

CT1100: Computer Systems

Topic 1: Introduction to R

Prof. Jim Duggan,
School of Engineering & Informatics
National University of Ireland Galway.



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Module Overview

- Exploring the essential building blocks of the information age
 - Semester 1: Data (R) and Hardware
 - Semester 2 Software & Networks
- Compulsory for all first year BA students taking IT as a subject
 - Labs from week 4 (1 hour per week, 3 time slots)
 - Worth 5 ECTS in credit
 - Continuous Assessment (MCQ tests, Assignments, Lab Exam)
- See also <https://github.com/JimDuggan/CT1100>



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Lecturer – Jim Duggan

- Lectures in
 - Programming (R, MATLAB),
 - Modelling & Simulation
- Research interests:
 - System Dynamics
 - Computational Epidemiology
 - Data Science & Artificial Intelligence

Review Infoveillance and Intelligence Infoveillance, Infodermatology, Digital Disease Surveillance, Infodemic Management

Article Cited By (6) Tweetations (29) Metrics

Review

The Application of Internet-Based Sources for Public Health Surveillance (Infoveillance): Systematic Review

Joana M Barros^{1,2}, MSc, Jim Duggan², PhD, Dietrich Rebholz-Schuhmann³, PhD

¹Insight Centre for Data Analytics, National University of Ireland Galway, Galway, Ireland

²School of Computer Science, National University of Ireland Galway, Galway, Ireland

³ZB MED - Information Centre for Life Sciences, University Cologne, Cologne, Germany

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Jim Duggan

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Galway, Ireland

Jim is a Lecturer in Computer Science at the National University of Ireland Galway (NUIG), and has been working with R for over 5 years. Before joining NUIG in 1995 he worked as a software engineer for Digital Equipment Corporation. He is author of two CRAN packages (`aimsir17` and `pysd2r`), and has also written a textbook on [system dynamics modelling with R](#). Jim's research interests include public health and epidemiology, where he combines extensive use of the tidyverse with mathematical modelling approaches, including the R package `deSolve`.

Teaching language(s): English

<https://education.rstudio.com/trainers/people/duggan+jim/>



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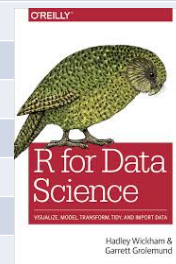
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Topics to be Covered (R)

Topic	Description
1	Introduction to R and R Studio Cloud
2	A program in R
3	The tibble – a way of storing information
4	Data Visualisation I
5	Data Transformation I
6	Running a Script in R
7	Data Visualisation II
8	Data Transformation II
9	Exploring Data
10	Communicating Results



<https://r4ds.had.co.nz>



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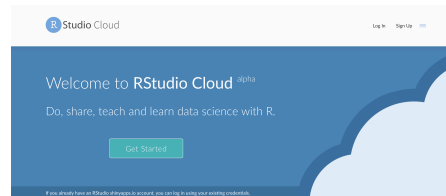
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The R Project for Statistical Computing

- R's *mission* is to enable the best and most thorough exploration of data possible (Chambers 2008).
- It is a dialect of the S language, developed at Bell Laboratories
- ACM noted that S "*will forever alter the way people analyze, visualize, and manipulate data*"



```

1 # We use this for processing the answer
2 # In programming, we "stand on the shoulders of giants"
3 library(stringr)
4
5 # This gets the input from the user.
6 # The result is stored in a variable
7 # Variables are important in programming!
8 name <- readline(prompt="Enter a name: ")
9
10 # We call a specially designed function to get the answer
11 # In R, we call functions all the time
12 # A function is a "mini-program"
13 ans <- str_reverse(name)
14
15 # After all this work, we output the result
16 cat("The reverse of ", name, " is ==> ", ans)

```



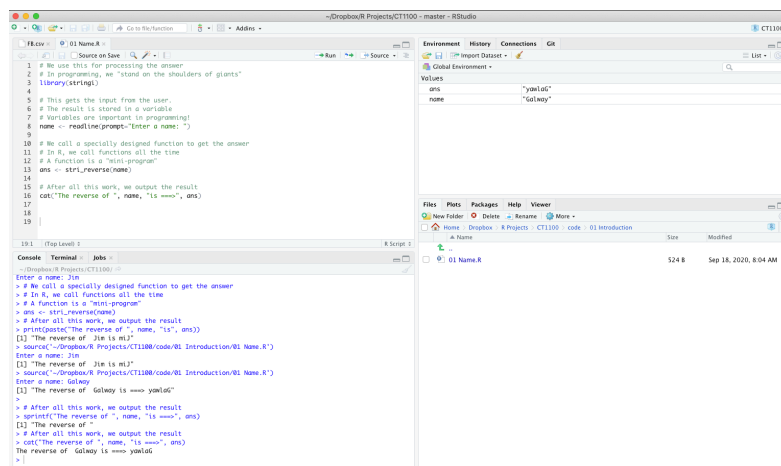
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First Steps: RStudio Cloud!



