

RcppOctave package: Seamless Interface to Octave – and Matlab

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RcppOctave package – Version 0.7 [April 5, 2012]

The *RcppOctave* package provides a direct interface to Octave from R, implemented using the *Rcpp* package¹ [1]. It allows to call Octave functions in a similar way as calling C/C++/Fortran functions using the R core function `.Call`. Since Octave uses a language that is mostly compatible with Matlab, the *RcppOctave* package may be used to run Matlab m-files. As a matter of fact, it was originally developed to facilitates the port and comparison of R and Matlab code.

The package provides modules that port R core random number generators into Octave, that enable to reproduce and compare stochastic computations. These may also be used in any Octave session, independently of R, increasing the range of RNGs available in Octave.

1 Sample session

The package provides the function `.CallOctave` to call Octave functions:

```
.0$eye(3)

##      [,1] [,2] [,3]
## [1,]    1    0    0
## [2,]    0    1    0
## [3,]    0    0    1

.0$svd(matrix(1:9, 3))

##      [,1]
## [1,] 1.685e+01
## [2,] 1.068e+00
## [3,] 5.543e-16
```

A convenient shortcut interface is defined by the object `.0` of class `Octave`, exported from *RcppOctave* package namespace:

```
.0$eye(3)

##      [,1] [,2] [,3]
## [1,]    1    0    0
## [2,]    0    1    0
## [3,]    0    0    1

.0$svd(matrix(1:9, 3))
```

¹<http://cran.r-project.org/package=Rcpp>

```
##          [,1]
## [1,] 1.685e+01
## [2,] 1.068e+00
## [3,] 5.543e-16
```

Comparing equivalent R and Octave functions is therefore as easy as comparing two R functions. For example, one can compare the respective functions `svd` with the following code:

```
# define random data
X <- matrix(runif(25), 5)

# run SVD in R
svd.R <- svd(X)
# run SVD in Octave
svd.O <- .O$svd(X)
# check results
svd.O

##          [,1]
## [1,] 2.49266
## [2,] 0.81574
## [3,] 0.66936
## [4,] 0.28636
## [5,] 0.07507

all.equal(svd.R$d, as.numeric(svd.O))

## [1] TRUE

# but not exactly identical
all.equal(svd.R$d, as.numeric(svd.O), tol = 10^-16)

## [1] "Mean relative difference: 3.006e-16"
```

We notice here that Octave default `svd` returns only the eigen values as a column vector. This is documented in its documentation that is accessible via the function `o_help`, which will show it in a similar way as R documentation:

```
# show Octave help for svd
o_help(svd)
```

The documentation for – Octave – `svd` states that the complete decomposition is returned, if three output values are provided. This can be done using argument `argout`:

```
# get full output from Octave svd
.O$svd(X, argout = 3)

## [[1]]
##          [,1]      [,2]      [,3]      [,4]      [,5]
## [1,] -0.4291  0.2655  0.84085 -0.1178  0.1567
## [2,] -0.2254 -0.3799  0.20170  0.3260 -0.8111
## [3,] -0.3976  0.3992 -0.25289  0.7681  0.1693
## [4,] -0.6527  0.2105 -0.42997 -0.5360 -0.2396
## [5,] -0.4254 -0.7626 -0.05884  0.0507  0.4811
##
```

```
## [[2]]
##      [,1]      [,2]      [,3]      [,4]      [,5]
## [1,] 2.493 0.0000 0.0000 0.0000 0.0000
## [2,] 0.000 0.8157 0.0000 0.0000 0.0000
## [3,] 0.000 0.0000 0.6694 0.0000 0.0000
## [4,] 0.000 0.0000 0.0000 0.2864 0.0000
## [5,] 0.000 0.0000 0.0000 0.0000 0.07507
##
## [[3]]
##      [,1]      [,2]      [,3]      [,4]      [,5]
## [1,] -0.5776 -0.2652  0.75034 -0.1792 -0.03039
## [2,] -0.4442 -0.1509 -0.55073 -0.6752  0.14391
## [3,] -0.1030 -0.1352 -0.01522  0.3098  0.93537
## [4,] -0.5336  0.8124 -0.07086  0.2238 -0.01664
## [5,] -0.4168 -0.4782 -0.35837  0.6050 -0.32120
##
```

Session information

```
R version 2.14.2 (2012-02-29)
Platform: x86_64-pc-linux-gnu (64-bit)

locale:
 [1] LC_CTYPE=en_ZA.UTF-8      LC_NUMERIC=C
 [3] LC_TIME=en_ZA.UTF-8      LC_COLLATE=en_ZA.UTF-8
 [5] LC_MONETARY=en_ZA.UTF-8  LC_MESSAGES=en_US.UTF-8
 [7] LC_PAPER=C               LC_NAME=C
 [9] LC_ADDRESS=C            LC_TELEPHONE=C
[11] LC_MEASUREMENT=en_ZA.UTF-8 LC_IDENTIFICATION=C

attached base packages:
[1] methods      stats      graphics  grDevices  utils      datasets  base

other attached packages:
[1] RcppOctave_0.7 Rcpp_0.9.10    knitr_0.4

loaded via a namespace (and not attached):
[1] codetools_0.2-8 digest_0.5.2    evaluate_0.4.1  formatR_0.3-4
[5] highlight_0.3.1 parser_0.0-14   plyr_1.7.1      stringr_0.6
[9] tools_2.14.2
```

References

- [1] Dirk Eddelbuettel and Romain François. “Rcpp: Seamless R and C++ Integration”. In: *Journal of Statistical Software* 40.8 (2011), pp. 1–18. URL: <http://www.jstatsoft.org/v40/i08/>.