Package ‘gestalt’

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Title Tools for Making and Combining Functions

Version 0.1.8

Description Provides a suite of function-building tools centered around a (forward) composition operator, %>>>%, which extends the semantics of the ‘magrittr’ %>% operator and supports ‘tidyverse’ quasiquotation. It enables you to construct composite functions that can be inspected and transformed as list-like objects. In conjunction with %>>>%, a compact function constructor, fn(), and a function that performs partial application, partial(), are also provided. Both support quasiquotation.

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URL https://github.com/egnha/gestalt

BugReports https://github.com/egnha/gestalt/issues

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Description

To compose functions,

- Use `compose()`:
  ```r
  compose(f, g, h, ...)
  ```
  This makes the function that applies \( f \), \( \text{first} \), then \( g \), then \( h \), etc. It has the `formals` of the first function applied (namely \( f \)). Thus
  ```r
  compose(paste, toupper)
  ```
  is equivalent to the function
  ```r
  function(\ldots, \text{sep} = " ", \text{collapse} = \text{NULL}) {
    \text{toupper}(paste(\ldots, \text{sep} = \text{sep}, \text{collapse} = \text{collapse}))
  }
  ```

- Use `\%\%\%`:
  ```r
  f \%\%\% g \%\%\% h \%\%\% \ldots
  ```
  It comprehends both the semantics of the `magrittr` `\%\%\%` operator and `quasiquotation`. Thus, assuming `sep` has the value `" ",`.
  ```r
  sample \%\%\% paste(collapse = !!sep)
  ```
  is equivalent to the function
  ```r
  function(x, size, replace = FALSE, prob = \text{NULL}) {
    paste(sample(x, size, replace, prob), collapse = "")
  }
  ```

Use `as.list()` to recover the list of composite functions. For example, both

```r
as.list(compose(paste, capitalize = toupper))
```

```r
as.list(paste \%\%\% capitalize: toupper)
```

return the (named) list of functions `list(paste, capitalize = toupper)`. 
Usage

compose(…)

fst %>>>% snd

Arguments

… Functions or lists thereof to compose, in order of application. Lists of functions are automatically spliced in. Unquoting of names, via !! on the left-hand side of :=, and splicing, via !!!, are supported.

fst, snd Functions. These may be optionally named using a colon (:), e.g., f %>>>% nm: g names the g-component "nm" (see ‘Exceptions to the Interpretation of Calls as Functions’). Quasiquotation and the magrittr \%>% semantics are supported (see ‘Semantics of the Composition Operator’, ‘Quasiquotation’ and ‘Examples’).

Value

Function of class CompositeFunction, whose formals are those of the first function applied (as a closure).

Semantics of the Composition Operator

The \%>% operator adopts the semantics of the magrittr \%>% operator:

1. Bare names are matched to functions: For example, in a composition like

   ... %>>>% foo %>>>% ...

   the ‘foo’ is matched to the function of that name.

2. Function calls are interpreted as a unary function of a point (\(\_\)): A call is interpreted as a function (of a point) in one of two ways:

   - If the point matches an argument value, the call is literally interpreted as the body of the function. For example, in the compositions

     ... %>>>% foo(x, \_\_\_) %>>>% ...

     ... %>>>% foo(x, y = \_\_) %>>>% ...

   the ‘foo(x, \_\_)’, resp. ‘foo(x, y = \_\_)’, is interpreted as the function function(..., \_\_\_ = \_\_) foo(x, \_\_), resp. function(..., \_\_\_ = \_\_\_ = \_\_) foo(x, y = \_\_).

   - Otherwise, the call is regarded as implicitly having the point as its first argument before being interpreted as the body of the function. For example, in the compositions

     ... %>>>% foo(x) %>>>% ...

