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]  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,]    1    4    7   10
[2,]    2    5    8   11
[3,]    3    6    9   12
> 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)
> y
     [,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
>
```

The array() function

- 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
 [1]  2  4  6  8 10 12 14 16 18 20
>
> y = array(x, c(2,5))
> y
     [,1] [,2] [,3] [,4] [,5]
[1,]    2    6   10   14   18
[2,]    4    8   12   16   20
>
> z = x
> z
 [1]  2  4  6  8 10 12 14 16 18 20
> dim(z) = c(2,5)
> z
     [,1] [,2] [,3] [,4] [,5]
[1,]    2    6   10   14   18
[2,]    4    8   12   16   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)