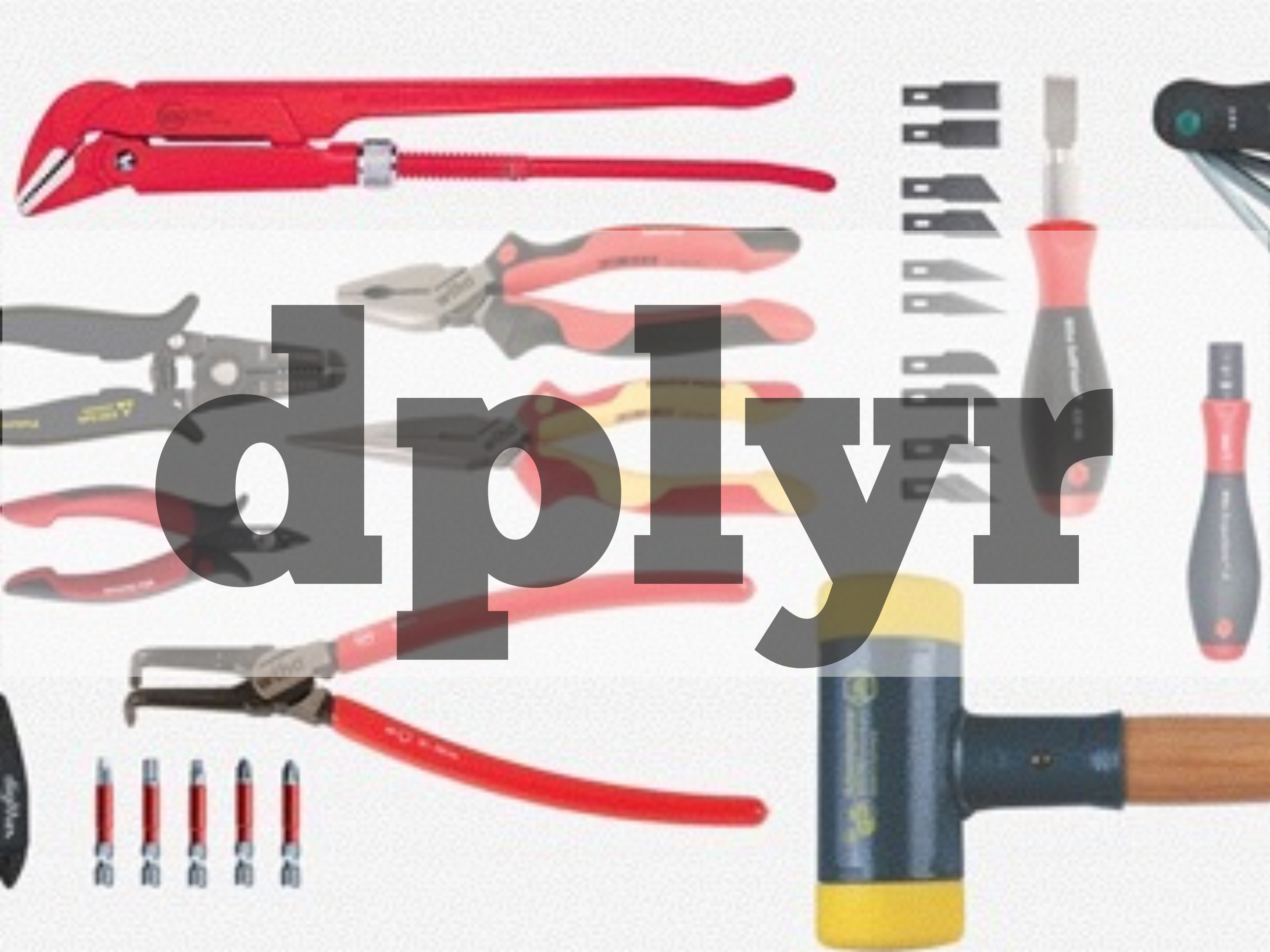

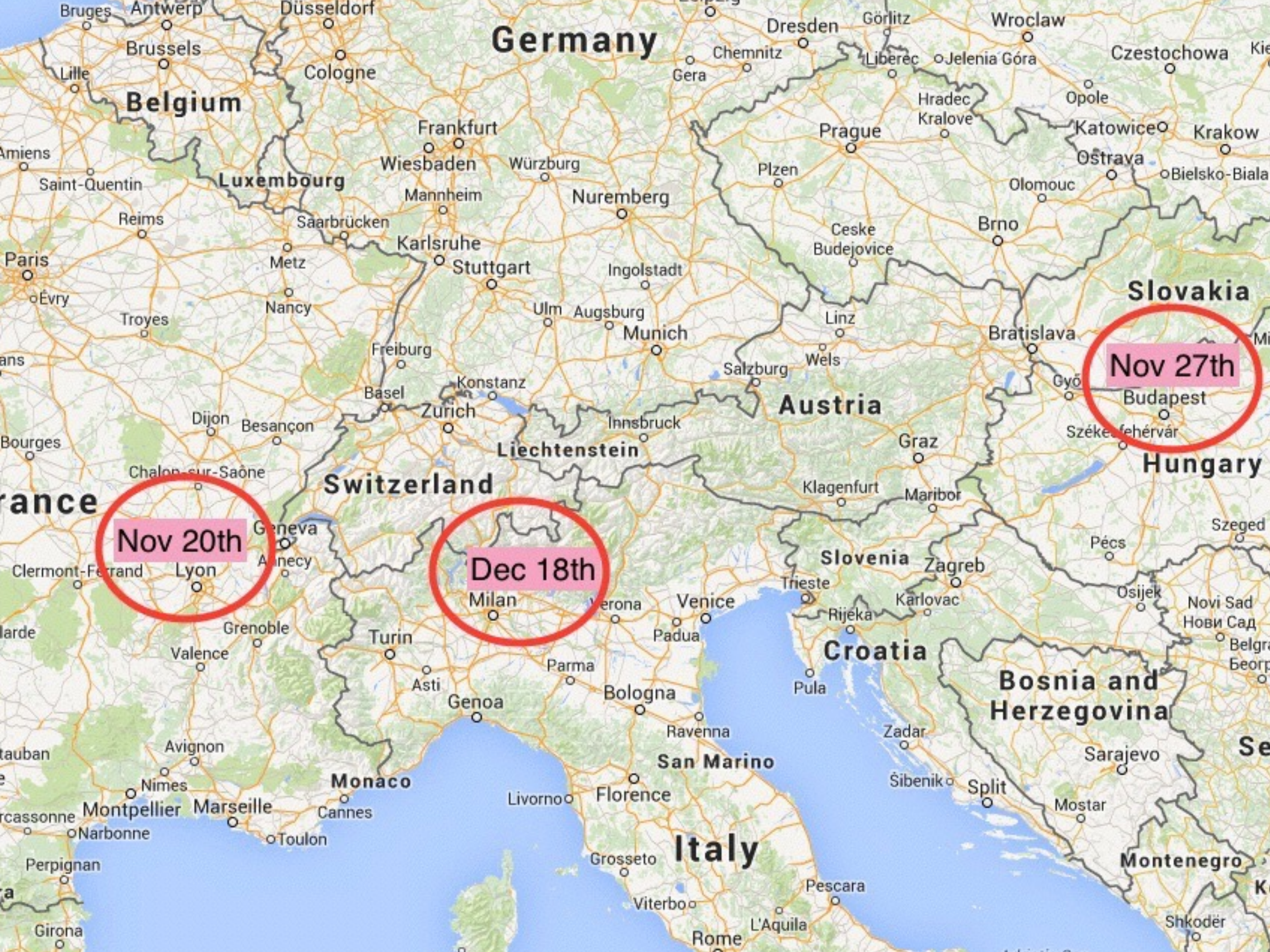
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Hungary
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San Marino
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Nov 27th
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Bruges
Antwerp
Düsseldorf
Brussels
Cologne
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verb

function that takes a data frame as its first argument

Examples of R verbs

head, tail, …

verb subject …

```
> head( iris, n = 4 )
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5          1.4         0.2  setosa
2          4.9         3.0          1.4         0.2  setosa
3          4.7         3.2          1.3         0.2  setosa
4          4.6         3.1          1.5         0.2  setosa
```

