MAT 4375

R commands

Vector and Matrix

- Create vectors

  a ← c(1:10) = (1,2,3,4,5,6,7,8,9,10)

  b ← sample(1:100, 5) = (11, 61, 35, 3, 82)

  c ← c(rep(1,2), rep(2,6)) = (1,1,2,2,2,2,2)

  d ← seq(1, 10, 2) = c(1,3,5,7,9)

- Create Matrices

  A ← matrix(c(1:12), nrow=3, ncol=4)

  $= \begin{pmatrix} 1 & 4 & 7 & 10 \\ 2 & 5 & 8 & 11 \\ 3 & 6 & 9 & 12 \end{pmatrix}$

  B ← rbind(c(1:5), c(6:10), c(11:15))

  $= \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \end{pmatrix}$

  C ← cbind(c(1:5), c(6:10), c(11:15))

  $= \begin{pmatrix} 1 & 6 & 11 \\ 2 & 7 & 12 \\ 3 & 8 & 13 \\ 4 & 9 & 14 \\ 5 & 10 & 15 \end{pmatrix}$

- Select rows and columns
  - A[1,] first row
  - A[,1] first column
  - A[1:5, 1:3] first 5 rows and 5 columns
  - A[, sample(1:q)] randomly selected columns
  - A[sample(1:p),] randomly selected rows

Elementary Matrix Operations

- Addition/Subtraction: A+B / A-B
- Multiplication: A %*% B
- A*B gives element by element multiplication
- c * A scalar multiplication
- Transpose: t(A)
- Diagonal: diag(A)
  - returns vector consisting of diagonal elements of A
  - if we do diag($\vec{a}$), $\vec{a}$ vector, then it returns a diagonal matrix with $\vec{a}$ as its diagonal vector
- lower.tri(A) returns true for all elements below the diagonal and false otherwise

  $\begin{pmatrix} \text{FALSE} & \text{FALSE} & \text{FALSE} \\ \text{TRUE} & \text{FALSE} & \text{FALSE} \\ \text{TRUE} & \text{TRUE} & \text{FALSE} \end{pmatrix}$

  - If we write A[lower.tri(A)]<-0, it replaces the elements below the diagonal with 0
- upper.tri(A) is similar
- Kronecker product: A %x% B
- Vectorization: as.matrix(as.numeric(A))

Trace, Determinant, Rank

Trace: sum(diag(A)) or matrix.trace(A) in package matrixcalc

Determinant: det(A)