     ... %>>>% foo(x, y(\_\_\_)) %>>>% ...

   the ‘foo(x)’, resp. ‘foo(x, y(\_\_\_))’, is interpreted as the function function(..., \_\_\_ = \_\_) foo(\_\_, x), resp. function(..., \_\_\_ = \_\_\_ = \_\_) foo(\_, x, y(\_\_

3. Expressions \{…\} are interpreted as a function of a point (\(\_\)): For example, in a composition
the '{foo(.); bar(.)}' is interpreted as the function 
function(..., . = ..1) {foo(.); bar(.)}.
Curly braces are useful when you need to circumvent 
'{%>>>%' usual interpretation of function 
calls. For example, in a composition
... %>>>% {foo(x, y(.))} %>>>% ...
the '{foo(x, y(.))}' is interpreted as the function 
function(..., . = ..1) foo(x, y(.)).
There is no point as first argument to foo.

Exceptions to the Interpretation of Calls as Functions: As a matter of convenience, some 
exceptions are made to the above interpretation of calls as functions:

- Parenthesis (()) applies grouping. (In R, `()` is indeed a function.) In particular, expressions 
  within parentheses are literally interpreted.
- Colon (:) applies naming, according to the syntax <name>: <function>, where <function> 
  is interpreted according to the semantics of `{%>>>%}. For example, in
... %>>>% aName: foo %>>>% ...
the function foo is named "aName".
- fn(), namespace operators (`::`, `:::`) and extractors (`$`, `[`, `[[`) are literally 
  interpreted. This allows for list extractors to be applied to composite functions appearing in 
a `{%>>>%` call (see 'Operate on Composite Functions as List-Like Objects'). For example, 
the compositions
  paste %>>>% tolower
  paste %>>>% base::tolower
(paste %>>>% toupper)[[1]] %>>>% tolower
are equivalent functions.

Quasiquotation
The `{%>>>%` operator supports Tidyverse unquoting (via !!). Use it to:

- Enforce immutability: For example, by unquoting res in
  res <- "result"
  get_result <- identity %>>>% lapply(`[[`, !!res)
you ensure that the function get_result() always extracts the component named "result", 
even if the binding res changes its value or is removed altogether.
- Interpret the point (.) in the lexical scope: Even though `{%>>>%` interprets `.` as a function 
  argument, you can still reference an object of that name via unquoting. For example,
  . <- "point"
  is_point <- identity %>>>% {. == !!.}
determines a function that checks for equality with the string "point".
• **Name composite functions, programmatically:** For example, unquoting \texttt{nm} in

\begin{verbatim}
\texttt{nm <- "aName"}
... \texttt{!nm: foo ...}
\end{verbatim}

names the `'foo'`-component of the resulting composite function "aName".

• **Accelerate functions by fixing constant dependencies:** For example, presuming the value of the call \texttt{f()} is constant and that \texttt{g} is a pure function (meaning that its return value depends only on its input), both

\begin{verbatim}
... \texttt{g(f()) ...}
... \texttt{g(!f()) ...}
\end{verbatim}

would be functions yielding the same values. But the first would compute \texttt{f()} anew with each call, whereas the second would simply depend on a fixed, pre-computed value of \texttt{f()}.

**Operate on Composite Functions as List-Like Objects**

You can think of a composite function as embodying the (possibly nested) structure of its list of constituent functions. In fact, you can apply familiar index and assignment operations to a composite function, as if it were this list, getting a function in return. This enables you to leverage composite functions as structured computations.

**Indexing:** For instance, the ‘sum’ in the following composite function

\begin{verbatim}
f <- abs \texttt{out: (log agg: sum)}
\end{verbatim}

can be extracted in the usual ways:

\begin{verbatim}
f[[2]][[2]]
f[[2][2]]
\end{verbatim}

\begin{verbatim}
f$\texttt{out}$agg
f["out"]["agg"]
f["out"]$agg
\end{verbatim}

\begin{verbatim}
f$\texttt{out}[[2]]$
f[[list("out", 2)]]
\end{verbatim}

The last form of indexing with a mixed list is handy when you need to create an index programmatically.

