 Sardar Patel Institute of Technology,Mumbai

Department of Electronics and Telecommunication Engineering T.E. Sem-V (2018-2019)

ETL54 -Statistical Computational Laboratory

**Lab-6:Matrix Computation**

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**Objective:**To carry out matrix computation​

**Outcomes:**

To create vectors and matrices

To extract elements from a matrix

To use and describe the general information commands with respect to matrix.

To carry out matrix operations

To find the eigenvalues and eigenvectors

**System Requirements:** Ubuntu OS with R and RStudio installed​

**Introduction to Linear Algebra:**

Create vectors and matrices

>v=c(2,3,4,5,6,7)

>v

[1] 2 3 4 5 6 7

>a=matrix(c(2,3,4,5,6,7),3,2)

> a

[,1] [,2]

[1,] 2 5

[2,] 3 6

[3,] 4 7

Extract elements from the matrix

>a[2,2]

[1] 6

> a[2,] [1] 3 6 > a[,2]

[1] 5 6 7

List the general information commands used in R for matrix.

1.dimension

2.length

3.nrow

4.ncol

5.dimnames

>a=matrix(1:10,5,2)

|  |  |
| --- | --- |
| > a |  |
|  | [,1] [,2] |
| [1,] | 1 6 |
| [2,] | 2 7 |
| [3,] | 3 8 |
| [4,] | 4 9 |
| [5,] | 5 10 |

1.

> ​**dim(a)**

[1] 5 2

> dim(a)=c(2,5)

> a

[,1] [,2] [,3] [,4] [,5]

[1,] 1 3 5 7 9

[2,] 2 4 6 8 10

2.

>​ **length(a)**

[1] 10

3.

> ​**nrow(a)**

[1] 2

4.

> **ncol(a)**​

[1] 5

5.

> ​**dimnames(a)**

NULL

Matrix Operations

> A=matrix(c(1:5,11:14),3,3)

> B=matrix(1:9,3,3)

> A

|  |  |
| --- | --- |
|  | [,1] [,2] [,3] |
| [1,] | 1 4 12 |
| [2,] | 2 5 13 |
| [3,]    > B | 3 11 14 |
|  | [,1] [,2] [,3] |
| [1,] | 1 4 7 |
| [2,] | 2 5 8 |
| [3,] | 3 6 9 |

**ADDITION**

> A+B

[,1] [,2] [,3]

[1,] 2 8 19

[2,] 4 10 21

[3,] 6 17 23

**SUBTRACTION**

> A-B

[,1] [,2] [,3]

[1,] 0 0 5

[2,] 0 0 5

[3,] 0 5 5

**MULTIPLY TWO MATRICES** > A%\*%B

[,1] [,2] [,3]

[1,] 45 96 147

[2,] 51 111 171

[3,] 67 151 235

**MULTIPLY ELEMENTS OF MATRIX**

> A\*B

|  |  |
| --- | --- |
|  | [,1] [,2] [,3] |
| [1,] | 1 16 84 |
| [2,] | 4 25 104 |
| [3,] | 9 66 126 |

**TRANSPOSE**

> t(A\*B)

[,1] [,2] [,3]

[1,] 1 4 9

[2,] 16 25 66

[3,] 84 104 126

**EXTRACT DIAGONAL**

> diag(A)

[1] 1 5 14

**ASSIGN DIAGONAL**

> diag(diag(A))

[,1] [,2] [,3]

[1,] 1 0 0

[2,] 0 5 0

[3,] 0 0 14

**INVERSE**

> solve(A)

[,1] [,2] [,3]

[1,] -1.3272727 1.38181818 -0.14545455

[2,] 0.2000000 -0.40000000 0.20000000

[3,] 0.1272727 0.01818182 -0.05454545

Describe the importance of matrix computation.

A matrix is a way to express a linear map between finite-dimensional vector spaces, given a choice of bases for said spaces. Since linear maps are useful, matrices are obviously useful. Studying matrices and their properties is of crucial importance in trying to improve linear solvers efficiency. Recognizing that the matrix behaves a particular property might be crucial to develop a fast algorithm or even to prove that a solution exists.

Create matrix and compute eigenvalues and eigenvector in R.

> A <- as.matrix(data.frame(c(1,-1,0),c(1,2,1),c(-2,1,-1)))

> A

c.1...1..0. c.1..2..1. c..2..1...1.

[1,] 1 1 -2

[2,] -1 2 1

[3,] 0 1 -1

> e=eigen(A)

> e$values

[1] 2 1 -1

**Conclusion:**

1)We learned to create matrices and vectors also how to extract element from vectors or rows or columns from matrix using various commands.

2)We found out the eigenvalues and eigenvectors for the matrices .

3)we learned to find out inverse and transpose of a matrix.