Alonso\_Week 1 Lab Assignment

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IST687 Introduction to Data Science: Week 1 Lab.

Boolean logic is logic where the answer to a question asked can only be TRUE or FALSE. There are no other options. Within R, there are three operators that are commonly used for Boolean logic: AND (&), OR (|), and NOT (!).

# AND (&)

The element-wise AND (&) operator is used to test whether two elements (including all elements within a vector) are equal to each other.

# 1 & 1 is TRUE because they share the same element.  
1 & 1

## [1] TRUE

# TRUE & TRUE are also TRUE because they share the same element  
TRUE & TRUE

## [1] TRUE

# TRUE & FALSE or FALSE & FALSE do not share the same element, hence they are both FALSE  
TRUE & FALSE

## [1] FALSE

FALSE & FALSE

## [1] FALSE

In R, there also exist another Logical AND (&&) that only tests whether the first element of two vectors are both TRUE.

# Returns TRUE since both of the first elements of the vectors are TRUE..  
a <- c(1, 2, 3, 4)  
b <- c(5, 6, 7, 8)  
print(a && b)

## [1] TRUE

# Returns FALSE because both of the first elements of the two vectors isn't TRUE  
a <- c(1, 2, 3, 4)  
d <- c(0, 6, 7, 8)  
print(a && d)

## [1] FALSE

# OR (|)

The element-wise OR (|) operator tests whether an element (or all elements in a vector) is either TRUE or FALSE based on whether one of them is TRUE.

# Two integers are both TRUE values, hence the operator recognizes them as TRUE.  
3 | 4

## [1] TRUE

# The same can be said of 1 and TRUE.  
1 | TRUE

## [1] TRUE

# But if none of the options is TRUE, then the logical operator gives FALSE  
0 | 0

## [1] FALSE

FALSE | FALSE

## [1] FALSE

There is also a Logical OR (||) operator that tests whether the first element of two vectors is TRUE or FALSE.

# Returns TRUE since one of the first elements of the vectors are TRUE.  
a <- c(1, 2, 3, 4)  
b <- c(5, 6, 7, 8)  
print(a || b)

## [1] TRUE

# Returns FALSE because one of the first elements of the two vectors isn't TRUE  
a <- c(FALSE, 2, 3, 4)  
d <- c(0, 6, 7, 8)

# NOT (!)

The final operator is the NOT (!) operator that takes each element of a vector and negates it, giving it its opposite value.

# All numbers, except 0, are TRUE. By negating a, we turn it FALSE.  
a <- 1  
!a

## [1] FALSE

# In the case of TRUE and FALSE, negating them inverses their values.  
b <- c(TRUE, FALSE)  
!b

## [1] FALSE TRUE