Package 'CBTF'

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Type Package

Title Caught by the Fuzz! - A Minimalistic Fuzz-Test Runner

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Description A simple runner for fuzz-testing functions in an R package's public interface. Fuzz testing helps identify functions lacking sufficient argument validation, and uncovers problematic inputs that, while valid by function signature, may cause issues within the function body.

URL https://mcol.github.io/caught-by-the-fuzz/

BugReports https://github.com/mcol/caught-by-the-fuzz/issues

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Contents

`CBTF-package` *CBTF: Caught by the Fuzz! A minimalistic fuzz-test runner*

Description

This package implements a very simple mechanism for fuzz-testing functions in the public interface of an R package.

Details

Fuzz testing helps identify functions lacking sufficient argument validation, and uncovers sets of inputs that, while valid by function signature, may cause issues within the function body.

The core functionality of the package is fuzz, whose aim is to call each provided function with a certain input and record the output produced. If an error is generated, this is captured and reported to the user, unless the error message matches a pattern of whitelisted errors. The objects returned by fuzz can be printed with print.cbtf and summary.cbtf.

The helper function get_exported_functions identifies the functions in the public interface of a given package, facilitating the generation of the list of functions to be fuzzed.

Function test_inputs by default generates a large set of potentially problematic inputs, but they can be limited just to the desired classes of inputs.

Author(s)

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See Also

Useful links:

- https://mcol.github.io/caught-by-the-fuzz/
- Report bugs at https://github.com/mcol/caught-by-the-fuzz/issues

fuzz *Fuzz-test the specified functions*

Description

This function calls each of the functions in `funs` with each of the objects specified in `what`, recording if any errors or warnings are thrown in the process.

Usage

```
fuzz(
  funs,
  what = test_inputs(),
  package = NULL,
  listify_what = FALSE,
  ignore_patterns = "",
  ignore_warnings = FALSE
)
```

Arguments

`funs`	A character vector of function names to test. If a `"package"` attribute is set and is no `package` argument is provided, functions are loaded from the namespace specified in the attribute.
`what`	A list of objects to be passed, one at a time, as the first argument to each function in `funs`. Ideally, the list should be named, so that each input tested can be pretty-printed with the corresponding name. For unnamed lists, a deparsed representation of the inputs will be used, which may appear unwieldy in some cases. If nothing is provided, a default set of inputs generated by test_inputs will be used.
`package`	A character string specifying the name of the package to search for functions. If `NULL` (default), the function will first check the `"package"` attribute of `funs`, and if that is not set, names will be searched in the global namespace.
`listify_what`	Whether each input in `what` should also be tested in its listified version (`FALSE` by default). When set to `TRUE`, if `what` is `list(x = x)`, the function will operate as if `what` were `list(x = x, "list(x)" = list(x))`, for any input object `x`.
`ignore_patterns`	One or more strings containing regular expressions to match the errors to ignore. The string "is missing, with no default" is always ignored.
`ignore_warnings`	Whether warnings should be ignored (`FALSE` by default).

Details

In order to reduce the number of false positive results produced, this function applies the following set rules, to establish if an error or warning condition should ignored (whitelisting):

- If the name of the function appears in the error or warning message, as it is considered that the condition has been handled by the developer.
- If the error or warning message contains the text "is missing, with no default", which is produced when a missing argument is used without a value being assigned to it.
- If the error or warning message contains any of the patterns specified in `ignore_patterns`.
- If a warning is thrown but `ignore_warnings = TRUE` is set.

In all whitelisted cases, the result is "OK", and the message that was received is stored in the `$msg` field (see the *Value* section).

Value

An object of class `cbtf` that stores the results obtained for each of the functions tested. This contains the following fields:

`$runs` — a list of data frames, each containing the results of fuzzing all the functions in `funs` with one of the inputs in `what`, with attribute "what" containing . The data frame contains the following columns and attributes:
- `fun`: The name of the function tested.
- `res`: The result of the fuzz test, see below for the possible values.
- `msg`: The error or warning message returned by the function, if any.
- `attr(*, "what")`: The character representation of the input tested.

`$package` — a character string specifying the package name where function names were searched, or `NA` if none was provided.

