How can we perform element-wise multiplication in R?

Authored by

stats writer

May 3, 2024

ARABPSYCHOLOGY.COM

RECOMMENDED CITATION

stats writer (2024). *How can we perform element-wise multiplication in R?*. PSYCHOLOGICAL SCALES. Retrieved from https://scales.arabpsychology.com/?p=142487

Element-wise multiplication is a mathematical operation that involves multiplying each element of one vector or matrix with its corresponding element in another vector or matrix. In R, this can be achieved using the "*" operator, which is used to multiply two vectors or matrices element-wise. This operation can also be performed using the "multiply" function in the "dplyr" package. The resulting vector or matrix will have the same dimensions as the original vectors or matrices. Element-wise multiplication is a useful tool in data analysis and can be used to perform various calculations such as scaling, normalization, and statistical operations.

Perform Element-Wise Multiplication in R

R is excellent at performing element-wise multiplication between two objects.

The following examples show how to perform element-wise multiplication between various objects in R.

Example 1: Multiply Two Vectors

The following code shows how to perform element-wise multiplication with two vectors:

```
#create vectors
a <- c(1, 3, 4, 5)
b <- c(2, 2, 3, 3)

#perform element-wise multiplication
a*b

2 6 12 15
```

ARABPSYCHOLOGY.COM

Here is how the results were calculated:

1 * 2 = 23 * 2 = 64 * 3 = 125 * 3 = 15

Example 2: Multiply Data Frame & Vector

The following code shows how to perform element-wise multiplication with a data frame and a vector:

```
#define data frame
df <- data.frame(a=c(1, 3, 4, 5),
b=c(2, 2, 3, 3))

#view data frame
df

a b
1 1 2
2 3 2
3 4 3
4 5 3

#define vector
x <- c(2, 5, 5, 8)

#multiply data frame by vector
```

ARABPSYCHOLOGY.COM

df*x

a b

1 2 4

2 15 10

3 20 15

4 40 24

Example 3: Multiply Two Data Frames

The following code shows how to perform element-wise multiplication between two data frames:

```
#define data frames
df1 <- data.frame(a=c(1, 3, 4, 5),
b=c(2, 2, 3, 3))
df2 <- data.frame(c=c(6, 2, 2, 2),
d=c(1, 7, 4, 9))

#multiply two data frames
df1*df2
```

a b

1 6 2

2 6 14

3 8 12

ARABPSYCHOLOGY.COM

4 10 27

Note that the resulting data frame is the same size as the two data frames that we multiplied.

Also note that we will receive an error if we attempt to multiply two data frames of different sizes:

```
#define data frames of unequal sizes
df1 <- data.frame(a=c(1, 3, 4, 5),
b=c(2, 2, 3, 3))

df2 <- data.frame(c=c(6, 2, 2),
d=c(1, 7, 4))

#attempt to multiply two data frames
df1*df2

Error in Ops.data.frame(df1, df2) :
'*' only defined for equally-sized data frames
```

ARABPSYCHOLOGY.COM