



The Data Scientist's Toolbox

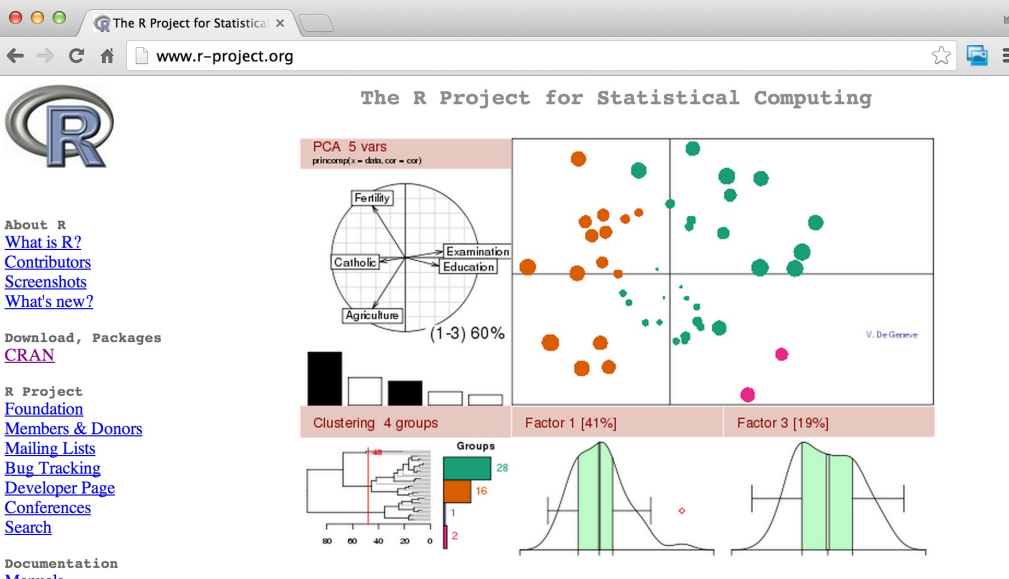
Johns Hopkins Bloomberg School of Public Health

What do data scientists do?

- Define the question
- Define the ideal data set
- Determine what data you can access
- Obtain the data
- Clean the data
- Exploratory data analysis
- Statistical prediction/modeling
- Interpret results
- Challenge results
- Synthesize/write up results
- Create reproducible code
- Distribute results to other people

The main workhorse of data science

The R Project for Statistical Computing



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PCA 5 vars
`prcomp(x = data, cor = cor)`

Clustering 4 groups

Factor 1 [41%]

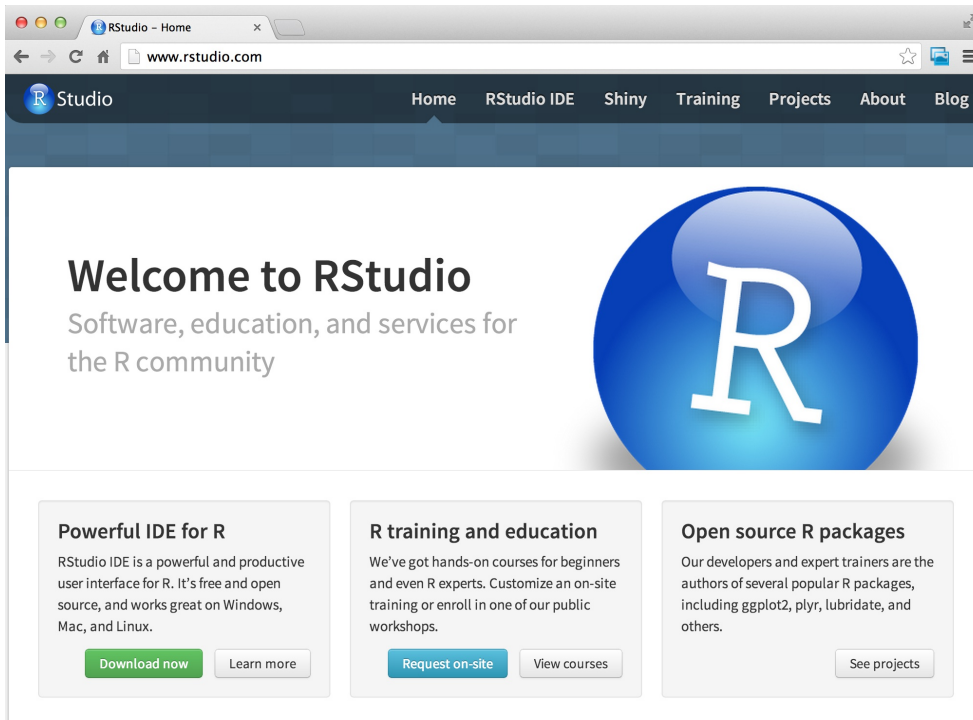
Factor 3 [19%]

