



# Introducción a los SIG con R

María Henar Salas Olmedo

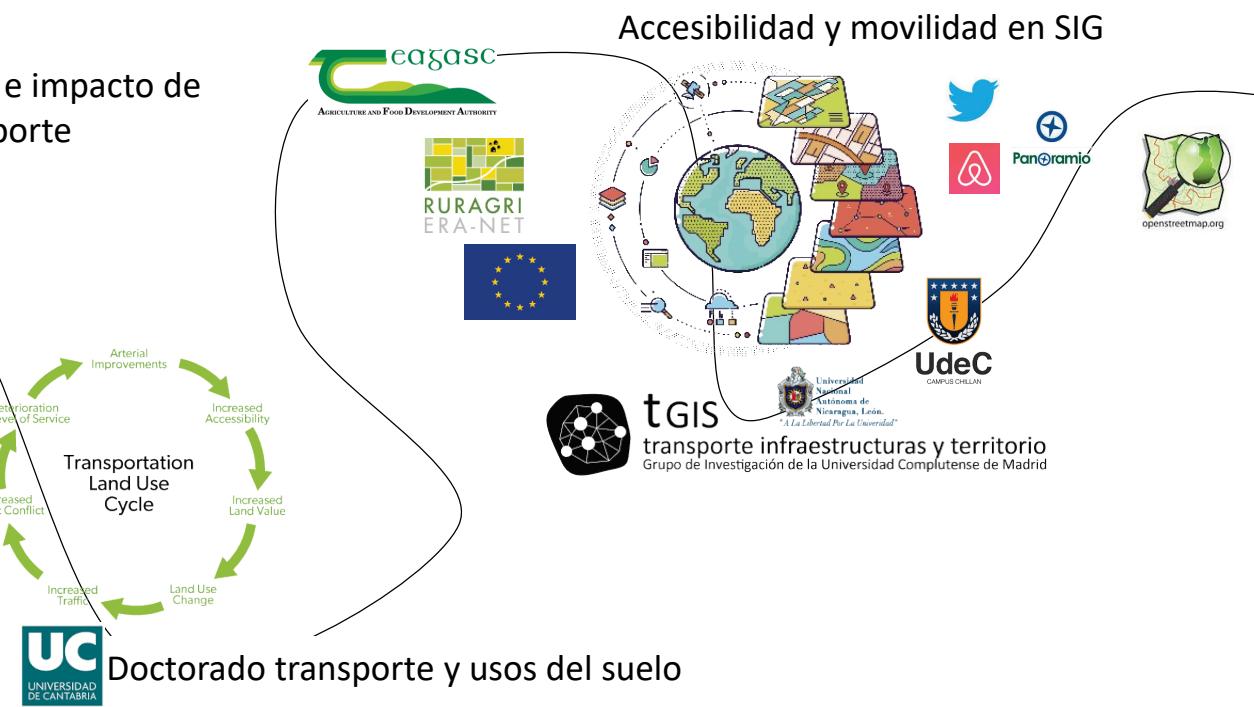
Cursos de Formación Nuevas Tecnologías 2018-2019

