HW2

Shariq Mian

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```
#Randomly generated 4 by 4 matrix
matrix4x4 <- matrix(sample.int(500,size=16,replace=FALSE),nrow=4,ncol=4)
matrix4x4
```

```
##      [,1] [,2] [,3] [,4]
## [1,]  278  489  426   35
## [2,]    1  323  146  188
## [3,]  156  178   22   87
## [4,]  244  456  294  292
```

#LU decomposition function

```
lower_upper_decomp_square <- function(x){

  #to check and ensure x is a square matrix, and > than 1
  if(nrow(x) != ncol(x) | (nrow(x) == 1 & ncol(x) == 1)){
    message("Square matrices greater than 1 by 1")
  }

  else{
    #lower diagonal
    lower<-diag(nrow(x))

    for(i in 1:nrow(x)){
      for(j in 1:ncol(x)){
        if (j < i){
          z <-x[i,j]/x[j,j]
          lower[i,j]<-z

          x[i,]<- x[i,]- z*x[j,]       #row reduce
        }
      }
    }
  }
  #initial matrix
  print(matrix4x4)
  #lower matrix
  print('L')
  print(lower)
  #upper matrix
  print('U')
```

```
  print(x)

  reconstruction<-lower%*%x
  print("L*U")
  reconstruction
}
```

```
lower_upper_decomp_square(matrix4x4)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]  278  489  426   35
## [2,]    1  323  146  188
## [3,]  156  178   22   87
## [4,]  244  456  294  292
## [1] "L"
##             [,1]        [,2]      [,3] [,4]
## [1,] 1.000000000  0.00000000 0.0000000    0
## [2,] 0.003597122  1.00000000 0.0000000    0
## [3,] 0.561151079 -0.30009518 1.0000000    0
## [4,] 0.877697842  0.08344438 0.5293969    1
## [1] "U"
##      [,1]          [,2]      [,3]     [,4]
## [1,]  278  4.890000e+02  426.0000  35.0000
## [2,]    0  3.212410e+02  144.4676 187.8741
## [3,]    0  1.421085e-14 -173.6963 123.7398
## [4,]    0 -7.523182e-15    0.0000 180.0961
## [1] "L*U"
```

```
##      [,1] [,2] [,3] [,4]
## [1,]  278  489  426   35
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## [3,]  156  178   22   87
## [4,]  244  456  294  292
```