Lecture 1A
R Fundamentals

Stats 20 Spring 2020 Prof. Lew

What is R?

- **Declarative** - programming is about expressing what you want — but not necessarily expressing how it is to be done
  - A functional expression language with a simple syntax
    - Relatively easy to learn and to read

- A free software environment for Statistical computing

- A globally based and cooperative endeavor originally based out of New Zealand
  - Website is CRAN

Examine the RStudio IDE Cheatsheet
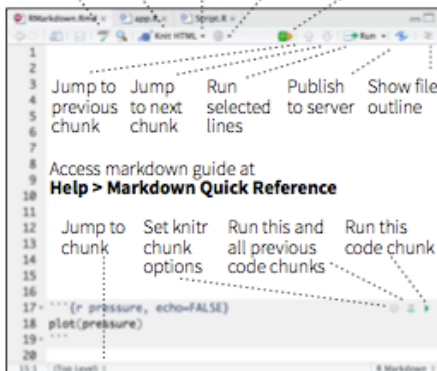
RStudio IDE : : **CHEAT SHEET**
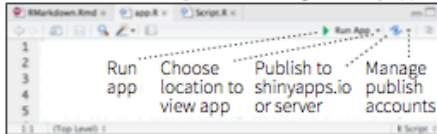
Documents and Apps

Open Shiny, R Markdown, knitr, Sweave, LaTeX, .Rd files and more in Source Pane

Check spelling
Render output
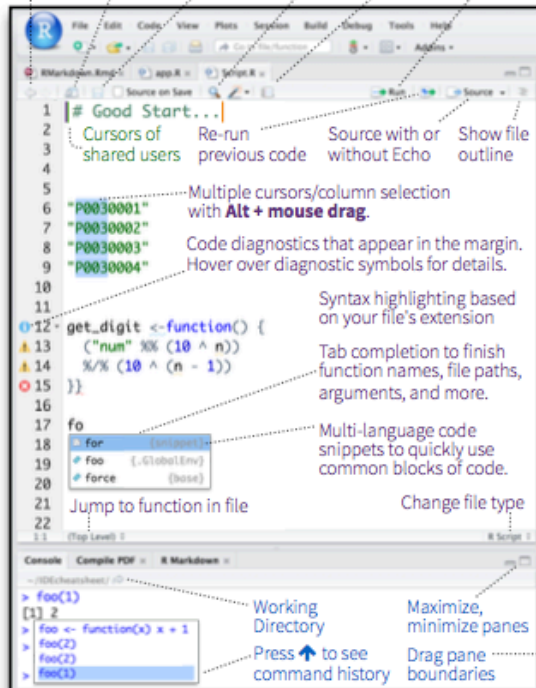Choose output format
Choose output location
Insert code chunk

Jump to previous chunk
Jump to next chunk
Run selected lines
Publish to server
Show file outline

Access markdown guide at
Help > Markdown Quick Reference

Jump to chunk
Set knitr chunk options
Run this and all previous code chunks
Run this code chunk

```
17 ```{r pressure, echo=FALSE}
18 plot(pressure)
19 ```
```

RStudio recognizes that files named **app.R, server.R, ui.R,** and **global.R** belong to a shiny app

Run app
Choose location to view app
Publish to shinyapps.io or server
Manage publish accounts

Write Code

Navigate tabs
Open in new window
Save
Find and replace
Compile as notebook
Run selected code

```
1 # Good Start...
```

Cursors of shared users
Re-run previous code
Source with or without Echo
Show file outline

```
6 "P0030001"
7 "P0030002"
8 "P0030003"
9 "P0030004"
```

Multiple cursors/column selection with **Alt + mouse drag**.

Code diagnostics that appear in the margin. Hover over diagnostic symbols for details.

```
12 get_digit <-function() {
13   ("num" %% (10 ^ n))
14   %/% (10 ^ (n - 1))
15 }}
```

Syntax highlighting based on your file's extension

Tab completion to finish function names, file paths, arguments, and more.

```
17 fo
18   for
19   foo    {.GlobalEnv}
20   force  {base}
```

Multi-language code snippets to quickly use common blocks of code.