04-12-2018

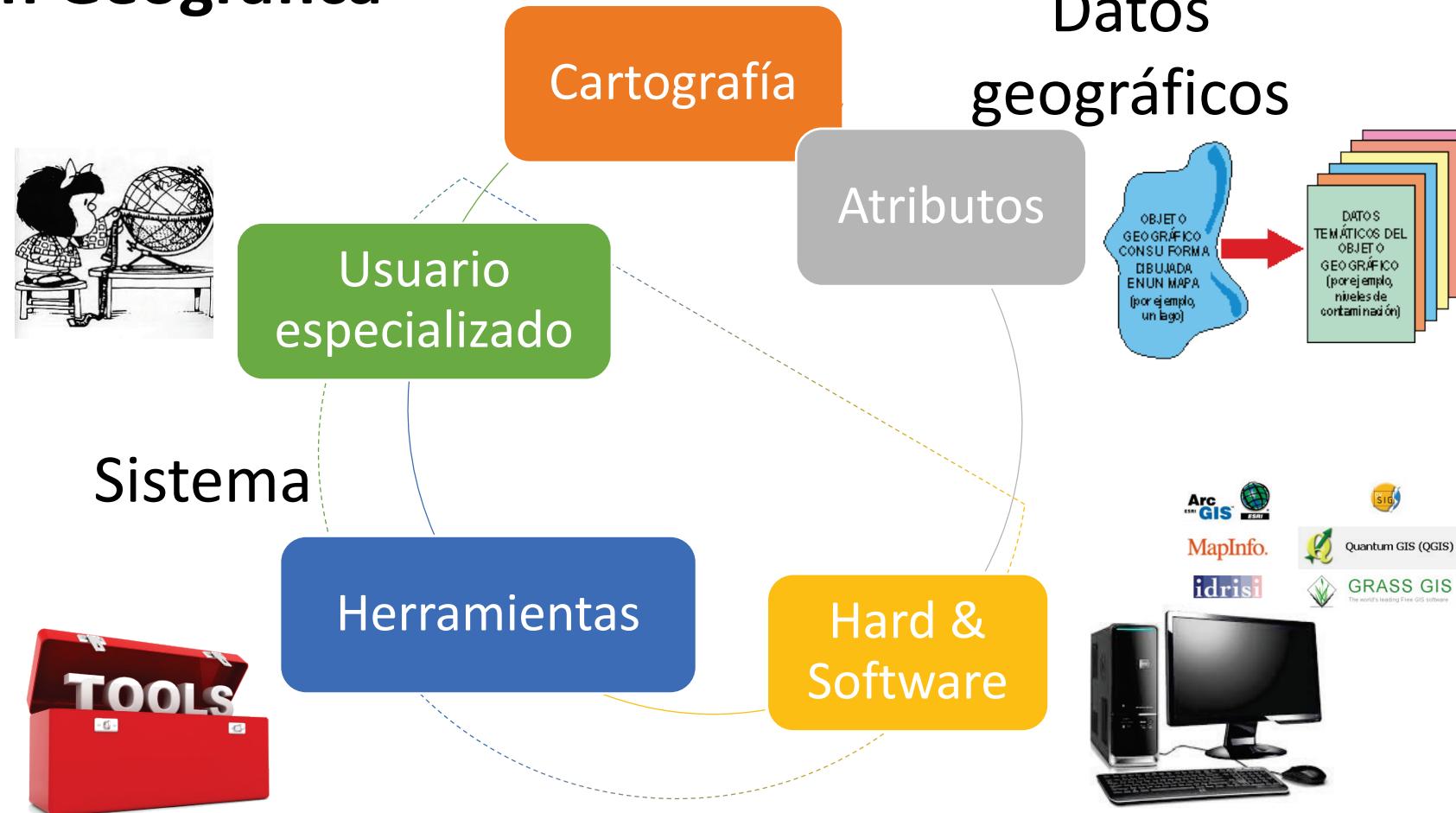




[msalas01@ucm.es](mailto:msalas01@ucm.es)



# Sistemas de Información Geográfica



## Portada

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  - [Modelos para la información geográfica](#)
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  - [SIG móvil](#)
- Parte 5. Visualización

# Introducción. ¿Qué puedo hacer con un SIG?

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*En este capítulo se presentan algunas nociones básicas sobre análisis espacial y su significado. Con ellas, se podrá abordar posteriormente la presentación de formulaciones específicas de diversa índole, que serán las piezas fundamentales del estudio de datos espaciales dentro de un SIG.*

*Al acabar el capítulo se tendrá un concepto general de las distintas clases de operaciones analíticas que serán desarrolladas en esta parte del libro. Para estudiar este capítulo es necesario previamente conocer los diferentes tipos de datos que se manejan en un SIG, de cara a poder entender la disposición de estos a uno u otro tipo de análisis.*

The Free Software Foundation (FSF) is a nonprofit with a worldwide mission to promote computer user freedom. We defend the rights of all software users. [Read more.](#)



Free software developers guarantee everyone equal rights to their programs: any user can study the source code, modify it, and share

<http://www.fsf.org/>

- ✓ *Software libre*
- ✓ *Cálculos estadísticos y gráficos*
- ✓ *Lenguaje R*
- ✓ *Documentación estandarizada*



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# The R Project for Statistical Computing

## Getting Started

R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and Mac OS. To [download R](#) please choose your preferred CRAN mirror.

If you have questions about R like how to download and install the software, or what the license terms are, please read our answers to frequently asked questions before you send an email.

## News

- [useR! 2017](#) (July 4 - 7 in Brussels) has opened registration and more at <http://user2017.brussels/>
- Tomas Kalibera has joined the R core team.
- The R Foundation welcomes five new ordinary members: Jennifer Bryan, Dianne Cook, Julie Josse, Tomas Kalibera, and Balasubramanian Narasimhan.
- [R version 3.3.2 \(Sincere Pumpkin Patch\)](#) has been released on Monday 2016-10-31.
- [The R Journal Volume 8/1](#) is available.
- The [useR! 2017](#) conference will take place in Brussels, July 4 - 7, 2017.
- [R version 3.3.1 \(Bug in Your Hair\)](#) has been released on Tuesday 2016-06-21.
- [R version 3.2.5 \(Very, Very Secure Dishes\)](#) has been released on 2016-04-14. This is a rebranding of the quick-fix release 3.2.4-revised.
- **Notice XQuartz users (Mac OS X)** A security issue has been detected with the Sparkle update mechanism used by XQuartz. Avoid updating over insecure channels.
- The [R Logo](#) is available for download in high-resolution PNG or SVG formats.
- [useR! 2016](#), has taken place at Stanford University, CA, USA, June 27 - June 30, 2016.
- [The R Journal Volume 7/2](#) is available.
- [R version 3.2.3 \(Wooden Christmas-Tree\)](#) has been released on 2015-12-10.
- [R version 3.1.3 \(Smooth Sidewalk\)](#) has been released on 2015-03-09.

R is available as Free Software under the terms of the [Free Software Foundation's GNU General Public License](#) in source code form. It compiles and runs on a wide variety of UNIX platforms and similar systems (including FreeBSD and Linux), Windows and Mac OS. Licencia: <https://www.r-project.org/COPYING>

<https://www.r-project.org/>



# Descarga



- ✓ Descarga a través de CRAN (por países)
- ✓ CRAN = red de servidores ftp con idénticas versiones de R
- ✓ Usa el más cercano para minimizar el uso de la red

← → C Es seguro | <https://cran.r-project.org/mirrors.html>

## CRAN Mirrors

The Comprehensive R Archive Network is available at the following URLs, please choose a location close to you. Some statistics on the status of the mirrors can be found here: [main page](#), [windows release](#), [windows old release](#).

