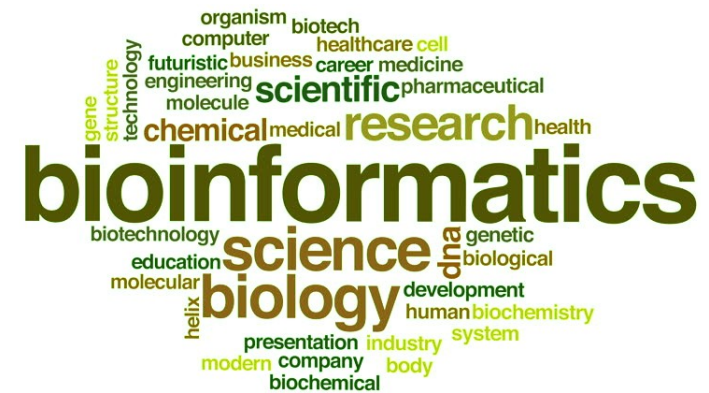


Día 1



Herramientas Bioinformáticas para las Ciencias Biológicas: Introducción a Python

Trimestre 190



Bioinformatics Training

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Instructor-led course

Provided by: [Bioinformatics](#)

This course has 1 scheduled run.
To book a place, please choose
your preferred date:

Thu 12 Mar 2020

09:30 - 17:30

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An Introduction to Solving Biological Problems with Python

[Beginners](#)

Description

This course provides a practical introduction to the writing of Python programs for the complete novice. Participants are lead through the core aspects of Python illustrated by a series of example programs. Upon completion of the course, attentive participants will be able to write simple Python programs and customize more complex code to fit their needs.

Course materials are available [here](#).

Please note that the content of this course has recently been updated. This course now mostly focuses on core concepts including Python syntax, data structures and reading/writing files. Concepts and strategies for working more effectively with Python are now the focus of a new 2-days course, [Data Science in Python](#).



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futuro

Instituto de Biotecnología

Cursos básicos optativos tópicos 13-2

Básicos

[Biología celular](#)
[Biología molecular](#)
[Calendario](#)

Tópicos Selectos

[Bioinformática](#)
[Determinación tridimensional](#)
[Diseño de Experimentos](#)
[Estructura y función proteínas](#)
[del Gen al producto](#)
[Genómica humana](#)
[Mecanismos de regulación](#)
[Mecanismos moleculares sistema inmune innato](#)
[El pez cebra un modelo biológico](#)
[Symbiomics](#)
[Tópico en inmunología](#)


first floor and there is currently no wheelchair or level access available to this level.

For a University of Cambridge [Raven](#) account you will need to book or register your

staff members from the [University of Cambridge](#), [Affiliated Institutions](#) and other external

are **only free for registered University of Cambridge students**. All other participants will be **form**. Registration fees and further details regarding the charging policy are available [here](#).
Criteria are available [here](#)

beginners and assumes no prior programming experience (beyond the ability to use a text

It would be an advantage, but nothing will be assumed and extremely little will be required.

Bioinformática2020

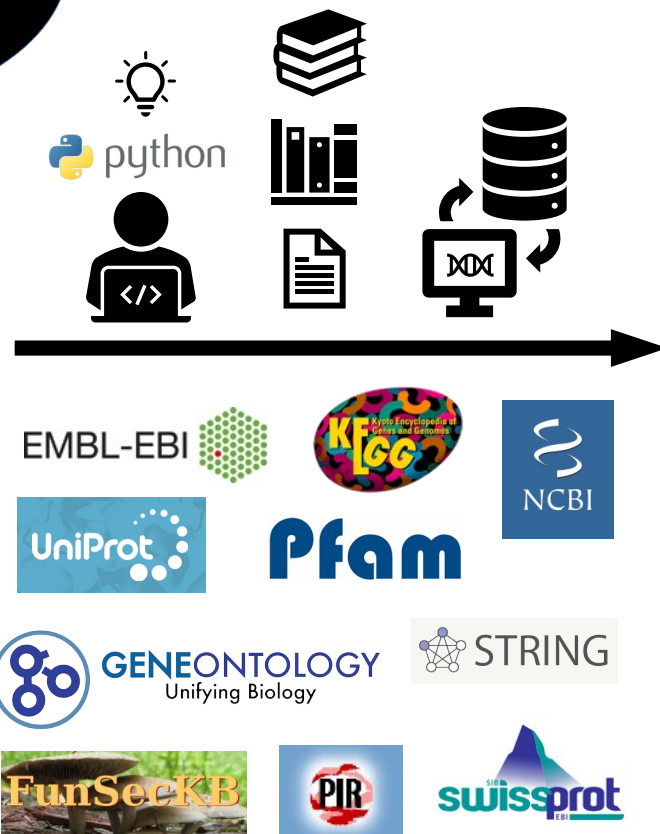
Objetivos

Lograr que el alumno:

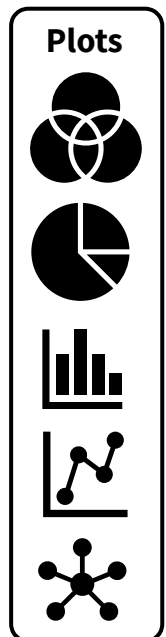
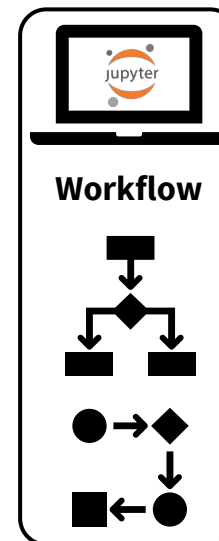
- **Reconozca** la importancia de las herramientas bioinformáticas.
- **Aplique** la funcionalidad de Python para procesar, analizar, interpretar, visualizar y almacenar información biológica relevante.
- **Implemente** flujos de trabajo en Jupyter Notebook.
- **Adquiera** fundamentos básicos de programación para aplicarlos en la solución de problemas (relacionados a su proyecto).

Objetivos

Genomic
Transcriptomic
Metagenomic
Proteomic
Microarray



Organization, Analysis, Interpretation and Storage



Contenido

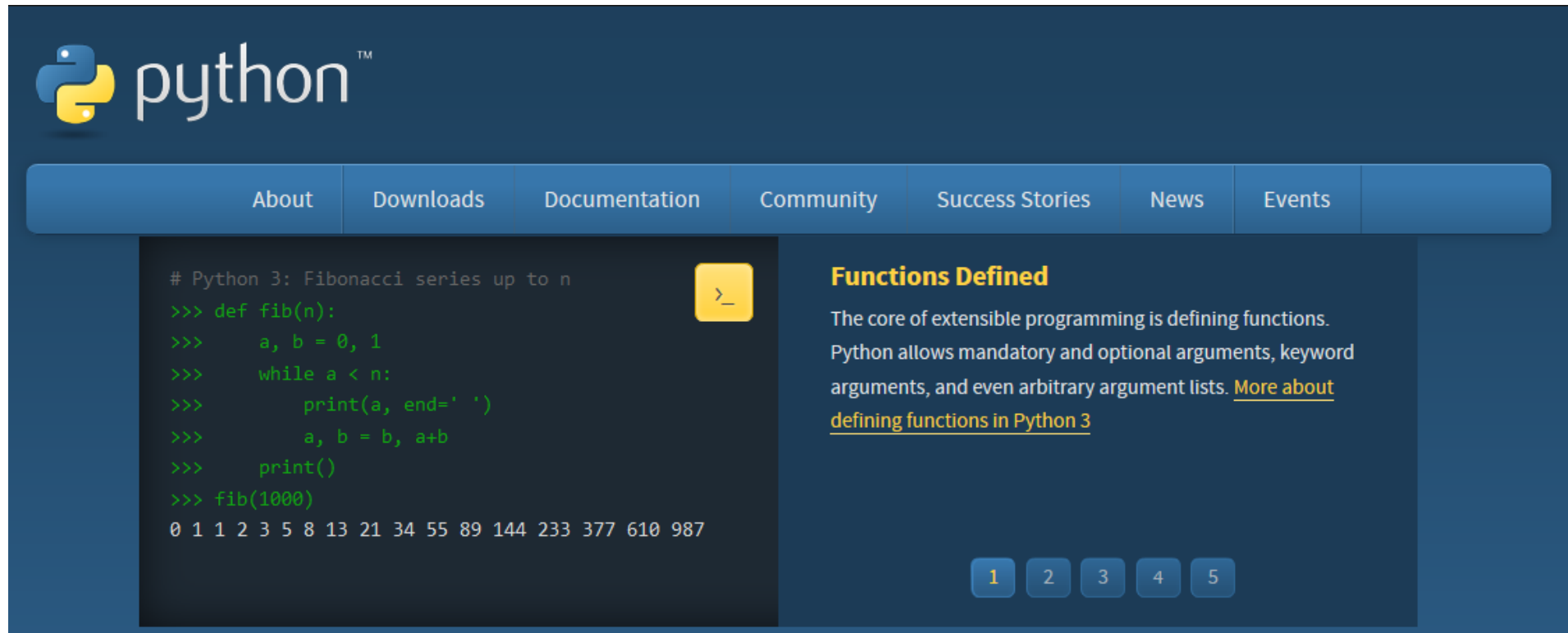
- **Proyecto**
- **Motivos**
- **Expectativas**

El Temario se encuentra en **GitHub:**
Bioinformática2020

<https://github.com/Bioinformatica2020/Semana1>

pcr2.1@hotmail.com

Literatura recomendada



The screenshot shows the Python.org website with the Python logo and a navigation bar. The main content area is divided into two columns. The left column contains a code snippet for a Fibonacci function, and the right column contains the 'Functions Defined' section.

