Actividad 1.1 Matrices y Estadística

Franco Mendoza Muraira A01383399

2023-10-31

Problema 1

```
A = matrix(c(2,4,-3,0,-2,5,9,0,6),nrow=3,ncol=3,byrow=TRUE)
B= matrix(c(8,6,-2,-7,9,-5,-3,5,1),nrow=3,ncol = 3,byrow=TRUE)
```

```
A
```

Matriz A:

```
##      [,1] [,2] [,3]
## [1,]    2    4   -3
## [2,]    0   -2    5
## [3,]    9    0    6
```

```
B
```

Matriz B:

```
##      [,1] [,2] [,3]
## [1,]    8    6   -2
## [2,]   -7    9   -5
## [3,]   -3    5    1
```

Operaciones con las matrices

```
# A+B =
A+B
```

```
##      [,1] [,2] [,3]
## [1,]   10   10   -5
## [2,]   -7    7    0
## [3,]    6    5    7
```

```r
# 4A+3B=
4*A+3*B
```

```
##      [,1] [,2] [,3]
## [1,]   32   34  -18
## [2,]  -21   19    5
## [3,]   27   15   27
```

```r
# A' =
t(A)
```

```
##      [,1] [,2] [,3]
## [1,]    2    0    9
## [2,]    4   -2    0
## [3,]   -3    5    6
```

```r
# A^-1
solve(A)
```

```
##            [,1]       [,2]        [,3]
## [1,] -0.1176471 -0.2352941  0.13725490
## [2,]  0.4411765  0.3823529 -0.09803922
## [3,]  0.1764706  0.3529412 -0.03921569
```

```r
# Determinante de A:
det(A)
```

```
## [1] 102
```

```r
# Determinante de la transpuesta de A:
det(t(A))
```

```
## [1] 102
```

Problema 2

```r
A = matrix(c(2,1,3,-3,3,0,-2,-1,4,5,0,-5),nrow=3,ncol=4,byrow = TRUE)
B= matrix(c(4,-3,5,8,2,1,-2,0),nrow=4,ncol=2)
```

```r
A
```

Matriz A:

```
##      [,1] [,2] [,3] [,4]
## [1,]    2    1    3   -3
## [2,]    3    0   -2   -1
## [3,]    4    5    0   -5
```

```
B
```

Matriz B:

```
##      [,1] [,2]
## [1,]    4    2
## [2,]   -3    1
## [3,]    5   -2
## [4,]    8    0
```

Operaciones con las matrices

```
# A*B
A%*%B
```

```
##      [,1] [,2]
## [1,]   -4   -1
## [2,]   -6   10
## [3,]  -39   13
```

Problema 3

```
df=read.csv(file="mcdonaldsmenu.csv")
cuant_df = df[,c("Calories","Protein","Carbohydrates","Sugars")]
```

Vector de medias

```
colMeans(cuant_df)
```

Vector de medias usando funcion colMeans de R:

```
##      Calories       Protein Carbohydrates        Sugars
##     368.26923      13.33846      47.34615      29.42308
```

```
ones = rep(1,nrow(cuant_df))
print(t(cuant_df)%*%ones*1/nrow(cuant_df))
```

Vector de medias usando formula matriz de medias:

```
##                     [,1]
## Calories      368.26923
## Protein        13.33846
## Carbohydrates  47.34615
## Sugars         29.42308
```

Se puede ver que los 2 vectores son iguales. #### **Matriz de Varianzas y Covarianzas**

```
print(cov(cuant_df))
```

Varianza y Covarianza usando funcion cov de R:

```
##                Calories    Protein Carbohydrates     Sugars
## Calories      57729.618 2162.92397     5305.2153 1788.86249
## Protein        2162.924  130.55682      113.6700  -58.96614
## Carbohydrates  5305.215  113.67003      798.1886  617.71785
## Sugars         1788.862  -58.96614      617.7178  822.53074
```

```
mean_df = as.matrix(sweep(cuant_df,2,colMeans(cuant_df)))
print( 1/nrow(cuant_df)*(t(mean_df)%*%(mean_df)))
```

Varianza y Covarianza con formula matriz varianza covarianza:

```
##                Calories    Protein Carbohydrates     Sugars
## Calories      57507.581 2154.60503     5284.8107 1781.98225
## Protein        2154.605  130.05467      113.2328  -58.73935
## Carbohydrates  5284.811  113.23284      795.1186  615.34201
## Sugars         1781.982  -58.73935      615.3420  819.36716
```

Se ve que las 2 matrices son diferentes, esto debido a la manera que son calculadas, pero los numeros de ambas matrices siguen siendo parecidos.

Matriz de Correlacion

```
covar= diag(cov(cuant_df))
cor(cuant_df)
```

Matriz de correlacion con funcion cor de R:

```
##                Calories    Protein Carbohydrates     Sugars
## Calories      1.0000000  0.7878475     0.7815395  0.2595981
## Protein       0.7878475  1.0000000     0.3521222 -0.1799396
## Carbohydrates 0.7815395  0.3521222     1.0000000  0.7623621
## Sugars        0.2595981 -0.1799396     0.7623621  1.0000000
```

```r
print(solve(sqrt(diag(covar)))%*%cov(cuant_df)%*%solve(sqrt(diag(covar))))
```

Matriz de correlacion con formula matriz de correlacion:

```
##           [,1]       [,2]      [,3]       [,4]
## [1,] 1.0000000  0.7878475 0.7815395  0.2595981
## [2,] 0.7878475  1.0000000 0.3521222 -0.1799396
## [3,] 0.7815395  0.3521222 1.0000000  0.7623621
## [4,] 0.2595981 -0.1799396 0.7623621  1.0000000
```

Se puede ver que las matrices son iguales siendo calculadas asi. #### **Valores y vectores propios de la matriz de covarianzas y de la de correlación.**

```r
eigen(var(cuant_df))
```

Valores y vectores propios de la matriz de covarianzas:

```
## eigen() decomposition
## $values
## [1] 58358.79314  1064.01670    35.77019    22.31447
##
## $vectors
##            [,1]        [,2]        [,3]        [,4]
## [1,] 0.99454997  0.06898162  0.02250405  0.07486964
## [2,] 0.03709065  0.15035634  0.57430757 -0.80385824
## [3,] 0.09208044 -0.51436789 -0.64757390 -0.55461239
## [4,] 0.03187217 -0.84146312  0.50031233  0.20152309
```

```r
eigen(cor(cuant_df))
```

Valores y vectores propios de la matriz de correlacion:

```
## eigen() decomposition
## $values
## [1] 2.48572064 1.37092983 0.11855765 0.02479189
##
## $vectors
##            [,1]       [,2]       [,3]       [,4]
## [1,] -0.5925675  0.2588663 -0.4718910  0.5993087
## [2,] -0.4113906  0.6212940  0.6457310 -0.1666823
## [3,] -0.5928778 -0.2754607 -0.2927979 -0.6977727
## [4,] -0.3579351 -0.6863697  0.5240418  0.3551891
```

‘