

1. Computer Systems - Course Overview

CT1100 - J. Duggan

CT1100 Overview

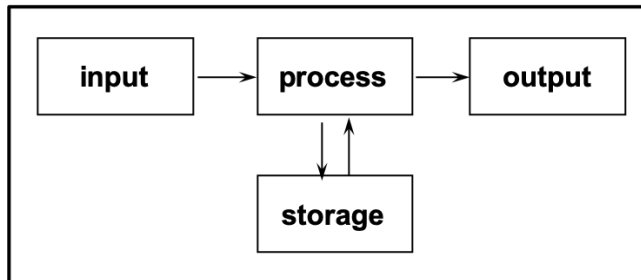
- Exploring the essential building blocks of the information age
- Semester 1 (J. Duggan)
 - Data
 - Hardware
- Semester 2 (M. Rezaei)
 - Software
 - Networks
- Module Information
 - Compulsory for all first year BA students taking IT as a subject
 - Labs from week 4 (1 hour per week, 3 time slots)
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

Overall Plan (Semester 1)

Lecture(s)	Topic
1	Course Introduction
2	The Processing Cycle and Binary Data
3	Data in R with Atomic Vectors
4	The CRAN Library and Calling Functions in R
5	Tidy Data and Data Frames
6-7	ggplot2 - A Grammar of Graphics
8-10	dplyr2 - The Grammar of Data Manipulation
11-12	Introduction to Hardware

The Processing Cycle in Computing

- Input, Process, Output key stages in computing
- Image recognition
 - Input (a photo)
 - Process (an algorithm)
 - Output (a name)



Sample Input Data (Match Events)

Time	Team	Scorer	From	Type	Points	Score
1	Dublin	Paul Mannion	Play	Point	1	1
2	Kerry	Sean O'Shea	Play	Point	1	1
3	Dublin	Dean Rock	Play	Point	1	2
4	Dublin	Dean Rock	Free	Point	1	3
10	Kerry	David Clifford	Play	Point	1	2
13	Kerry	Sean O'Shea	FortyFive	Point	1	3
14	Kerry	Stephen O'Brien	Play	Point	1	4
16	Dublin	Paul Mannion	Play	Point	1	4
18	Kerry	Sean O'Shea	Free	Point	1	5
19	Dublin	Jack McCaffrey	Play	Goal	3	7

Processing - Summarising the Data

```
## # A tibble: 10 x 3
## # Groups:   Team [2]
##   Team    Scorer      Points
##   <chr>  <chr>      <dbl>
## 1 Dublin Dean Rock          10
## 2 Dublin Jack McCaffrey       6
## 3 Dublin Paul Mannion         2
## 4 Dublin Con O'Callaghan      1
## 5 Kerry  Sean O'Shea          10
## 6 Kerry  Killian Spillane       4
## 7 Kerry  David Clifford         2
## 8 Kerry  Gavin Crowley          1
## 9 Kerry  Stephen O'Brien        1
## 10 Kerry Tommy Walsh            1
```

Processing - Analysing the Scores

```
## # A tibble: 6 x 3
## # Groups:   Team [2]
##   Team    From      Points
##   <chr>  <chr>      <dbl>
## 1 Dublin Play          12
## 2 Dublin Free           6
## 3 Dublin FortyFive      1
## 4 Kerry  Play          12
## 5 Kerry  Free           4
## 6 Kerry  FortyFive       3
```

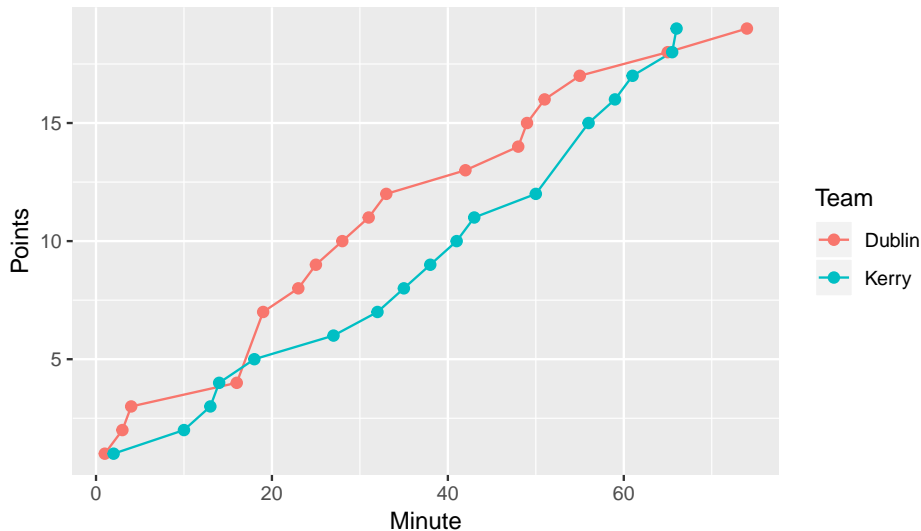
Processing - Before the 34th Minute

```
## # A tibble: 6 x 3
## # Groups:   Team [2]
##   Team    From      Points
##   <chr>  <chr>      <dbl>
## 1 Dublin Play          8
## 2 Dublin Free          3
## 3 Dublin FortyFive     1
## 4 Kerry  Free          3
## 5 Kerry  Play          3
## 6 Kerry  FortyFive     1
```


