Becoming a tidy ninja with tidyr

tidyr

A package that ***reshapes*** the layout of tables and **tidies/cleans** existing data

Verb	Usage
gather	collapses multiple columns in key-value pairs
spread	spreads a key-value pair across multiple columns
replace_na	replace missing values
fill	fills missing values by using previous entry
separate	turns a single character column into multiple columns
extract	turns each regex capture group into a new column
unite	paste together multiple columns into one
complete	explicitly completes missing data combinations

```
df <- data.frame(id = 1,
date = paste0(seq(as.Date("2015/10/20"), by = "day", length.out =
3),"T","9:00:00"),
parent = c(round(sort(10 - rnorm(2,1,1),decreasing = TRUE),2),NA),
met1 = c(round(sort(8 - rnorm(2,1,1),decreasing = TRUE),2),NA),
wt = c(70,rep(NA,2)),
age = c(50,rep(".”,2)))
```

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

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gather	collapses multiple columns in key-value pairs
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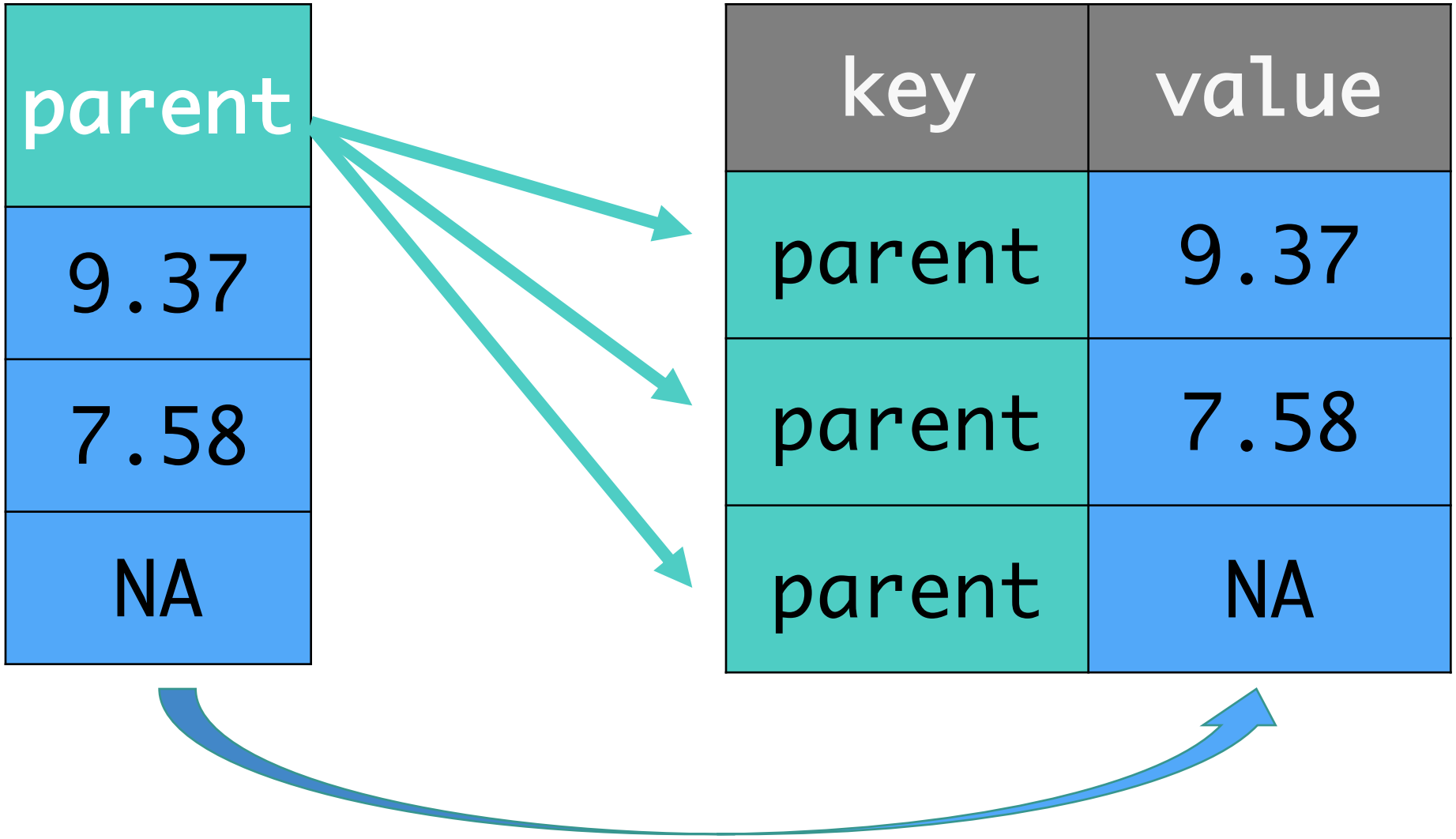
complete	explicitly completes missing data combinations

```
gather(df,
       <key_col_name>,
       <value_col_name>,
       <column(s)_to_pivot>)
```