python™

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```
# Python 3: Fibonacci series up to n
>>> def fib(n):
>>>     a, b = 0, 1
>>>     while a < n:
>>>         print(a, end=' ')
>>>         a, b = b, a+b
>>>     print()
>>> fib(1000)
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987
```

Functions Defined

The core of extensible programming is defining functions. Python allows mandatory and optional arguments, keyword arguments, and even arbitrary argument lists. [More about defining functions in Python 3](#)

1 2 3 4 5

Literatura recomendada

Bioinformatics for Beginners

Genes, Genomes, Molecular Evolution, Databases and 2

Rui Jiang
Xuegong Zhang
Michael Q. Zhang *Editors*

Basics of Bioinformatics

Lecture Notes of the Graduate School on Bioinformatics of China

Supratim Choudhury

TSINGHUA UNIVERSITY PRESS



Texts in Computer Science

Ben Stephenson

The Python Workbook

A Brief Introduction with Exercises and Solutions

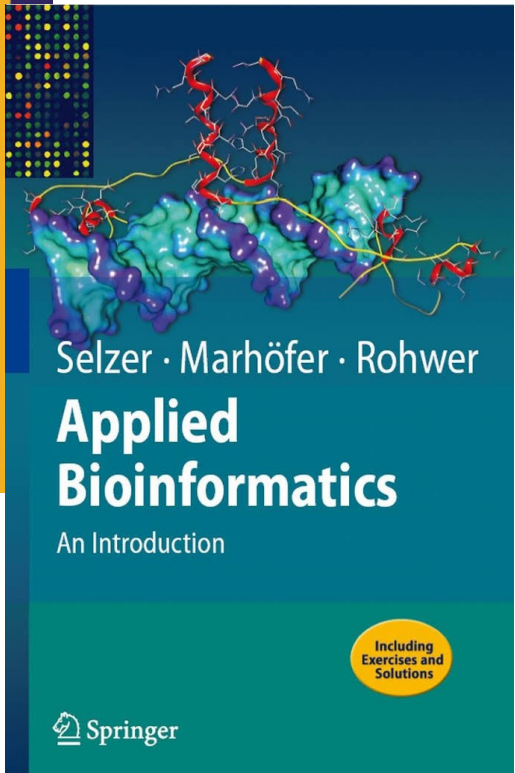
Second Edition

Statistics for Biology and Health

Warren J. Ewens
Gregory Grant

Statistical Methods in Bioinformatics

An Introduction
Second Edition