Additionally, you can excise sub-composite functions with \texttt{[ }, \texttt{head()}, \texttt{tail()}. For example:

• Both \texttt{f[1]} and \texttt{head(f, 1)} get the ‘abs’ as a composite function, namely \texttt{compose(abs)}
• \texttt{f[[2:1]]} reverses the order of the top-level functions to yield
  \texttt{out: (log agg: sum)} \texttt{\textbf{abs}}
• \texttt{f$\texttt{out}[c(FALSE, TRUE)]} gets the ‘sum’ as a (named) composite function

**Subset Assignment:** Similarly, subset assignment works as it does for lists. For instance, you can replace the ‘sum’ with the identity function:
Multiple constituent functions can be reassigned using \texttt{\textless{}\textgreater{}}. For example
\begin{verbatim}
f[2] <- list(log)
f["out"] <- list(log)
f[c(FALSE, TRUE)] <- list(log)
\end{verbatim}
all replace the second constituent function with \texttt{log}, so that \texttt{f} becomes \texttt{abs E \%\%\% log}.

\textbf{Other List Methods:} The generic methods \texttt{unlist().length().names()} also apply to composite functions. In conjunction with \texttt{compose()}, you can use \texttt{unlist()} to “flatten” compositions. For example
\begin{verbatim}
compose(unlist(f, use.names = FALSE))
\end{verbatim}
gives a function that is identical to
\begin{verbatim}
abs \%\%\% log \%\%\% sum
\end{verbatim}

\textbf{Composite Functions Balance Speed and Complexity}

The speed of a composite function made by \texttt{compose()} or \texttt{\%\%\%\%} (regardless of its nested depth) is on par with a manually constructed \textit{serial} composition. This is because \texttt{compose()} and \texttt{\%\%\%\%} are \textbf{associative}, semantically and operationally. For instance, triple compositions,
\begin{verbatim}
compose(f, g, h)
f \%\%\% g \%\%\% h

compose(f, compose(g, h))
f \%\%\% (g \%\%\% h)

compose(compose(f, g), h)
(f \%\%\% g) \%\%\% h
\end{verbatim}
are all implemented as the \textit{same function}. Lists of functions are automatically “flattened” when composed.

Nevertheless, the original nested structure of constituent functions is faithfully recovered by \texttt{as.list()}. In particular, \texttt{as.list()} and \texttt{compose()} are \textbf{mutually invertible}: \texttt{as.list(compose(fs))} is the same as \texttt{fs}, when \texttt{fs} is a (nested) list of functions. (But note that the names of the list of composite functions is always a character vector; it is never NULL.)
See Also

`constant()`: combined with `%>%>>%`, this provides a lazy, structured alternative to the `magrittr` `%>%` operator.

Examples

```r
# Functions are applied in the order in which they are listed
inv <- partial("/", 1) # reciprocal
f0 <- compose(abs, log, inv)
stopifnot(all.equal(f0(-2), 1 / log(abs(-2))))

# Alternatively, compose using the `%>%>>%` operator
f1 <- abs %>%>>% log %>%>>% {1 / .}
stopifnot(all.equal(f1(-2), f0(-2)))

## Not run:
# Transform a function to a JSON function
library(jsonlite)

# By composing higher-order functions:
jsonify <- fromJSON %>%>>% { . %>%>>% toJSON }

# By directly composing with input/output transformers:
jsonify <- fn(fromJSON %>%>>% f %>%>>% toJSON)
## End(Not run)

# Formals of initial function are preserved
add <- function(a, b = 0) a + b
stopifnot(identical(formals(compose(add, inv)), formals(add)))

# Compositions can be provided by lists, in several equivalent ways
f2 <- compose(list(abs, log, inv))
f3 <- compose(!!! list(abs, log, inv))
f4 <- compose(abs, list(log, inv))
f5 <- compose(abs, !!! list(log, inv))
stopifnot(
  all.equal(f2, f0), all.equal(f2(-2), f0(-2)),
  all.equal(f3, f0), all.equal(f3(-2), f0(-2)),
  all.equal(f4, f0), all.equal(f4(-2), f0(-2)),
  all.equal(f5, f0), all.equal(f5(-2), f0(-2))
)

# compose() and as.list() are mutually invertible
f6 <- compose(abs, as.list(compose(log, inv)))
stopifnot(
  all.equal(f6, f0), all.equal(f6(-2), f0(-2))
)
fs <- list(abs, log, inv)
stopifnot(all.equal(check.attributes = FALSE,
  as.list(compose(fs)), fs,
)
```
# `constant` supports names, `magrittr `%>%` semantics, and quasiquotation

```r
sep <- ""
scramble <- function shuffle: sample %>% paste(collapse = !!sep)
nonsense <- scramble(letters)
stopifnot(
  nchar(nonsense) == 26L,
  identical(letters, sort(strsplit(nonsense, sep)[[1]])),
  identical(scramble$shuffle, sample)
)
```

