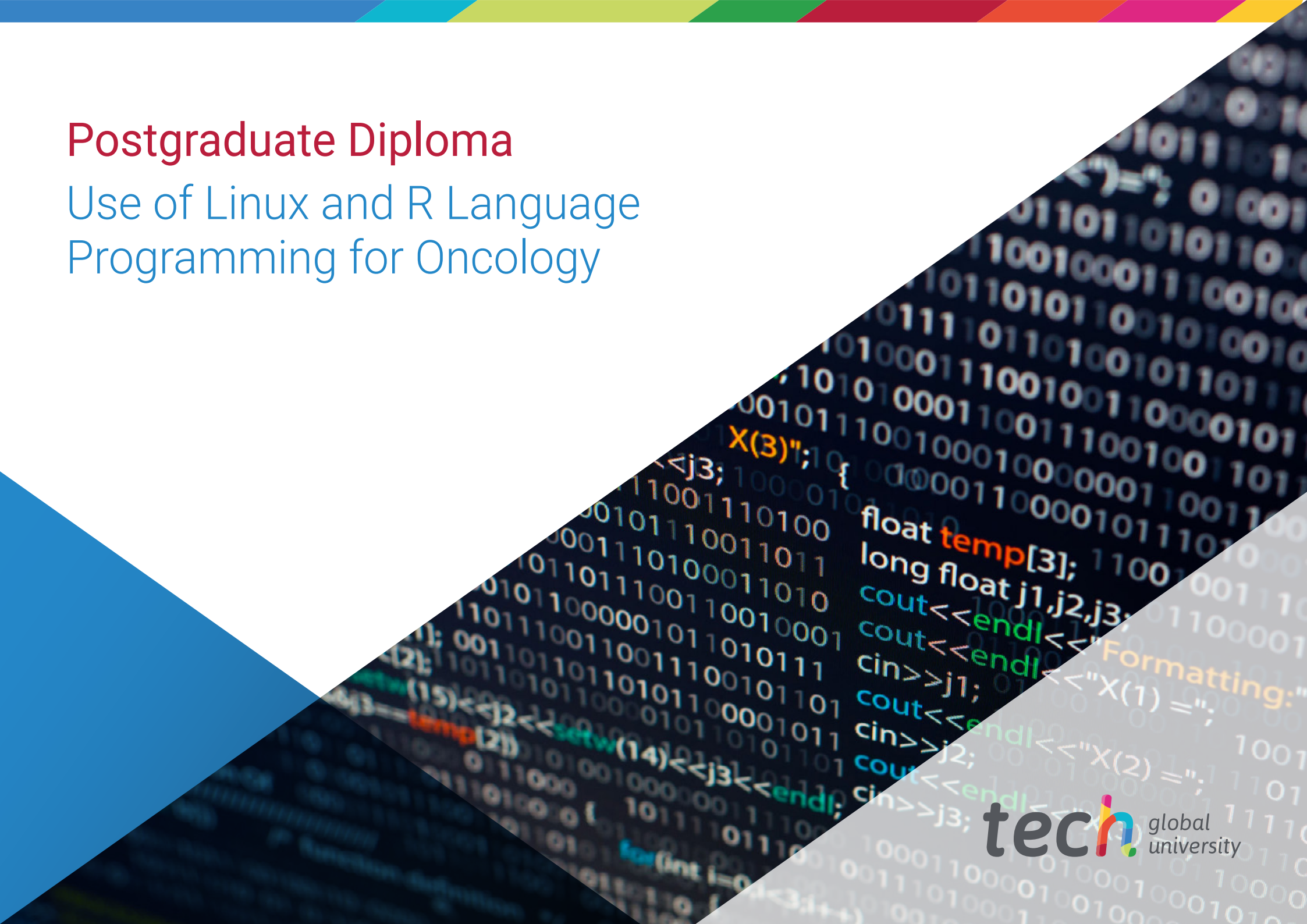
Postgraduate Diploma

Use of Linux and R Language Programming for Oncology



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Postgraduate Diploma

Use of Linux and R Language Programming for Oncology

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Global University**
- Credits: **19 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/us/medicine/postgraduate-diploma/postgraduate-diploma-use-linux-r-language-programming-oncology

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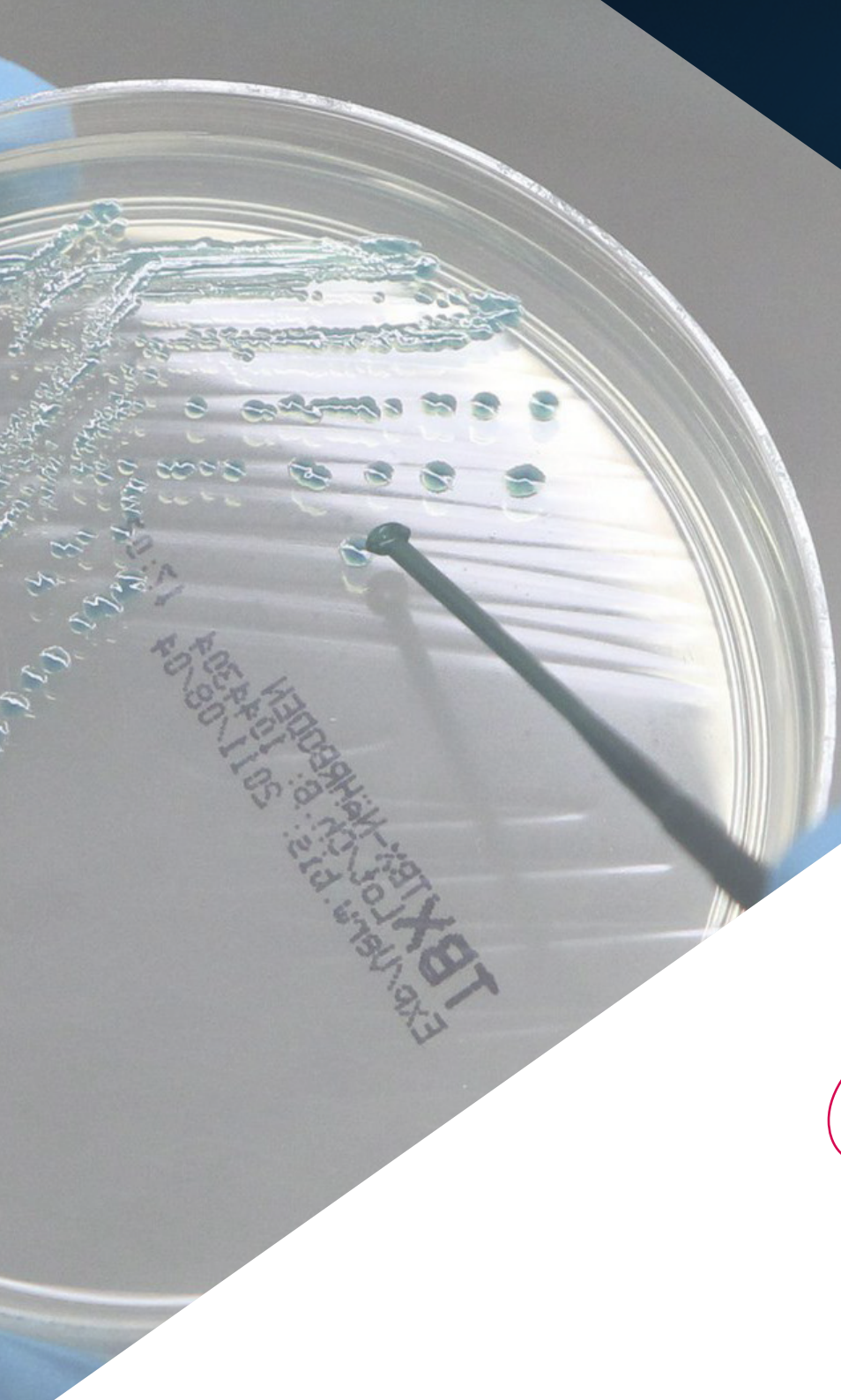
01

