



# ANÁLISIS GEOESPACIAL

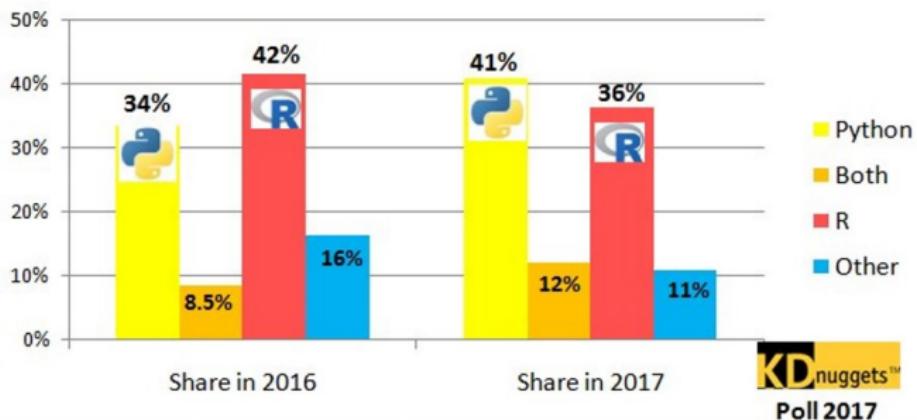
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(Versión:February 26, 2021)



## Python, R, Both, or Other platforms for Analytics, Data Science, Machine Learning





## TIOBE Index for September 2019

Aug 2019	Aug 2018	Change	Programming Language	Ratings	Change
1	1		Java	16.028%	-0.85%
2	2		C	15.154%	+0.19%
3	4	▲	Python	10.829%	+3.83%
4	3	▼	C++	6.057%	-1.41%
5	6	▲	C	3.842%	+0.30%
6	5	▼	Visual Basic .NET	3.695%	-1.07%
7	8	▲	JavaScript	2.258%	-0.15%
8	7	▼	PHP	2.075%	-0.85%
9	14	▲	Objective-C	1.690%	+0.33%
10	9	▼	SQL	1.629%	-0.89%
11	15	▲	Ruby	1.316%	+0.13%
12	13	▲	MATLAB	1.274%	-0.09%
13	44	▲	Groovy	1.225%	+1.04%
14	12	▼	Delphi/Object Pascal	1.194%	-0.18%
15	10	▼	Assembly language	1.114%	-0.30%
16	19	▲	Visual Basic	1.025%	+0.10%
17	17		Go	0.973%	-0.02%
18	11	▼	Swift	0.890%	-0.49%
19	16	▼	Perl	0.860%	-0.31%
20	18	▼	R	0.822%	-0.14%

Programming  
language  
"popularity"

<https://www.tiobe.com/tiobe-index/>

<https://www.tiobe.com/tiobe-index/programming-languages-definition/>

**Python code is fast to develop:** As the code is not required to be compiled and built, Python code can be much readily changed and executed. This makes for a fast development cycle.

**Python code is not as fast in execution:** Since the code is not directly compiled and executed and an additional layer of the Python virtual machine is responsible for execution, Python code runs a little slow as compared to conventional languages like C, C++, etc.

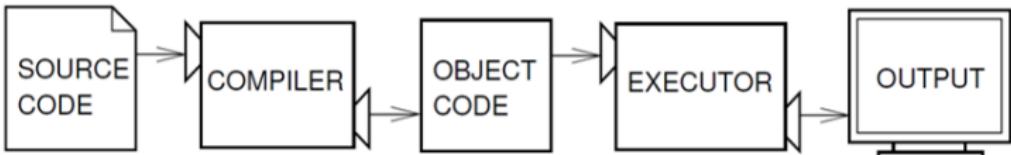
**It is interpreted:** Many programming languages require that a program be converted from the source language, such as C++ or Visual Basic, into binary code that the computer can understand. This requires a compiler with various options. Python is an interpreted language, which means it does not need compilation to binary code before it can be run. You simply run the program directly from the source code, which makes Python easier to work with and much more portable than other programming languages.