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 MacOS. 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.

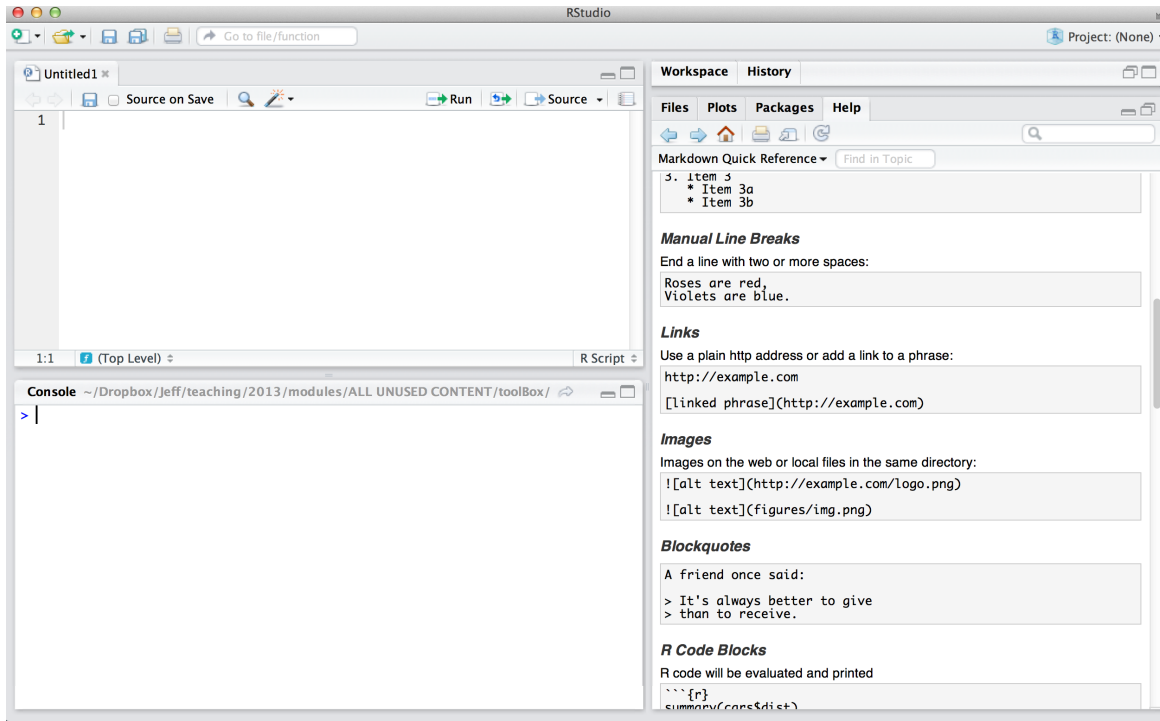
<http://www.r-project.org/>

Where we will work on coding



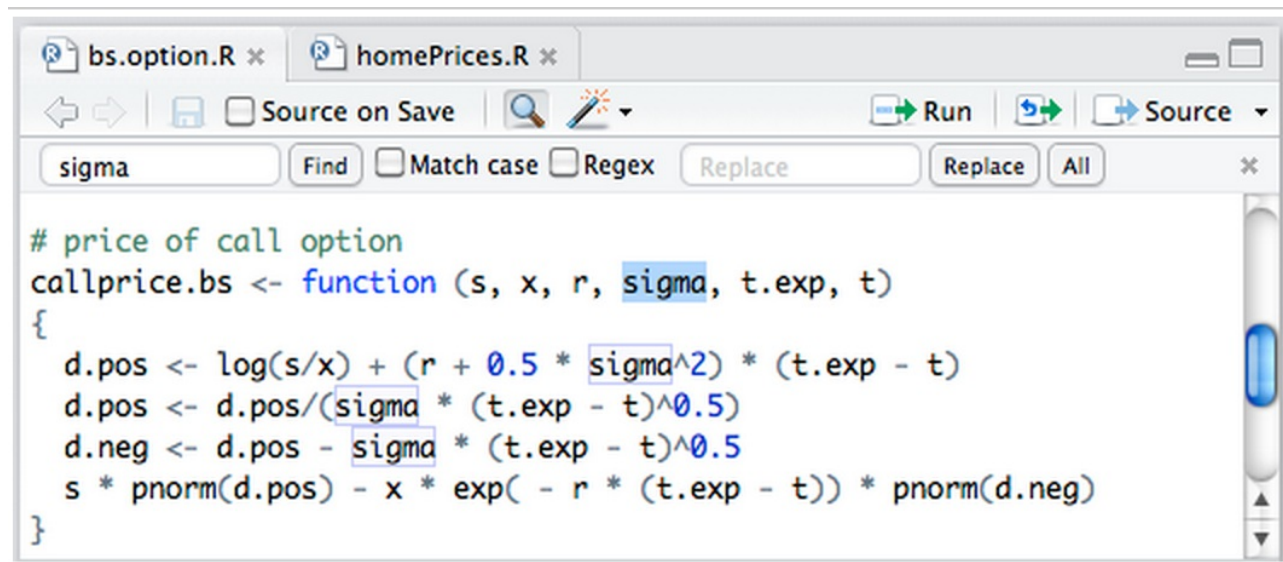
<http://www.rstudio.com/>

Rstudio's interface



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

Primary file types - R script



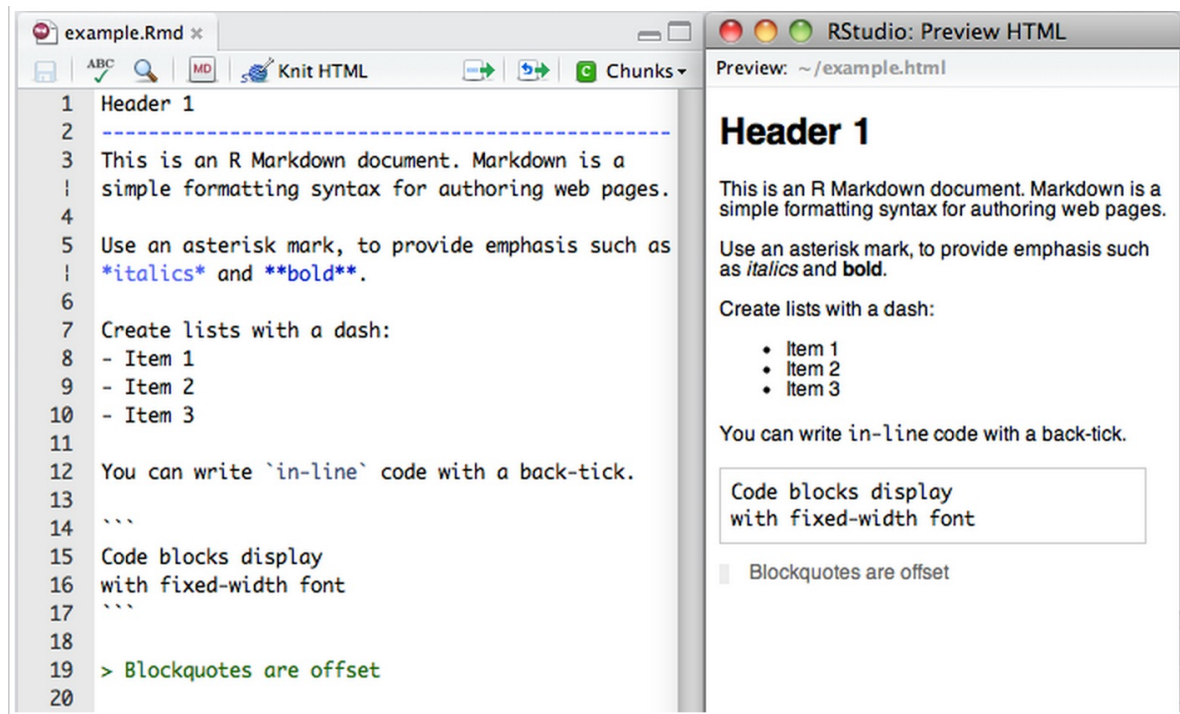
The screenshot shows the RStudio Source editor with two tabs: 'bs.option.R' and 'homePrices.R'. The 'bs.option.R' tab is active. The editor contains the following R code:

```
# price of call option
callprice.bs <- function (s, x, r, sigma, t.exp, t)
{
  d.pos <- log(s/x) + (r + 0.5 * sigma^2) * (t.exp - t)
  d.pos <- d.pos/(sigma * (t.exp - t)^0.5)
  d.neg <- d.pos - sigma * (t.exp - t)^0.5
  s * pnorm(d.pos) - x * exp(- r * (t.exp - t)) * pnorm(d.neg)
}
```

