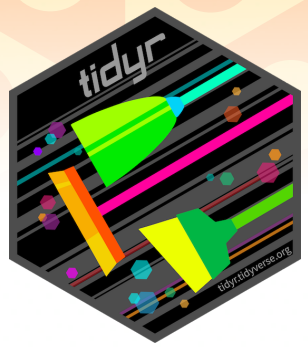
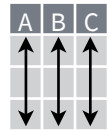


Tidy Data with tidyr : : CHEAT SHEET



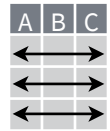
Tidy data is a way to organize tabular data in a consistent data structure across packages.

A table is tidy if:



Each **variable** is in its own **column**

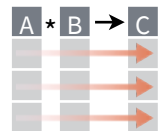
&



Each **observation**, or **case**, is in its own row



Access **variables** as **vectors**



Preserve **cases** in vectorized operations

Tibbles

AN ENHANCED DATA FRAME

Tibbles are a table format provided by the **tibble** package. They inherit the data frame class, but have improved behaviors:

- **Subset** a new tibble with `[],` a vector with `[[` and `$.`
- **No partial matching** when subsetting columns.
- **Display** concise views of the data on one screen.

options(tibble.print_max = n, tibble.print_min = m, tibble.width = Inf) Control default display settings.

View() or **glimpse()** View the entire data set.

CONSTRUCT A TIBBLE

tibble(...) Construct by columns.

`tibble(x = 1:3, y = c("a", "b", "c"))`

tribble(...) Construct by rows.

```
tribble(~x, ~y,  
  1, "a",  
  2, "b",  
  3, "c")
```

Both make this tibble

```
A tibble: 3 x 2  
  x     y  
  <int> <chr>  
1     1 a  
2     2 b  
3     3 c
```

as_tibble(x, ...) Convert a data frame to a tibble.

enframe(x, name = "name", value = "value")

Convert a named vector to a tibble. Also **deframe()**.

is_tibble(x) Test whether x is a tibble.



Reshape Data - Pivot data to reorganize values into a new layout.

table4a

country	1999	2000
A	0.7K	2K
B	37K	80K
C	212K	213K

→

country	year	cases
A	1999	0.7K
B	1999	37K
C	1999	212K
A	2000	2K
B	2000	80K
C	2000	213K

pivot_longer(data, cols, names_to = "name", values_to = "value", values_drop_na = FALSE)

"Lengthen" data by collapsing several columns into two. Column names move to a new names_to column and values to a new values_to column.

```
pivot_longer(table4a, cols = 2:3, names_to = "year",  
  values_to = "cases")
```

table2

country	year	type	count
A	1999	cases	0.7K
A	1999	pop	19M
A	2000	cases	2K
A	2000	pop	20M
B	1999	cases	37K
B	1999	pop	172M
B	2000	cases	80K
B	2000	pop	174M
C	1999	cases	212K
C	1999	pop	1T
C	2000	cases	213K
C	2000	pop	1T

→

country	year	cases	pop
A	1999	0.7K	19M
A	2000	2K	20M
B	1999	37K	172M
B	2000	80K	174M
C	1999	212K	1T
C	2000	213K	1T

pivot_wider(data, names_from = "name", values_from = "value")

The inverse of pivot_longer(). "Widen" data by expanding two columns into several. One column provides the new column names, the other the values.

```
pivot_wider(table2, names_from = type,  
  values_from = count)
```

Split Cells - Use these functions to split or combine cells into individual, isolated values.

table5

country	century	year
A	19	99
A	20	00
B	19	99
B	20	00

→

country	year
A	1999
A	2000
B	1999
B	2000

unite(data, col, ..., sep = "_", remove = TRUE, na.rm = FALSE) Collapse cells across several columns into a single column.

```
unite(table5, century, year, col = "year", sep = "")
```

table3

country	year	rate
A	1999	0.7K/19M
A	2000	2K/20M
B	1999	37K/172M
B	2000	80K/174M

→

country	year	cases	pop
A	1999	0.7K	19M
A	2000	2K	20M
B	1999	37K	172
B	2000	80K	174

separate(data, col, into, sep = "[^:alnum:]]+", remove = TRUE, convert = FALSE, extra = "warn", fill = "warn", ...) Separate each cell in a column into several columns. Also **extract()**.

```
separate(table3, rate, sep = "/",  
  into = c("cases", "pop"))
```

table3

country	year	rate
A	1999	0.7K
A	1999	19M
A	2000	2K
A	2000	20M
B	1999	37K
B	1999	172M
B	2000	80K
B	2000	174M

separate_rows(data, ..., sep = "[^:alnum:]]+", convert = FALSE) Separate each cell in a column into several rows.

```
separate_rows(table3, rate, sep = "/")
```