Introduction

The concept of genomic or precision oncology is not entirely new; physicians have been using blood type to tailor blood transfusions for over a century. What is different today is the rapid growth of genomic data that can be collected quickly and cheaply from the patient and the community at large, and the potential to gain insights from sharing that data.



This specialization will generate a sense of confidence when practicing medicine, which will help you grow personally and professionally"

The scale and complexity of genomic data dwarf the measurements traditionally used in laboratory testing. In recent years there has been an enormous development of informatics to analyze and interpret DNA sequencing, and it has created a gap between biological knowledge and its application to routine clinical practice. It is therefore necessary to educate, disseminate and incorporate these informatics techniques among the medical community in order to be able to interpret the massive analysis of data from publications, biological or medical databases and medical records, among others, and thus enrich the biological information available at the clinical level.

This machine learning will enable the development of precision oncology, in order to interpret genomic characteristics and find targeted therapies, or to identify risks to certain diseases and establish more individualized preventive measures. A fundamental objective of the program is to bring students closer to and disseminate computer knowledge, which is already applied in other fields of knowledge but has minimal implementation in the medical world, despite the fact that for genomic medicine to become a reality, it is necessary to accurately interpret the huge volume of clinical information currently available and associate it with the biological data generated after a bioinformatic analysis. While this is a difficult challenge, it will allow the effects of genetic variation and potential therapies to be explored quickly, inexpensively and with greater precision than is currently possible.

Humans are not naturally equipped to perceive and interpret genomic sequences, to understand all the mechanisms, pathways and interactions that take place within a living cell, nor to make medical decisions with tens or hundreds of variables. To move forward, a system with superhuman analytical capabilities is required to simplify the work environment and show the relationships and proximities between variables. In genomics and biology, it is now recognized that it is better to spend resources on new computational techniques than on pure data collection, something that is possibly the same in medicine and, of course, oncology.

This **Postgraduate Diploma in Use of Linux and R Language Programming for Oncology** is the most complete and up-to-date scientific program on the market. Its most notable features are:

- Development of practical cases presented by experts in the use of Linux and programming with R language for oncology. Its graphic, schematic and eminently practical contents provide scientific and practical information on those disciplines that are essential for professional practice
- News developments in the use of linux and R language programming for oncology
- It contains practical exercises where the self-assessment process can be carried out to improve learning
- With special emphasis on innovative methodologies in the use of linux and R language programming for oncology
- 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 accessible from any fixed or portable device with an Internet connection

Update your knowledge with the Postgraduate Diploma in the Use of Linux and R Language Programming for Oncology program"

This Postgraduate Diploma may be the best investment you can make in the selection of an up-to-date program for two reasons: in addition to updating your knowledge in the use of Linux and R language programming for oncology, you will obtain a Postgraduate Diploma from TECH Global University"

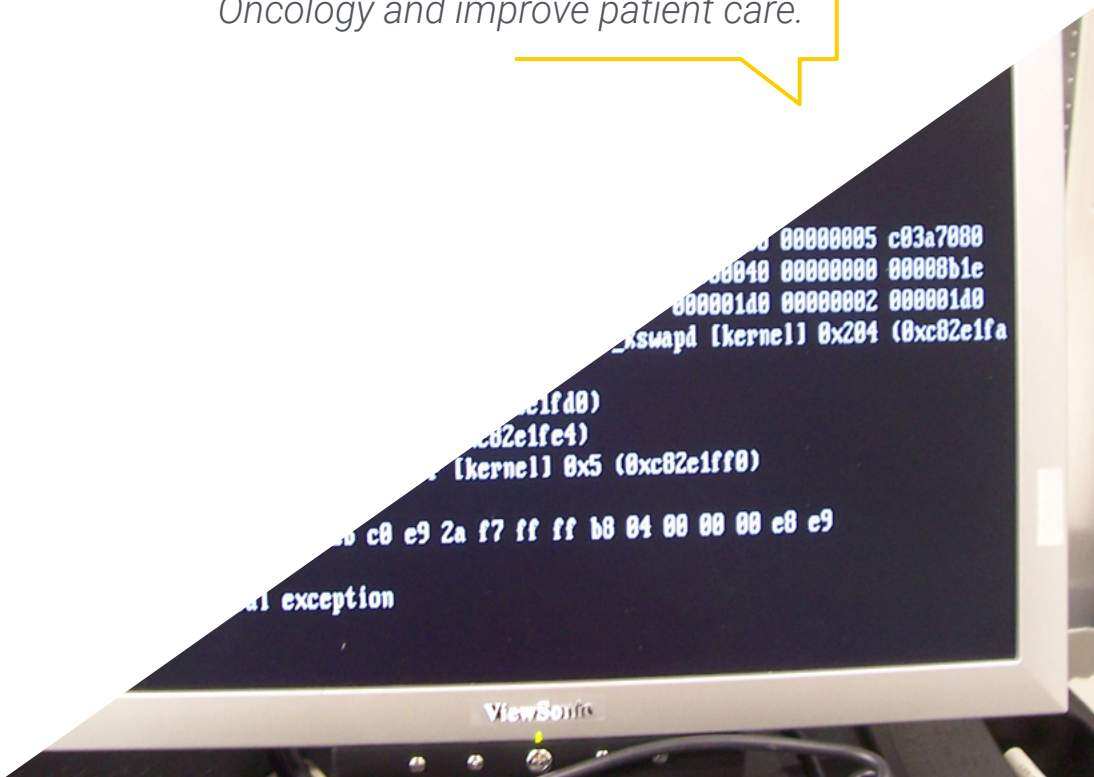
Increase your decision-making confidence by updating your knowledge through this Postgraduate Diploma.