0-Cloud	<a href="https://cloud.r-project.org/">https://cloud.r-project.org/</a> <a href="http://cloud.r-project.org/">http://cloud.r-project.org/</a>	Automatic redirection to servers worldwide, currently sponsored by Rstudio
Algeria	<a href="https://cran.usthb.dz/">https://cran.usthb.dz/</a> <a href="http://cran.usthb.dz/">http://cran.usthb.dz/</a>	Automatic redirection to servers worldwide, currently sponsored by Rstudio
Argentina	<a href="http://mirror.fcaglp.unlp.edu.ar/CRAN/">http://mirror.fcaglp.unlp.edu.ar/CRAN/</a>	University of Science and Technology Houari Boumediene University of Science and Technology Houari Boumediene
Australia	<a href="https://cran.csiro.au/">https://cran.csiro.au/</a> <a href="http://cran.csiro.au/">http://cran.csiro.au/</a> <a href="https://cran.ms.unimelb.edu.au/">https://cran.ms.unimelb.edu.au/</a> <a href="http://cran.ms.unimelb.edu.au/">http://cran.ms.unimelb.edu.au/</a> <a href="https://cran.curtin.edu.au/">https://cran.curtin.edu.au/</a>	Universidad Nacional de La Plata  CSIRO CSIRO University of Melbourne University of Melbourne Curtin University of Technology
Austria	<a href="https://cran.wu.ac.at/">https://cran.wu.ac.at/</a> <a href="http://cran.wu.ac.at/">http://cran.wu.ac.at/</a>	Wirtschaftsuniversität Wien Wirtschaftsuniversität Wien
Belgium	<a href="http://www.freakstatistics.be/cran/">http://www.freakstatistics.be/cran/</a>	EETT envoi Association
Spain	<a href="http://cran.mirror.ac.za/">http://cran.mirror.ac.za/</a>	TENET, Johannesburg
Spain	<a href="https://ftp.cixug.es/CRAN/">https://ftp.cixug.es/CRAN/</a> <a href="http://ftp.cixug.es/CRAN/">http://ftp.cixug.es/CRAN/</a> <a href="https://cran.rediris.es/">https://cran.rediris.es/</a> <a href="http://cran.rediris.es/">http://cran.rediris.es/</a>	Oficina de software libre (CIXUG) Oficina de software libre (CIXUG) Spanish National Research Network, Madrid Spanish National Research Network, Madrid
Sweden	<a href="https://ftp.acc.umu.se/mirror/CRAN/">https://ftp.acc.umu.se/mirror/CRAN/</a> <a href="http://ftp.acc.umu.se/mirror/CRAN/">http://ftp.acc.umu.se/mirror/CRAN/</a>	Academic Computer Club, Umeå University Academic Computer Club, Umeå University
Switzerland	<a href="https://stat.ethz.ch/CRAN/">https://stat.ethz.ch/CRAN/</a> <a href="http://stat.ethz.ch/CRAN/">http://stat.ethz.ch/CRAN/</a>	ETH Zürich ETH Zürich
Taiwan	<a href="https://ftp.yzu.edu.tw/CRAN/">https://ftp.yzu.edu.tw/CRAN/</a>	Department of Computer Science and Engineering, Yuan Ze University

<https://cran.r-project.org/mirrors.html>



# Descarga

- ✓ Descarga (varios SO)
- ✓ Código fuente
- ✓ Preguntas frecuentes
- ✓ Envío de paquetes

RedIRIS (Red Académica y de Investigación Nacional) [ES] | <https://cran.rediris.es>

The Comprehensive R Archive Network

**Download and Install R**

Precompiled binary distributions of the base system and contributed packages. **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

**Source Code for all Platforms**

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (Monday 2016-10-31, Sincere Pumpkin Patch) [R-3.3.2.tar.gz](#). read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

**Questions About R**

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

## What are R and CRAN?

R is 'GNU S', a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modelling, statistical tests, time series analysis, classification, clustering, etc. Please consult the [R project homepage](#) for further information.

CRAN is a network of ftp and web servers around the world that store identical, up-to-date, versions of code and documentation for R. Please use the CRAN [mirror](#) nearest to you to minimize network load.

## Submitting to CRAN

To "submit" a package to CRAN, check that your submission meets the [CRAN Repository Policy](#) and then use the [web form](#).

If this fails, upload to <ftp://CRAN.R-project.org/incoming/> and send an email to [CRAN@R-project.org](mailto:CRAN@R-project.org) following the policy. Please do not attach submissions to emails, because this will clutter up the mailboxes of half a dozen people.

Note that we generally do not accept submissions of precompiled binaries due to security reasons. All binary distribution listed above are compiled by selected maintainers, who are in charge for all binaries of their platform, respectively.

<https://cran.rediris.es/>

# Descarga

✓ Descarga para instalar  
R por primera vez



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R for Windows



Máster  
Universitario en  
TECNOLOGÍAS DE LA  
INFORMACIÓN  
GEGRÁFICA (TIG)

Subdirectories:

[base](#)

Binaries for base distribution (managed by Duncan Murdoch). This is what you want to [install R for the first time](#).

[contrib](#)

Binaries of contributed CRAN packages (for R >= 2.11.x; managed by Uwe Ligges). There is also information on [third party software](#) available for CRAN Windows services and corresponding environment and make variables.

[old contrib](#)

Binaries of contributed CRAN packages for outdated versions of R (for R < 2.11.x; managed by Uwe Ligges).

[Rtools](#)

Tools to build R and R packages (managed by Duncan Murdoch). This is what you want to build your own packages on Windows, or to build R itself.

Please do not submit binaries to CRAN. Package developers might want to contact Duncan Murdoch or Uwe Ligges directly in case of questions / suggestions related to Windows binaries.

You may also want to read the [R FAQ](#) and [R for Windows FAQ](#).

Note: CRAN does some checks on these binaries for viruses, but cannot give guarantees. Use the normal precautions with downloaded executables.

[Download R 3.5.1 for Windows](#) (62 megabytes, 32/64 bit)