**It is object oriented:** Python is an object-oriented programming language. An object-oriented program involves a collection of interacting objects, as opposed to the conventional list of tasks. Many modern programming languages support object-oriented programming. ArcGIS and QGIS is designed to work with object-oriented languages, and Python qualifies in this respect.

An **interpreter** reads a high-level program and executes it, meaning that it does what the program says. It processes the program a little at a time, alternately reading lines and performing computations.



A **compiler** reads the program and translates it completely before the program starts running. In this context, the high-level program is called the source code, and the translated program is called the object code or the executable. Once a program is compiled, you can execute it repeatedly without further translation.





## SCRIPTING LANGUAGE VERSUS PROGRAMMING LANGUAGE

### SCRIPTING LANGUAGE

A programming language that supports scripts: programs written for a special run-time environment that automate the execution of tasks

Execution speed is slow

Can be divided into client-side scripting languages and server-side scripting languages

Easier to learn

Ex: JavaScript, Perl, PHP, Python and Ruby

Mostly used for web development

### PROGRAMMING LANGUAGE

A formal language, which comprises a set of instructions used to produce various kinds of output

Compiler-based languages are executed much faster while interpreter-based languages are executed slower

Can be divided into high-level, low-level languages or compiler-based or interpreter-based languages

Not as easy to learn

Ex: C, C++, and Assembly

Used to develop various applications such as desktop, web, mobile, etc.

Visit [www.PEDIAA.com](http://www.PEDIAA.com)



<https://wiki.python.org/moin/Python2orPython3>



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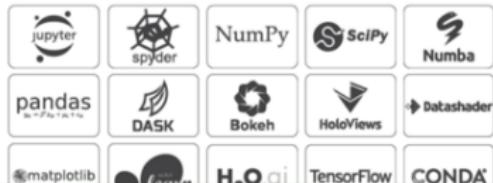
# Anaconda Distribution

The World's Most Popular Python/R Data Science Platform

Download

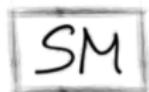
The open-source Anaconda Distribution is the easiest way to perform Python/R data science and machine learning on Linux, Windows, and Mac OS X. With over 15 million users worldwide, it is the industry standard for developing, testing, and training on a single machine, enabling *individual data scientists* to:

- Quickly download 1,500+ Python/R data science packages
- Manage libraries, dependencies, and environments with Conda
- Develop and train machine learning and deep learning models with scikit-learn, TensorFlow, and Theano

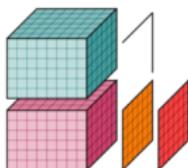
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<https://www.anaconda.com/download/>



StatsModels  
Statistics in Python



xarray



scikits-image  
image processing in python



machine learning in Python



And many,  
many more...



pandas  
 $y_{it} = \beta^t x_{it} + \mu_i + \epsilon_{it}$



bokeh



NumPy



IP[y]:  
IPython



Ambiente de Trabajo



spyder



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**jupyterlab** 0.32.1 An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture. Launch

**jupyter notebook** 5.5.0 Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis. Launch

**ipyconsole** 4.3.1 PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more. Launch

**spyder** 3.2.8 Scientific Python Development Environment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features. Launch

**vscode** 1.27.1 Streamlined code editor with support for development operations like debugging, task running and version control. Launch

**glueviz** 0.13.3 Multidimensional data visualization across files. Explore relationships within and among related datasets. Install

**orange3** 3.13.0 Component based data mining framework. Data visualization and data analysis for novice and expert; Interactive workflows with a large toolbox. Install