Take the opportunity to learn about the latest advances in the Use of Linux and R Language Programming for Oncology and improve patient care.

It includes in its teaching staff professionals belonging to the field of the use of linux and R language programming for oncology, who pour into this specialization the experience of their work, as well as recognized specialists belonging to reference societies and prestigious universities.

Thanks to its multimedia content elaborated with the latest educational technology, this Postgraduate Diploma will allow the professional a situated and contextual learning, that is to say, a simulated environment that will provide an immersive learning programmed to work in real situations.

This program is designed around Problem-Based Learning, whereby the student must try to solve the different professional practice situations that arise during the course. For this, the student will have the help of an innovative interactive video system made by recognized experts in the field of the use of linux and R language programming for oncology and with great teaching experience.



02

Objectives

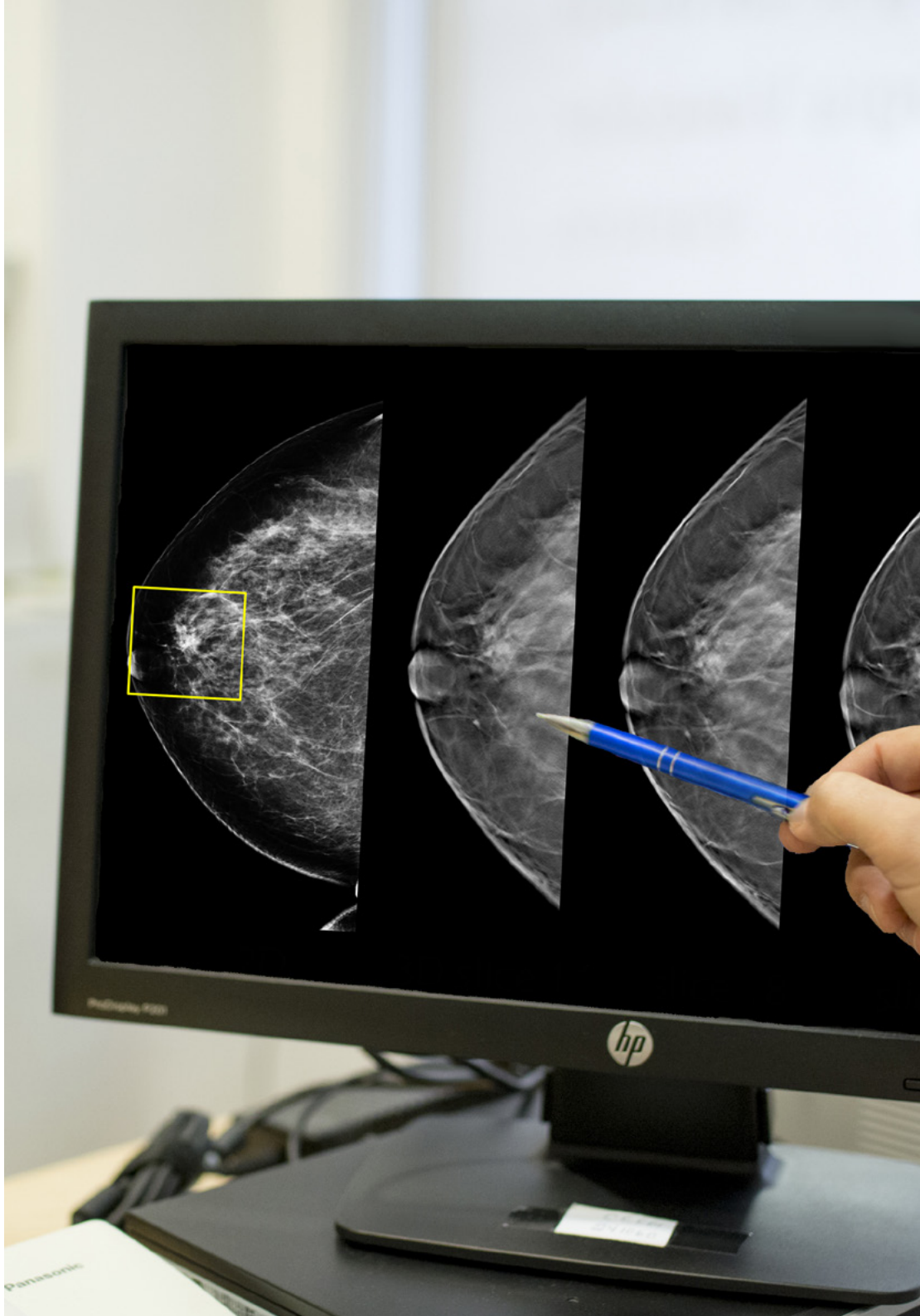
The program in Use of Linux and R Language Programming for Oncology is oriented to facilitate the performance of the physician dedicated to the treatment of oncological pathology in which it is necessary to accurately interpret the huge volume of clinical information currently available and associate it with the biological data generated after a bioinformatics analysis.