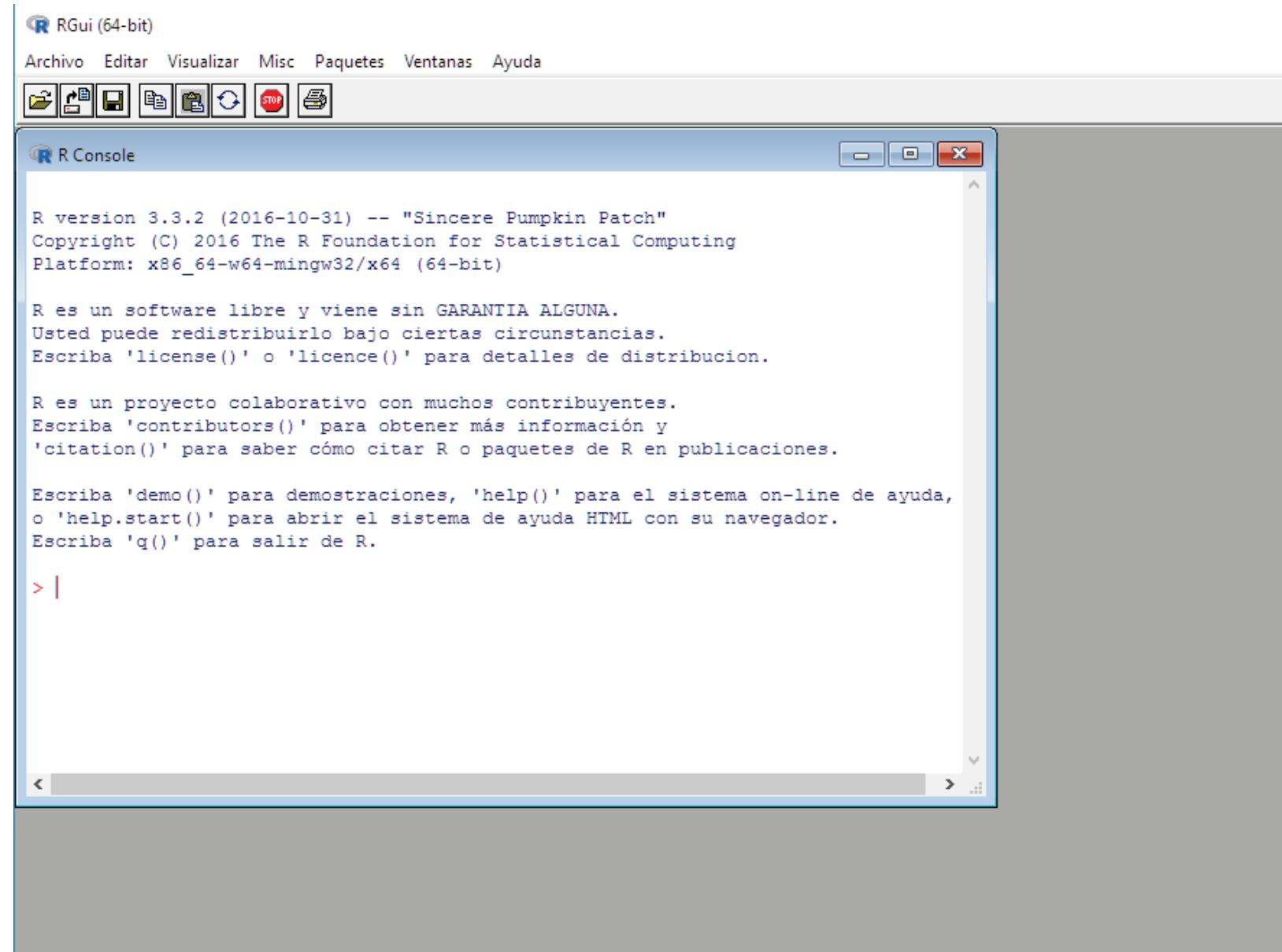
[Installation and other instructions](#)

[New features in this version](#)

<https://cran.rediris.es/>

# Componentes

- ✓ *R (core GUI)*
- ✓ *Paquetes (extensiones)*
- ✓ *RStudio (friendly GUI)*

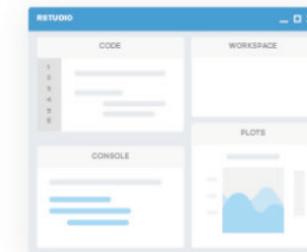


# Componentes



- ✓ Rstudio - interfaz para usar R de forma más amigable

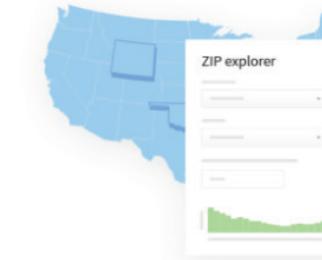
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RStudio

RStudio makes R easier to use. It includes a code editor, debugging & visualization tools.

[Download](#) [Learn More](#)



Shiny

Shiny helps you make interactive web applications for visualizing data. Bring R data analysis to life.

[Learn More](#)



R Packages

Our developers create popular packages to expand the features of R. Includes ggplot2, dplyr, R Markdown & more.

[Learn More](#)

<https://www.rstudio.com/>





✓ Descarga la versión de escritorio libre

RStudio Desktop Open Source License	FREE	RStudio Desktop Commercial License	\$995 per year	RStudio Server Open Source License	FREE	RStudio Server Pro Commercial License	\$9,995 per year
Integrated Tools for R	●	●	●	●	●	●	●
Priority Support		●	●		●	●	●
Access via Web Browser			●	●	●	●	●
Enterprise Security					●	●	●
Project Sharing					●	●	●
Manage Multiple R Sessions & Versions					●	●	●
Admin Dashboard					●	●	●
Load Balancing					●	●	●
License	AGPL	Commercial	AGPL	Commercial			
Pricing	FREE	\$995/yr	FREE	\$9,995/yr			
	<a href="#">DOWNLOAD</a>	<a href="#">BUY NOW</a>	<a href="#">DOWNLOAD</a>	<a href="#">DOWNLOAD</a>			

<https://www.rstudio.com/products/rstudio/download/>



## RStudio Desktop 1.0.136 — Release Notes

RStudio requires R 2.11.1+. If you don't already have R, download it [here](#).