**rstudio** 1.1.423 A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks. Install

 Anaconda Navigator

File Help

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Channels

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Search Packages 

Name	T	Description	Version
<input checked="" type="checkbox"/> _ipyw_jlab_nb_ext...			0.1.0
<input checked="" type="checkbox"/> alabaster		Configurable, python 2+3 compatible sphinx theme	0.7.10
<input checked="" type="checkbox"/> anaconda			5.0.1
<input checked="" type="checkbox"/> anaconda-client		Anaconda.org command line client library	 1.6.5
<input checked="" type="checkbox"/> anaconda-project		Reproducible, executable project directories	 0.8.0
<input checked="" type="checkbox"/> asn1crypto		Asn.1 parser and serializer	 0.22.0
<input checked="" type="checkbox"/> astroid		Abstract syntax tree for python with inference support	 1.5.3
<input checked="" type="checkbox"/> astropy		Community-developed python library for astronomy	 2.0.2
<input checked="" type="checkbox"/> babel		Utilities to internationalize and localize python applications	 2.5.0
<input checked="" type="checkbox"/> backports			1.0
<input checked="" type="checkbox"/> backports.shutil_...			1.0.0
<input checked="" type="checkbox"/> beautifulsoup4		Python library designed for screen-scraping	4.6.0

217 packages available





## cmd. Command Prompt

Microsoft Windows [Version 10.0.10240]  
<c> 2015 Microsoft Corporation. All rights reserved.

C:\Users\Brennan>\_

```
conda create xxxx
conda activate xxxx
deactivate
conda intall xxxx
conda uninstall xxx
conda update xxx
```

# Python Packaging Index

The screenshot shows the PyPI project page for 'pip'. At the top, there's a navigation bar with links for 'Help', 'Donate', 'Log in', and 'Register'. Below the header, the project name 'pip 19.1.1' is displayed, along with a 'Latest version' button. A 'pip install pip' button is also present. The page notes that it was last released on May 6, 2019. A descriptive text at the bottom states: 'The PyPA recommended tool for installing Python packages.'

pip 19.1.1

pip install pip

Last released: May 6, 2019

The PyPA recommended tool for installing Python packages.

<https://pypi.org/project/pip/>

# Python

```
(base) C:\Users\Edier>python
Python 3.6.3 |Anaconda, Inc.| (default, Oct 15 2017, 03:27:45) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> print(1+2)
3
>>> for i in range(5):
...     print(i)
...
0
1
2
3
4
>>> _
```

