

# uRProgramming

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Madison R user Group Meeting

# 1. Introduction

- Teaching to myself and others R programming.
- Approach R programming to similar to the programming languages used in software engineering.
- Benefits utilizing other auxiliary tools.
- Disadvantages of not using modular programming and software development tools.

# What is R

- Programming language mainly used for statistical programming
- Free to download and use
- Strong Contribution from user Community
- Relative to the other statistical programming
- Deficits, except CRAN there is no authority to verify the packages

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should be adopted when starting to build a new software system. The definition of the TIOBE index can be found [here](#).

Mar 2017	Mar 2016	Change	Programming Language	Ratings	Change
1	1		Java	16.384%	-4.14%
2	2		C	7.742%	-6.86%
3	3		C++	5.184%	-1.54%
4	4		C#	4.409%	+0.14%
5	5		Python	3.919%	-0.34%
6	7	▲	Visual Basic .NET	3.174%	+0.61%
7	6	▼	PHP	3.009%	+0.24%
8	8		JavaScript	2.667%	+0.33%
9	11	▲	Delphi/Object Pascal	2.544%	+0.54%
10	14	▲	Swift	2.268%	+0.68%
11	9	▼	Perl	2.261%	+0.01%
12	10	▼	Ruby	2.254%	+0.02%
13	12	▼	Assembly language	2.232%	+0.39%
14	16	▲	R	2.016%	+0.73%
15	13	▼	Visual Basic	2.008%	+0.33%
16	15	▼	Objective-C	1.997%	+0.54%
17	48	▲	Go	1.982%	+1.78%
18	18		MATLAB	1.854%	+0.66%

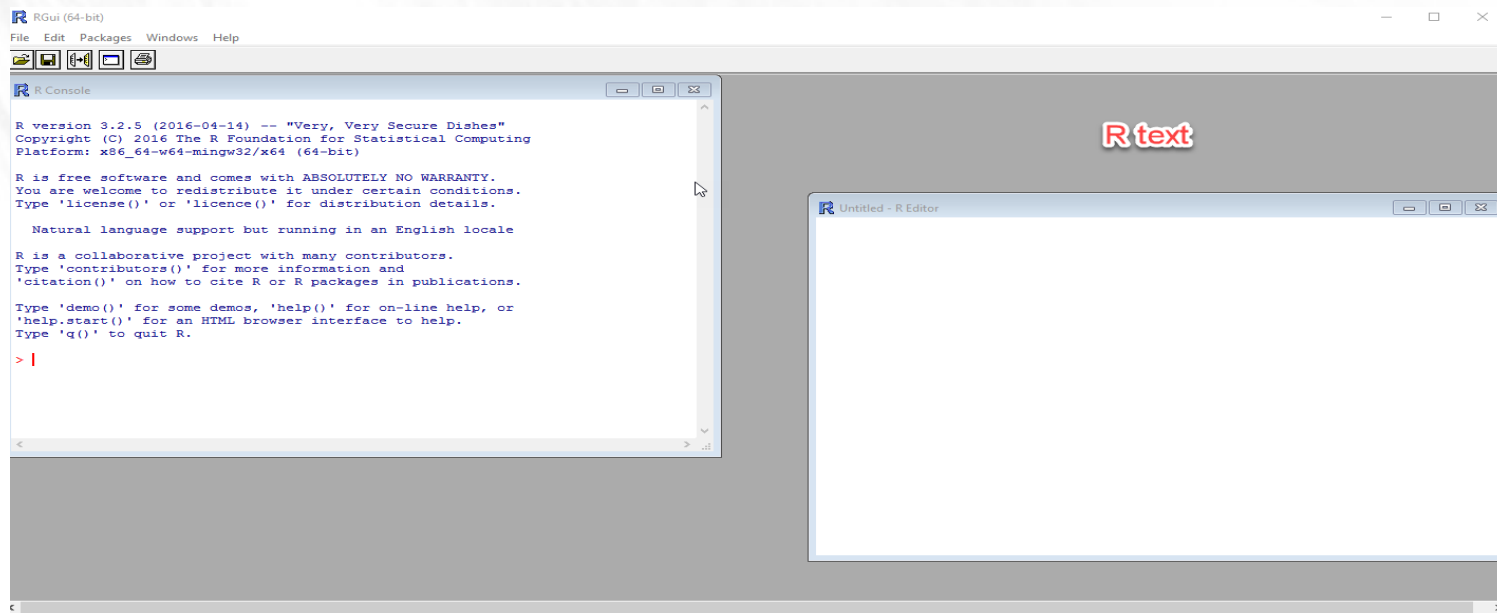
# R Distribution

- Linux
  - Debian
  - Ubuntu
- Windows
- Mac OS
- CRAN packages (over 10,000 packages)