Selzer · Marhöfer · Rohwer

Applied Bioinformatics

An Introduction

Including
Exercises and
Solutions

Springer

Día 2

¿Qué es la Informática?

Se refiere al **procesamiento automático de información** mediante **dispositivos electrónicos y sistemas computacionales**.

Hardware



“¿QUÉ ES HARDWARE?

El que recibe los golpes cuando falla el **SOFTWARE.**”



@humoralotico

Software



Entrada (ingreso de información)
Procesamiento
Salida (resultados)

Algoritmo y programación

- Un **algoritmo** es una secuencia finita de pasos que resuelven un problema.

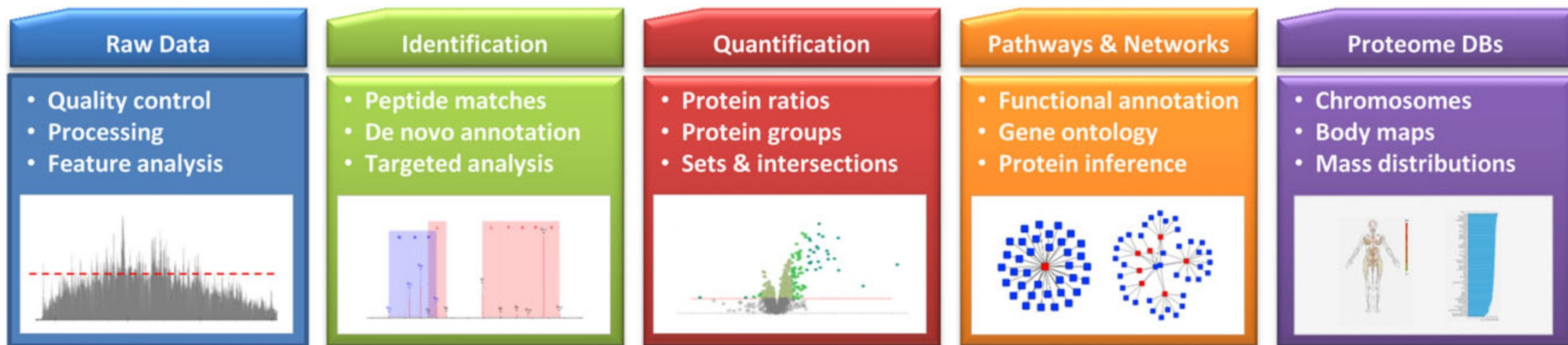
UN ALGORITMO ES LA ESENCIA DE UN PROCEDIMIENTO COMPUTACIONAL

- Un **programa de computadora** es una secuencia de instrucciones que controlan el comportamiento de computadora.
- Un **algoritmo** debe ser **traducido a un programa** antes de que la computadora pueda usarlo para resolver el problema.
- El proceso de traducción es llamado **programación** y la persona que traduce es llamado **programador**.

¿Qué es la bioinformática?

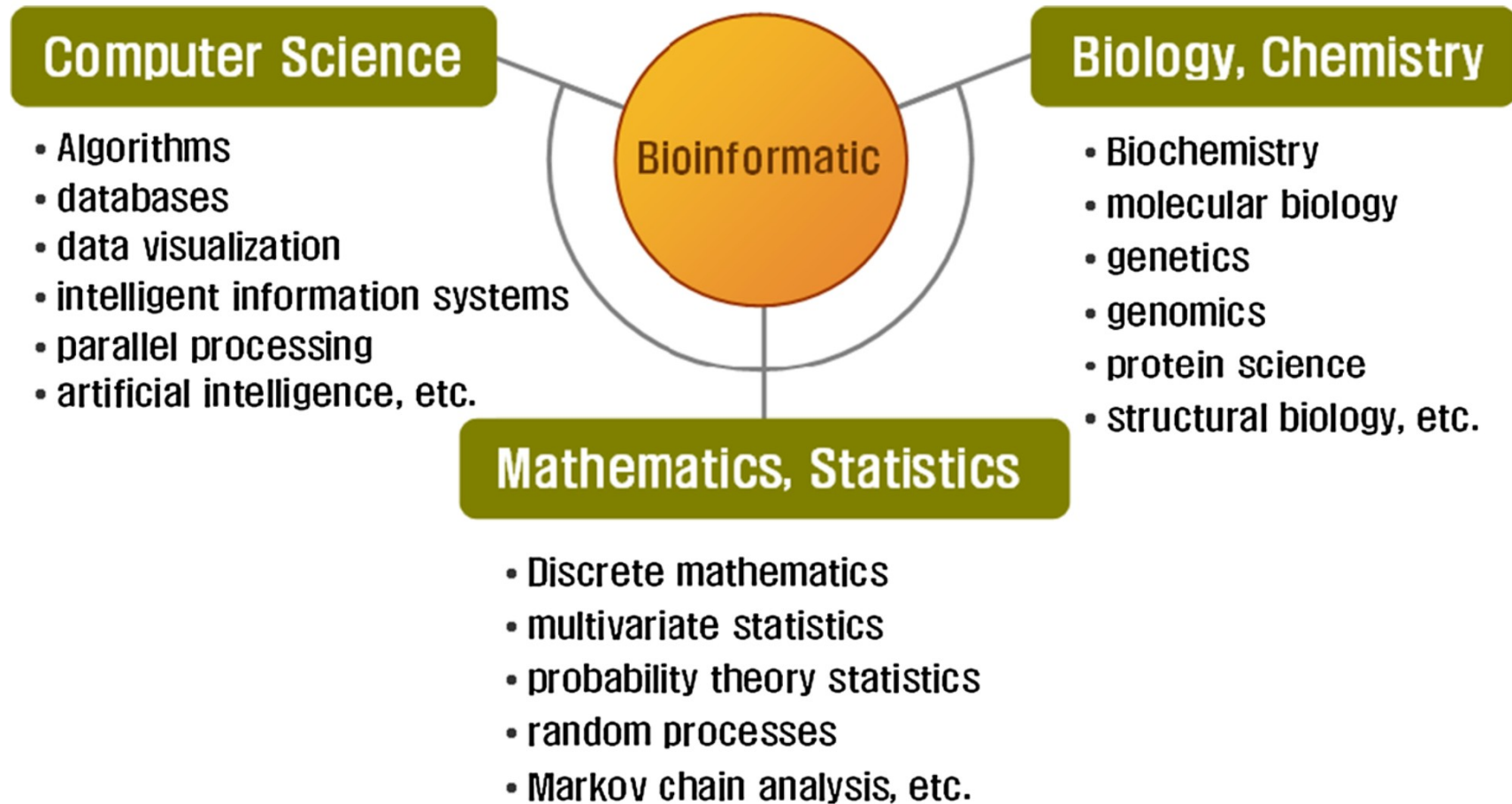