### Installers for Supported Platforms

#### Installers

- [RStudio 1.0.136 - Windows Vista/7/8/10](#)
- [RStudio 1.0.136 - Mac OS X 10.6+ \(64-bit\)](#)
- [RStudio 1.0.136 - Ubuntu 12.04+/Debian 8+ \(32-bit\)](#)
- [RStudio 1.0.136 - Ubuntu 12.04+/Debian 8+ \(64-bit\)](#)
- [RStudio 1.0.136 - Fedora 19+/RedHat 7+/openSUSE 13.1+ \(32-bit\)](#)
- [RStudio 1.0.136 - Fedora 19+/RedHat 7+/openSUSE 13.1+ \(64-bit\)](#)

Size	Date	MD5
81.9 MB	2016-12-21	93b3f307f567c33f7a4db4c114099b3e
71.2 MB	2016-12-21	12d6d6ade0203a2fce6fe3dea65c1ae
85.5 MB	2016-12-21	0a20fb89d8aaeb39b329a640ddadd2c5
92.1 MB	2016-12-21	2a73b88a12a9fbaf96251cecf8b41340
84.7 MB	2016-12-21	fa6179a7855bfff0f939a34c169da45fd
85.7 MB	2016-12-21	2b3a148ded380b704e58496befb55545

### Zip/Tarballs

#### Zip/tar archives

- [RStudio 1.0.136 - Windows Vista/7/8/10](#)
- [RStudio 1.0.136 - Ubuntu 12.04+/Debian 8+ \(32-bit\)](#)
- [RStudio 1.0.136 - Ubuntu 12.04+/Debian 8+ \(64-bit\)](#)
- [RStudio 1.0.136 - Fedora 19+/RedHat 7+/openSUSE 13.1+ \(32-bit\)](#)
- [RStudio 1.0.136 - Fedora 19+/RedHat 7+/openSUSE 13.1+ \(64-bit\)](#)

Size	Date	MD5
117.5 MB	2016-12-21	f415939bf5012c0ab127c7cfbc9600be
86.2 MB	2016-12-21	fca75f953dd425694b7fd4335bd29165
93.2 MB	2016-12-21	7cf0092653aa44fc76325a8f1325fb1f
85.4 MB	2016-12-21	30c89299d30ec03b38098e51e9bf49b8
86.6 MB	2016-12-21	ea2a262f650e92f568f48edc1c093902

### Source Code

A tarball containing source code for RStudio v1.0.136 can be downloaded from [here](#)

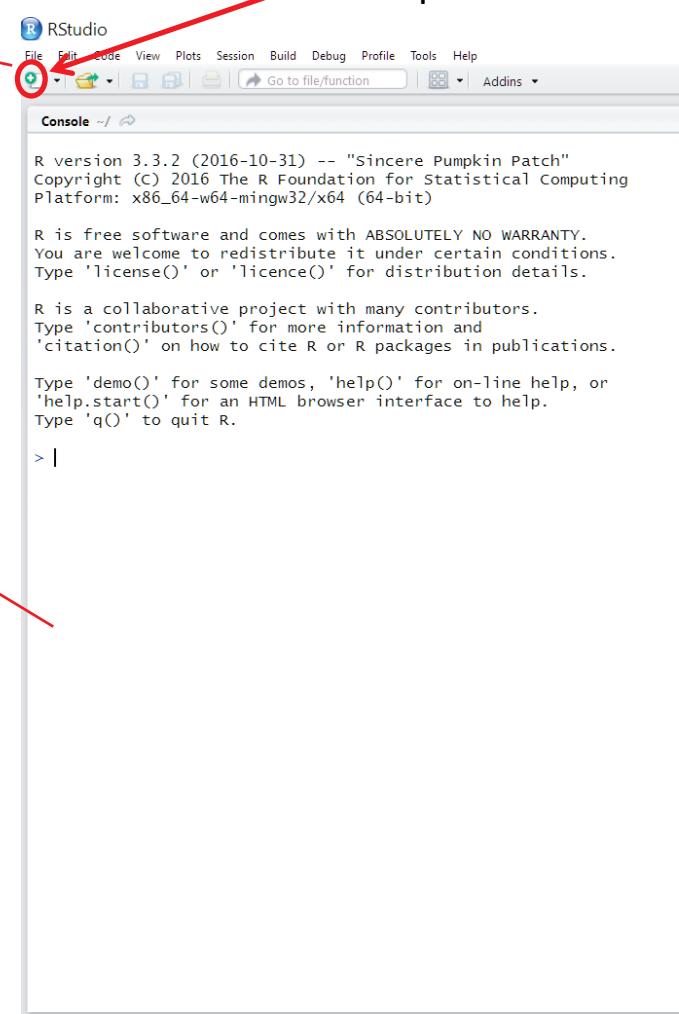
<https://www.rstudio.com/products/rstudio/download/>



# RStudio

Menú: facilita algunas operaciones básicas (crear y guardar scripts, instalar paquetes, etc.)