<table>
<thead>
<tr>
<th>constant</th>
<th>Values as Functions</th>
</tr>
</thead>
</table>

**Description**

A constant is a fixed value that incorporates its very computation. This is none other than a function that computes a fixed value when called without arguments. `constant()` declares such a function as a bona fide constant by transforming it to a function that caches the value of its void call (i.e., `constant()` memoizes void functions).

Combine `%>%` with `constant()` for a lazy, structured alternative to the `magrittr `%>%` operator (see ‘Examples’).

**Usage**

```r
constant(f)
variable(f)
```

**Arguments**

- `f` Function, or symbol or name (string) thereof, that can be called without arguments. (NB: `constant()` itself does not check whether `f()` is indeed a valid call.)

**Value**

`constant()` yields a function without formal arguments that returns the (cached, visibility-preserving) value of the void call `f()`.

`variable()` is the inverse transformation of `constant()`: it recovers the underlying (uncached) function of a constant function.

**See Also**

`%>%`
Examples

# Function with a constant return value
val <- {message("Computing from scratch"); mtcars} %>%
  split(.cyl) %>%
  lapply(function(data) lm(mpg ~ wt, data)) %>%
  lapply(summary) %>%
  sapply([, "r.squared"])

# With every invocation, `val()` is computed anew:
val()
val()

# Declaring `val` as a constant ensures that its value is computed only once.
# On subsequent calls, the computed value is simply fetched:
const <- constant(val)
const()
const()

# As values, `val()` and `const()` are identical. But `const()`, moreover,
# has structure, namely the function `const`:
const

# For instance, you can inspect the intermediate summaries:
head(const, -1)

# Which can itself be a constant:
summ <- constant(head(const, -1))
summ()
summ()

## Not run:
# Think of `%>%` combined with `constant()` as a lazy, structured
# alternative to the magrittr `%>%` operator.
library(magrittr)

val2 <- mtcars %>%
  split(.cyl) %>%
  lapply(function(data) lm(mpg ~ wt, data)) %>%
  lapply(summary) %>%
  sapply([, "r.squared"])

# `val2` and `const()` are identical values. But whereas `val2` is computed
# immediately and carries no structure, `const` embodies the process that
# produces its value, and allows you to defer its realization to the
# invocation `const()`.
stopifnot(identical(val2, const()))
## End(Not run)

# Use `variable()` to recover the original `\dquote{variable}` function
val_var <- variable(const)
stopifnot(identical(val_var, val))
val_var()
Description

Programming in R typically involves:

1. Making a context: assigning values to names.
2. Performing an action: evaluating an expression relative to a context.

let() and run() enable you to treat these procedures as reusable, composable components.

- let() makes a context: it lazily binds a sequence of ordered named expressions to a child of a given environment (by default, the current one).
  For instance, in an environment `env` where `z` is in scope,
  ```
  let(env, x = 1, y = x + 2, z = x * y * z)
  ```
  is equivalent to calling
  ```
  local({
    x <- 1
    y <- x + 2
    z <- x * y * z
    environment()
  })
  ```
  except let() binds the named expressions lazily (as promises) and comprehends tidyverse quasiquotation.

