R 4.0.0 has been out for a while, now, and — apart from a case where merge() was slower than dirt — it’s been really stable for at least me (I use it daily on macOS, Linux, and Windows). Sure, it came with some headline-grabbing features/upgrades, but I’ve started looking at what other useful nuggets might be in the [changelog](https://cran.r-project.org/doc/manuals/r-devel/NEWS.html) and decided to blog them as I find them.

Today’s nugget is the venerable stopifnot() function which was significantly enhanced by [this PR by Neil Fultz](https://bugs.r-project.org/bugzilla/show_bug.cgi?id=17688).

Prior to R 4.0.0, if you wanted to use stopifnot() to perform some input validation (a.k.a. — in this case — [assertions])(<https://en.wikipedia.org/wiki/Assertion_(software_development)>) you’d do something like this (I’m borrowing from Neil’s example):

some\_ƒ <- function(alpha, gradtol, steptol, interlim) {

stopifnot(

(is.numeric(alpha)),

(length(alpha) == 1),

(alpha > 0),

(alpha < 1),

(is.numeric(gradtol)),

(length(gradtol) == 1),

(gradtol > 0),

(is.numeric(steptol)),

(length(steptol) == 1),

(steptol > 0),

(is.numeric(interlim)),

(length(interlim) == 1),

(interlim > 0)

)

message("Do something awesome")

}

When run with acceptable inputs we get:

some\_ƒ(0.5, 3, 10, 100)

## Do something awesome

But, when run with something out of kilter:

some\_ƒ("a", 3, 10, 100)

## Error in some\_ƒ("a", 3, 10, 100) : (is.numeric(alpha)) is not TRUE

we get a semi-useful, but somewhat unfriendly message back. Sure, it points to the right expression, but we’re supposed to be the kinder, friendlier data science (and general purpose) language who cares a bit more about our users. To that end, many folks switch to doing something like this:

some\_ƒ <- function(alpha, gradtol, steptol, interlim) {

if (!is.numeric(alpha)) { stop('Error: alpha should be numeric') }

if (length(alpha) != 1) { stop('Error: alpha should be a single value'); }

if (alpha < 0) { stop('Error: alpha is negative'); }

if (alpha > 1) { stop('Error: alpha is greater than one'); }

if (!is.numeric(gradtol)) { stop('Error: gradtol should be numeric') }

if (length(gradtol) != 1) { stop('Error: gradtol should be a single value'); }

if (gradtol <= 0) { stop('Error: gradtol should be positive'); }

if (!is.numeric(steptol)) { stop('Error: steptol should be numeric') }

if (length(steptol) != 1) { stop('Error: steptol should be a single value'); }

if (steptol <= 0) { stop('Error: steptol should be positive'); }

if (!is.numeric(iterlim)) { stop('Error: iterlim should be numeric') }

if (length(iterlim) != 1) { stop('Error: iterlim should be a single value'); }

if (iterlim <= 0) { stop('Error: iterlim should be positive'); }

message("Do something awesome")

}

which results in:

some\_ƒ("a", 3, 10, 100)

## Error in some\_ƒ("a", 3, 10, 100) : Error: alpha should be numeric

(you can make even better error messages than that).

Neal thought there had to be a better way, and made one! The ... expressions can be *named* and those names will become the error message:

some\_ƒ <- function(alpha, gradtol, steptol, interlim) {

stopifnot(

'alpha should be numeric' = (is.numeric(alpha)),

'alpha should be a single value' = (length(alpha) == 1),

'alpha is negative' = (alpha > 0),

'alpha is greater than one' = (alpha < 1),

'gradtol should be numeric' = (is.numeric(gradtol)),

'gradtol should be a single value' = (length(gradtol) == 1),

'gradtol should be positive' = (gradtol > 0),

'steptol should be numeric' = (is.numeric(steptol)),

'steptol should be a single value' = (length(steptol) == 1),

'steptol should be positive' = (steptol > 0),

'iterlim should be numeric' = (is.numeric(interlim)),

'iterlim should be a single value' = (length(interlim) == 1),

'iterlim should be positive' = (interlim > 0)

)

message("Do something awesome")

}

some\_ƒ("a", 3, 10, 100)

## Error in some\_ƒ("a", 3, 10, 100) : alpha should be numeric

Way easier to write and way more respectful to the caller.

**Gratuitous Statistics**

CRAN has ~2,600 packages that use stopifnot() in their package /R/ code with the following selected distributions (charts are all log10 scale):

Here are the packages with 50 or more files using stopifnot():

pkg n

1 spatstat 252

2 pracma 145

3 QuACN 80

4 raster 74

5 spdep 61

6 lavaan 54

7 surveillance 53

8 copula 50

Here are the packages with one or more files that have 100 or more calls to stopifnot() in them:

pkg fil ct

1 ff ordermerge.R 278

2 OneArmPhaseTwoStudy zzz.R 142

3 bit64 integer64.R 137

4 updog rflexdog.R 124

5 RNetCDF RNetCDF.R 123

6 Rlda rlda.R 105

7 aster2 transform.R 105

8 ads fads.R 104

9 georob georob\_exported\_functions.R 104

10 bit64 highlevel64.R 101

O\_O That’s quite a bit of checking!

**FIN**

If you’re working on switching to R 4.0.0 or have switched, this and many other new features await!