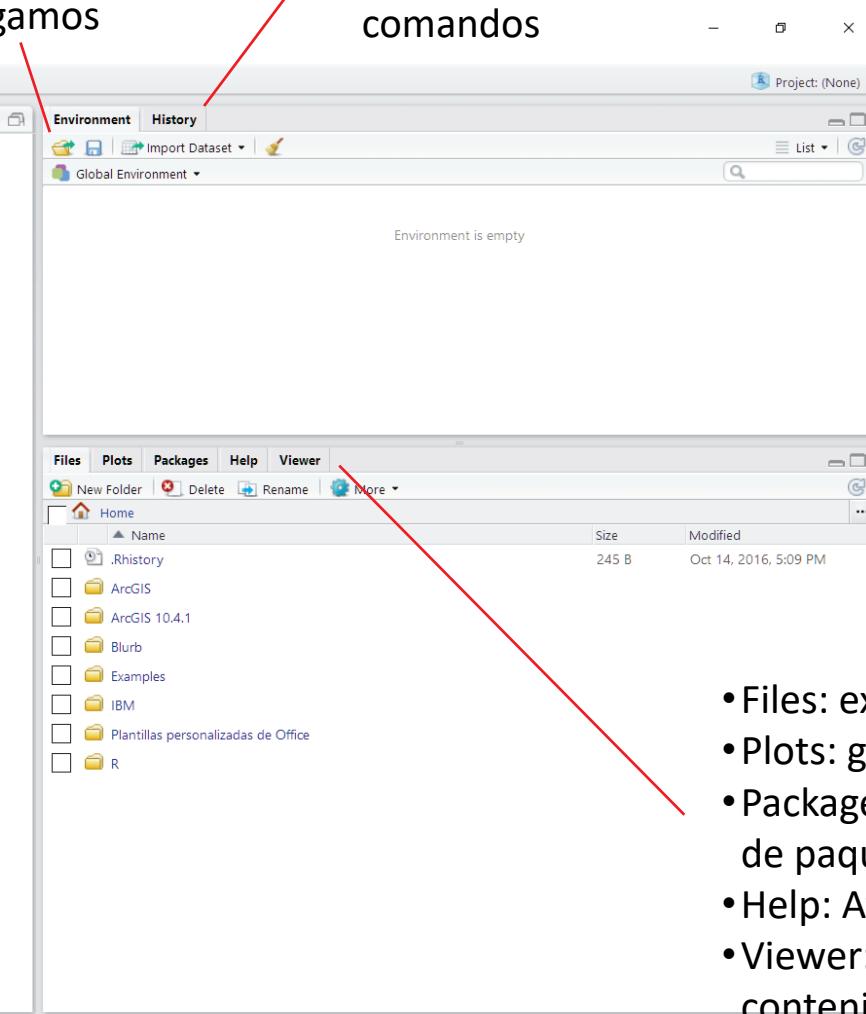
Create a new R Script



Consola:  
muestra los resultados

Environment:  
muestra los datos que cargamos

History:  
muestra el histórico de comandos



- Files: explorador
- Plots: gráficos
- Packages: búsqueda de paquetes
- Help: Ayuda
- Viewer: visor de contenido web local



# RStudio

Script: aquí escribimos nuestros comandos

Lupa: abre el menú *Buscar y Reemplazar*

Run: Ejecuta el comando de la línea del cursor, o de las líneas seleccionadas

The screenshot shows the RStudio IDE interface. On the left, the 'Script' pane displays an R script with several lines of code. The 'Console' pane at the bottom shows the R startup message and basic usage instructions. The 'Environment' pane on the right shows an empty global environment. A red arrow points from the 'Lupa' text to the search icon in the top toolbar. Another red arrow points from the 'Run' text to the 'Run' button in the top toolbar. A red line also connects the 'Script' text to the 'Script' pane.





# Análisis espacial en R

[CRAN Task View: Analysis of Spatial Data](#)

**Maintainer:** Roger Bivand

**Contact:** Roger.Bivand at nhh.no

**Version:** 2018-06-02

**URL:** <https://CRAN.R-project.org/view=Spatial>

Base R includes many functions that can be used for reading, visualising, and analysing spatial data. The focus in this view is on "geographical" spatial data, where observations can be identified with geographical locations, and where additional information about these locations may be retrieved if the location is recorded with care. Base R functions are complemented by contributed packages, some of which are on CRAN, and others are still in development. One active location is [R-Forge](#), which lists "Spatial Data and Statistics" projects in its [project tree](#). Information on R-spatial packages, especially [sp](#) is posted on the R-Forge r spatial project [website](#), including a visualisation gallery. Active development of [sp](#) is continuing on [sp](#).

The contributed packages address two broad areas: moving spatial data into and out of R, and analysing spatial data in R.

The [R-SIG-Geo](#) mailing-list is a good place to begin for obtaining help and discussing questions about both accessing data, and analysing it. The mailing list is a good place to search for information about relevant courses. Further information about courses may be found under the "Events" tab of [this blog](#).

There are a number of contributed tutorials and introductions; a recent one is [Introduction to visualising spatial data in R](#) by Robin Lovelace and James Cheshire.

The packages in this view can be roughly structured into the following topics. If you think that some package is missing from the list, please let me know.

<https://cran.r-project.org/web/views/Spatial.html>





## El dato geográfico en R

- Classes for spatial data
- Handling spatial data
- Reading and writing spatial data
- Visualization
- Point pattern analysis
- Geostatistics
- Disease mapping and areal data analysis
- Spatial regression
- Ecological analysis
- ...

<https://cran.r-project.org/web/views/Spatial.html>



# El dato geográfico en R

**sp**

Tabla de atributos  
(`data.frame`)

```
Formal class 'SpatialLinesDataFrame' [package "sp"] with 4 slots
  ..@ data       : 'data.frame': 1 obs. of 3 variables:
    ..$ id        : Factor w/ 1 level "a": 1
    ..$ use       : Factor w/ 1 level "road": 1
    ..$ cars_per_hour: num 10
  ..@ lines      :List of 1
    ..$ :Formal class 'Lines' [package "sp"] with 2 slots
      ..@ Lines:List of 1
        ..$ :Formal class 'Line' [package "sp"] with 1 slot
          ..$ @ coords: num [1:3, 1:2] 0.248 0.993 0.536 0.772 0.67 ...
          ..$ @ ID   : chr "a"
      ..@ bbox      : num [1:2, 1:2] 0.248 0.261 0.993 0.772
        ..$ @ dimnames:List of 2
        ..$ @ x       : chr [1:2] "x" "y"
        ..$ @ min     : chr [1:2] "min" "max"
      ..@ proj4string:Formal class 'CRS' [package "sp"] with 1 slot
        ..$ @ projargs: chr NA
```