Puede ser definida como una **disciplina** científica **multidisciplinaria** encargada de la aplicación de **herramientas computacionales** para **organizar, analizar, interpretar, visualizar y almacenar información biológica** a gran escala.

Genet. Mol. Res, 2017;16(1): gmr16019645



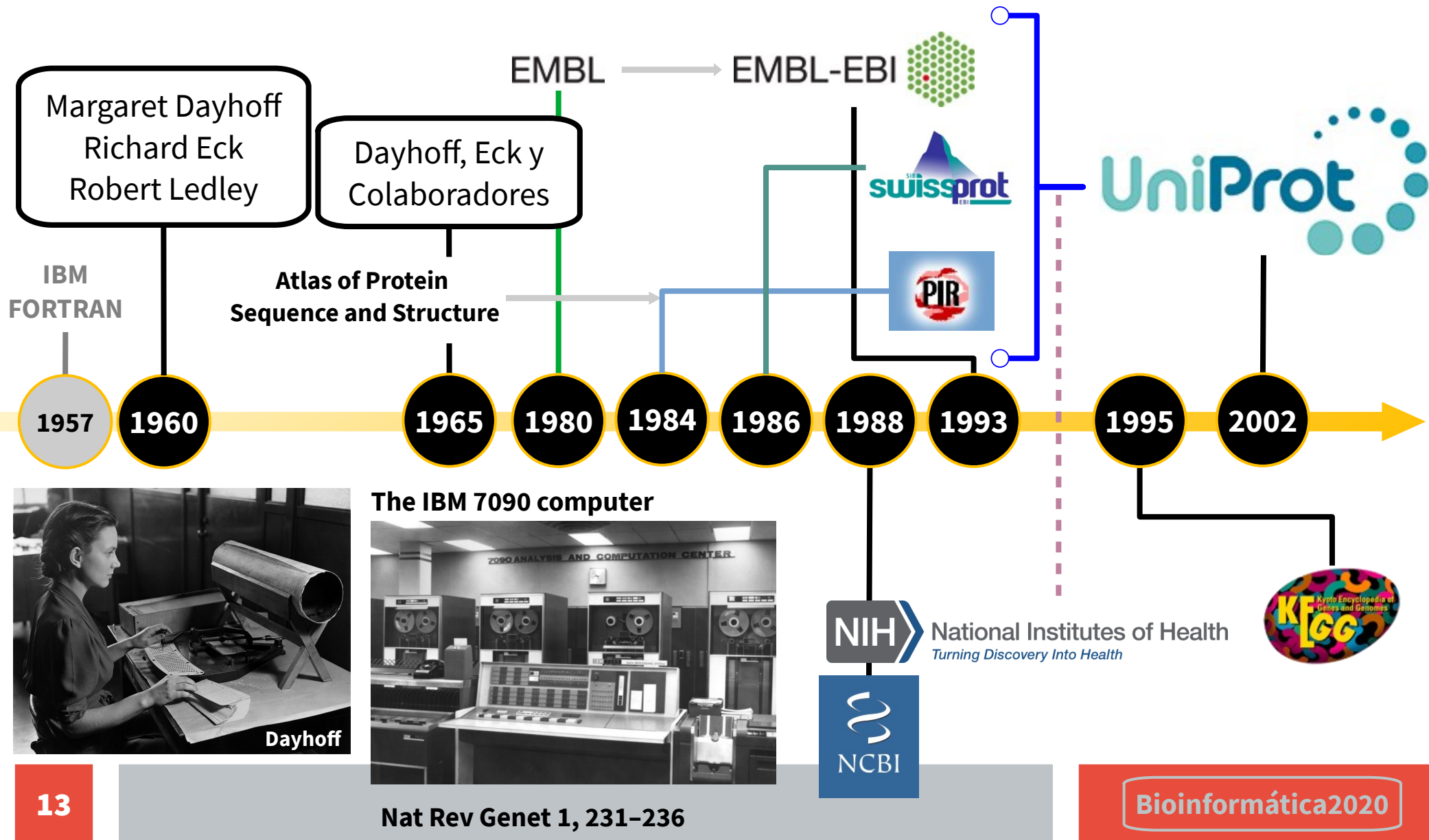
Proteomics, 2015;15(8):1341-55

¿Qué es la bioinformática?

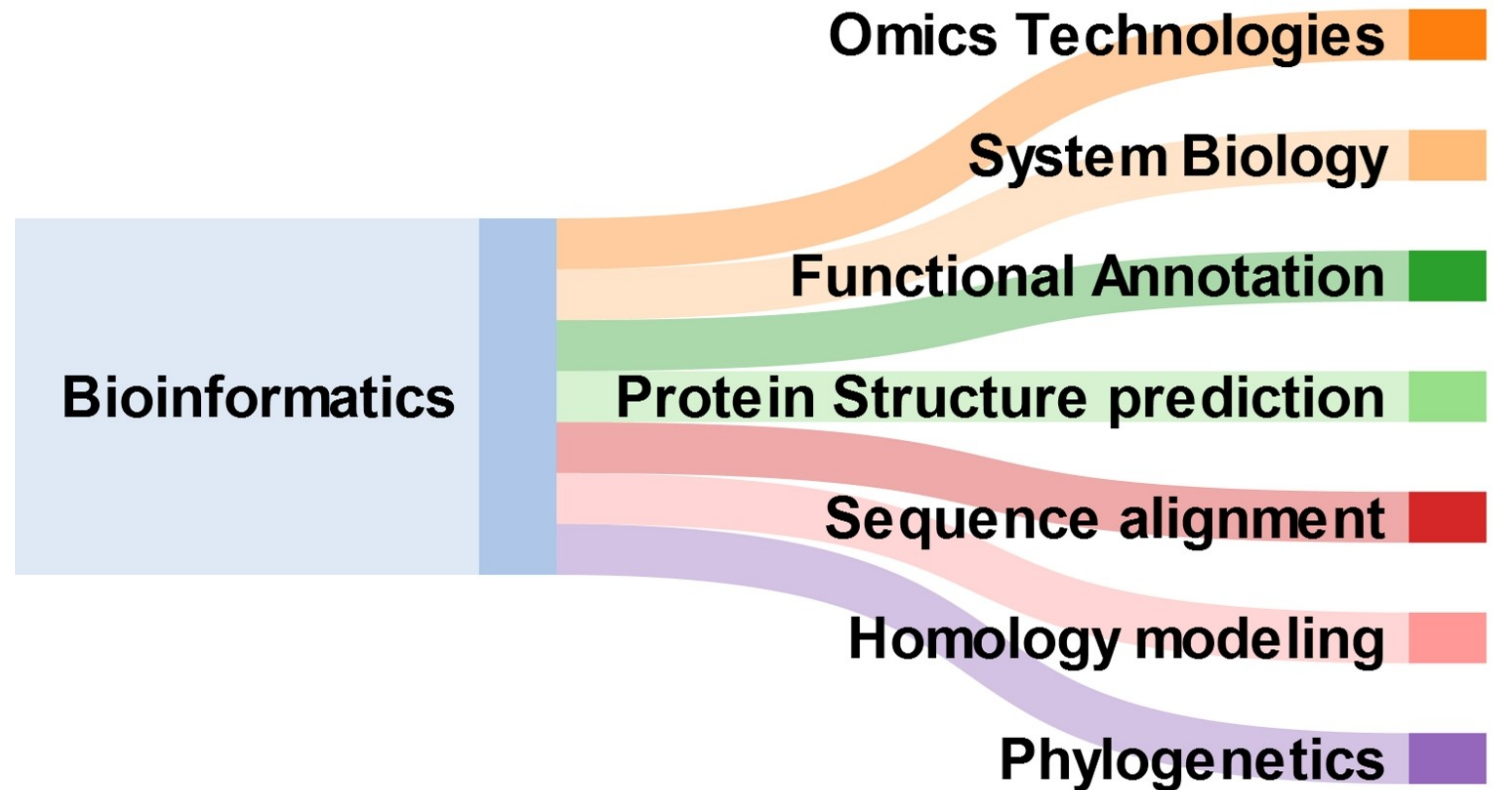
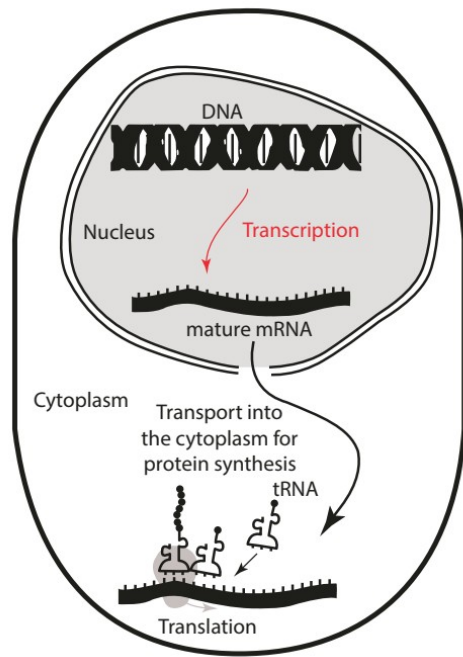


Wireless Pers Commun, 2019;105:405

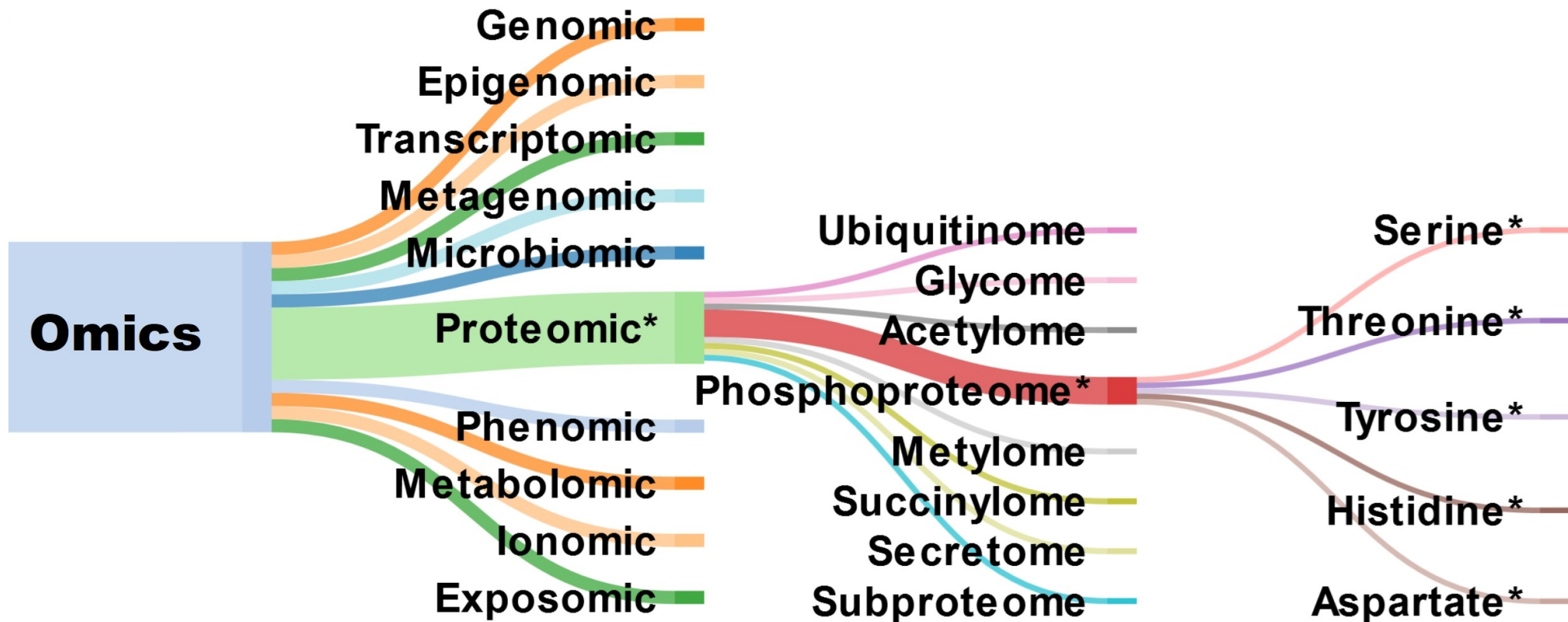
Inicio de la Bioinformática























Aplicaciones



Aplicaciones



Lenguajes de programación

1	Java		11	MATLAB	
2	C		12	R	
3	Python		13	Perl	
4	C++		14	Assembly Language	
5	Visual Basic .NET		15	Swift	
6	Javascript		16	Go	
7	C#		17	Delphi/Object Pascal	
8	PHP		18	Ruby	
9	SQL		19	PL/SQL	
10	Objective-C		20	Visual Basic	

Python: **Biopython**



Perl: **Bioperl**



Java: **Biojava**



R: **Bioconductor**



BioRuby



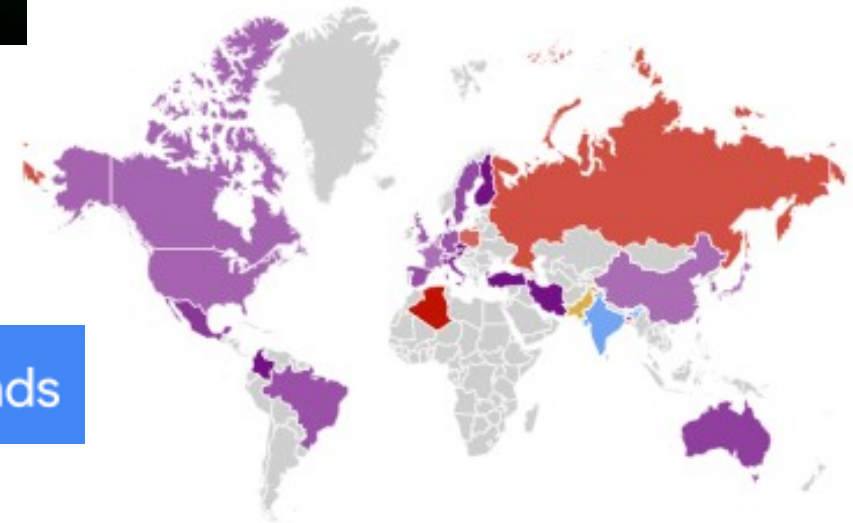
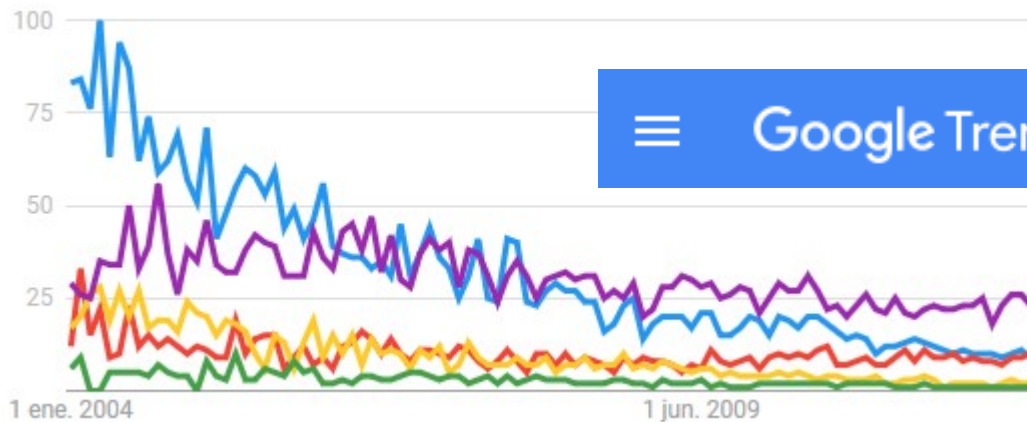
BioRuby

Open source bioinformatics library for Ruby

Linux: **Bio-Linux**



● BioPerl ● Biopython ● BioJava ● BioRuby ● Bioconductor



¿Qué es Python?

- Es de propuesta general
- De alto nivel