gather(df, key, value, parent)



id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

```
gather(df,
       analyte
       dv,
       parent, met1)
```

id	date	wt	age	analyte	dv
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA

id	date	wt	age	analyte	dv
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

Stack back together

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

```
gather(df,
       analyte
       dv,
       parent, met1)
```

id	date	wt	age	analyte	DV

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

```
gather(df,
       analyte
       dv,
       parent, met1)
```

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

```
gather(df,
       analyte
       dv,
       parent, met1)
```

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

```
gather(df,
       analyte
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id	date	wt	age	analyte	DV
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1	2015-10-22T9:00:00	NA	.	parent	NA

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
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```
gather(df,
       analyte
       dv,
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id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
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       analyte
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id	date	wt	age	analyte	DV
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1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41

id	date	wt	age	parent	met1
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gather(df,
       analyte
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id	date	wt	age	analyte	DV
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```
gather(df,
       analyte,
       dv,
       parent, met1)
```

gather()

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
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id	date	wt	age	parent	met1
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1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

(former column names)

key

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
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id	date	wt	age	parent	met1
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1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

(former cells)

key values

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

gather()

Collapses multiple columns into two columns:

1. a key column that contains the former column names
2. a value column that contains the former column cell values

```
gather(df, analyte,DV,parent:met1)
```

data frame to reshape

name of the new key column

name of the new value column

name or numeric indices of columns to collapse

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1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

Active Moiety Concentration
= Parent + Met1

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1	2015-10-22T9:00:00	NA	.	met1	NA

```
gdf %>%
spread(analyte,DV)
```

id	date	wt	age	parent	met1

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
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```
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```

id	date	wt	age	parent	met1
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1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

```
gdf %>%
spread(analyte,DV)
```

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1	2015-10-20T9:00:00	70	50	met1	8.05
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1	2015-10-22T9:00:00	NA	.	met1	NA

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1	2015-10-22T9:00:00	NA	.	parent	NA
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1	2015-10-21T9:00:00	NA	.	met1	6.41
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```
gdf %>%
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1	2015-10-20T9:00:00	70	50	9.37	8.05
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1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

```
gdf %>%
spread(analyte,DV)
```

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

```
gdf %>%
spread(analyte,DV)
```

id	date	wt	age	parent	met1	AM
1	2015-10-20T9:00:00	70	50	9.37	8.05	
1	2015-10-21T9:00:00	NA	.	7.58	6.41	
1	2015-10-22T9:00:00	NA	.	NA	NA	

mutate

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

```
gdf %>%
spread(analyte,DV)
```

spread()

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

key (new column names)

```
gdf %>%
spread(analyte,DV)
```

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
1	2015-10-22T9:00:00	NA	.	met1	NA

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

key **value** (new cells)

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
1	2015-10-21T9:00:00	NA	.	parent	7.58
1	2015-10-22T9:00:00	NA	.	parent	NA
1	2015-10-20T9:00:00	70	50	met1	8.05
1	2015-10-21T9:00:00	NA	.	met1	6.41
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```
gdf %>%
spread(analyte,DV)
```

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

spread()

Generates multiple columns from two columns:

1. each unique value in the key column becomes a column name
2. each value in the **value** column becomes a cell in the new columns