- run() performs an action: it evaluates an expression relative to an environment (by default, the current one) and, optionally, a sequence of lazily evaluated ordered named expressions.
  For instance, in an environment `env` where `x` is in scope,
  ```
  run(env, x + y + z, y = x + 2, z = x * y * z)
  ```
  is equivalent to calling
  ```
  local({
    y <- x + 2
    z <- x * y * z
    x + y + z
  })
  ```
  except run(), like let(), binds `y` and `z` lazily and comprehends quasiquotation.

Usage

```r
let(`_data` = parent.frame(), ...)
run(`_data` = parent.frame(), `_expr`, ...)
```
Arguments

_\texttt{data}_

Context of named values, namely an environment, list or data frame; if a list or data frame, it is interpreted as an environment (like the \texttt{envir} argument of \texttt{eval()}).

... 

Named expressions. An expression looks up values to the left of it, and takes precedence over those in \texttt{\_data}. \texttt{Quasiquotation} of names and expressions is supported (see ‘Examples’).

\texttt{\_expr}'

Expression to evaluate ("run"). Quasiquotation is supported.

Value

\texttt{run()} returns the evaluation of \texttt{\_expr} in the combined environment of \texttt{\_data} and .... 

\texttt{let()} returns an environment where the bindings in ... are in scope, as promises, as if they were assigned from left to right in a child of the environment defined by \texttt{\_data}.

Composing Contexts

\textbf{Contexts}, as made by \texttt{let()}, have an advantage over ordinary local assignments because contexts are both lazy and composable. Like assignments, the order of named expressions in a context is significant.

For example, you can string together contexts to make larger ones:

\begin{verbatim}
foo <-
  let(a = ., b = a + 2) %>>% 
  let(c = a + b) %>>% 
  run(a + b + c)

foo(1)
#> [1] 8
\end{verbatim}

Earlier bindings can be overridden by later ones:

\begin{verbatim}
bar <-
  foo[1:2] %>>%         # Collect the contexts of 'foo()
  let(c = c - 1) %>>% # Override 'c'
  run(a + b + c)

bar(1)
#> [1] 7
\end{verbatim}

Bindings are promises; they are only evaluated on demand:

\begin{verbatim}
run(let(x = a_big_expense(), y = "avoid a big expense"), y)
#> [1] "avoid a big expense"
\end{verbatim}

Remark

“Contexts” as described here should not be confused with “contexts” in \texttt{R’s internal mechanism}.
See Also

`with()` is like `run()`, but more limited because it doesn’t support quasiquotation or provide a means to override local bindings.

Examples

```r
# Miles-per-gallon of big cars
mtcars$mpg[mtcars$cyl == 8 & mtcars$disp > 350]
run(mtcars, mpg[cyl == 8 & disp > 350])
run(mtcars, mpg[big_cars], big_cars = cyl == 8 & disp > 350)

# 'let()' makes a reusable local context for big cars
cars <- let(mtcars, big = cyl == 8 & disp > 350)

eval(quote(mpg[big]), cars)  # Quoting restricts name lookup to 'cars'
run(cars, mpg[big])  # The same, but shorter and more transparent

run(cars, wt[big])
mtcars$wt[mtcars$cyl == 8 & mtcars$disp > 350]

# Precedence of names is from right to left ("bottom-up"): a <- '1000
run(`_expr` = a + b, a = 1, b = a + 2)  # 4: all references are local
run(list(a = 1), a + b, b = a + 2)  # 4: 'b' references local 'a'
run(let(a = 1, b = a + 2), a + b)  # 4: 'b' references local 'a'
run(let(a = 1, b = a + 2), a + b, a = 0)  # 3: latter 'a' takes precedence
run(list(a = 1, b = a + 2), a + b)  # 1003: 'b' references global 'a'

# Bound expressions are lazily evaluated: no error unless 'x' is referenced
run(`_expr` = "S'all good, man.", x = stop("!"))
run(let(x = stop("!")), "S'all good, man.")
let(x = stop("!"))  # Environment binding 'x'
let(x = stop("!")))$x  # Error: !

# Quasiquotation is supported
a <- 1
run(let(a = 2), a + !!a)  #> [1] 3
run(let(a = 1 + !!a, b = a), c(a, b))  #> [1] 2 2
```

---

**fn**

*Function Declarations with Quasiquotation*

---

Description

`fn()` enables you to create (anonymous) functions, of arbitrary call signature. Use it in place of the usual `function()` invocation whenever you want to:

- **Be concise**: The function declarations
\( fn(x, y = 1 \sim x + y) \)

\[ \text{function}(x, y = 1) \times y \]

are equivalent.