- Dinámico
- Sintaxis sencilla
- Gran cantidad de bibliotecas
- Altamente interactivo
- Es libre
- Aplicaciones científicas
- Tiene una gran comunidad





ANACONDA®

Python



Qt Console

4.3.1

PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.

Launch



Spyder

3.3.1

Scientific PYTHON Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection Features

Launch



Glueviz

0.13.3

Multidimensional data visualization across files. Explore relationships within and among related datasets.

Install



JupyterLab

0.35.3

An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.

Install



Notebook

5.7.0

Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.

Install



Orange 3

3.16.0

Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.

Install



RStudio

1.1.456

A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks.

Install



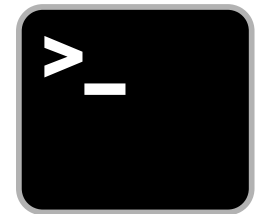
VS Code

1.28.2

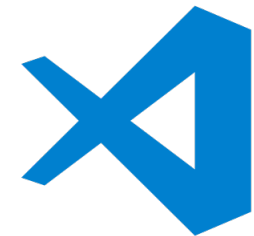
Streamlined code editor with support for development operations like debugging, task running and version control.

Install

Herramientas



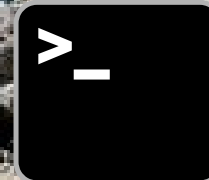
MARKDOWN



Visual Studio Code