This Postgraduate Diploma is designed for you to update your knowledge in the Use of Linux and R Language Programming for Oncology, with the use of the latest educational technology, to contribute with quality and safety to decision making"

General Objective

- Be able to accurately interpret the volume of clinical information currently available and associated with the biological data generated after a bioinformatic analysis

Take the opportunity and take the step to get up to date on the latest developments in the Use of Linux and R Language Programming for Oncology"



Specific Objectives

Module 1. 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 2. Data Analysis Processing in Big Data Projects: R Language Programming

- 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 3. 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 4. 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

03

Course Management

The program includes in its teaching staff reference specialists in the use of Linux and R language programming for oncology who pour into this specialization the experience of their work. Additionally, other recognized specialists participate in its design and preparation which means that the program is developed in an interdisciplinary manner.

Learn from leading professionals, the latest advances in the use of linux and R language programming for oncology"

Management

Mr. Krallinger, Martin

- Head of the text mining unit at the Spanish National Cancer Research Center (CNIO)
- He has completed the selection process for the position of head of the text mining unit at the Barcelona Supercomputing Center (BSC)
- Expert in the field of biomedical and clinical text mining and linguistic technologies
- Expert in specific text mining applications for drug safety, molecular systems biology and oncology
- Participated in the implementation and evaluation of biomedical named entity recognition components, information extraction systems, semantic indexing of large datasets of heterogeneous document types
- 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

Dr. Oruezábal Moreno, Mauro Javier

- Head of the medical Oncology Service at La Paz University Hospital since 2017
- Research Visitors at University of Southampton
- Master's Degree in Bioinformatics and Biostatistics UOC-UB
- Master's Degree in bioinformatics analysis by the University Pablo de Olavide
- Doctor of Medicine from the Complutense University of Madrid. Outstanding Cum Laude Qualification
- Member of the Spanish Society of Medical Oncology and GECP Group (Spanish Spanish Group of Lung Caner)
- Specialist (MIR) in Medical Oncology, University Hospital San Carlos of Madrid
- Degree in Medicine and Surgery, Navarra University

Professors

Dr. Alberich Martí, Ricardo

- Full university professor of Mathematics, Sciences and Computing (Director)
- Computer Science and Artificial Intelligence University of the Balearic Islands

Dr. Burón Fernández, María Rosario

- Internal Medicine Service
- Infanta Cristina University Hospital

Dr. Gomila Salas, Juan Gabriel

- University Professor Mathematical , Sciences and Computer Science and Artificial Intelligence , University of the Balearic Islands

Torres, Arnau Mir

- Full university Professor of Mathematical , Sciences and Computer Science and Artificial Intelligence , University of the Balearic Islands

04

Structure and Content

The structure of the contents has been designed by a team of professionals from the best educational centers, universities and companies in the national territory, aware of the relevance of current specialization in order to intervene in the specialization and accompaniment of students, and committed to quality teaching through new educational technologies.

The Postgraduate Diploma in the Use of Linux and R Language Programming for Oncology contains the most complete and up-to-date scientific program on the market"

Module 1. Use of Unix and Linux in Bioinformatics

1.1. Introduction to the Linux Operating System
- 1.1.1. What is an Operating System?
- 1.1.2. The Benefits of Using Linux

1.2. Linux Environment and Installation
- 1.2.1. Linux Distributions?
- 1.2.2. Linux Installation Using a USB Memory
- 1.2.3. Linux Installation Using a CD-ROM
- 1.2.4. Linux Installation Using a Virtual Machine

1.3. The Command Line
- 1.3.1. Introduction
- 1.3.2. What is a Command Line?
- 1.3.3. Working on the Terminal
- 1.3.4. Shell and Bash

1.4. Basic Browsing
- 1.4.1. Introduction
- 1.4.2. How to Learn the Current Location?
- 1.4.3. Absolute and Relative Routes
- 1.4.4. How to Navigate in the System?

1.5. File Manipulation
- 1.5.1. Introduction
- 1.5.2. How to Build a Directory?
- 1.5.3. How to Move to a Directory?
- 1.5.4. How to Create an Empty File?
- 1.5.5. Copying a File and Directory
- 1.5.6. Deleting a File and Directory

1.6. VI Text Editor
- 1.6.1. Introduction
- 1.6.2. How to Save and Exit?
- 1.6.3. How to Browse a File in the VI Text Editor?
- 1.6.4. Deleting Contents
- 1.6.5. The Undo Command

1.7. Wildcards
- 1.7.1. Introduction
- 1.7.2. What are Wildcards?
- 1.7.3. Examples of Wildcards

1.8. Licences
- 1.8.1. Introduction
- 1.8.2. How to See the Licences of a File?
- 1.8.3. How to Change the Licences?
- 1.8.4. Licence Configuration
- 1.8.5. Licences for Directories
- 1.8.6. The “Root” User

1.9. Filters
- 1.9.1. Introduction
- 1.9.2. Head
- 1.9.3. Tail
- 1.9.4. Sort
- 1.9.5. nl
- 1.9.6. wc
- 1.9.7. Cut
- 1.9.8. Sed
- 1.9.9. Uniq
- 1.9.10. Tac
- 1.9.11. Other Filters

1.10. Grep and Common Expressions
- 1.10.1. Introduction
- 1.10.2. eGrep
- 1.10.3. Common Expressions
- 1.10.4. Some Examples

1.11. Pipelines and Redirection
- 1.11.1. Introduction
- 1.11.2. Redirect to a File
- 1.11.3. Save a File
- 1.11.4. Redirect From a File
- 1.11.5. STDERR Redirection
- 1.11.6. Pipelines

1.12. Managing Processes
- 1.12.1. Introduction
- 1.12.2. Active Processes
- 1.12.3. Closing a Corrupt Program
- 1.12.4. Foreground and Background Work

1.13. Bash
- 1.13.1. Introduction
- 1.13.2. Important Points
- 1.13.3. Why / ?
- 1.13.4. Variables
- 1.13.5. The Declarations