%>%

from `magrittr`

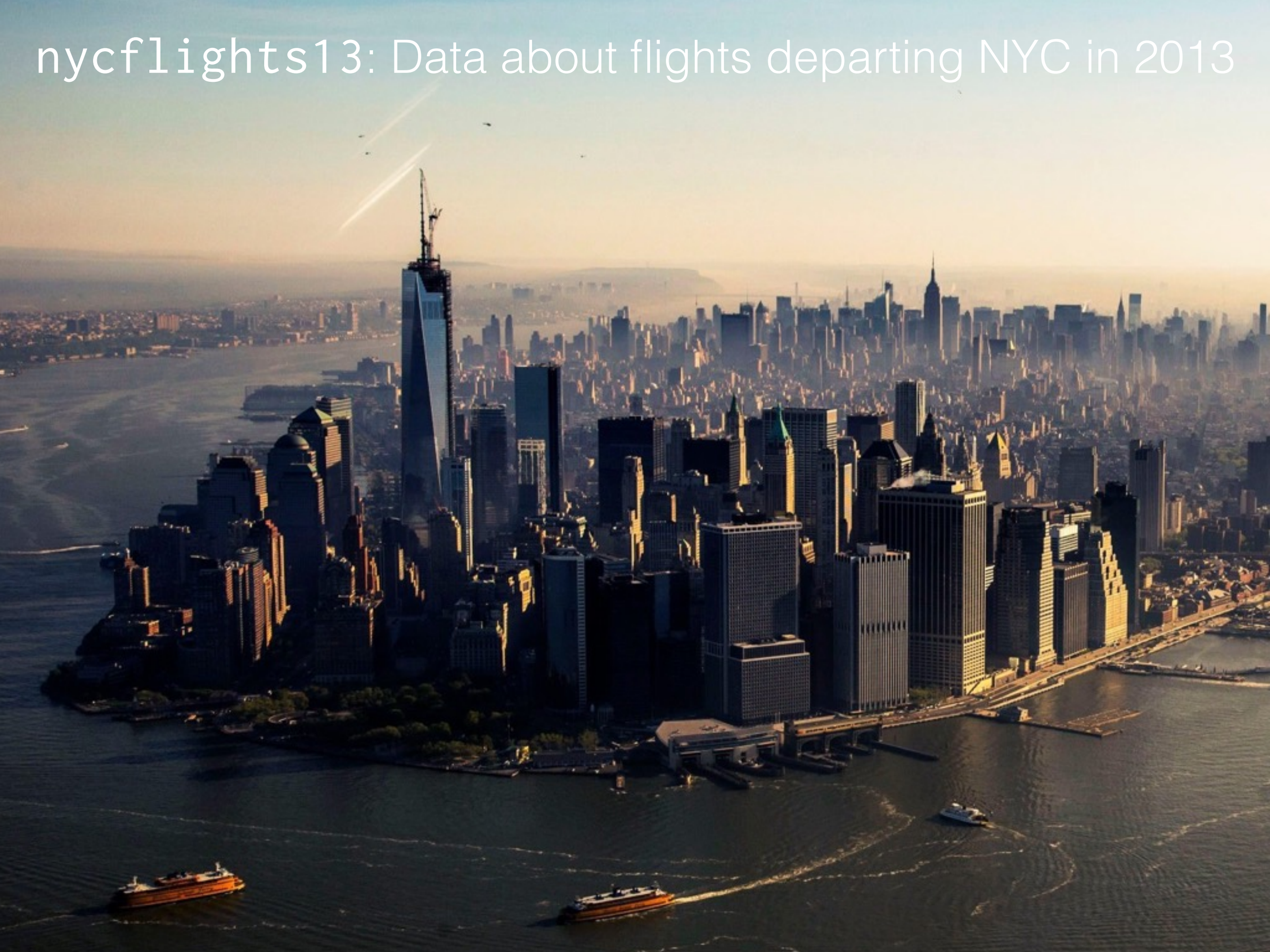
Classic R code

```
mean( rnorm( 100, mean = 4, sd = 4), trim = .1 )
```

Pipeline R code with %>%

```
100 %>%
  rnorm( mean = 4, sd = 4) %>%
  mean( trim = .1 )
```