The `res` column in each of the data frames in the `$runs` field can contain the following values:

- OK: either no error or warning was produced (in which case, the `msg` entry is left blank), or it was whitelisted (in which case, the message received is stored in `msg`).
- SKIP: no test was run, either because the given name cannot be found, or it doesn't correspond to a function, or the function accepts no arguments, or the function contains a call to readline; the exact reason is given in `msg`.
- WARN: a warning was thrown for which no whitelisting occurred and `ignore_warnings = FALSE`; its message is stored in `msg`.
- FAIL: an error was thrown for which no whitelisting occurred; its message is stored in `msg`.

See Also

get_exported_functions, test_inputs, summary.cbtf, print.cbtf

Examples

```
## this should produce no errors
res <- fuzz(funs = c("list", "matrix", "mean"),
            what = test_inputs(c("numeric", "raw")))
summary(res)

## display all results even for successful tests
print(res, show_all = TRUE)
```

```
## this will catch an error (false positive)
fuzz(funs = "matrix",  what = test_inputs("scalar"))
```

`get_exported_functions` *Get the names of the exported functions of a package*

Description

This function extracts the exports from the namespace of the given package via getNamespaceExports and discards non-fuzzable objects (non-functions and functions with no arguments). The set of names returned can be further restricted via the `ignore_names` argument.

Usage

```
get_exported_functions(package, ignore_names = "")
```

Arguments

`package`	Name of the package to fuzz-test.
`ignore_names`	Names of functions to ignore: these are removed from the names returned. This can be helpful, for example, to discard function aliases.

Value

A character vector of the names of the fuzzable functions exported from the given package, with the `"package"` attribute set. This can be used directly as the `funs` argument of fuzz without need to specify the `package` argument.

See Also

fuzz

Examples

```
## get the fuzzable functions in the public interface of this package
funs <- get_exported_functions("CBTF")
```

length.cbtf *Compute the number of inputs tested*

Description

Compute the number of inputs tested

Usage

```
## S3 method for class 'cbtf'
length(x)
```

Arguments

x	An object of class cbtf.

Value

An integer corresponding to the number of inputs tested in a run.

Examples

```
res <- fuzz(funs = c("list", "matrix", "mean"),
            what = test_inputs(c("numeric", "raw")))
length(res)
```

print.cbtf *Print the results from a fuzz run*

Description

This formats with colours the results from a fuzz run and prints them to the terminal.

Usage

```
## S3 method for class 'cbtf'
print(x, show_all = FALSE, ...)
```

Arguments

x	An object of class cbtf.
show_all	Whether all results should be printed. By default (FALSE), only the functions that reported an error or a warning are printed. If TRUE, all functions tested are printed, including those that were successful or were skipped.
...	Further arguments passed to or from other methods. These are currently ignored.

Value

No return value, called for side effects.

See Also

summary.cbtf

Examples

```
res <- fuzz(funs = c("list", "matrix", "mean"),
            what = test_inputs(c("numeric", "raw")))
print(res, show.all = TRUE)
```

`summary.cbtf` *Results summary from a fuzz run*

Description

Reports some summary statistics from the results of a run of fuzz.

Usage

```
## S3 method for class 'cbtf'
summary(object, ...)
```

Arguments

`object`	An object of class `cbtf`.
`...`	Further arguments passed to or from other methods. These are currently ignored.

Value

A data frame containing the following columns and attributes is returned invisibly:

`fun`	The names of the function tested.
`what`	The inputs tested.
`res`	One of "OK", "FAIL", "WARN" or "SKIP" for each combination of function and input tested (see the *Value* section in fuzz).
`msg`	The message received in case of error, warning or skip, or an empty string if no failure occurred.
`attr(*, "summary_table")`	The tabulation of results that was printed out.

See Also

print.cbtf

Examples

```
res <- fuzz(funs = c("list", "matrix", "mean"),
            what = test_inputs(c("numeric", "raw")))
summary(res)
```

`test_inputs` *Default input tests*

Description

This function provides a selection of potentially problematic inputs by class. List inputs are very limited by design, as they can be automatically generated by setting `listify_what = TRUE` in fuzz.

Usage

```
test_inputs(use = "all", skip = "")
```

Arguments

`use`	Names of input classes to use. Valid names are "all" (default), "scalar", "numeric", "integer", "logical", "character", "factor", "data.frame", "matrix", "array", "date", "raw" and "list".
`skip`	Names of input classes to skip.

Value

A named list of inputs corresponding to the input classes selected.

See Also

fuzz

Examples

```
## only the scalar and numeric tests
inputs1 <- test_inputs(c("scalar", "numeric"))

## everything but the data, raw and list tests
inputs2 <- test_inputs("all", skip = c("date", "raw", "list"))
```

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