Processing - After the 34th Minute

```
## # A tibble: 5 x 3
## # Groups:   Team [2]
##   Team    From      Points
##   <chr> <chr>      <dbl>
## 1 Dublin Play          4
## 2 Dublin Free          3
## 3 Kerry  Play          9
## 4 Kerry  FortyFive       2
## 5 Kerry  Free           1
```

Processing - Visualising the Data



Data processing in R

```
x <- c(3, 4, 5, 6, 7)
x
```

```
## [1] 3 4 5 6 7
```

```
x[1:2]
```

```
## [1] 3 4
```

```
sum(x)
```

```
## [1] 25
```

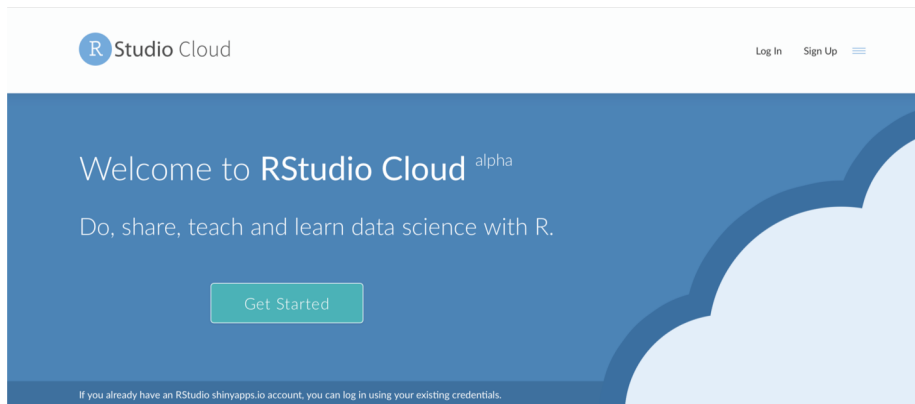
```
mean(x)
```

```
## [1] 5
```

```
x > 5
```

```
## [1] FALSE FALSE FALSE  TRUE  TRUE
```

Setup an Account on rstudio.cloud



Create a project

The screenshot displays the RStudio Cloud web interface. On the left is a sidebar with the 'Studio Cloud' logo and navigation links: 'Spaces' (with 'Your Workspace' selected), '+ New Space', 'Learn' (with links to 'Guide', 'What's New', 'Primers', 'Cheat Sheets', and 'Feedback and Questions'), and 'Info' (with 'Terms and Conditions'). The main content area is titled 'Your Workspace' and has tabs for 'Projects' (active) and 'Info'. Below the 'Your Projects' heading, a large grey box contains the text 'No Projects'. A 'New Project' button with a dropdown arrow is visible, and its menu is open, showing two options: '+ New Project' and 'New Project from Git Repo'. On the right side, there is an 'Options' panel with a search bar labeled 'Search Projects', a 'Sort Projects' section with radio buttons for 'By name' (selected) and 'By date created', and a 'Capacity' section explaining that the personal workspace allows for a virtually unlimited number of projects. A link to learn more about the workspace is also present. The top right corner shows a trash icon and the user's profile 'JD Jim Duggan'.

RStudio ready for use

The screenshot displays the RStudio Cloud interface for a workspace named "CT1100 Workspace / Project 101". The user is logged in as "Jim Duggan".

Left Sidebar (Navigation):

- Spaces
 - Your Workspace
 - CT1100 Workspace**
 - New Space
- Learn
 - Guide
 - What's New
 - Primers
 - Cheat Sheets
 - Feedback and Questions
- Info
 - Terms and Conditions
 - System Status

Main Editor Area:

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

Console: /cloud/project/

```
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 'licence()' 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.

> |
```

Environment Pane: Environment History Connections

Global Environment

Environment is empty

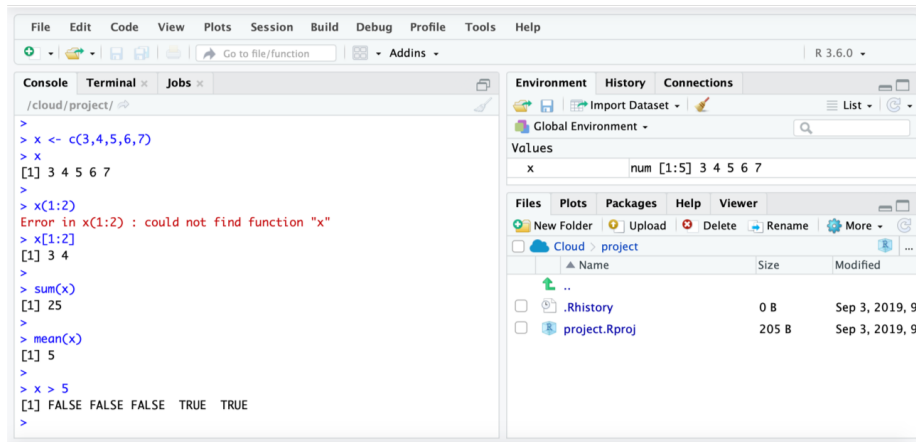
Files Pane: Files Plots Packages Help Viewer

