



1-05a Arrays

CSI 500

Course material derived from:

An Introduction to R. Notes on R: A Programming Environment for Data Analysis and Graphics Version 3.4.3 (2017-11-30)

https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf



Arrays

- R considers arrays to be a special type of vector
 - has a \$dim attribute set to non-NULL value
 - indicates dimensions of matrix (can be > 2)

```
# arrays and $dim attributes
> x = 1:12
> x
      1 2 3 4 5 6 7 8 9 10 11 12
> attributes(x)
NULL
> dim(x) = c(3,4)
> x
     [,1] [,2] [,3] [,4]
[1,]
                      10
[2,]
[3,]
> attributes(x)
$dim
[1] 3 4
```



Arrays

- You can "manually" create a matrix by setting or adjusting the \$dim attribute of a vector
 - there are easier ways...

```
# arrays and $dim attributes
> dim(x) = c(2,3,2)
> x
, , 1
    [,1] [,2] [,3]
[1,] 1 3 5
[2,] 2 4 6
, , 2
     [,1] [,2] [,3]
[1,] 7 9 11
[2,] 8 10 12
> attributes(x)
$dim
[1] 2 3 2
```



Array indexing

- You can access array elements by specifying an "index"
 - The index may be a single value
 - The index may be a range of values
- The index may be a complement (indicates a value or range of values NOT to return)
 - use the "-" sign on the index expression

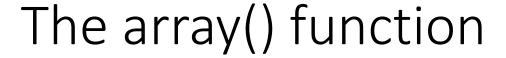
```
# array indexing
> x = seq(from=2, to=20, by=2)
> x
[1] 2 4 6 8 10
[6] 12 14 16 18 20
> x[3]
[1] 6
> x[4:8]
[1] 8 10 12 14 16
> x[-(4:8)]
[1] 2 4 6 18 20
```



Array indexing

 The index may include an entire dimension (using "," operator)

```
# array indexing
> x = seq(from=2, to=20, by=2)
> x
[1] 2 4 6 8 10
[6] 12 14 16 18 20
> y = matrix(nrow=2,ncol=5,data=x)
> V
    [,1] [,2] [,3] [,4] [,5]
[1,] 2 6 10 14
                        18
[2,] 4 8 12 16
                        20
> y[, 2:4]
    [,1] [,2] [,3]
[1,] 6 10 14
[2,]
       8 12 16
```



- R provides the array() function to create array data
 - similar to concept we saw before using dim(), but array() provides cleaner syntax

```
# array() example
> x = seq(from=2, to=20, by=2)
> X
      2 4 6 8 10 12 14 16 18 20
>
> y = array(x, c(2,5))
> y
     [,1] [,2] [,3] [,4]
[1,]
                            18
                            20
[2,]
> z = x
> z
      2 4 6 8 10 12 14 16 18 20
> dim(z) = c(2,5)
> z
     [,1] [,2] [,3] [,4]
[1,]
                            18
[2,]
                            20
>
```

Summary

- R provides support for arrays
 - built as an extension of vectors
 - allows more than 2 dimensions
 - all data must be the same base type (numeric, character, logical)