Expand Tables

Create new combinations of variables or identify implicit missing values (combinations of variables not present in the data).

x

x1	x2	x3
A	1	3
B	1	4
B	2	3

→

x1	x2
A	1
A	2
B	1
B	2

expand(data, ...) Create a new tibble with all possible combinations of the values of the variables listed in ... Drop other variables.

```
expand(mtcars, cyl, gear,  
  carb)
```

x

x1	x2	x3
A	1	3
B	1	4
B	2	3

→

x1	x2	x3
A	1	3
A	2	NA
B	1	4
B	2	3

complete(data, ..., fill = list()) Add missing possible combinations of values of variables listed in ... Fill remaining variables with NA.

```
complete(mtcars, cyl, gear,  
  carb)
```

Handle Missing Values

Drop or replace explicit missing values (NA).

x

x1	x2
A	1
B	NA
C	NA
D	3
E	NA

→

x1	x2
A	1
D	3

drop_na(data, ...) Drop rows containing NA's in ... columns.

```
drop_na(x, x2)
```

x

x1	x2
A	1
B	NA
C	NA
D	3
E	NA

→

x1	x2
A	1
B	1
C	1
D	3
E	3

fill(data, ..., .direction = "down") Fill in NA's in ... columns using the next or previous value.

```
fill(x, x2)
```

x

x1	x2
A	1
B	NA
C	NA
D	3
E	NA

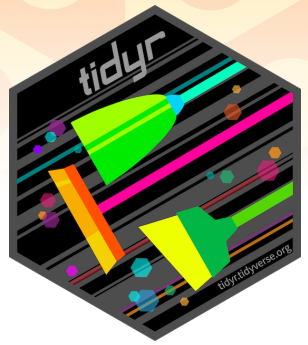
→

x1	x2
A	1
B	2
C	2
D	3
E	2

replace_na(data, replace) Specify a value to replace NA in selected columns.

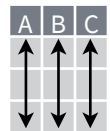
```
replace_na(x, list(x2 = 2))
```

Tidy Data with tidyr : : CHEAT SHEET



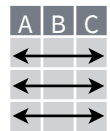
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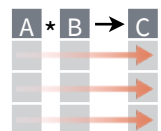
&



Each **observation**, or **case**, is in its own row



Access **variables** as **vectors**



Preserve **cases** in vectorized operations

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tribble(...) Construct by rows.

