Building R packages

Stat 580: Statistical Computing

- Theme: Black - White
- Printable version

References

- "Writing R Extensions", by R Core Team.
- "R packages", by Hadley Wickham.

Before the hard work

- Why building a package?
  - own convenience (e.g. especially useful for R's C interface)
  - for everybody
    - will it be an important package?
    - what is the target group of users?
    - do some marketing (R CRAN)

Public packages

- Planning for a public package:
  - what is the good subset of functionality you should provide for the initial version?
    - stable?
  - more functionality in the future?
    - are they going to affect the structure and functions in earlier versions?
  - design of complex output object
    - what should be included in the object
    - utility functions of the object
    - for example, `lm()` returns an object of class `lm`
    - S3 classes and methods can be useful

S3 Classes

- Using S3 classes allows simpler and more intuitive function names:

```
matstat <- function(X){
  cmean <- colMeans(X)
  rmean <- rowMeans(X)
  return(list(cmean=cmean, rmean=rmean, nr=nrow(X), nc=ncol(X)))
}

plotmatstat <- function(obj, type=0){
  if (type==0){
  plot(obj$rmean, xlab="rows", ylab="row means")
  } else if (type==1){
  plot(obj$cmean, xlab="cols", ylab="col means")
  } else {
    stop("type not equal to 0 or 1")
  }
}

a <- matrix(runif(10*20), nr=10)
res <- matstat(a)
plotmatstat(res)
```

S3 Classes

- Using S3 classes allows simpler and more intuitive function name:

```
matstat <- function(X){
  cmean <- colMeans(X)
  rmean <- rowMeans(X)
  out <- list(cmean=cmean, rmean=rmean, nr=nrow(X), nc=ncol(X))
  class(out) <- "mstat"
  return(out)
}

plot.mstat <- function(obj, type=0){
  if (type==0){
  plot(obj$rmean, xlab="rows", ylab="row means")
  } else if (type==1){
  plot(obj$cmean, xlab="cols", ylab="col means")
  } else {
    stop("type not equal to 0 or 1")
  }
}

a <- matrix(runif(10*20), nr=10)
res <- matstat(a)
plot(res)
```

S3 Classes

- example of common methods: `print`, `summary`, `plot`, `predict`
  - create generic function via `UseMethod()`
  - use `methods` to list all available methods for an generic function, or all methods for a class
    - `methods(plot)`,`methods(class="mstat")`

```
print.mstat <- function(x){
  cat("dims:", x$nr, x$nc, "\n")
}
```

- common strategy:
  - at the end of the function, create a list
  - assign a class via `class()`
  - write corresponding methods

S3 Classes

- assign an existing class to a new object manually can create problems, since the structure may not match
  - creates errors during the applications of some methods

Example

```
ascomplex <- function(x, y){
  out <- list(real=x, img=y)
  class(out) <- "com"
  return(out)
}

print.com <- function(x) {
  cat(paste(c(x$real, "+", x$img, "i\n"), collapse=""))
}

`+.com` <- function(x, y) {
  r <- x$real + y$real
  c <- x$img + y$img
  return(ascomplex(r, c))
}

`-.com` <- function(x, y) {
  r <- x$real - y$real
  c <- x$img - y$img
  return(ascomplex(r, c))
}

`*.com` <- function(x, y){
  r <- x$real * y$real - x$img * y$img
  c <- x$real * y$real + x$img * y$real
  return(ascomplex(r, c))
}
```

Building R packages

1. Create a template package via `package.skeleton()`
    - supply a name: `package.skeleton("mypackage")`
    - this creates a folder with correct structure
2. Put your codes into the right folder
3. Edit the package files (DESCRIPTION, NAMESPACE)
4. Edit help files (we won't cover this, check "writing R Extensions")
5. Build, check and install the package

`package.skeleton()`

- create a folder with
  - "data": contains .rda files of each data object
  - "DESCRIPTION": general information
  - "man": help files
  - "NAMESPACE": contain "exports" and "imports" information
  - "R": contains .R files
  - "Read-and-delete-me": check and delete

DESCRIPTION

- update the information
- license: popular choices include GPL-3 or GPL (>= 2)
- if the package depends on other packages:
  - add: "Imports" or "Depends:" followed by a list of the packages separated by comma
    - "Imports": load these packages
    - "Depends": attach these packages

NAMESPACE

- to export:
  - export(): export functions (including S3 and S4 generics).
  - exportPattern(): export all functions that match a pattern.
  - exportClasses(), exportMethods(): export S4 classes and methods.
  - S3method(): export S3 methods.
- to import:
  - import(): import all functions from a package.
  - importFrom(): import selected functions (including S4 generics).
  - importClassesFrom(), importMethodsFrom(): import S4 classes and methods.
  - useDynLib(): import a function from C.

Build, check, and install

in command line:

- build

```
R CMD build mypackage
```

  - generate a .tar.gz file ("tarball")

- install

```
R CMD install mypackage
```

  - either the folder or the tarball file

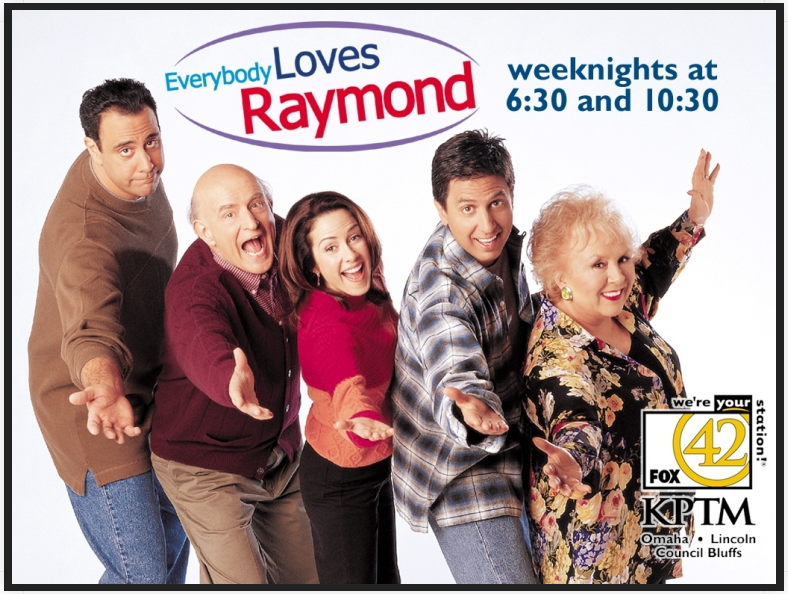
- check

```
R CMD check mypackage
```

  - need checking before submitting to CRAN

The end

As an old saying goes,



I hope you enjoy this course!

I am looking forward to your presentations! Thanks!