IF YOU CAN’T BEAT ’EM ...

SOME COMMENTS ON USING R ALONG WITH OTHER LANGUAGES

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Open Source Statistical Software for Data Science — Invited Papers
Joint Statistical Meetings (JSM), Chicago, IL
Welcome to Lollapalooza!
Content

• Single- or Multi-Language?
• Interlude
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Single- Or Multi-Language?
Better with more than one?

• No one language fits all
• Real-world projects are frequently multi-language
• See e.g. job ads which rarely ever list just one language
Counter-claim: $1 + 1 < 2$

Or better with just one?

- Mental switching cost between languages? Possibly
- Interop difficult and less portable? Maybe, but that is an argument against weak systems / OSs
- Easier / less to learn?
- “More hoops” to code?
Mental switching costs?

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Forcing us to alternate between comment characters %, # and // may have been the biggest trick ever pulled by the Devil.

RETWEETS 6
LIKES 5

10:22 AM - 10 Aug 2014
Open Question

- Hard to measure or test: Any empirics on real world projects?
- Code competition / comparisons (e.g. Project Euler): Are they realistic?
INTERLUDE
Chambers (2008) Software For Data Analysis
Chapters 10 and 11 devoted to Interfaces I: C and Fortran and Interfaces II: Other Systems.
Chambers (2016) Extending R
An entire book about this with concrete Python, Julia and C++ code and examples
The fundamental lesson about programming in the large is that requires a correspondingly broad and flexible response. In particular, no single language or software system os likely to be ideal for all aspects. Interfacing multiple systems is the essence. Part IV explores the design of of interfaces from R.
Thanks to John Chambers for a scanned copy of this historic sketch.
Empirics
Growth of Rcpp usage on CRAN

Number of CRAN packages using Rcpp (left axis)
Percentage of CRAN packages using Rcpp (right axis)
library(pagerank)  # github.com/andrie/pagerank

cran <- "http://cloud.r-project.org"

pr <- compute_pagerank(cran)
round(100*pr[1:5], 3)

## Rcpp MASS ggplot2 Matrix mvtnorm
## 2.452 1.771 1.088 0.920 0.749
Top 25 of Page Rank as of July 2016

Rcpp
MASS
ggplot2
Matrix
mvtnorm
survival
plyr
lattice
httr
stringr
sp
igraph
dplyr
RcppArmadillo
jsonlite
reshape2
foreach
XML
coda
RCurl
nlme
data.table
zoo
rgl
boot
ILLUSTRATION
**Setup**

```r
py_cflags <- system("python2.7-config --cflags", intern=TRUE)
se <- Sys.setenv; ge <- Sys.getenv # shorthands to typeset
se("PKG_CFLAGS"=sprintf("%s %s", ge("PKG_CFLAGS"), py_cflags))
se("PKG_CXXFLAGS"=sprintf("%s %s", ge("PKG_CXXFLAGS"), py_cflags))
py_ldflags <- system("python2.7-config --ldflags", intern=TRUE)
se("PKG_LIBS"=sprintf("%s %s %s", ge("PKG_CFLAGS"),
                     "-lboost_python-py27", py_ldflags))
```
#include <Rcpp.h>
#include <Python.h>

// [[Rcpp::export]]
void initialize_python() {
    Py_SetProgramName("");  /* optional but recommended */
    Py_Initialize();
}

// [[Rcpp::export]]
void hello_python() {
    PyRun_SimpleString("from time import time,ctime
    "print 'Today is',ctime(time())\n");
}
Hello, World: Called from R

```r
initialize_python()
hello_python()
```

## Today is Sat Jul 30 13:38:01 2016


Disclaimer: For illustration purposes. Works as designed on Ubuntu. Not meant to be universally portable to all three OSs.
CONCLUSION
Being Polyglot

Mixing Languages

• Common
• Natural
• Unavoidable
Consequences

- Must make it easier to interoperate
- Stop bickering among ourselves
- Build systems that are larger than the sum of their parts
Just Do It
Lars Wirzenius “Which license is the most free?”

Free software licences can be roughly grouped into permissive and copyleft ones. [...] A permissive licence lets you do things that a copyleft one forbids, so clearly the permissive licence is more free. A copyleft licence means software using it won’t ever become non-free against the wills of the copyright holders, so clearly a copyleft licence is more free than a permissive one.

Both sides are both right and wrong, of course, which is why this argument will continue forever. [...] If a discussion about the relative freedom of licence types becomes heated, step away. It’s not worth participating anymore.

http://yakking.branchable.com/posts/comparative-freeness/