MthStat 768

January 28, 2024

```r
A <- matrix(c(1, 1, 0, 1, 1, 1), 3, 2)
print(A)
```

```
##      [,1] [,2]
## [1,]    1    1
## [2,]    1    1
## [3,]    0    1
```

```r
AtA <- t(A) %*% A
print(AtA)
```

```
##      [,1] [,2]
## [1,]    2    2
## [2,]    2    3
```

```r
invA <- solve(t(A) %*% A)
print(invA)
```

```
##      [,1] [,2]
## [1,]  1.5   -1
## [2,] -1.0    1
```

```r
P <- A %*% solve(t(A) %*% A) %*% t(A)
print(P)
```

```
##      [,1] [,2] [,3]
## [1,]  0.5  0.5    0
## [2,]  0.5  0.5    0
## [3,]  0.0  0.0    1
```

```r
tP <- t(P)
print(tP)
```

```
##      [,1] [,2] [,3]
## [1,]  0.5  0.5    0
## [2,]  0.5  0.5    0
## [3,]  0.0  0.0    1
```

```r
idemP <- P %*% P
print(idemP)
```

```
##      [,1] [,2] [,3]
## [1,]  0.5  0.5    0
## [2,]  0.5  0.5    0
## [3,]  0.0  0.0    1
```

```r
A <- matrix(c(1, -1, -1, 1), 2, 2)
eigen(A)
```

```
## eigen() decomposition
## $values
## [1] 2 0
##
## $vectors
##            [,1]       [,2]
## [1,] -0.7071068 -0.7071068
## [2,]  0.7071068 -0.7071068
```

```r
out <- eigen(A)
lmb <- out$values
print(lmb)
```

```
## [1] 2 0
```

```r
Lambda <- diag(lmb)
print(Lambda)
```

```
##      [,1] [,2]
## [1,]    2    0
## [2,]    0    0
```

```r
V <- out$vectors
print(V)
```

```
##            [,1]       [,2]
## [1,] -0.7071068 -0.7071068
## [2,]  0.7071068 -0.7071068
```

```r
t(V) %*% V
```

```
##      [,1] [,2]
## [1,]    1    0
## [2,]    0    1
```