New Folder Upload Delete Rename More

Name	Size	Modified
..		
.Rhistory	0 B	Sep 3, 2019, 9:20 AM
project.Rproj	205 B	Sep 3, 2019, 9:20 AM

Run code in console.

- `x` is data!
- R allows you process the data with function calls



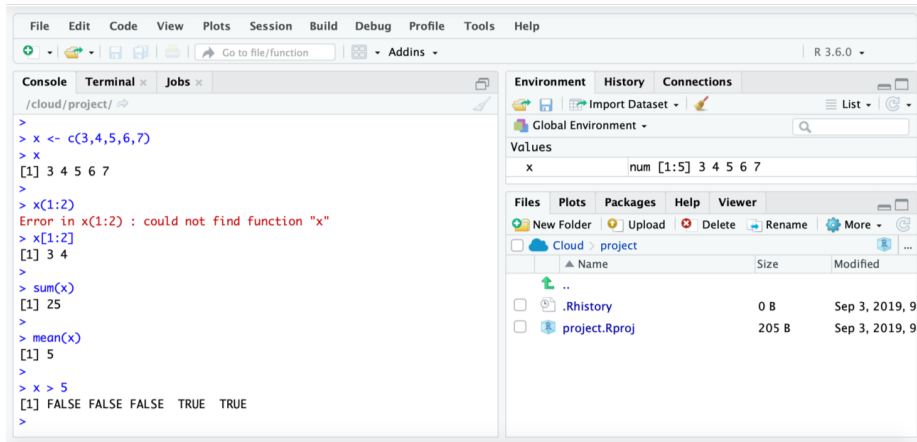
The screenshot displays the RStudio IDE interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The top right corner shows the R version as 3.6.0. The left pane is divided into three tabs: Console, Terminal, and Jobs. The Console tab is active, showing the following R code and output:

```
>
> x <- c(3,4,5,6,7)
> x
[1] 3 4 5 6 7
>
> x(1:2)
Error in x(1:2) : could not find function "x"
> x[1:2]
[1] 3 4
>
> sum(x)
[1] 25
>
> mean(x)
[1] 5
>
> x > 5
[1] FALSE FALSE FALSE TRUE TRUE
>
```

The right pane is divided into three tabs: Environment, History, and Connections. The Environment tab is active, showing the Global Environment. The Values section displays the variable `x` with the value `num [1:5] 3 4 5 6 7`. Below the Environment tab is the Files pane, which shows the project structure. The Files pane has tabs for Files, Plots, Packages, Help, and Viewer. The Files tab is active, showing a tree view of the project files:

	Name	Size	Modified
<input type="checkbox"/>	..		
<input type="checkbox"/>	.Rhistory	0 B	Sep 3, 2019, 9
<input type="checkbox"/>	project.Rproj	205 B	Sep 3, 2019, 9

Challenge 1.1 - Replicate the following in RStudio Cloud



The screenshot displays the RStudio Cloud interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for creating a new file, opening a file, saving, and other standard file operations. The main workspace is divided into three panes: Console, Environment, and Files.

Console Pane: Shows the following R code and output:

```
>
> x <- c(3,4,5,6,7)
> x
[1] 3 4 5 6 7
>
> x[1:2]
Error in x[1:2] : could not find function "x"
> x[1:2]
[1] 3 4
>
> sum(x)
[1] 25
>
> mean(x)
[1] 5
>
> x > 5
[1] FALSE FALSE FALSE TRUE TRUE
>
```

Environment Pane: Shows the Global Environment with a search bar. The Values section displays the variable `x` as a numeric vector of length 5, with values 3, 4, 5, 6, and 7.

Files Pane: Shows the file structure of the project. It includes a table with columns for Name, Size, and Modified:

	Name	Size	Modified
<input type="checkbox"/>	..		
<input type="checkbox"/>	.Rhistory	0 B	Sep 3, 2019, 9
<input type="checkbox"/>	project.Rproj	205 B	Sep 3, 2019, 9

Summary

- Welcome to CT1100
- Semester 1
 - Practical focus - understanding and manipulating data
 - Using RStudio Cloud
- Next Week
 - Input - Process - Output
 - Binary data
 - More on R (atomic vectors)