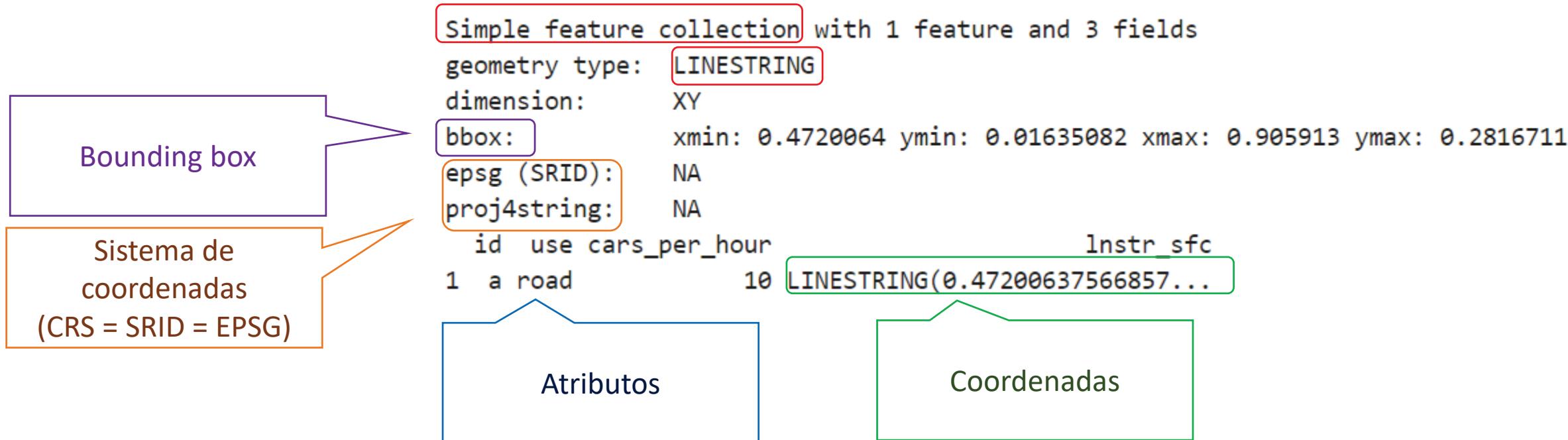
Coordenadas

Bounding box

Sistema de  
coordenadas  
(CRS = SRID = EPSG)

# El dato geográfico en R

**sf**



# Ejercicio\_01: Datos espaciales, geovisor y análisis espacial

*María Henar Salas Olmedo*

*04 de diciembre de 2018*

- 1. Objetivos
- 2. Paquetes necesarios
- 3. Importar archivos
- 4. Visualizar variables en un mapa
- 5. Análisis espacial

## 1. Objetivos

Con la realización de este ejercicio, el estudiante será capaz de:

1. Importar datos espaciales en R
2. Utilizar las propiedades espaciales de los datos
3. Mostrar los resultados en un geovisor o mapa interactivo

El ejercicio para alcanzar estos objetivos consiste en seleccionar y mostrar en un mapa interactivo los centros de salud del Ayuntamiento de Madrid que están a 100 metros o menos de una base de bicicletas públicas.



## Instalación del paquete sf (recomendado)

1. Instalar o actualizar R a la **versión 3.5.1** o superior: <https://cran.r-project.org/bin/windows/base/>
2. Re-instalar y/o actualizar los paquetes a esta versión: `update.packages(checkBuilt=TRUE, ask=FALSE)`
3. Instalar el paquete sf: `install.packages("sf", dependencies = TRUE)`

## Importar shapefile con el paquete sp

```
# Reading shp file as spatial points data frame

filepath <- paste0(input_path, "centros_de_salud_2018")
centros_salud_spdf <- rgdal::readOGR(dsn = filepath,
                                         layer = "centros_de_salud_muni_madrid_2018",
                                         integer64 = 'allow.loss') # to convert integer64 to integer32

# Reading shp file as spatial polygon data frame

filepath <- paste0(input_path, "secciones_censales_2017")
poblacion_spdf <- rgdal::readOGR(dsn = filepath,
                                         layer = "secciones_censales_muni_madrid_2017",
                                         integer64 = 'allow.loss')
```

## Añadir campos a la tabla de atributos de un spdf

```
# Creating codigo_seccion field in spdf datasets by adding '28' to GEOCODIGO  
poblacion_spdf@data$codigo_seccion <- paste0('28', poblacion_spdf@data$GEOCODIGO)  
  
# Adding poblacion_dt fields by codigo_seccion  
poblacion_spdf@data <- merge(poblacion_spdf@data,  
                                poblacion_dt,  
                                by = 'codigo_seccion',  
                                all.x = TRUE)
```

Para acceder a la tabla de atributos, es necesario entrar en el slot 'data':  
población\_spdf@data\$columna



## Reproyectar spdf en otro sistema de coordenadas

```
# Projecting spdf datasets
bases_bicis_spdf <- spTransform(bases_bicis_spdf, CRS("+init=epsg:4326"))
centros_salud_spdf <- spTransform(centros_salud_spdf, CRS("+init=epsg:4326"))
poblacion_spdf <- spTransform(poblacion_spdf, CRS("+init=epsg:4326"))
```

## Añadir una capa a un mapa a partir de un spdf

```
# Bike stations
m = addCircleMarkers(m,
                      data = bases_bicis_spdf,
                      popup = paste0("<strong> Base nº: </strong>",
                                    bases_bicis_spdf@data$`Número`),
                      radius = 5,
                      stroke = TRUE,
                      fillOpacity = 1,
                      fillColor = '#00bfff',
                      color = '#00bfff',
                      group = "BiciMAD")
```

