

**Stevens Institute of Technology**

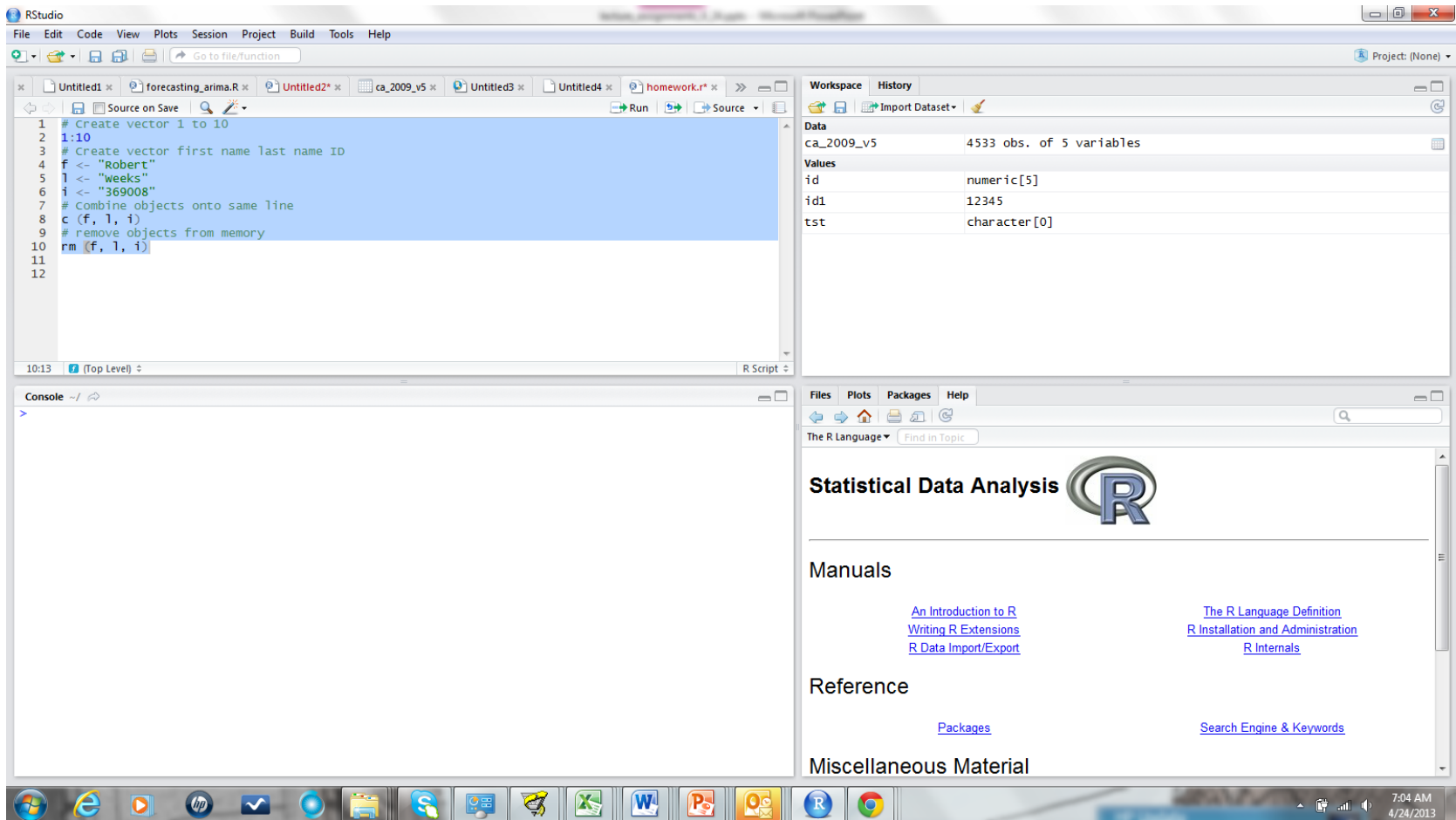
**Khasha Dehnad**

# R and R Studio Download

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

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

# Intro to R: R-Studio



# Intro to R Help

- **An Introduction to R**
- **Table of Contents**
- [An Introduction to R](#)
- [Preface](#)
- [1 Introduction and Preliminaries](#)
  - ▶ [1.1 The R Environment](#)
  - ▶ [1.2 Related Software and Documentation](#)
  - ▶ [1.3 R and Statistics](#)
  - ▶ [1.4 R and the Window System](#)
  - ▶ [1.5 Using R Interactively](#)

# Intro to R: Help

- Online Manuals
  - ▶ <http://127.0.0.1:40040/doc/html/index.html>
- Google

# Intro to R:

- R at heart is a FUNCTIONAL language
- Case sensitive -- A and a are different
- All alphanumeric symbols and ``.' , `_'`
- ``;'` is a separator

# Intro to R: Elements in R

- Simple Data Types
- Operators
- Vectors
- Functions
- List and Data Frame
- Expressions
- Packages and Libraries

# Intro to R: Simple data types

- Most Common SIMPLE data types in R:
  - ▶ Integer
  - ▶ Float
  - ▶ Double
  - ▶ Booleans
  - ▶ Characters
  - ▶ Complex
  - ▶ NA



# Intro to R: Comments

- ▶ `# this is a Line Comment`
- ▶ `# Course : My course`
- ▶ `# First Name : Khasha`
- ▶ `# Last Name : Dehnad`
- ▶ `# Id : 12345`

# Intro to R: Operators

- Default prompt

>

+

- Operators

+

-

\*

/

^

- Assignment operator

<-

= We use '=' for passing parameters or assigning names only

# Intro to R: Vector

- ▶ Vector is the simplest structure in R.
- ▶ The elements in a vector are the same data type.