Jump to function in file

Change file type

Working Directory
Maximize, minimize panes

```
> foo(1)
[1] 2
> foo <- function(x) x + 1
> foo(2)
> foo(2)
> foo(1)
```
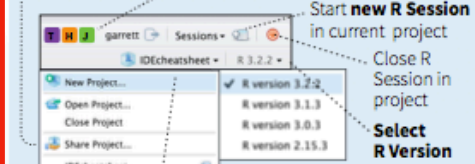
Press ↑ to see command history
Drag pane boundaries

R Support

Import data with wizard
History of past commands to run/copy
Display .RPres slideshows
File > New   File > R Presentation

Load workspace
Save workspace
Delete all saved objects
Search inside environment

Choose environment to display from list of parent environments
Display objects as list or grid

```
Data
 iris          150 obs. of 5 variables
Values
 a             1
Functions
 foo           function (x)
```

Displays saved objects by type with short description
View in data viewer
View function source code

Files   Plots   Packages   Help   Viewer

Create folder
Upload file
Delete file
Rename file

Copy...
Move...
Export...
Set As Working Directory
Go To Working Directory

Change directory

Path to displayed directory

hello.R   19 B   Apr 13, 2016, 11:17 AM

A File browser keyed to your working directory. Click on file or directory name to open.
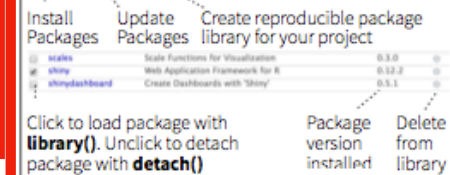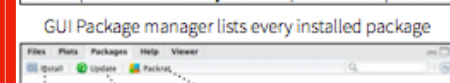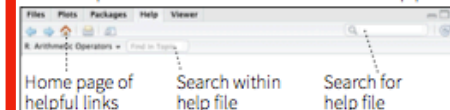
Debug Mode

Open with **debug(), browser(),** or a breakpoint. RStudio will open the debugger mode when it encounters a breakpoint while executing code.

Click next to line number to add/remove a breakpoint.

Launch debugger mode from origin of error
Open traceback to examine the functions that R called before the error occurred

```
> foo()
Error in get_digit(num, x)...:
Error!
```

Show Traceback
Rerun with Debug

Highlighted line shows where execution has paused

```
Console  ~/IDEcheatsheet
   Next  ↵  ⇤  ▶ Continue  ■ Stop
```

Run commands in environment where execution has paused
Examine variables in executing environment
Select function in traceback to debug
Step through code one line at a time
Step into and out of functions to run
Resume execution
Quit debug mode

Version Control with Git or SVN

Turn on at **Tools > Project Options > Git/SVN**

Stage files:
Show file diff
Commit staged files
Push/Pull to remote
View History

```
A  Added
D  Deleted
M  Modified
R  Renamed
?  Untracked
```

Open shell to type commands

Revert...
Ignore...
Shell...

current branch
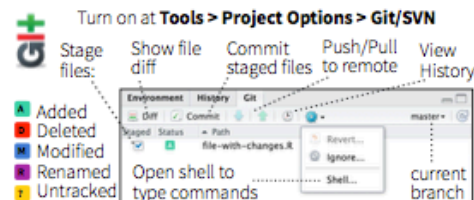
Package Writing

File > New Project > New Directory > R Package

Turn project into package, Enable roxygen documentation with **Tools > Project Options > Build Tools**

Roxygen guide at
Help > Roxygen Quick Reference

RStudio

RStudio IDE : : CHEAT SHEET

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- Check spelling
- Render output
- Choose output format
- Choose output location
- Insert code chunk

- Jump to previous chunk
- Jump to next chunk
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- Run this and all previous code chunks
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```
17 - ```{r pressure, echo=FALSE}
18   plot(pressure)
19 - ```
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RStudio recognizes that files named **app.R**, **server.R**, **ui.R**, and **global.R** belong to a shiny app

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Write Code

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- Find and replace
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```
1   # Good Start...
2
3
4
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9   "P0030004"
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12 - get_digit <- function() {
13     ("num" %% (10 ^ n))
14     %/% (10 ^ (n - 1))
15   }}
16
17   fo
18     for      {snippet}
19     foo      {.GlobalEnv}
20     force    {base}
21
22
```

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- Source with or without Echo
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Syntax highlighting based on your file's extension

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Multi-language code snippets to quickly use common blocks of code.

Jump to function in file

Change file type

```
Console  Compile PDF  R Markdown
~/IDEcheatsheet/
> foo(1)
[1] 2
> foo <- function(x) x + 1
  foo(2)
  foo(2)
> foo(1)
```

- Working Directory
- Maximize, minimize panes
- Press ↑ to see command history
- Drag pane boundaries

R Support

- **Import data** with wizard
- History of past commands to run/copy
- Display .RP... **File > New R Presenta...**

```
Environment  History  Build  Git  Presentation
Import Dataset
Global Environment
```

- Load workspace
- Save workspace
- Delete all saved objects
- Sear... envi...

Choose environment to display from list of parent environments