`nycflights13`: Data about flights departing NYC in 2013



```
> library("nycflights13")
> flights
Source: local data frame [336,776 x 16]

   year month day dep_time dep_delay arr_time arr_delay carrier tailnum flight
1  2013     1   1      517         2      830        11      UA  N14228   1545
2  2013     1   1      533         4      850        20      UA  N24211   1714
3  2013     1   1      542         2      923        33      AA  N619AA   1141
4  2013     1   1      544        -1     1004       -18      B6  N804JB    725
5  2013     1   1      554        -6      812       -25      DL  N668DN    461
6  2013     1   1      554        -4      740        12      UA  N39463   1696
7  2013     1   1      555        -5      913        19      B6  N516JB    507
8  2013     1   1      557        -3      709       -14      EV  N829AS   5708
9  2013     1   1      557        -3      838        -8      B6  N593JB     79
10 2013     1   1      558        -2      753         8      AA  N3ALAA    301
..  ...   ... ...      ...       ...      ...       ...     ...     ...    ...
Variables not shown: origin (chr), dest (chr), air_time (dbl), distance (dbl),
  hour (dbl), minute (dbl)
```

tbl_df

A data frame that does print all of itself by default

```
> data <- tbl_df(mtcars)
> data
Source: local data frame [32 x 11]

    mpg cyl  disp  hp drat    wt  qsec vs am gear carb
1  21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
2  21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
3  22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
4  21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
5  18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
6  18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
7  14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
8  24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
9  22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
10 19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
..  ...  ...   ...  ...  ...   ...   ... .. ..  ...  ...
```

filter

A subset of the rows of the data frame

```
filter(flights, month == 1, day == 1)

flights %>%
  filter( dep_delay < 10 )


flights %>%
  filter( arr_delay < dep_delay )


flights %>%
     filter( hour < 12, arr_delay <= 0 )
```

arrange

reorder a data frame

```
flights %>%
  filter( hour < 8 ) %>%
  arrange( year, month, day )
```

```
flights %>%
  arrange( desc(dep_delay) )
```

select

select certain columns from the data frame

```r
# Select columns by name
select(flights, year, month, day)

# Select all columns between year and day
select(flights, year:day)

# Select all columns except those from year to
# day (inclusive)
select(flights, -(year:day))
```

mutate

modify or create columns based on others

```
d <- flights %>%
  mutate(
    gain = arr_delay - dep_delay,
    speed = distance / air_time * 60
  ) %>%
  filter( gain > 0 ) %>%
  arrange( desc(speed) )

d %>%
  select( year, month, day, dest, gain, speed )
```

summarise

collapse a data frame into one row …

```
summarise(flights,
  delay = mean(dep_delay, na.rm = TRUE))
```

```
flights %>%
  filter( dep_delay > 0 ) %>%
  summarise(arr_delay = mean(arr_delay, na.rm = TRUE))
```

group_by

Group observations by one or more variables

```
flights %>%
  group_by( tailnum ) %>%
  summarise(
    count = n(),
    dist = mean(distance, na.rm = TRUE),
    delay = mean(arr_delay, na.rm = TRUE)
  ) %>%
  filter( is.finite(delay) ) %>%
  arrange( desc(count) )
```

```
flights %>%
  group_by(dest) %>%
  summarise(
  planes = n_distinct(tailnum),
  flights = n()
) %>%
arrange( desc(flights) )
```

joins

joining two data frames

inner_join

all rows from x where there are matching values in y, and all columns from x and y. If there are multiple matches between x and y, all combination of the matches are returned.

```
destinations <- flights %>%
  group_by(dest) %>%
  summarise(
    planes = n_distinct(tailnum),
    flights = n()
  ) %>%
  arrange( desc(flights) ) %>%
  rename( faa = dest )

inner_join( destinations, airports, by = "faa")
```

inner_join

all rows from x where there are matching values in y, and all columns from x and y. If there are multiple matches between x and y, all combination of the matches are returned.

```
destinations <- flights %>%
  group_by(dest) %>%
  summarise(
    planes = n_distinct(tailnum),
    flights = n()
  ) %>%
  arrange( desc(flights) )

inner_join( destinations, airports,
  by = c( "dest" = "faa" ) )
```

other joins
See ?join

- `left_join, right_join`
- `inner_join, outer_join`
- `semi_join`
- `anti_join`

dplyr %>% summary

- Simple verbs: filter, mutate, select, summarise, arrange
- Grouping with group_by
- Joins with *_join
- Convenient with %>%
- F🛫ST

dplyr

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