Week16 - IS622

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Exercise 11.4.1

The SVD for the matrix is given. Find the Moore-Penrose pseudoinverse of M .

Answer

```
M <- matrix(c(48, 14, 14, -48), ncol=2, byrow=TRUE)

U <- matrix(c(3/5, 4/5, 4/5, -3/5), ncol=2, byrow=TRUE)
Sigma <- matrix(c(50, 0, 0, 25), ncol=2, byrow=TRUE)
Vt <- matrix(c(4/5, -3/5, 3/5, 4/5), ncol=2, byrow=TRUE)
```

Notice that the SVD decomposition is not very good, as the results are close to M but not quite the same:

```
U %*% Sigma %*% Vt
```

```
##      [,1] [,2]
## [1,]   36   -2
## [2,]   23  -36
```

```
M
```

```
##      [,1] [,2]
## [1,]   48   14
## [2,]   14  -48
```

I will use the M given, and find its SVD decomposition:

```
# SVD decompose of M
factor <- svd(M)
d <- factor$d
u <- factor$u
v <- factor$v

# Confirm
u %*% diag(d) %*% t(v)
```

```
##      [,1] [,2]
## [1,]   48   14
## [2,]   14  -48
```

To find the pseudoinverse of M, I follow page 429 in the book and find pseudoinverse of Sigma (or d above):

```r
# Use pseudoinverse of d to get inverse of M
t(v) * diag(c(1/50, 1/50)) * t(u)
```

```
##         [,1]    [,2]
## [1,] 0.0192  0.0000
## [2,] 0.0000 -0.0192
```

Lets compare to the real inverse:

```r
# Real inverse
library(MASS)
ginv(M)
```

```
##         [,1]    [,2]
## [1,] 0.0192  0.0056
## [2,] 0.0056 -0.0192
```

Exercise 11.3.4

Section 11.3.5 showed how to guess the movies a person would most like. How would you use a similar technique to guess the people that would most like a given movie, if all you had were the ratings of that movie by a few people?

Answer

Will post to discussion board