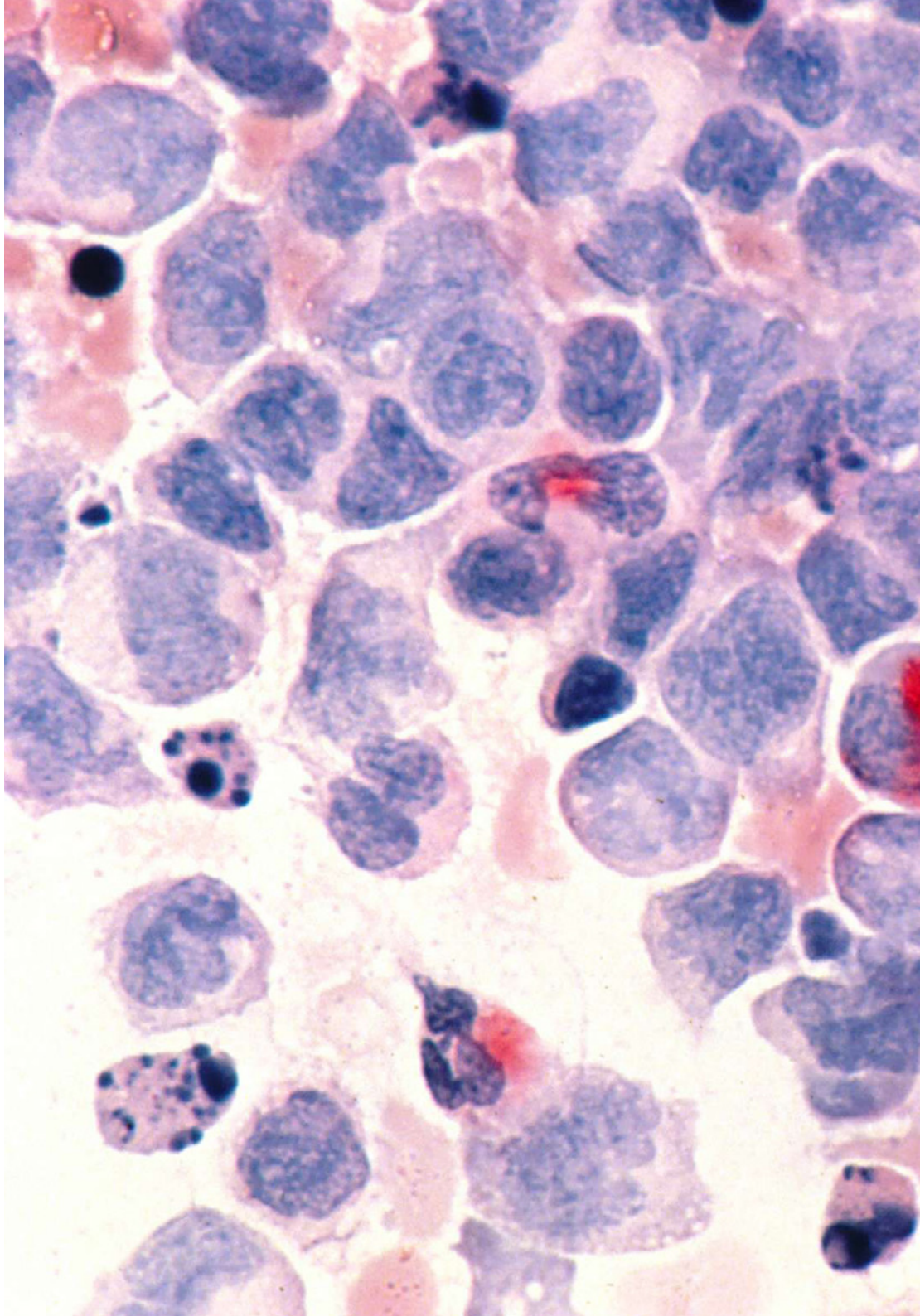
Module 2. Data Analysis Processing in Big Data Projects: R Language Programming

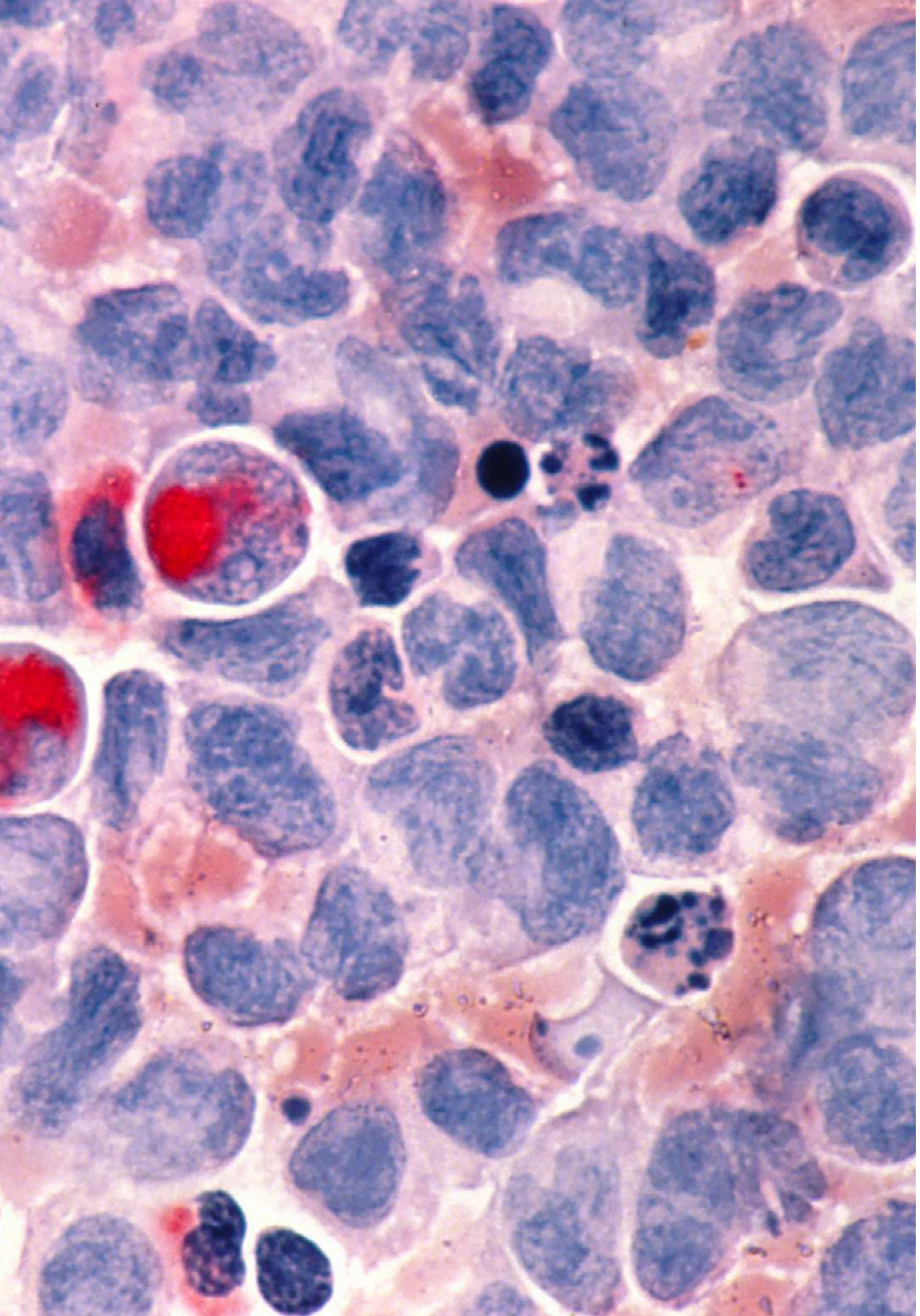
2.1. Introduction to R Language Programming
- 2.1.1. What is R?
- 2.1.2. R Installation and the Graphic Interface of R
- 2.1.3. Packages
  - 2.1.3.1. Standard Packages
  - 2.1.3.2. Contributed Packages and CRAN