```
Data
 iris        150 obs. of 5 variables
Values
 a           1
Functions
 foo         function (x)
```

Displays saved objects by type with short description

View in data viewer

```
Files  Plots  Packages  Help  Viewer
New Folder  Upload  Delete  Rename  More
Home  IDEcheatsheet
   Name
                                    Copy...
                                    Move...
                                    Export...
                                    Set As Working D...
                                    Go To Working D...
```

- Create folder
- Upload file
- Delete file
- Rename file

Path to displayed directory

hello.R   19 B   Apr

A File browser keyed to your working directory. Click on file or directory name to open.

Debug Mode

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- Launch debugger mode from origin of error
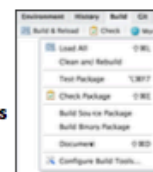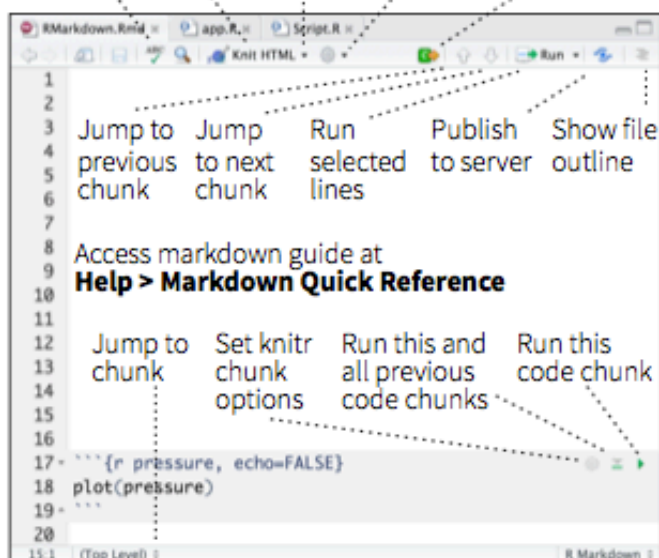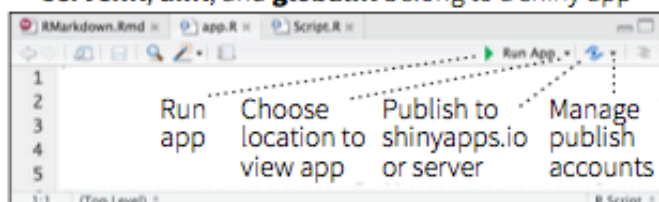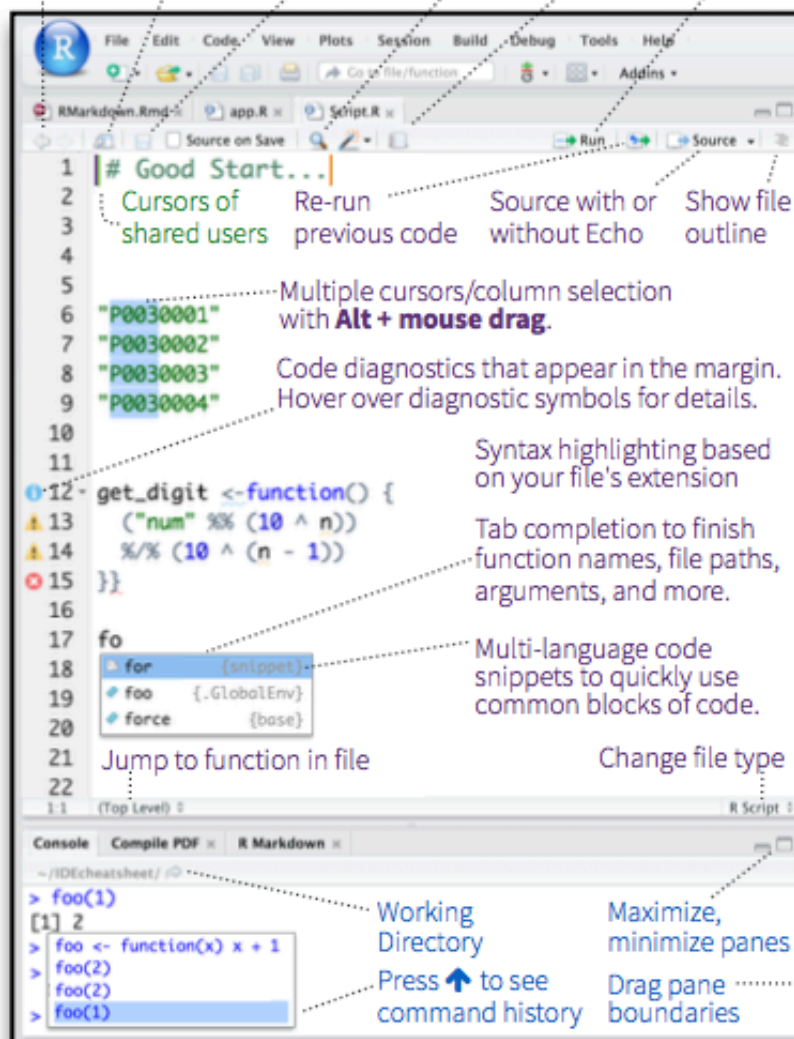- Open traceback to examine the functions that R called before the error occurred

Version Control with Git

Turn on at **Tools > Project Options > G...**

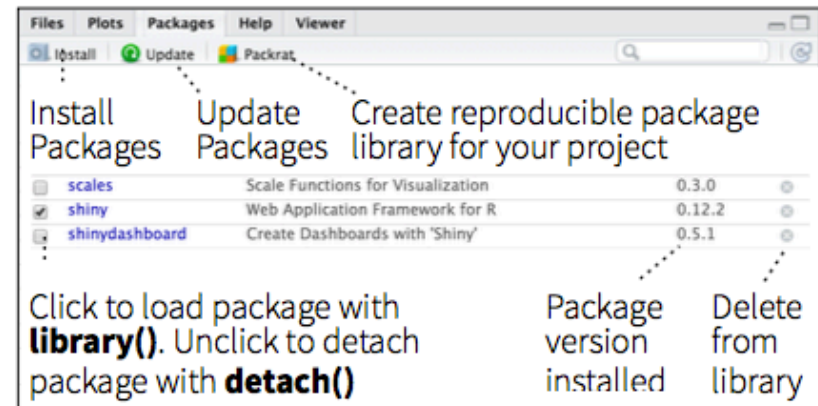- Stage files:
- Show file diff
- Commit staged files
- Push/P... to remo...
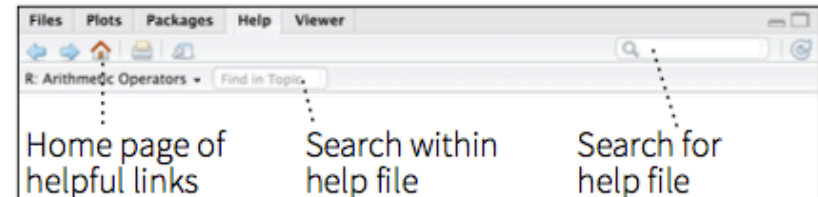
Additional Panes

- Plot
- Packages
- Help