- **Enforce immutability:** By enabling Tidyverse quasiquotation, \( fn() \) allows you to “burn in” values at the point of function creation. This guards against changes in a function’s enclosing environment. (See ‘Use Unquoting to Make Robust Functions’.)

\( fn_() \) is a variant of \( fn() \) that does not comprehend quasiquotation. It is useful when you want unquoting (‘!!’) or splicing (‘!!!’) operators in the function body to be literally interpreted, rather than immediately invoked. (See ‘Quasiquotation’ for a complementary way to literally interpret unquoting and splicing operators in \( fn() \).)

**Usage**

\( fn(\ldots, \ldots = \text{parent.frame}()) \)

\( fn_() \ldots, \ldots = \text{parent.frame}() \)

**Arguments**

- \ldots \hspace{2cm} \text{Function declaration, which supports quasiquotation.}
- ..env \hspace{2cm} \text{Environment in which to create the function (i.e., the function’s enclosing environment).}

**Value**

A function whose enclosing environment is ..env.

**Function Declarations**

A **function declaration** is an expression that specifies a function’s arguments and body, as a comma-separated expression of the form

\[ \arg_1, \arg_2, \ldots, \arg_N \sim \text{body} \]

or

\[ \arg_1, \arg_2, \ldots, \arg_N, \sim \text{body} \]

(Note in the second form that the body is a one-sided formula. This distinction is relevant for argument splicing, see ‘Quasiquotation’.)

- To the left of \( \sim \), you write a conventional function-argument declaration, just as in \( \text{function}(<\text{arguments}>) \): each of \( \arg_1, \arg_2, \ldots, \arg_N \) is either a bare argument (e.g., \( \times \) or \( \ldots \)) or an argument with default value (e.g., \( \times = 1 \)).
- To the right of \( \sim \), you write the function body, i.e., an expression of the arguments.
Quasiquotation

All parts of a function declaration support Tidyverse quasiquotation:

- To unquote values (of arguments or parts of the body), use `!!`:
  ```r
  z <- 0
  fn(x, y = !!z ~ x + y)
  fn(x ~ x > !!z)
  ```

- To unquote argument names (with default value), use `:=` (definition operator):
  ```r
  arg <- "y"
  fn(x, !!arg := 0 ~ x + !!as.name(arg))
  ```

- To splice in a (formal) list of arguments, use `!!!`:
  ```r
  # NB: Body is a one-sided formula
  fn(!!!alist(x, y = 0), ~ x + y)
  ```

  Splicing allows you to treat a complete function declaration as a unit:
  ```r
  soma <- alist(x, y = 0, ~ x + y)
  fn(!!!soma)
  ```

- To write literal unquoting operators, use ` QUQ()`, ` QUQS()`, which read as “quoted unquoting,” “quoted unquote-splicing,” resp. (cf. ` fn_()`):
  ```r
  library(dplyr)
  my_summarise <- fn(df, ... ~ { 
    group_by <- quos(...)
    df %>%
    group_by(QUQS(group_by)) %>%
    summarise(a = mean(a))
  })
  ```

  (Source: [Programming with dplyr](https://dplyr.tidyverse.org/))

Use Unquoting to Make Robust Functions

Functions in R are generally impure, i.e., the return value of a function will not in general be determined by the value of its inputs alone. This is because, by design, a function may depend on objects in its lexical scope, and these objects may mutate between function calls. Normally this isn’t a hazard.

However, if you are working interactively and sourcing files into the global environment, or using a notebook interface like Jupyter or R Notebook, it can be tricky to ensure that you haven’t unwittingly mutated an object that an earlier function depends upon.