```
def inputNum():  
    number = int(input("Enter a Number smaller than 10: "))  
    if int(float(number)) > 10:  
        print('Number greater than 10, enter another number')  
        while int(float(number)) > 10:  
            number = int(input("Enter a Number: "))  
            if int(float(number)) > 10:  
                print('Number greater than 10, enter another number')  
            else:  
                print('The number is correct')  
    else:  
        print('The number is correct')
```



<http://www.instylevacations.ca/post/view/10-interesting-facts-about-mt-everest>

Descargar Python 3.7.5

Python 3.7.5

Release Date: Oct. 15, 2019

Files

Version	Operating System	Description	MD5 Sum	File Size	GPG
Gzipped source tarball	Source release		1cd071f78ff6d9c7524c95303a3057aa	23126230	SIG
XZ compressed source tarball	Source release		08ed8030b1183107c48f2092e79a87e2	17236432	SIG
macOS 64-bit/32-bit installer	Mac OS X	{Deprecated} for Mac OS X 10.6 and later	cd503606638c8e6948a591a9229446e4	35020778	SIG
macOS 64-bit installer	Mac OS X	for macOS 10.9 and later	20d9540e88c6aaba1d2bc1ad5d069359	28198752	SIG
Windows help file	Windows		608cafa250f8baa11a69bbfcb842c0e0	8141193	SIG
Windows x86-64 embeddable zip file	Windows	for AMD64/EM64T/x64	436b0f803d2a0b393590030b1cd59853	7500597	SIG
Windows x86-64 executable installer	Windows	for AMD64/EM64T/x64	697f7a884e80cca9dff3a77e979b0f8	26777448	SIG
Windows x86-64 web-based installer	Windows	for AMD64/EM64T/x64	b8b6e5ce8c27c20bfd28f1366ddf8a2f	1363032	SIG
Windows x86 embeddable zip file	Windows		726877d1a1f5a7dc68f6a4fa48964cd1	6745126	SIG
Windows x86 executable installer	Windows		cfe9a828af6111d5951b74093d70ee89	25766192	SIG
Windows x86 web-based installer	Windows		ea946f4b76ce63d366d6ed0e32c11370	1324872	SIG

Instalar Python

2. Ejecutar como administrador

3. Activar la casilla: **Add Python to Path**



- ☐ Install launcher for all users (recommended)
- ☒ Add Python 3.6 to PATH



→ Install Now
C:\Users\pGEN1\AppData\Local\Programs\Python\Python37

Includes IDLE, pip and documentation
Creates shortcuts and file associations

Corroborar la instalación

muestra todos los módulos instalados

>python -mpip list

ingresar al intérprete de Python

>python

otra forma de revisar los módulos instalados

>>> help("modules")

Ahora haz el siguiente ejercicio

La función **print** se puede usar con comillas dobles o simples