- Viewer
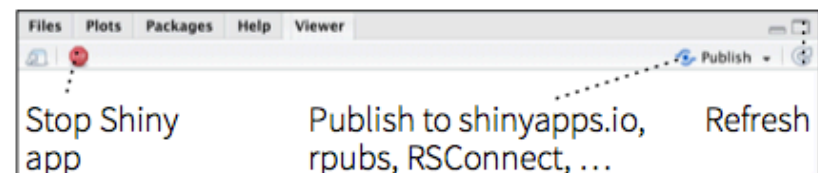
RStudio opens plots in a dedicated Plots pane

| Files | Plots | Packages | Help | Viewer |

Navigate recent plots · Open in window · **Export plot** · Delete plot · Delete all plots

GUI Package manager lists every installed package

| Files | Plots | Packages | Help | Viewer |

Install Packages · Update Packages · Create reproducible package library for your project

	scales	Scale Functions for Visualization	0.3.0
✓	shiny	Web Application Framework for R	0.12.2
	shinydashboard	Create Dashboards with 'Shiny'	0.5.1

Click to load package with **library()**. Unclick to detach package with **detach()** · Package version installed · Delete from library

RStudio opens documentation in a dedicated Help pane

| Files | Plots | Packages | Help | Viewer |

R: Arithmetic Operators ▾ | Find in Topic

Home page of helpful links · Search within help file · Search for help file

Viewer Pane displays HTML content, such as Shiny apps, RMarkdown reports, and interactive visualizations

| Files | Plots | Packages | Help | Viewer |

Stop Shiny app · Publish to shinyapps.io, rpubs, RSConnect, … · Refresh

View(<data>) opens spreadsheet like view of data set

Filter				
	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
	All	All	All	All	All
1	5.1	3.5	1.4	0.2	setosa
2					
3					

Filter rows by value · Sort by · Search