2.2. Basic Features of R
- 2.2.1. The Environment of R
- 2.2.2. Software and Related Documentation
- 2.2.3. R and Statistics
- 2.2.4. R and the Window System
- 2.2.5. Using R Interactively
- 2.2.6. An Introductory Session
- 2.2.7. Obtaining Help With Functions and Features
- 2.2.8. R Commands, Cap Sensitivity, Etc
- 2.2.9. Recovery and Correction of Previous Commands
- 2.2.10. Execute Commands or Diverting the Output to a File
- 2.2.11. Data Storage and Object Deletion

2.3. Types of Objects in R
- 2.3.1 Simple Manipulations; Numbers and Vectors
  - 2.3.1.1. Vectors and Their Assignment
  - 2.3.1.2. Vector Arithmetic
  - 2.3.1.3. Generating Regular Sequences
  - 2.3.1.4. Logical Vectors
  - 2.3.1.5. Lost Values
  - 2.3.1.6. Character Vectors
  - 2.3.1.7. Index Vectors
    - 2.3.1.7.1. Selecting and Modifying Subsets of a Dataset
  - 2.3.1.8. Other Types of Objects
- 2.3.2 Objects, Their Modes and Attributes
  - 2.3.2.1. Intrinsic Attributes: Mode and Length
  - 2.3.2.2. Changing the Length of an Object
  - 2.3.2.3. Obtaining and Configuring Attributes
  - 2.3.2.4. The Class of an Object
- 2.3.3 Sorted and Unsorted Factors
  - 2.3.3.1. A Specific Example
  - 2.3.3.2. The Tapply () Function and Unequal Matrices
  - 2.3.3.3. Sorted Factors
- 2.3.4 Matrices
  - 2.3.4.1. Matrices
  - 2.3.4.2. Matrix Indexation. The Subsections of a Matrix
  - 2.3.4.3. Index Matrices
  - 2.3.4.4. The Array () Function
  - 2.3.4.5. Mixed Arithmetic of Vectors and Matrices. The Recycling Rule
  - 2.3.4.6. The Outer Product of Two Matrices

2.3.4.7. The General Transposition of a Matrix
2.3.4.8. Matrix Multiplication
2.3.4.9. Eigenvalues and Eigenvectors
2.3.4.10. Decomposition of Singular Values and Determinants
2.3.4.11. Forming Partitioned Matrices, Cbind () and Rbind ()
2.3.4.12. The Concatenation Function, c (), With Matrices
2.3.5 Factor Frequency Tables
2.3.6 Lists
2.3.6.1. Creating and Modifying Lists
2.3.6.2. Concatenation Lists
2.3.7 Dataframes
2.3.7.1. How to Create Dataframes?
2.3.7.2. Attach () and Separate ()
2.3.7.3. Working With Dataframes
2.4. Reading and Writing Data
2.4.1 The Read.Table () Function
2.4.2 The Scan () Function
2.4.3 Access to the Sets of Incorporated Data
2.4.4 Loading Data From Other R Packages
2.4.5 Editing Data
2.5. Grouping, Loops and Conditional Execution
2.5.1 Grouped Expressions
2.5.2 Control Statements
2.5.2.1. Conditional Execution: If Sentences
2.5.2.2. Repetitive Execution: For Loops, Repetition and Time
2.6. Writing Your Own Functions
2.6.1 Simple Examples
2.6.2 Defining New Binary Operators
2.6.3 Arguments With Name and Default Value
2.6.4 Argument "..."
2.6.5 Assignments Within Functions





Module 3. Statistical Analysis in R

3.1. Discrete Probability Distributions
3.2. Continuous Probability Distributions
3.3. Introduction to Inference and Sampling (Point Estimate)
3.4. Confidence Intervals
3.5. Hypothesis Testing
3.6. ANOVA of a Factor
3.7. Adjustment Suitability (Chi-Square Test)
3.8. Fitdist Package
3.9. Introduction to Multivariant Statistics

Module 4. Graphical Environment in R

4.1. Graphical Procedures
- 4.1.1 High-Level Plotting Commands
  - 4.1.1.1. The Plot () Function
  - 4.1.1.2. Multivariate Data Visualization
  - 4.1.1.3. Screen Graphics
  - 4.1.1.4. High-Level Plotting Arguments
- 4.1.2 Low-Level Plotting Commands
  - 4.1.2.1. Mathematical Annotation
  - 4.1.2.2. Hershey Vectorial Sources
- 4.1.3 Interacting With Graphics
- 4.1.4 The Use of Graphic Parameters
  - 4.1.4.1. Permanent Changes: The Par () Function
  - 4.1.4.2. Temporal Changes: Arguments to Graphical Functions
- 4.1.5 List of Graphic Parameters
  - 4.1.5.1. Graphical Elements
  - 4.1.5.2. Axles and Markings
  - 4.1.5.3. Figure Margins
  - 4.1.5.4. Multi-Figure Environment
- 4.1.6 Descriptive Statistics: Graphical Representations

