Matrices in R: Takeaways

Syntax

CREATING A MATRIX

- Restructure a vector into a matrix using the matrix() function:

```
matrix_1 <- matrix(1:12, ncol = 4, nrow = 3)

matrix_2 <- matrix(1:12, ncol = 4)

matrix_3 <- matrix(1:12, nrow = 3)
```

- Combine Vectors or Matrices by Row

```
matrix_4 <- rbind(matrix_1, matrix_2)

matrix_5 <- rbind(vector_1, vector_2)

matrix_6 <- rbind(vector_1, matrix_1)
```

- Combine Vectors or Matrices by Column

```
matrix_7 <- cbind(matrix_1, matrix_2)

martix_8 <- cbind(vector_1, vector_2)

matrix_9 <- cbind(vector_1, matrix_1)
```

INDEXING MATRICES BY ELEMENT

- Extract a single element:

```
matrix[2, 5]

 matrix["Stanford","patents"]
```

- Extract multiple elements:

```
matrix[c(1,2),c(1,3)]

matrix[c("Harvard","Stanford"),c("world_rank","influence")]

matrix[tuition >= 45000, "patents"]
```

INDEXING MATRICES BY ROWS AND COLUMNS

- Extract a single row:

```
matrix[1,]

matrix["Harvard",]
```

- Extract a single column:

```
matrix[,2]

matrix[,"quality_of_education"]
```

- Extract multiple rows or columns:

```
matrix[,c("quality_of_education","influence","broad_impact")]

matrix[,c("2,3,4")]
```

CALCULATE THE SUM/MEAN OF VALUES IN A VECTOR OR MATRIX

- Sum/Mean of values in a vector:

```
sum(vector)

     mean(vector)
```

- Sum/Mean of values in a matrix:

```
sum(matrix[,"column"])

 mean(matrix["row",])
```

- Sum/Mean of values in a matrix by column:

```
colSums(matrix)

 colMeans(matrix)
```

- Sum/Mean of values in a matrix by row:

```
rowSums(matrix)

 rowMeans(matrix)
```

RANK VALUES OF A VECTOR OR SUBSET OF A MATRIX

- Rank values of a vector:

```
rank(vector)
```

- Rank values of a matrix:

```
rank(matrix[,"column"])

rank(matrix["row",])
```

NAMING MATRIX ROWS AND COLUMNS

- Assign name attributes to rows of a matrix:

```
rownames(matrix) <- vector_row_names
```

- Assign name attributes to columns of a matrix:

```
colnames(matrix) <- vector_column_names
```

REMOVING ROWS AND COLUMNS FROM A MATRIX

- Removing a single element:

```
matrix[-1, -2]
```

- Removing multiple elements:

```
matrix[c(-2, -5, -7), ]
```

Concepts

- In this course we will learn the following data structures:
    - Vector: one-dimensional structure for storing values of SAME TYPE.
    - **Matrix: two-dimensional structure for storing values of SAME TYPE.**
    - Lists: multi-dimensional stucture for storing values of ANY DATA TYPE/OBJECT.
    - Dataframe: multi-dimensional structure for storing values of ANY DATA TYPE/OBJECT like datasets.

- R is a **1-indexed** programming language, which means that the first element in a matrix is assigned a position of one.

- How to combine vectors or matrices in R.

- How to aggregate elements by columns/rows in R over a two-dimensional data structure.

Resources

- Documentation on indexing matrices in R