<https://cran.r-project.org/web/packages/>

## 2 Environment Setup for R scripts

- Windows (once you installed R)
  - RGUI or R shell is available

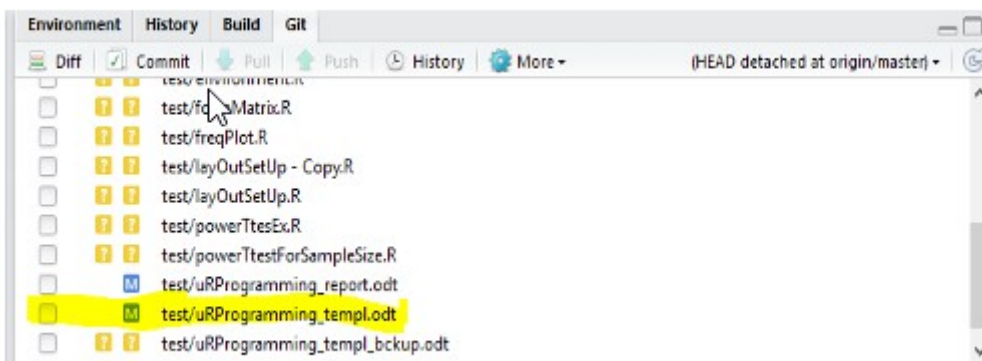


- Or use IDE like Rstudio or Microsoft R open

# How do you maintain the scripts

- Manually create different versions
- Or use version control common practice
  - Version control such as git, svn or commercial products
  - One way is to use graphical or command line interface
- Chapter II uRProgramming

- Git plugin Rstudio (live demo from R studio)





- Source tree (live demo)

The screenshot displays the SourceTree application window. The top menu bar includes File, Edit, View, Repository, Actions, Tools, and Help. Below the menu is a toolbar with icons for Clone/New, Commit, Push, Pull, Fetch, Branch, Merge, Stash, Discard, Tag, Git Flow, Terminal, Explorer, and Settings. The main workspace is divided into three panes. The left pane shows the 'r\_repo' repository with a file status section (Working Copy) and a branches section (graphic\_section\_added, master). The right pane shows a commit history table with columns: Graph, Description, Date, Author, and Commit. The table lists 14 commits, with the most recent one being 'Uncommitted changes' dated 4 Mar 2017 22:08. The commit history is ordered by date, with the oldest commit at the bottom.

Graph	Description	Date	Author	Commit
	<b>Uncommitted changes</b>	4 Mar 2017 22:08	*	*
○ graphic_section_added	more graph options added	28 Feb 2017 0:46	zekai otles <zekai c	a9832ec
	figure caption added	25 Feb 2017 9:33	zekai otles <zekai c	9510321
	minor delete not rquired library	25 Feb 2017 8:58	zekai otles <zekai c	0a234f2
	First time checkin	25 Feb 2017 8:57	zekai otles <zekai c	856db21
	update index table	22 Feb 2017 23:29	zekai otles <zekai c	6b44788
	firstTime checkin cor and covariance calcluculation	22 Feb 2017 0:27	zekai otles <zekai c	80f419a
	minor modification	20 Feb 2017 23:47	zekai otles <zekai c	28d1b88
	Code for random NumGen is completed.	20 Feb 2017 23:11	zekai otles <zekai c	d723c76
	firdt time check in to create functionalrandomm Number generator	18 Feb 2017 9:57	zekai otles <zekai c	a976565
	set.seed number is added	18 Feb 2017 2:34	zekai otles <zekai c	9f4eb00
	rnorm and runif section added	14 Feb 2017 20:49	zekai otles <zekai c	e9522ab
	updated for summary section added	12 Feb 2017 1:20	zekai otles <zekai c	acb767a
	imole stats modified	11 Feb 2017 11:25	zekai otles <zekai c	5c858dd

- Source tree (live demo)

The screenshot displays the SourceTree application interface. The top menu bar includes File, Edit, View, Repository, Actions, Tools, and Help. Below the menu is a toolbar with icons for Clone/New, Commit, Push, Pull, Fetch, Branch, Merge, Stash, Discard, and Tag. On the right side of the toolbar are icons for Git Flow, Terminal, Explorer, and Settings.