# IPython

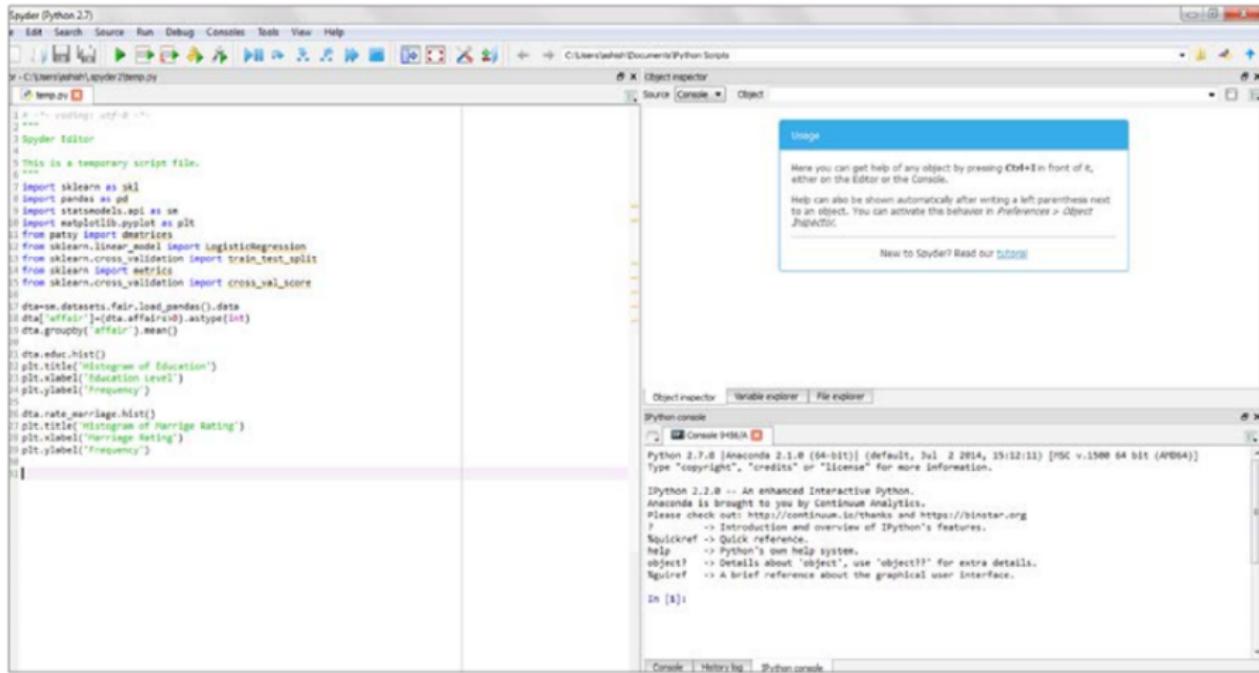
```
IPython: C:\Users\Edier
(base) C:\Users\Edier>ipython
Python 3.6.3 |Anaconda, Inc.| <default, Oct 15 2017, 03:27:45> [MSC v.1900 64 bit (AMD64)]
Type 'copyright', 'credits' or 'license' for more information
IPython 6.1.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: type sorted?
Signature: sorted(iterable, /, *, key=None, reverse=False)
Docstring:
Return a new list containing all items from the iterable in ascending order.

A custom key function can be supplied to customize the sort order, and the
reverse flag can be set to request the result in descending order.
Type:    builtin_function_or_method

In [2]: type sorted
```

# Spyder



# Jupyter Lab

## Notebook .ipynb

The screenshot shows the Jupyter Lab interface. On the left, there is a file browser titled "MACHINE LEARNING > NOTEBOOKS" listing various Jupyter notebooks. In the center, a notebook titled "15\_Regresion\_lineal.ipynb" is open. The notebook contains text and code cells. The text cells provide course information and a brief introduction to Linear Regression. The code cells demonstrate how to import libraries like scikit-learn and load the Boston housing dataset. A section titled "Método OLS de la librería statsmodels" is also visible.

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CURSO: Análisis Geoespacial (Sem02-2019)  
Profesor: Edier Aristizábal (evaristizabal@unal.edu.co)  
Curso website: <https://umvirtual.medellin.unal.edu.co/course/view.php?id=579>

## 15: Regresión Lineal

La Regresión Lineal (RL) asume que las variables predictoras tienen una distribución Gaussiana y que no son correlacionables; por lo tanto es importante en el análisis de datos explorar estas condiciones. Adicionalmente, hay que tener en cuenta que los modelos de RL son modelos geométricos, es decir que se basan en calcular las distancias entre la predicción y los datos reales; por lo tanto es importante normalizar o estandarizar los datos.

```
[ ]: Para iniciar con la implementación de los modelos RL, primero se importan las librerías a utilizar.
```

```
[1]: from sklearn.model_selection import KFold  
from sklearn.model_selection import cross_val_score  
from sklearn.model_selection import train_test_split  
from sklearn.metrics import r2_score, mean_squared_error, mean_absolute_error  
import matplotlib.pyplot as plt  
import numpy as np
```

En este taller utilizaremos la base de datos Boston disponible en la librería Sklearn para problemas de regresión. Por lo tanto la cargamos, sepáramos en datos de entrenamiento y datos de validación con un 30%, y definimos como variables predictoras  $X^*$ , y variable dependiente " $y$ ".

```
[3]: from sklearn.datasets import load_boston  
boston=load_boston()  
X=boston.data  
y=boston.target  
X_train, X_test, y_train, y_test=train_test_split(X, y, test_size=0.3)
```

## Método OLS de la librería statsmodels