# Intro to R: Some Vector Constructors

- `C()`
  - `x<-c(10,5,6,6,6,7)`
  - `y<-c('My First Name','My last Name')`
- `seq()` and `:`
  - `seq(1,4,0.5)`
  - `1:10`
- `rep()`
  - `> rep(5,10)`

# Intro to R: Help Functions

## ■ R Built-in Help Functions

- ▶ `>help(xxx)`
- ▶ `>?xxx`
- ▶ `>help.start()`
- ▶ `> example(xxx)`

# Intro to R: Functions

## Some vector and mathematical functions

<code>sort(x)</code>	Sort the elements of <code>x</code> .
<code>rev(x)</code>	Reverse the order of the elements of <code>x</code> .
<code>rank(x)</code>	Ranks of the elements of <code>x</code> .
<code>log(x,base)</code>	The logarithms of all elements of <code>x</code> in base <code>base</code> .
<code>exp(x)</code>	The exponentials of the elements of <code>x</code> .
<code>sqrt(x)</code>	The square roots of the elements of <code>x</code> .
<code>abs(x)</code>	The absolute value of the elements of <code>x</code> .
<code>round(x,n)</code>	Rounds all elements of <code>x</code> to <code>n</code> decimal places.
<code>cumsum(x)</code>	Returns a vector where the $i$ th element is the sum from $x[1]$ to $x[i]$ .
<code>cumprod(x)</code>	The same for the product.
<code>match(x,s)</code>	Returns a vector with the same length as <code>x</code> , with the elements of <code>x</code> that are contained in <code>s</code> . The ones that do not belong to <code>s</code> have the value NA.
<code>union(x,y)</code>	Returns a vector with the union of vectors <code>x</code> and <code>y</code> .
<code>intersect(x,y)</code>	Returns a vector with the intersection of vectors <code>x</code> and <code>y</code> .
<code>setdiff(x,y)</code>	Returns a vector resulting from removing the elements of <code>y</code> from <code>x</code> .
<code>is.element(x,y)</code>	Return TRUE if <code>x</code> is contained in vector <code>y</code> .
<code>choose(n,k)</code>	Calculates the number of combinations of <code>k</code> <code>n</code> to <code>n</code> .

# Intro to R: Functions

## Some basic statistics

<code>sum(x)</code>	Sum of the elements of <code>x</code> .
<code>max(x)</code>	Largest value of the elements in <code>x</code> .
<code>min(x)</code>	Smallest value of the elements in <code>x</code> .
<code>which.max(x)</code>	The index of the largest value in <code>x</code> .
<code>which.min(x)</code>	The index of the smallest value in <code>x</code> .
<code>range(x)</code>	The range of values in <code>x</code> (has the same result as <code>c(min(x),max(x))</code> ).
<code>length(x)</code>	The number of elements of <code>x</code> .
<code>mean(x)</code>	The mean value of the elements of <code>x</code> .
<code>median(x)</code>	The median value of the elements of <code>x</code> .
<code>sd(x)</code>	The standard deviation of the elements of <code>x</code> .
<code>var(x)</code>	The variance of the elements of <code>x</code> .
<code>quantile(x)</code>	The quantiles of <code>x</code> .
<code>scale(x)</code>	Standardizes the elements of <code>x</code> , <i>i.e.</i> subtracts the mean and divides by the standard deviation. Results in a vector with zero mean and unit standard deviation. Also works with data frames (column-wise and only with numeric data!).

# Intro to R : Vector Recycling Rule

■ **>1:2+1:4**

$$\begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 1 \\ 2 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \\ 4 \\ 6 \end{bmatrix}$$

■ **>1:4+1:7**

$$\begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{bmatrix} = \begin{bmatrix} 2 \\ 4 \\ 6 \\ 8 \\ 6 \\ 8 \\ 10 \end{bmatrix}$$



# Intro to R: Managing the environment

- ▶ `mode()`
- ▶ `length()`
- ▶ `ls()`
- ▶ `library()`
- ▶ `installed.packages()`
- ▶ `rm ()`
- ▶ `setdiff()`



# Intro to R: List

- Lists consist of an ordered collection of other objects known as its components.
- These components do not need to be of the same type, mode or length

```
my.lst <- list(stud.id=34453, stud.name="John",  
stud.marks=c(14.3,12,15,19))
```

# Intro to R : Dataframe

- Dataframe is a list of vectors of equal length

```
my.dataset <- data.frame(site=c('A','B','A','A','B'),  
season=c('Winter','Summer','Summer','Spring','Fall'),  
pH = c(7.4,6.3,8.6,7.2,8.9))
```

```
my.dataset <-  
read.table("path",Header=T,sep=' /t')
```

```
my.dataset<-  
read.csv("http://www.math.smith.edu/sasr/data  
sets/help.csv")
```