```
spread(df, analyte,DV)
```

spread()

Generates multiple columns from two columns:

1. each unique value in the key column becomes a column name
2. each value in the **value** column becomes a cell in the new columns

```
spread(df, analyte,DV)
```

data frame to reshape

column to use for keys

column to use for values

```
gdf <- df %>% gather(analyte,DV,parent:met1)
```

id	date	wt	age	parent	met1
1	2015-10-20T9:00:00	70	50	9.37	8.05
1	2015-10-21T9:00:00	NA	.	7.58	6.41
1	2015-10-22T9:00:00	NA	.	NA	NA

```
gdf %>%
spread(analyte,DV)
```

id	date	wt	age	analyte	DV
1	2015-10-20T9:00:00	70	50	parent	9.37
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replace_na()

- replaces missing values with specific value of choice
- replaces many missing values at once to any “type”

```
df %>%
  replace_na(
    list(parent="BQL",
         met1="unknown",AM=-99)
)
```

id	date	wt	age	parent	met1	AM
1	2015-10-20T9:00:00	70	50	9.37	8.05	17.42
1	2015-10-21T9:00:00	NA	.	7.58	6.41	14.26
1	2015-10-22T9:00:00	NA	.	NA	NA	NA

id	date	wt	age	parent	met1	AM
1	2015-10-20T9:00:00	70	50	9.37	8.05	17.42
1	2015-10-21T9:00:00	NA	.	7.58	6.41	14.26
1	2015-10-22T9:00:00	NA	.	NA	NA	NA

BQL	unknown	-99

```
df %>% replace_na(list(
        parent="BQL",
        met1="unknown",
        AM=-99)
    )
```

id	date	wt	age	parent	met1	AM
1	2015-10-20T9:00:00	70	50	9.37	8.05	17.42
1	2015-10-21T9:00:00	NA	.	7.58	6.41	14.26
1	2015-10-22T9:00:00	NA	.	BQL	unknown	-99

```
Replacements <- list(
    parent="BQL",
    met1="unknown",
    AM=-99)
df %>% replace_na(replacements)
```

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What will be outcome of fill()'ing age

id	date	wt	age	parent	met1	AM
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1	2015-10-21T9:00:00	70	.	7.58	6.41	14.26
1	2015-10-22T9:00:00	70	.	BQL	unknown	-99

tidyr verbs are select() aware

```
df %>% fill(everything())
df %>% fill(contains(“OCC”))
df %>% fill(-USUBJID)
```

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id	date	time	wt	age	parent	met1	AM

id	date	wt	age	parent	met1	AM
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1	2015-10-21T9:00:00	70	.	7.58	6.41	14.26
1	2015-10-22T9:00:00	70	.	BQL	unknown	-99

```
df %>% separate(date,into=c("date","time"),sep="T")
```

id	date	time	wt	age	parent	met1	AM
1	2015-10-20	9:00:00	70	50	9.37	8.05	17.42
1	2015-10-21	9:00:00	70	.	7.58	6.41	14.26
1	2015-10-22	9:00:00	70	.	BQL	unknown	-99

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spread	spreads a key-value pair across multiple columns
replace_na	replace missing values
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separate	turns a single character column into multiple columns
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id	date	time	wt	age	parent	met1	AM
1	2015-10-20	9:00:00	70	50	9.37	8.05	17.42
1	2015-10-21	9:00:00	70	.	7.58	6.41	14.26
1	2015-10-22	9:00:00	70	.	BQL	unknown	-99

```
df %>% unite(datetime,date,time,sep="T")
```

id	datetime	wt	age	parent	met1	AM
1	2015-10-20T9:00:00	70	50	9.37	8.05	17.42
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```
df_comp <- dplyr::data_frame(id = c(1,1,1,2,2),
                             time = c(0,1,2,0,1))
```

id	time
1	0
1	1
1	2
2	0
2	1

```
df_comp %>% complete(  id, time)
```

id	time
1	0
1	1
1	2
2	0
2	1
2	2

complete()

- explicitly completes missing data combinations

```
df_comp %>%
    complete(id, time, fill = list())
```

columns to be expanded

what to fill in case of missing combinations