05

Methodology

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

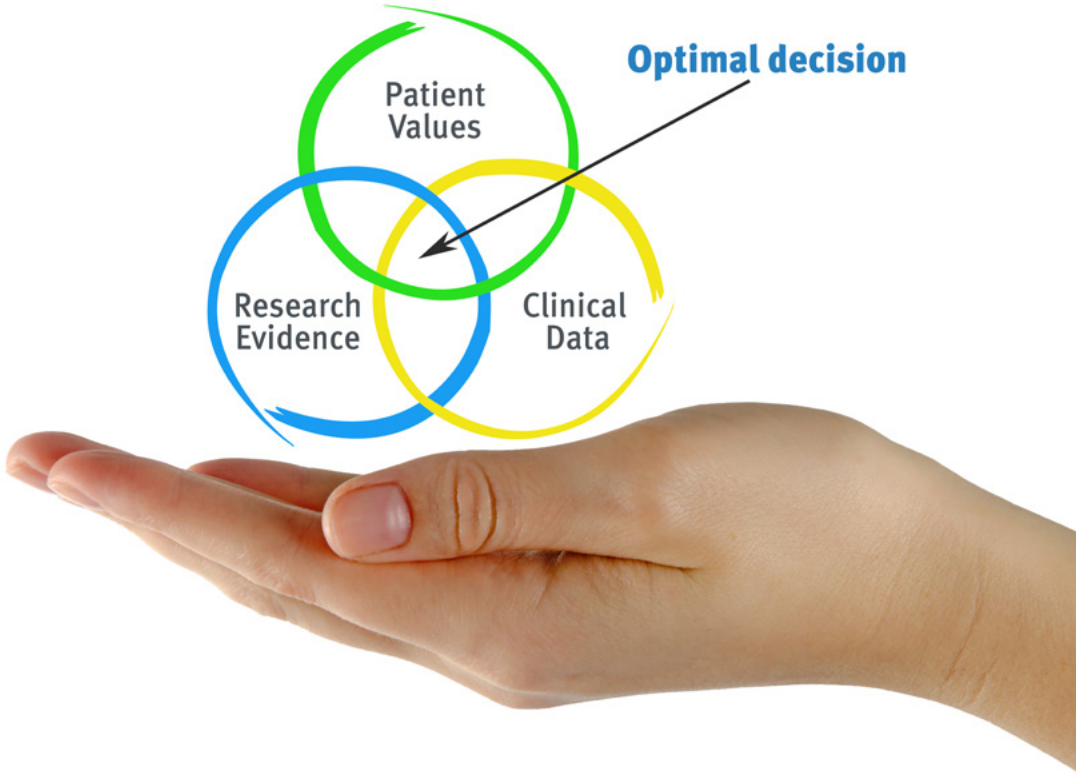
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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. 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:

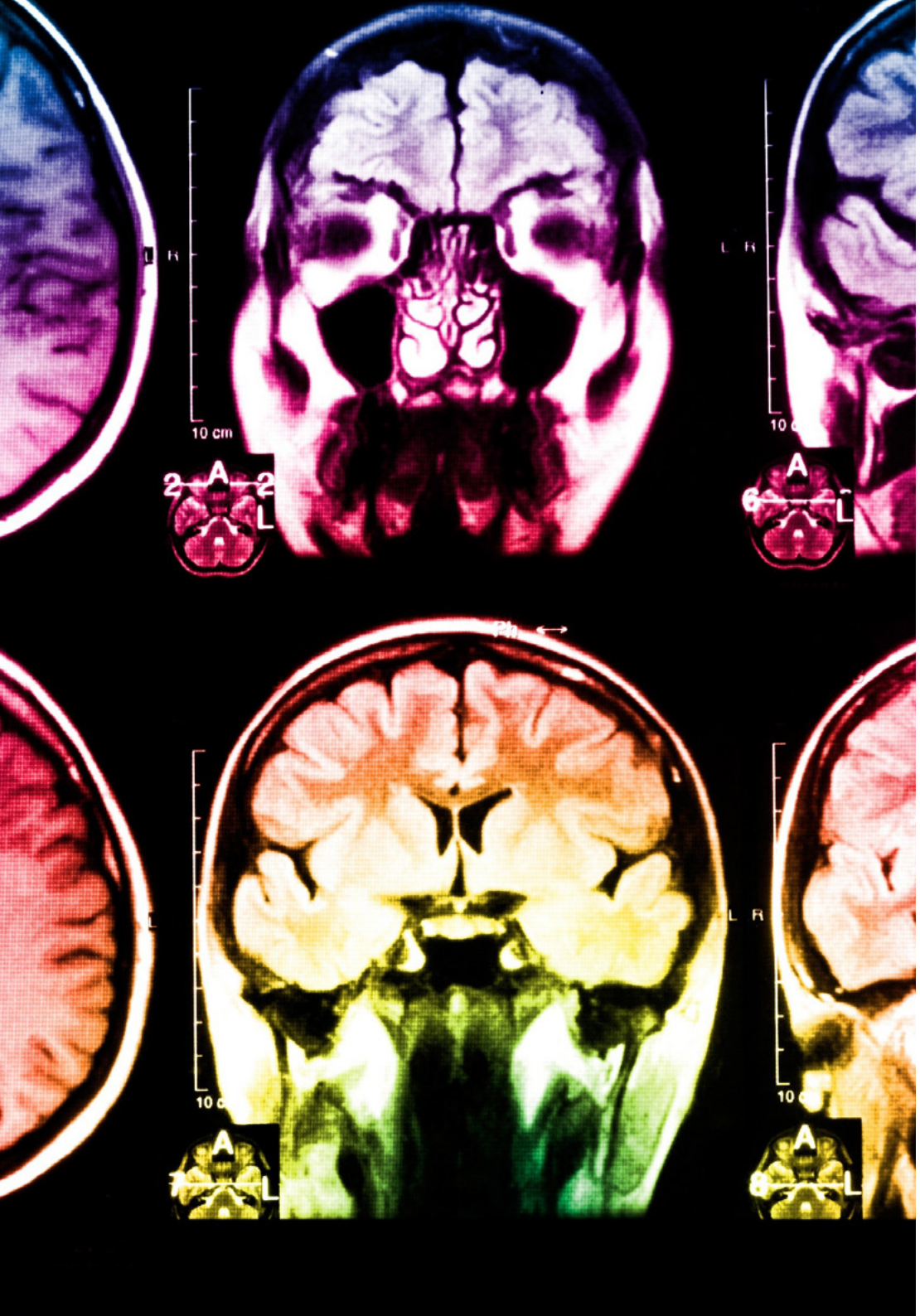
1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better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