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tribble(~x, ~y,  
  1, "a",  
  2, "b",  
  3, "c")
```

Both make this tibble

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A tibble: 3 x 2  
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3     3 c
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Convert a named vector to a tibble. Also **deframe()**.

is_tibble(x) Test whether x is a tibble.



Reshape Data - Pivot data to reorganize values into a new layout.

table4a

country	1999	2000
A	0.7K	2K
B	37K	80K
C	212K	213K

→

country	year	cases
A	1999	0.7K
B	1999	37K
C	1999	212K
A	2000	2K
B	2000	80K
C	2000	213K

pivot_longer(data, cols, names_to = "name", values_to = "value", values_drop_na = FALSE)

"Lengthen" data by collapsing several columns into two. Column names move to a new names_to column and values to a new values_to column.

`pivot_longer(table4a, cols = 2:3, names_to = "year", values_to = "cases")`

table2

country	year	type	count
A	1999	cases	0.7K
A	1999	pop	19M
A	2000	cases	2K
A	2000	pop	20M
B	1999	cases	37K
B	1999	pop	172M
B	2000	cases	80K
B	2000	pop	174M
C	1999	cases	212K
C	1999	pop	1T
C	2000	cases	213K
C	2000	pop	1T

→

country	year	cases	pop
A	1999	0.7K	19M
A	2000	2K	20M
B	1999	37K	172M
B	2000	80K	174M
C	1999	212K	1T
C	2000	213K	1T

pivot_wider(data, names_from = "name", values_from = "value")

The inverse of pivot_longer(). "Widen" data by expanding two columns into several. One column provides the new column names, the other the values.

`pivot_wider(table2, names_from = type, values_from = count)`

Split Cells - Use these functions to split or combine cells into individual, isolated values.

table5

country	century	year
A	19	99
A	20	00
B	19	99
B	20	00

→

country	year
A	1999
A	2000
B	1999
B	2000

unite(data, col, ..., sep = "_", remove = TRUE, na.rm = FALSE) Collapse cells across several columns into a single column.

`unite(table5, century, year, col = "year", sep = "")`

table3

country	year	rate
A	1999	0.7K/19M
A	2000	2K/20M
B	1999	37K/172M
B	2000	80K/174M

→

country	year	cases	pop
A	1999	0.7K	19M
A	2000	2K	20M
B	1999	37K	172
B	2000	80K	174

separate(data, col, into, sep = "[^:alnum:]]+", remove = TRUE, convert = FALSE, extra = "warn", fill = "warn", ...) Separate each cell in a column into several columns. Also **extract()**.

`separate(table3, rate, sep = "/", into = c("cases", "pop"))`

table3

country	year	rate
A	1999	0.7K/19M
A	2000	2K/20M
B	1999	37K/172M
B	2000	80K/174M

→

country	year	rate
A	1999	0.7K
A	1999	19M
A	2000	2K
A	2000	20M
B	1999	37K
B	1999	172M
B	2000	80K
B	2000	174M

separate_rows(data, ..., sep = "[^:alnum:]]+", convert = FALSE) Separate each cell in a column into several rows.

`separate_rows(table3, rate, sep = "/")`

Expand Tables

Create new combinations of variables or identify implicit missing values (combinations of variables not present in the data).

x

x1	x2	x3
A	1	3
B	1	4
B	2	3

→

x1	x2
A	1
A	2
B	1
B	2

expand(data, ...) Create a new tibble with all possible combinations of the values of the variables listed in ... Drop other variables.

`expand(mtcars, cyl, gear, carb)`

x

x1	x2	x3
A	1	3
B	1	4
B	2	3

→

x1	x2	x3
A	1	3
A	2	NA
B	1	4
B	2	3

complete(data, ..., fill = list()) Add missing possible combinations of values of variables listed in ... Fill remaining variables with NA.

`complete(mtcars, cyl, gear, carb)`

Handle Missing Values

Drop or replace explicit missing values (NA).

x

x1	x2
A	1
B	NA
C	NA
D	3
E	NA

→

x1	x2
A	1
D	3

drop_na(data, ...) Drop rows containing NA's in ... columns.

`drop_na(x, x2)`

x

x1	x2
A	1
B	NA
C	NA
D	3
E	NA

→

x1	x2
A	1
B	1
C	1
D	3
E	3

fill(data, ..., .direction = "down") Fill in NA's in ... columns using the next or previous value.

`fill(x, x2)`

x

x1	x2
A	1
B	NA
C	NA
D	3
E	NA

→

x1	x2
A	1
B	2
C	2
D	3
E	2

replace_na(data, replace) Specify a value to replace NA in selected columns.

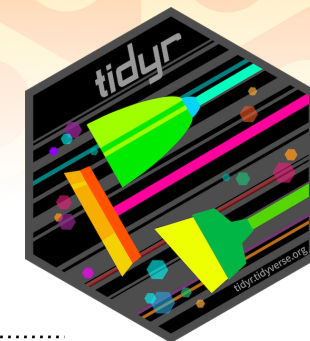
`replace_na(x, list(x2 = 2))`

Nested Data

A **nested data frame** stores individual tables as a list-column of data frames within a larger organizing data frame. List-columns can also be lists of vectors or lists of varying data types.

Use a nested data frame to:

- Preserve relationships between observations and subsets of data. Preserve the type of the variables being nested (factors and datetimes aren't coerced to character).
- Manipulate many sub-tables at once with **purrr** functions like `map()`, `map2()`, or `pmap()` or with **dplyr** `rowwise()` grouping.



CREATE NESTED DATA

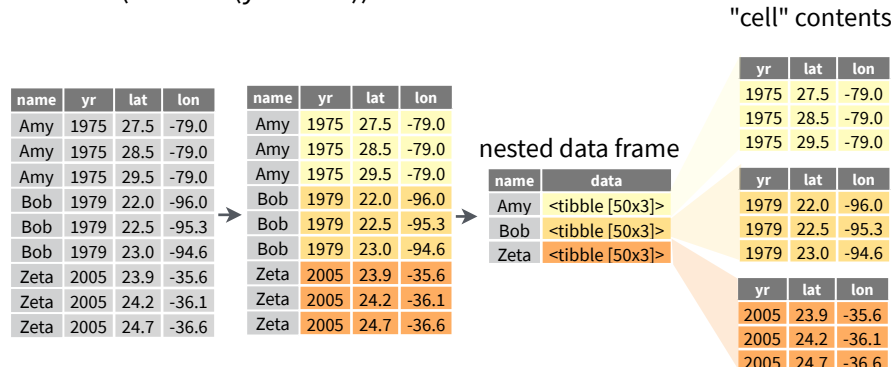
nest(data, ...) Moves groups of cells into a list-column of a data frame. Use alone or with **dplyr::group_by()**:

1. Group the data frame with **group_by()** and use **nest()** to move the groups into a list-column.

```
n_storms <- storms %>%
  group_by(name) %>%
  nest()
```

2. Use **nest(new_col = c(x, y))** to specify the columns to group using **dplyr::select()** syntax.

```
n_storms <- storms %>%
  nest(data = c(year:lon))
```



Index list-columns with `[[]]`. `n_storms$data[[1]]`

CREATE TIBBLES WITH LIST-COLUMNS

tibble::tribble(...) Makes list-columns when needed.