The code defines a function `callprice.bs` that calculates the price of a call option. The parameters are `s` (stock price), `x` (strike price), `r` (risk-free rate), `sigma` (volatility), `t.exp` (expiration time), and `t` (current time). The function uses the Black-Scholes formula to calculate the option price.

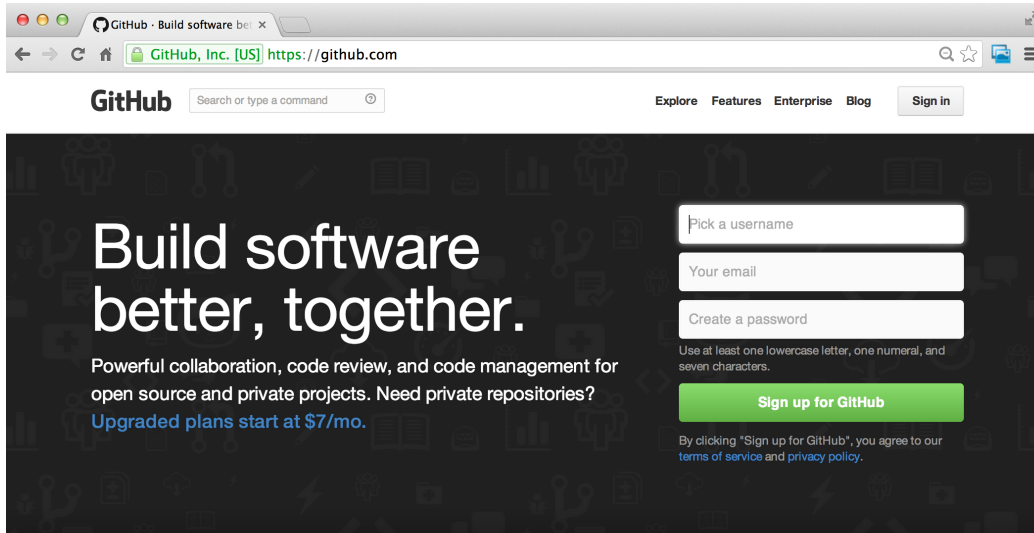
<http://www.rstudio.com/ide/docs/using/source>

Primary file types - R markdown document



http://www.rstudio.com/ide/docs/authoring/using_markdown

Sharing your results - Github & Git



The screenshot shows the GitHub homepage in a web browser. The browser's address bar displays "https://github.com". The GitHub logo is on the left, and navigation links for "Explore", "Features", "Enterprise", "Blog", and "Sign in" are on the right. The main content area has a dark background with the text "Build software better, together." and a description of GitHub's features. On the right side of this area is a sign-up form with three input fields: "Pick a username", "Your email", and "Create a password". Below these fields is a green "Sign up for GitHub" button. A note below the button states: "Use at least one lowercase letter, one numeral, and seven characters." At the bottom of the sign-up section, it says: "By clicking 'Sign up for GitHub', you agree to our [terms of service](#) and [privacy policy](#)."

GitHub

Search or type a command

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Build software better, together.

Powerful collaboration, code review, and code management for open source and private projects. Need private repositories? [Upgraded plans start at \\$7/mo.](#)

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Why you'll love GitHub.

Powerful features to make software development more collaborative.

Where to run Github commands - the shell