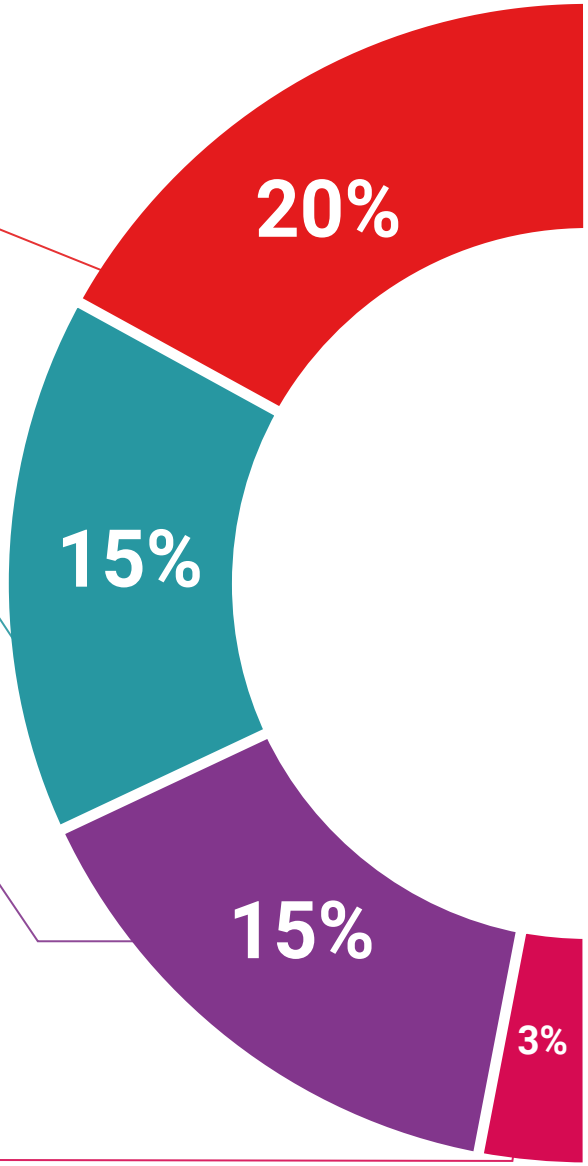
Interactive Summaries

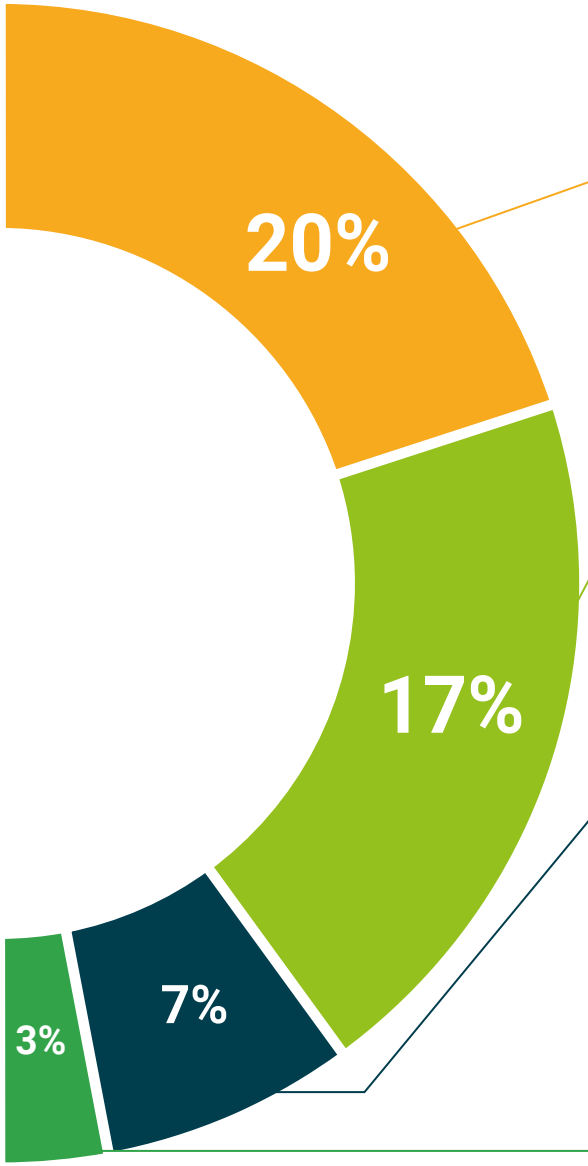
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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.

06

Certificate

The Postgraduate Diploma in Use of Linux and R Language Programming for Oncology 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 degree without travel or laborious paperwork"

This private qualification will allow you to obtain a **Postgraduate Diploma in Use of Linux and R Language Programming for Oncology** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University private qualification is a European University publicly recognized by the Government of Andorra (***official bulletin***). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

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

Title: **Postgraduate Diploma in Use of Linux and R Language Programming for Oncology**

Modality: **online**

Duration: **6 months**

Accreditation: **19 ECTS**

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

Postgraduate Diploma in Use of Linux and R Language Programming for Oncology

This is a private qualification of 570 hours of duration equivalent to 19 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
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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Postgraduate Diploma

Use of Linux and R Language Programming for Oncology

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Global University**
- Credits: **19 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Postgraduate Diploma

Use of Linux and R Language Programming for Oncology

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