Stat 415: Regression Classwork/Lab 7

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2022-07-18

## Problem 1 Matrix

X <- matrix(c(4,  
 1,  
 2,  
 3,  
 3,  
 4),ncol = 1, byrow = TRUE)  
  
X

## [,1]  
## [1,] 4  
## [2,] 1  
## [3,] 2  
## [4,] 3  
## [5,] 3  
## [6,] 4

Y <- matrix(c(16,  
 5,  
 10,  
 15,   
 13,   
 22),ncol = 1, byrow = TRUE)  
Y

## [,1]  
## [1,] 16  
## [2,] 5  
## [3,] 10  
## [4,] 15  
## [5,] 13  
## [6,] 22

## Y’Y

transposeY <- t(Y)  
transposeY%\*%Y

## [,1]  
## [1,] 1259

## X’X

transposeXs <- t(X)  
transposeXs%\*%X

## [,1]  
## [1,] 55

## X’Y

transposeXs <- t(X)  
transposeXs%\*%Y

## [,1]  
## [1,] 261

## Problem 2 Matrix

x <- matrix(c(1, 49,  
 1, 69,  
 1, 89,  
 1, 99,  
 1, 109),ncol = 2, byrow = TRUE)  
x

## [,1] [,2]  
## [1,] 1 49  
## [2,] 1 69  
## [3,] 1 89  
## [4,] 1 99  
## [5,] 1 109

y <- matrix(c(124,  
 95,  
 71,  
 45,   
 18), ncol = 1, byrow = TRUE)  
y

## [,1]  
## [1,] 124  
## [2,] 95  
## [3,] 71  
## [4,] 45  
## [5,] 18

## Linear Model’s Intercept and Slope

transposex <- t(x)  
transposex

## [,1] [,2] [,3] [,4] [,5]  
## [1,] 1 1 1 1 1  
## [2,] 49 69 89 99 109

product1 <- transposex%\*%x  
product1

## [,1] [,2]  
## [1,] 5 415  
## [2,] 415 36765

det(product1)

## [1] 11600

solve(product1)

## [,1] [,2]  
## [1,] 3.16939655 -0.0357758621  
## [2,] -0.03577586 0.0004310345

int <- solve(product1)%\*%transposex%\*%y  
int

## [,1]  
## [1,] 211.270690  
## [2,] -1.694828

## residuals

residuals\_xy <- y - x%\*%int  
residuals\_xy

## [,1]  
## [1,] -4.2241379  
## [2,] 0.6724138  
## [3,] 10.5689655  
## [4,] 1.5172414  
## [5,] -8.5344828

## Fitted values

fitted\_vals <- x%\*%int  
fitted\_vals

## [,1]  
## [1,] 128.22414  
## [2,] 94.32759  
## [3,] 60.43103  
## [4,] 43.48276  
## [5,] 26.53448

## Problem 3: Inverse of transpose equals transpose of inverse

A <- matrix(c(3, 2, 7,  
 6, 0, -1,  
 6, 2, 5), ncol = 3, byrow = TRUE)  
A

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

det(A) # Determinant does not equal 0

## [1] 18

transposeA <- t(A)  
inverseoftransposeA <- solve(transposeA)  
inverseoftransposeA

## [,1] [,2] [,3]  
## [1,] 0.1111111 -2.0 0.6666667  
## [2,] 0.2222222 -1.5 0.3333333  
## [3,] -0.1111111 2.5 -0.6666667

inverseA <- solve(A)  
transposeofInverseA <- t(inverseA)  
transposeofInverseA

## [,1] [,2] [,3]  
## [1,] 0.1111111 -2.0 0.6666667  
## [2,] 0.2222222 -1.5 0.3333333  
## [3,] -0.1111111 2.5 -0.6666667