The main window is titled "r\_repo" and shows the file path "C:\Users\otles\OneDrive\Doc". The left sidebar contains a "FILE STATUS" section with "Working Cc" and "BRANCHES" section with "graphic\_section\_added" and "master". The "TAGS" section shows "origin". The "REMOTES" section shows "origin".

The central pane displays a commit history table with columns: Graph, Description, Date, Author, and Commit. The table shows a series of commits, with the most recent one highlighted in blue. The commit history includes a merge of the 'graphic\_section\_added' branch into the 'origin/master' branch.

The bottom pane shows the details of the selected commit (a5453eb). It includes the commit message, the author (LAPTOP-KG8AVOII\otles <otlesz@gmail.com>), the date (Monday, March 13, 2017 11:21:12 PM), and the labels (HEAD, -, graphic\_section\_added, origin/graphic\_section\_added). It also shows the merge branch 'graphic\_section\_added' of https://bitbucket.org/otles/r\_repo into graphic\_section\_added.

The bottom status bar includes buttons for File Status, Log / History, and Search.

Graph	Description	Date	Author	Commit
	Uncommitted changes	13 Mar 2017 23:29	*	*
	graphic_section_added	13 Mar 2017 23:21	LAPTOP-KG8AVOII\	a5453eb
	presentation added	13 Mar 2017 23:15	LAPTOP-KG8AVOII\	d5649a1
	after matplotlib added	9 Mar 2017 0:10	LAPTOP-KG8AVOII\	c751e4c
	first time addition to matplotlib	9 Mar 2017 0:00	LAPTOP-KG8AVOII\	fefebfe
	minor modification	6 Mar 2017 22:37	LAPTOP-KG8AVOII\	2a97206
	first time addition	5 Mar 2017 17:34	LAPTOP-KG8AVOII\	a0d5414
	first time addition	5 Mar 2017 17:19	LAPTOP-KG8AVOII\	7b9a61f
	stack bar are kind of working	5 Mar 2017 17:18	LAPTOP-KG8AVOII\	f8cd5c6
	Modified Box plot figure block	4 Mar 2017 23:14	LAPTOP-KG8AVOII\	ddea698
	Modified after adding bar plot example to the document.	4 Mar 2017 22:21	LAPTOP-KG8AVOII\	cd7ed22
	Modified after adding bar plot example to the document.	4 Mar 2017 22:17	zekai otles <zekai c	ab551a2
	more graph options added	28 Feb 2017 0:46	zekai otles <zekai c	a9832ec
	figure caption added	25 Feb 2017 9:33	zekai otles <zekai c	9510321

Commit: a5453eb9a82cbfb2537ac45545ec80d66b3c67df [a5453eb]  
Parents: d5649a1006, 7b9a61f9b7  
Author: LAPTOP-KG8AVOII\otles <otlesz@gmail.com>  
Date: Monday, March 13, 2017 11:21:12 PM  
Labels: HEAD, -, graphic\_section\_added, origin/graphic\_section\_added

Merge branch 'graphic\_section\_added' of https://bitbucket.org/otles/r\_repo into graphic\_section\_added

# Conflicts:  
# test/freqPlot.R

# Demo version control

- Use git with Rstudio
- Checkin
- Modify
- Pull
- Push

# Build R package

- Command line
- Build package from Rstudio

# Modular Programming

- In general, long scripts are pretty common
- Modularize the scripts using function
- Generalize the functions, so it can be used for multiple times
- Ex. Functions

### 3. Data types in R

- Logical
- Character
- Integer
- Double
- Complex
- Ex:

## 4. Conditional Statements

- If block
- If {} else {}
- Switch (modular if block)

```
switch("iki", bir = "bir", iki = "Two", uc = "uc")
```

```
[1] "Two"
```

## 5. Loop structures

Reaching elements by sequence

```
for (values in sequence) {  
statement  
}
```

Access of certain elements by controlling

```
while(expression){  
statement  
}
```



## 6. Data Structures

- Where the data stored
  - Database file (MySQL)
  - Flat data files (csv, excel files)

# Data Structures

- Data Frame
- Vector for atomic data types, such as integer
- Matrix (special two dimensional array storage)
- Array one to multi dimensional data storage
- List heterogeneous data storage

# 7. Simple Statistical Functions

- Simple Stats
- Normal Distribution
- Random Number Generation (seed)

## 8. Graphical Outputs

- Histogram
- Barplot
- Stack barplot
- Multiline xy plots

# Table Output

- Table
- as.table