INTRODUCTION TO R

Matrix Arithmetic

Matrix Arithmetic

- `colSums(), rowSums()`
- Standard arithmetic possible
- Element-wise computation

lotr_matrix

```
> the_fellowship <- c(316, 556)
> two_towers <- c(343, 584)
> return_king <- c(378, 742)

> lotr_matrix <- rbind(the_fellowship, two_towers, return_king)
> colnames(lotr_matrix) <- c("US", "non-US")
> rownames(lotr_matrix) <- c("Fellowship", "Two Towers",
                             "Return King")

> lotr_matrix
             US non-US
Fellowship  316    556
Two Towers  343    584
Return King 378    742
```

Matrix - Scalar

```
> lotr_matrix / 1.12
                   US   non-US
Fellowship  282.1429 496.4286
Two Towers  306.2500 521.4286
Return King 337.5000 662.5000

> lotr_matrix - 50
              US non-US
Fellowship   266    506
Two Towers   293    534
Return King  328    692
```

```
> lotr_matrix
              US non-US
Fellowship   316    556
Two Towers   343    584
Return King  378    742
```

Matrix - Matrix

```
> # Definition of theater_cut omitted
> theater_cut
     [,1] [,2]
[1,]   50   50
[2,]   80   80
[3,]  100  100

> lotr_matrix - theater_cut
              US non-US
Fellowship   266    506
Two Towers   263    504
Return King  278    642
```

```
> lotr_matrix
              US non-US
Fellowship   316    556
Two Towers   343    584
Return King  378    742
```

Recycling

```
> lotr_matrix - c(50, 80, 100)
              US non-US
Fellowship   266    506
Two Towers   263    504
Return King  278    642

> matrix(c(50, 80, 100), nrow = 3, ncol = 2)
     [,1] [,2]
[1,]   50   50
[2,]   80   80
[3,]  100  100
```

```
> lotr_matrix
              US non-US
Fellowship   316    556
Two Towers   343    584
Return King  378    742
```

Matrix Multiplication

```
> # Definition of rates omitted
> rates
     [,1] [,2]
[1,] 1.11 1.11
[2,] 0.99 0.99
[3,] 0.82 0.82

> lotr_matrix * rates
                US non-US
Fellowship  350.76 617.16
Two Towers  339.57 578.16
Return King 309.96 608.44
```

```
> lotr_matrix
                US non-US
Fellowship     316    556
Two Towers     343    584
Return King    378    742
```

Matrices and Vectors

- Very similar
- Vector = 1D, matrix = 2D
- Coercion if necessary
- Recycling if necessary
- Element-wise calculations

INTRODUCTION TO R

Let’s practice!