```
>>> print("Primera semana del curso")
```

```
>>> print("Semana1:" + "Segunda clase")
```

```
>>> print("Semana1: " + "Segunda clase")
```

Hacer la prueba con comillas simples

Comillas dependiendo del contexto

```
>>> print(" 'Primera semana del curso' ")
```

```
>>> print(' "Semana1: ' + 'Segunda clase" ')
```

Módulos de Python

- Un módulo permite organizar lógicamente el código de Python.
- Un módulo agrupa el código de tal forma que lo hace mas fácil de entender y usar.
- Un módulo es un objeto de Python con atributos y nombres arbitrarios que puede enlazar y hacer referencia a su función.

pandas atributo: **read_csv**

pandas.read_csv()

Instalación de Módulos

Instalar módulos usando la función: **pip**
desde la terminal de Windows (**cmd**)

>python -mpip install pandas

>python -mpip install matplotlib

¿cómo comprobarías la instalación de los módulos?

Ver las funciones de un módulo:

```
>python
```

```
>>> import pandas
```

```
>>> funciones = pandas.__dict__
```

```
>>> funciones.keys()
```

Otra forma de buscarlos

>python -mpip list | grep "pandas"

Actividades

1. Revisar la literatura recomendada.
2. Instalar los siguientes módulos y comprobar su instalación:

`requests`

`scipy`

`colormap`

3. Revisar expresiones regulares y/o metacaracteres.

aquí un link: <https://docs.python.org/3/library/re.html>