You can use unquoting to guard against such mutations.

**Example:** Consider the following function:

```r
a <- 1
foo <- function(x) x + a
```
What is the value of `foo(1)`? It is not necessarily 2, because the value of `a` may have changed between the creation of `foo()` and the calling of `foo(1)`:  
```r
foo(1) #> [1] 2
a <- 0
foo(1) #> [1] 1
```
In other words, `foo()` is impure because the value of `foo(x)` depends not only on the value of `x` but also on the externally mutable value of `a`.

With `fn()`, you can unquote `a` to “burn in” its value at the point of creation:
```r
a <- 1
foo <- fn(x ~ x + !!a)
```
Now `foo()` is a pure function, unaffected by changes to `a` in the lexical scope:
```r
foo(1) #> [1] 2
a <- 0
foo(1) #> [1] 2
```

**Examples**

```r
defn(x ~ x + 1)
defn(x, y ~ x + y)
defn(x, y = 2 - x + y)
defn(x, y = 1, ... ~ log(x + y, ...))
# to specify '...' in the middle, write '... = '
defn(x, ..., = , y ~ log(x + y, ...))
# use one-sided formula for constant functions or commands
defn(~ NA)
defn(~ message("!"))
# unquoting is supported (using `!!` from rlang)
zero <- 0
defn(x = !!zero - x > !!zero)
# formals and function bodies can also be spliced in
f <- function(x, y) x + y
g <- function(y, x, ...) x - y
frankenstein <- fn(!!!formals(f), ~ !!body(g))
stopifnot(identical(frankenstein, function(x, y) x - y))
# mixing unquoting and literal unquoting is possible
library(dplyr)
summariser <- quote(mean)
my_summarise <- fn(df, ... ~ {
```
Fix a Number of Arguments to a Function

**Description**

`partial()` enables partial application: given a function, it fixes the value of selected arguments to produce a function of the remaining arguments.

departial() “inverts” the application of partial() by returning the original function.

**Usage**

```
partial(.f, ...)

departial(.f)
```

**Arguments**

- `..f` Function.
- `...` Argument values of ..f to fix, specified by name or position. Captured as quosures. Unquoting and splicing are supported (see ‘Examples’).
Details

Even while `partial()` truncates formals, it remains compatible with functions that use `missing()` to test whether a specified argument was supplied in a call. For example, `draw3 <- partial(sample, size = 3)` works as a function that randomly draws three elements, even though `sample()` invokes `missing(size)` and `draw3()` has signature function `(x, replace = FALSE, prob = NULL).

Because partially applied functions call the original function in an ad hoc environment, impure functions that depend on the calling context as a value, rather than as a lexical scope, may not be amenable to `partial()`. For example, `partial(ls, all.names = TRUE)()` is not equivalent to `ls(all.names = TRUE)`, because `ls()` inspects the calling environment to produce its value, whereas `partial(ls, all.names = TRUE)()` calls `ls(all.names = TRUE)` from an (ephemeral) execution environment.

Value

`partial()` returns a function whose formals are a literal truncation of the formals of `..f()` (as a closure) by the fixed arguments. `partial(..f)` is identical to `..f`.

In conformance with R's calling convention, fixed argument values are lazy promises. Moreover, when forced, they are tidily evaluated. Lazy evaluation of fixed arguments can be overridden via unquoting, see 'Examples'.