```
tribble( ~max, ~seq,
  3, 1:3,
  4, 1:4,
  5, 1:5)
```

max	seq
3	<int [3]>
4	<int [4]>
5	<int [5]>

tibble::tibble(...) Saves list input as list-columns.

```
tibble(max = c(3, 4, 5), seq = list(1:3, 1:4, 1:5))
```

tibble::enframe(x, name="name", value="value")

Converts multi-level list to a tibble with list-cols.

```
enframe(list('3'=1:3, '4'=1:4, '5'=1:5), 'max', 'seq')
```

OUTPUT LIST-COLUMNS FROM OTHER FUNCTIONS

dplyr::mutate(), **transmute()**, and **summarise()** will output list-columns if they return a list.

```
mtcars %>%
  group_by(cyl) %>%
  summarise(q = list(quantile(mpg)))
```

RESHAPE NESTED DATA

unnest(data, cols, ..., keep_empty = FALSE) Flatten nested columns back to regular columns. The inverse of `nest()`.

```
n_storms %>% unnest(data)
```

unnest_longer(data, col, values_to = NULL, indices_to = NULL)

Turn each element of a list-column into a row.

```
starwars %>%
  select(name, films) %>%
  unnest_longer(films)
```

name	films
Luke	The Empire Strik...
Luke	Revenge of the S...
Luke	Return of the Jed...
C-3PO	The Empire Strik...
C-3PO	Attack of the Cl...
C-3PO	The Phantom M...
R2-D2	The Empire Strik...
R2-D2	Attack of the Cl...
R2-D2	The Phantom M...

unnest_wider(data, col) Turn each element of a list-column into a regular column.

```
starwars %>%
  select(name, films) %>%
  unnest_wider(films)
```

name	films
Luke	<chr [5]>
C-3PO	<chr [6]>
R2-D2	<chr [7]>

name	..1	..2	..3
Luke	The Empire...	Revenge of...	Return of...
C-3PO	The Empire...	Attack of...	The Phantom...
R2-D2	The Empire...	Attack of...	The Phantom...

hoist(.data, .col, ..., .remove = TRUE) Selectively pull list components out into their own top-level columns. Uses **purrr::pluck()** syntax for selecting from lists.

```
starwars %>%
  select(name, films) %>%
  hoist(films, first_film = 1, second_film = 2)
```

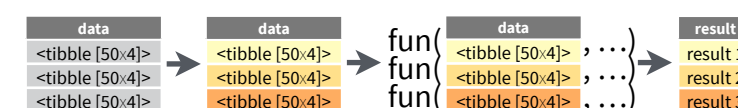
name	films
Luke	<chr [5]>
C-3PO	<chr [6]>
R2-D2	<chr [7]>

name	first_film	second_film	films
Luke	The Empire...	Revenge of...	<chr [3]>
C-3PO	The Empire...	Attack of...	<chr [4]>
R2-D2	The Empire...	Attack of...	<chr [5]>

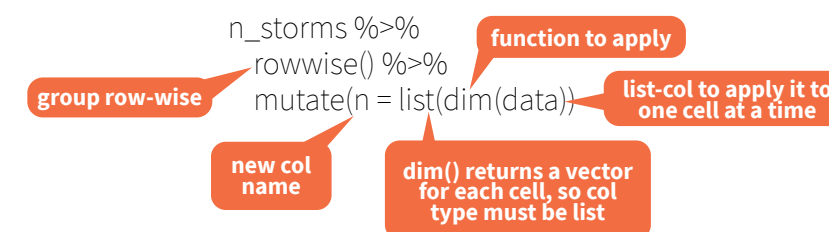
TRANSFORM NESTED DATA

A vectorized function takes a vector and outputs a vector of the same length (see **dplyr** cheat sheet). When working with list-columns you don't have access to the usual vectorized functions.

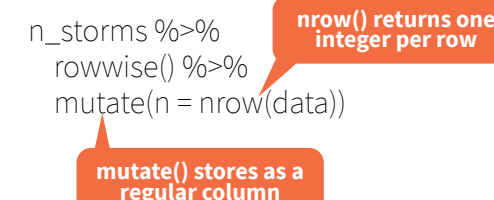
dplyr::rowwise(.data, ...) Group data by row. This allows you to specify what you want for one row, and **dplyr** applies the subsequent function to each row. This allows you to work with list-columns using the expected behavior of vectorized functions, and to apply functions element-wise to a list.



Apply a function to a list-column and **create a new list-column**.



Apply a function to a list-column and **create a regular column**.



Apply a function to **multiple list-columns**.

```
starwars %>%
  rowwise() %>%
  mutate(transport = list(append(vehicles, starships)))
```



See **purrr** package for more list functions.