## Añadir una capa a un mapa a partir de un spdf

```
# Creating a 100 meter buffer from bike stations
startbufproj = gBuffer(bases_bicis_spdf, width = 100)

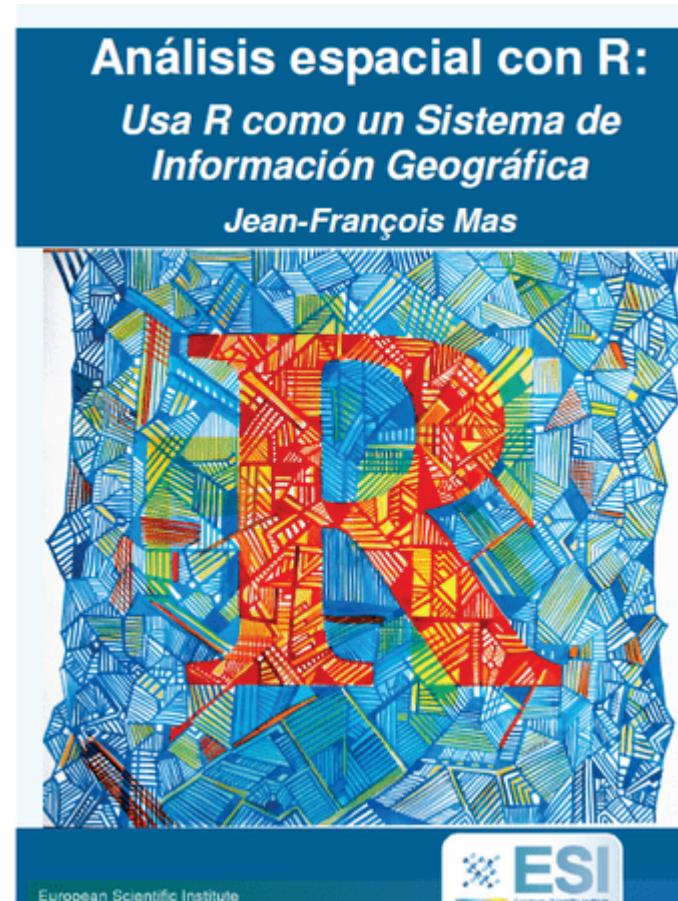
# Selecting health centres within a 100 m radius of bike stations
o = sp::over(centros_salud_spdf, startbufproj)
odf = data.frame(o)

# Setting row id as common id
odf$codo = 1:nrow(odf)
centros_salud_spdf$cod = 1:nrow(centros_salud_spdf)

# Selecting health centres that overlap with the 100 meter buffer
odf = subset(odf, odf$o == 1)

# Adding health centre info to the selected ones
near = merge(odf,
             centros_salud_spdf,
             by.x = "codo",
             by.y = "cod",
             all.x = TRUE,
             all.y = FALSE)
```

## Recursos



### Índice general

#### Introducción

- 1 Instalación y presentación de R y RStudio
- 2 Operaciones básicas en R
- 3 Organización de los objetos espaciales en R
- 4 Importación/exportación de datos espaciales
- 5 Operaciones básicas de SIG (vector)
- 6 Operaciones básicas de SIG (raster)
- 7 Análisis geoestadístico: Detección de hot spots
- 8 Análisis de imágenes de percepción remota
- 9 Elaboración de mapas
- 10 Poniendo R a interactuar con QGIS y Dinamica

<https://mappinggis.com/2018/08/analisis-espacial-con-r-usa-r-como-un-sistema-de-informacion-geografica/#Descarga del libro>



## Recursos

# Curso de Introducción a R

*Vicente Coll Serrano y Pedro J. Pérez*

**2018-12-03**

## Contacto

Este **Curso de Introducción a R** es impartido por:

- [Vicente Coll Serrano](#), profesor Titular de Universidad del Área de **Métodos Cuantitativos para la Economía y la Empresa** (Departamento de Economía Aplicada) de la Universidad de Valencia.
- Pedro J. Pérez Vázquez, profesor Titular de Universidad del Departamento de **Análisis Económico** de la Universidad de Valencia.

Para más información puedes contactar con nosotros por correo electrónico: **Vicente Coll** ([email](#)), **Pedro J. Pérez** ([email](#))

[https://www.uv.es/vcoll/curso\\_r.html](https://www.uv.es/vcoll/curso_r.html)





# Recursos

## R TUTORIALS: BASICS

by Simon Ejdemyr

### Introduction

In this first in a number of tutorials, we'll cover the very basics of R: how to execute code; how to install and load packages; style; and trouble shooting.

### Dataset Basics

This tutorial introduces datasets – “data frames” in R. Datasets can be thought of as a collection of vectors stored as columns. We'll talk about how to create datasets and how to read them from file. We'll also talk more conceptually about how datasets should be structured.

### Collapsing Data

This tutorial explains how to find summary statistics for different categories in a dataset – what is often referred to as collapsing data. Like the tutorial on modifying data, the tutorial draws on a set of intuitive and elegant functions from the dplyr package.

### Vectors

This tutorial introduces a key object in R: vectors. It explains how to create different types of vectors, how to subset them, how to modify them, and how to summarize them.

### Modifying Data

Being able to quickly modify datasets – using tasks like subsetting, sorting, extracting unique observations, renaming variables, dropping variables, and creating new variables – is critical. This tutorial explains how to easily do this in R with functions from the dplyr package.

### Merging & Appending

This tutorial explains how to combine datasets by merging or appending them. Merging means transferring columns from one dataset to another, while appending means transferring rows from one dataset to another.

<https://sejdemyr.github.io/r-tutorials/basics/>





## Recursos

# Introduction to Spatial Data Types in R

*claudia engel*

*Last updated: May 15, 2017*

- 1. Conceptualizing a spatial vector objects in R
  - Exercise 1
  - The `sp` package
  - The `sf` package
  - Exercise 2
- 2. Creating a spatial object from a lat/lon table
  - Exercise 3
  - A brief, but important word about projection.
- 3. Loading shape files into R
  - How to work with `rgdal`
    - Exercise 4
  - How to do this in `sf`
- 4. Raster data
  - Exercise 5



## Recursos

# Geocomputation with R

*Robin Lovelace, Jakub Nowosad, Jannes Muenchow*

2018-12-03

## Welcome

---

This is the online home of *Geocomputation with R*, a book on geographic data analysis, visualization and modeling.

**Note:** This book has been published by [CRC Press](#) in the [R Series](#). The online version of this book is free to read here.

- 2 Geographic data in R
- 3 Attribute data operations
- 4 Spatial data operations
- 5 Geometry operations
- 6 Reprojecting geographic data
- 7 Geographic data I/O
- II Extensions
- 8 Making maps with R
- 9 Bridges to GIS software
- 10 Scripts, algorithms and functions
- 11 Statistical learning
- III Applications
- 12 Transportation
- 13 Geomarketing
- 14 Ecology

<https://geocompr.robinlovelace.net>





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<http://www.tutorialr.es/es/index.html>

**R**

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<http://madrid.r-es.org/>





# Muchas gracias!