Examples

```r
# Arguments can be fixed by name
draw3 <- partial(sample, size = 3)
draw3(letters)

# Arguments can be fixed by position
draw3 <- partial(sample, , 3)
draw3(letters)

# Use `departial()` to recover the original function
stopifnot(identical(departial(draw3), sample))

# Lazily evaluate argument values by default
# The value of 'n' is evaluated whenever `rnd()` is called.
rnd <- partial(runif, n = rpois(1, 5))
replicate(4, rnd(), simplify = FALSE)  # variable length

# Eagerly evaluate argument values with unquoting (`!!`)
# The value of 'n' is fixed when 'rnd_eager' is created.
rnd_eager <- partial(runif, n = !!rpois(1, 5))
len <- length(rnd_eager())
reps <- replicate(4, rnd_eager(), simplify = FALSE)  # constant length
stopifnot(all(vapply(reps, length, integer(1)) == len))

# Mix evaluation schemes by combining lazy evaluation with unquoting (`!!`)
# Here 'n' is lazily evaluated, while 'max' is eagerly evaluated.
rnd_mixed <- partial(runif, n = rpois(1, 5), max = !!sample(10, 1))
replicate(4, rnd_mixed(), simplify = FALSE)
```
### posure

**Variable Composite Functions**

**Description**

posure() enables you to create efficient variable (i.e., parameterized) composite functions. For instance, say you have a composite function such as

```r
function(..., b = 2, n) {
  (sample %>% log(base = b) %>% rep(n))(...)
}
```

# Alternatively, expressed with the magrittr %>%:

```r
function(..., b = 2, n) {
  sample(...) %>% log(base = b) %>% rep(n)
}
```

which varies according to the values of b and n. You can express this more succinctly with posure(), by dropping the placeholder argument (`'...'`):
This creates a function with same **formals** and return values.

But the `posure()` version is more efficient because it creates the composite function just *once*, rather than anew with each function call. Moreover, it is robust than the functionally equivalent construction with the **magrittr** `%>%` because `posure()` validates the constituent functions (see ‘Examples’).

**Usage**

```r
posure(..., ..env = parent.frame())
```

**Arguments**

- `...` Function declaration whose body must be a function composition expressed using `%>%`. **Quasiquotation** is supported. The syntax is that of `fn()` (see ‘Function Declarations’) except that declaring `...` among `...` is ambiguous.

- `..env` Environment in which to create the function. (You should rarely need to set this.)

**Details**

`posure()` *curries* composite functions. However, the main significance of `posure()` is its efficiency, which is achieved via non-standard scoping semantics (transparent to the caller). `posure()` creates the given composite function once. When the resulting variable composite function is called, its dependencies are dynamically bound to its localized *lexical* scope, for fast lookup, then removed when the function exits. Thus a `posure` is a (parameterized) closure that is *partially dynamically scoped*. (This portmanteau is due to **Henry Stanley**.)

**Value**

Function with **formals** function (...`, `<composite_function_dependencies>`), where `<composite_function_dependencies>` stands for the formals captured by the dots of `posure()`. In particular, a call of the form

```r
posure(a, b = value ~ f(a, b) %>%% g(a, b))
```

produces a function with the same formals and return values as

```r
function(..., a, b = value) {
  (f(a, b) %>%% g(a, b))(...)
}
```

**See Also**

`%>%`, `fn()`, `partial()`.

```r
posure(b = 2, n ~ {
  sample %>%% log(base = b) %>%% rep(n)
})
```
Examples

```r
foo <- posure(b = 2, n ~ {
    sample %>% log(base = b) %>% rep(n)
})

# A posure is a composite function with dependencies:
foo

set.seed(1)
foo(2^((1:10), size = 2, n = 3)
#> [1] 3 4 3 4 3 4

set.seed(1)
rep(log(sample(2^((1:10), size = 2), base = 2), 3)
#> [1] 3 4 3 4 3 4

# However, a 'posure()' does the composition upfront, so it is faster
# than the equivalent function defined using the magrittr pipe:

library(magrittr)  # Provides the pipe %>%

foo_pipe <- function(..., b = 2, n) {
    sample(...) %>% log(base = b) %>% rep(n)
}

set.seed(1)
foo_pipe(2^((1:10), size = 2, n = 3)
#> [1] 3 4 3 4 3 4

# Moreover, posures are safer than functions defined using the pipe,
# because '%>%%' validates constituent functions:

posure(b = 2, n ~ log(Base = b) %>% rep(n))  # Error: unused argument (Base = b)

posure(b = 2 ~ my_sample %>% log(base = b))  # Error: object 'my_sample' not found
```
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