Data Science 2

Introduction to advanced data science - spring 2023

January 15, 2023

1 _scoping_practice_2 (5 pts)

Package content display

1. Find the built-in and automatically loaded `methods` package.
2. Display only the first 20 items contained in the built-in and automatically loaded `methods` package.
3. How many items are there in total?

Solution

1. Display built-in packages.

```
search()
```

```
 [1] ".GlobalEnv"        "ESSR"              "package:stats"
 [4] "package:graphics"  "package:grDevices" "package:utils"
 [7] "package:datasets"  "package:methods"   "Autoloads"
[10] "package:base"
```

2. List first 20 elements of the package (list).

```
ls("package:methods")[1:20]
```

```
 [1] "addNextMethod"         "allNames"              "Arith"
 [4] "as"                    "as<-"                  "asMethodDefinition"
 [7] "assignClassDef"        "assignMethodsMetaData" "balanceMethodsList"
```

```
 [10] "body<-"                "cacheGenericsMetaData" "cacheMetaData"
 [13] "cacheMethod"           "callGeneric"           "callNextMethod"
 [16] "canCoerce"             "cbind2"                "checkAtAssignment"
 [19] "checkSlotAssignment"   "classesToAM"
```

3. Print total length of package list.

```
length(ls("package:methods"))
```

```
[1] 203
```

Functions and environments

1. Which environment owns the `read.table` function?
2. Which environment owns the `data` function?
3. Which environment owns the `matrix` function?
4. Which environment owns the `jpeg` function?
5. What does `jpeg` do? To find this out, run the `help` function on the command inside the R console and copy the description here:

   > Graphics devices for BMP, JPEG, PNG and TIFF format bitmap files.

6. Show that `base::matrix` is called **after** `utils::read.table` by comparing the indices in the `character` vector `search()`.

   Tip: to extract indices, you can use the `which` function in connection with logical operators.

Solution

- Function environments:

```
env <- c(
  "read.table:"=environment(read.table),
  "data:"=environment(data),
  "matrix:"=environment(matrix),
  "jpeg:"=environment(jpeg))
class(env)
env
```

```
[1] "list"
$`read.table:`
<environment: namespace:utils>

$`data:`
<environment: namespace:utils>

$`matrix:`
<environment: namespace:base>

$`jpeg:`
<environment: namespace:grDevices>
```

- Search path order: `utils` before `base` means that the index of the package names in `search` is smaller:

```
which(search()=="package:utils") < which(search()=="package:base")
```

```
[1] TRUE
```

Functions and packages

Use `ls` and a test for `character` string equality to confirm that the function `smoothScatter` is part of the `graphics` package.

Tip: given a set of logical vectors, the function `any` tests if at least one of the values is true. E.g.

```
any(c("Jim","Jane","Joe") == "Jane")  # this is TRUE
any(c("Jim","Jane","Joe") == "Janet")  # this is FALSE
```

```
[1] TRUE
[1] FALSE
```

Solution

`ls()` is a `character` vector that contains all functions in the package.

```
any(ls("package:graphics")=="smoothScatter")
```

```
[1] TRUE
```