White board

Working With R

By:

Sandesh G

AGENDA - DAY 2

R objects

Matrices

Lists

Useful Functions

R objects - Matrices

Matrix

2D array of data elements

One atomic data type

Creating a matrix

matrix(values, attributes)

Ex: matA <- matrix(1:9,nrow=3,ncol=3)
matA <-matrix(1:9,nrow=3,ncol=3,byrow=T)
matA <-matrix(c(1,3,2,4),nrow=2,ncol=2)

Recycling in a Matrix

```
> matrix(1:3, nrow = 2, ncol = 3)
     [,1] [,2] [,3]
[1,]    1    3    2
[2,]    2    1    3
```

```
> matrix(1:4, nrow = 2, ncol = 3)
     [,1] [,2] [,3]
[1,]    1    3    1
[2,]    2    4    2

Warning message:
 In matrix(1:4, nrow = 2, ncol = 3)
 data length [4] is not a sub-multiple or multiple
 of the number of columns [3]
```

R objects - Matrices

cbind & rbind functions

```
> matA<-cbind(1:3, 1:3)
     [,1] [,2]
[1,]    1    1
[2,]    2    2
[3,]    3    3
> cbind(matA,2:4)
     [,1] [,2] [,3]
[1,]    1    1    2
[2,]    2    2    3
[3,]    3    3    4
```

```
> matA<-rbind(1:3, 1:3)
     [,1] [,2] [,3]
[1,]    1    2    3
[2,]    1    2    3
> rbind(matA,2:4)
     [,1] [,2] [,3]
[1,]    1    2    3
[2,]    1    2    3
[3,]    2    3    4
```

R objects - Matrices

Naming a matrix

```
> colnames(matA)<-c(letters[1:2])
> rownames(matA)<-c(LETTERS[1:2]
> matA
   a  b
A  1  5
B  2  6
> colnames(matA)<-c('a','b')
> rownames(matA)<-c('A','B')
```

```
> m <- matrix(1:4, byrow = TRUE, nrow = 2,
dimnames = list(c("row1", "row2"), c("col1", "col2")))
> m
     col1 col2
row1    1    2
row2    3    4
```

R objects - Matrices

Sub-setting a Matrix

```
> m <- matrix(1:9, nrow = 3)
> m[1,3]                    #particular element
> m[3,2]
> m[,1]
> m[1,]
> m[2]
```

```
> m[2, c(2, 3)]             # multiple selections
> m[c(1, 2), c(2, 3)]
> m[c(1, 3), c(1, 2)]
```

```
> m[c(TRUE,FALSE), ]                    # by logical
> m[c(FALSE,FALSE,TRUE),c(TRUE,TRUE,FALSE)]
> m[FALSE,TRUE]   #Column names
> m[TRUE,FALSE]   #Row names
> m[F, c(T,F)]          #Selected Column names
> m[c(T,F),F]           #Selected Row names
```

```
> m["r1","c3" ]                 # by name
> m["r2", ]
> m[ ,"c3"]
> m[c("r2","r3"),c("c2")]
```

R objects - Matrices

Dimension of a matrix

```
> dim(m)
[1] 3  4
> matrix(m[,2])   #retaining dimension values
> m[ ,2,drop=FALSE]
> m[2, ,drop=FALSE]
```

Deleting a particular row/column

```
> m<- m[-1, ]          # Deleting with in a matrix
> m<- m[ ,-2]
> m<- m[-1,-2]
> m<- m[c(-1),c(-1,-2)]
```

R objects - Matrices

Matrix Calculus

```
> colSums(m)          #sum of Columns
> rowSums(m)          #sum of Rows
> nrow(m)             #Number of rows
> ncol(m)             #Number of columns
> rowMeans(m)         #Mean row wise
> colMeans(m)         # Mean Column wise
```

```
> m+1                 #Addition
> m-1                 #Subtraction
> m/2                 #Division
> m*2                 #Multiplication
> m%%3                #Modulus
> m**2                #Exponentiation
> m^2                 #Exponentiation
```

R objects - Matrices

Matrix Calculus

```
> diag(m)          #diagonal elements of matrix m
> diag(<num>)#Creates  <num>X<num> identity matrix
> m
      [,1]    [,2]    [,3]
[1,]    1       4       7
[2,]    2       5       8
[3,]    3       6       9
> m + c(1,2,3)
      [,1]    [,2]    [,3]
[1,]    2       5       8              #+1
[2,]    4       7      10              #+2
[3,]    6       9      12              #+3
```

Matrix-Matrix Calculus

```
> m+ diag(3)     #matrix addition
> m – m          #matrix subtraction
> m%*%m          # matrix multiplication
> m*m            # matrix multiplication element wise
```

R objects - Lists

Lists

- Comprises of different R objects
- No Coercion
- Loss of Some functionality

Creating Lists

list() function is used to create lists

```
>mylist <- list(1,'2',matA)  #matA is a matrix
[[1]]
[1]  1
[[2]]
[1]  "2"
[[3]]
      [,1]  [,2]  [,3]  [,4]  [,5]
[1,]     1     3     5     7     9
[2,]     2     4     6     8    10
```

R objects - Lists

Naming Lists

```
> names(mylist)<-c('num', 'char' , 'matrixA' )
> mylist                    #using names  function
$num
[1] 1
$char
[1] "2"
$matrixA
     [,1] [,2] [,3] [,4] [,5]
[1,]    1    3    5    7    9
[2,]    2    4    6    8   10
```

```
> mylist<-list(num=1,char='2',matrixA=matA)
>mylist                    #naming while declaration
$num
[1] 1
$char
[1] "2"
$matrixA
     [,1] [,2] [,3] [,4] [,5]
[1,]    1    3    5    7    9
[2,]    2    4    6    8   10
```

Useful Functions

```
seq(start ,end ,step_size)
```

```
sqrt(a)
```

```
rep(a, times)
```

```
plot(x,y,type='l',asp=T,xlab="X->",ylab="Y->",main="Title")
```

```
par(new=T, mfrow=c(1,2))
```

Q & A

Thank You