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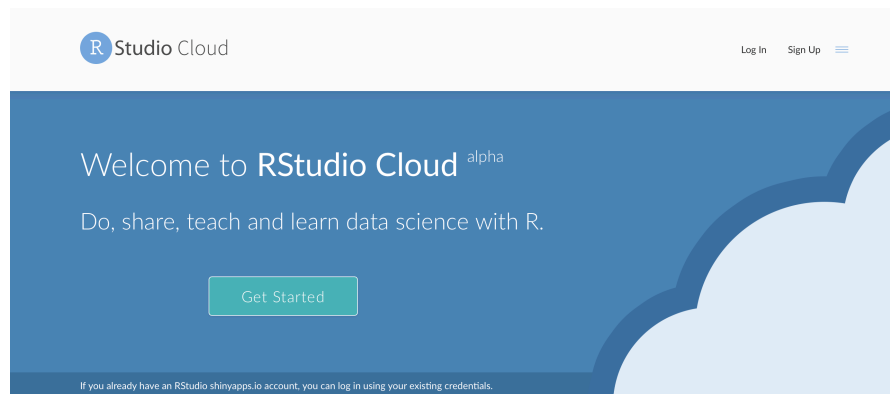
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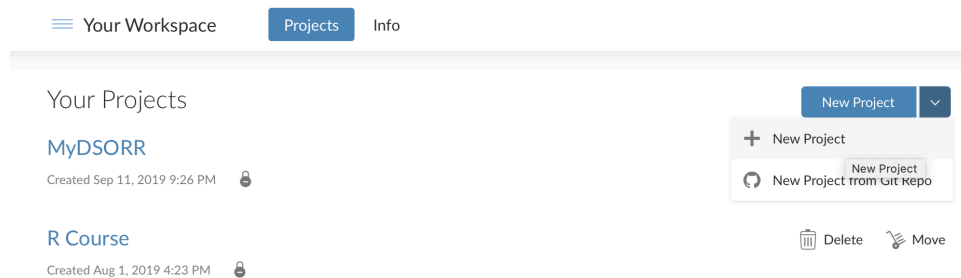
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(1) Create your account on <https://rstudio.cloud> and login



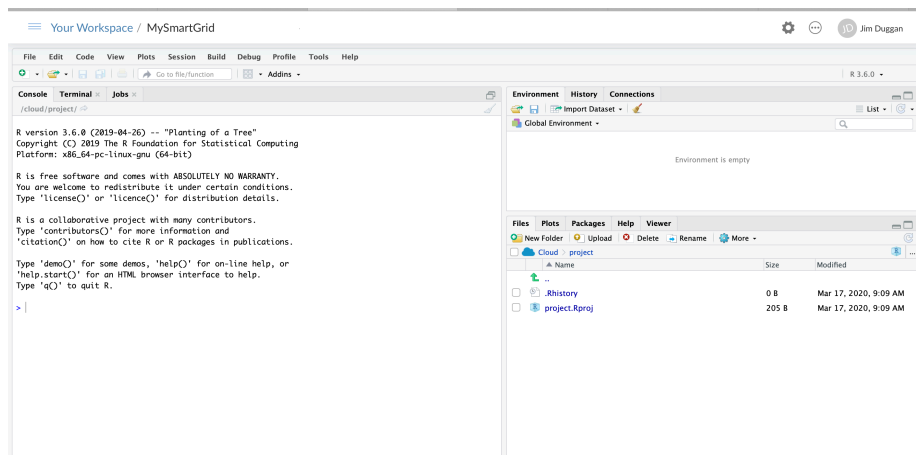
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(2) In your workspace, create a project



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(3) Name the project (e.g. MySmartGrid)



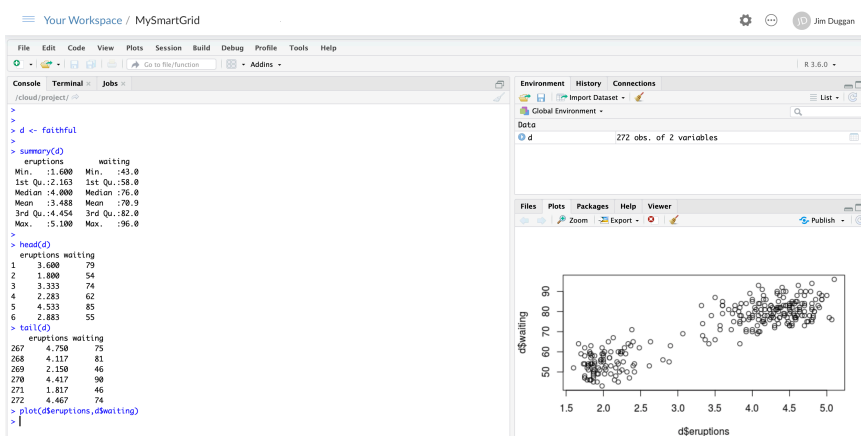
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(4) Run some R code in Console



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(5) Install required packages

The screenshot shows the RStudio Cloud interface. The 'Tools' menu is open, and 'Install Packages...' is selected. The console displays the R version (3.6.0) and a sine wave plot. The environment pane shows the current workspace with variables 'x' and 'y'.

```

R version 3.6.0 (2019-04-26) -- "Planting of a Tree"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> x <- 1:100
> y <- sin(x)
> plot(x,y,type = "l")
>
  
```



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(6) For example, ggplot2

The screenshot shows the RStudio Cloud interface with the 'Install Packages' dialog box open. The 'Packages' field contains 'ggplot2'. The console shows the same R version and sine wave plot as in the previous screenshot.

```

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```



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(7) Packages required

Package	Purpose
ggplot2	Produce graphics for data
dplyr	Analysis of data held in tibbles/data frames
aimsir17	2017 Weather data for Ireland
stringi	For manipulating strings



Challenge 1.1

- At the R Console, try it out as a calculator
- Try some classic equations
 - Convert miles to kilometers (use 1.6)
 - Convert Celsius to Fahrenheit ($9/5 C + 32$)
- Now, using the **<-** assignment operator to store your answer in a variable
- **Variables** are the names you give to *computer memory locations* which are used *to store values in a computer program*

