Data I/O + Structure

Data Wrangling in R

What did I just read in?

- `nrow()` displays the number of rows of a data frame
- `ncol()` displays the number of columns
- `dim()` displays a vector of length 2: # rows, # columns

```
dim(ufo)
```

```
[1] 88875    11
```

```
nrow(ufo)
```

```
[1] 88875
```

```
ncol(ufo)
```

```
[1] 11
```

All Column Names

- `colnames()` displays the column names

```
colnames(ufo)
```

```
 [1] "datetime"             "city"                 "state"               
 [4] "country"              "shape"                "duration (seconds)"  
 [7] "duration (hours/min)" "comments"             "date posted"         
[10] "latitude"             "longitude"           
```

Data Input

- Sometimes you get weird messages when reading in data.
- The problems()` function shows you any issues with the data read-in.

```
problems(ufo)
```

```
# A tibble: 199 x 5
     row col   expected   actual     file
   <int> <chr> <chr>      <chr>      <chr>
 1   877 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 2  1712 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 3  1814 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 4  2857 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 5  3733 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 6  4755 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 7  5388 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 8  5422 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
 9  5613 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
10  5848 <NA>  11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
# … with 189 more rows
```

```
dim(problems(ufo))
```

```
[1] 199   5
```

Data Input

- The `spec()` functions show you the specification of how the data was read in, `cols_condense` can help with this.

```
spec(ufo)
```

```
cols(
  datetime = col_character(),
  city = col_character(),
  state = col_character(),
  country = col_character(),
  shape = col_character(),
  `duration (seconds)` = col_double(),
  `duration (hours/min)` = col_character(),
  comments = col_character(),
  `date posted` = col_character(),
  latitude = col_character(),
  longitude = col_double()
)
```

```
cols_condense(spec(ufo))
```

```
cols(
  .default = col_character(),
  `duration (seconds)` = col_double(),
  longitude = col_double()
)
```

Data Input

This specification is passed to `readr` functions:

```
ufo_char = read_csv("../data/ufo/ufo_data_complete.csv", col_types = cols(
  .default = col_character(),
  longitude = col_double()
))
```

```
Warning: 196 parsing failures.
 row col   expected    actual                                file
 877  -- 11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
1712  -- 11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
1814  -- 11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
2857  -- 11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
3733  -- 11 columns 12 columns '../data/ufo/ufo_data_complete.csv'
.... ... .......... .......... ...................................
See problems(...) for more details.
```

```
dim(problems(ufo))
```

```
[1] 199   5
```

```
dim(problems(ufo_char))
```

```
[1] 196   5
```

Data Input: Checking for problems

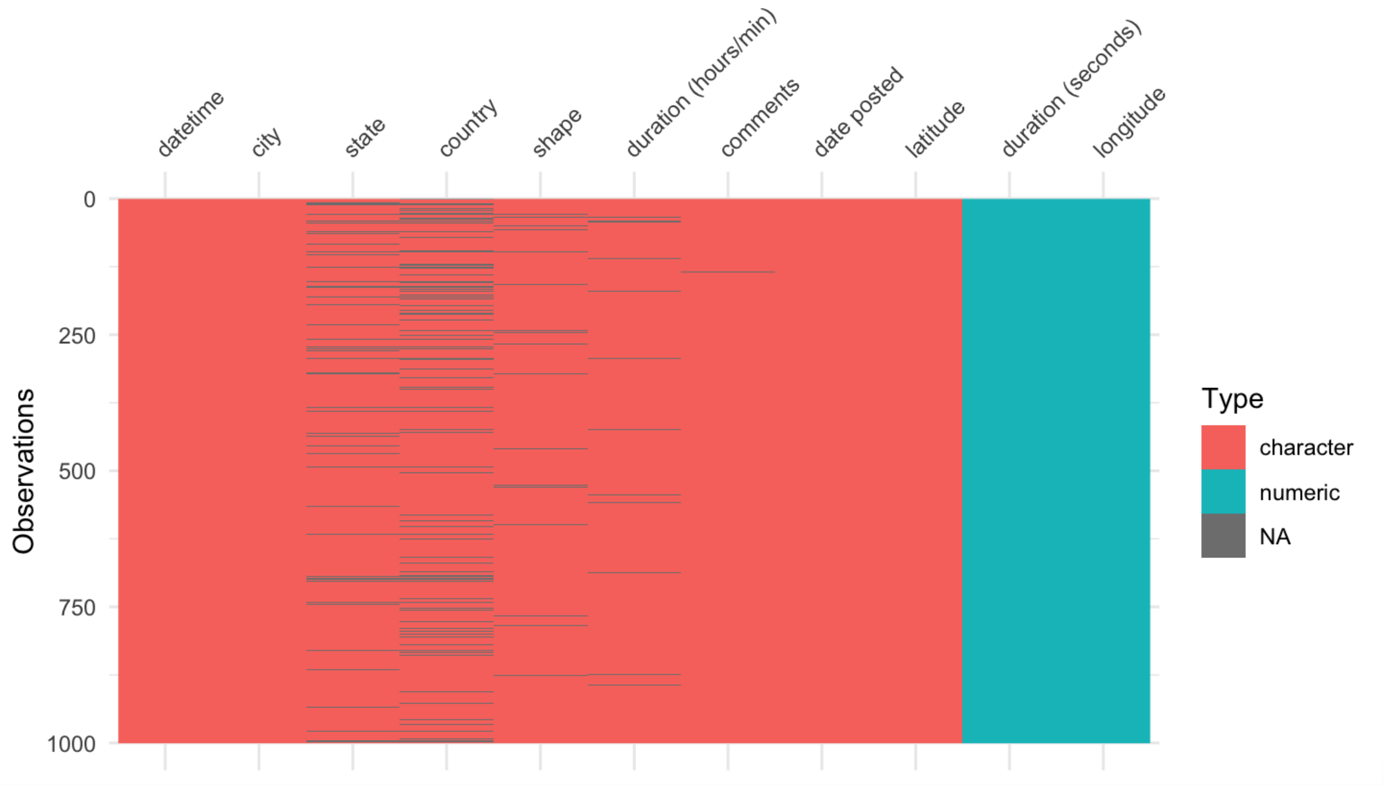
- The `stop_for_problems()` function will stop if your data had an error when reading in. If this occurs, you can either use `col_types` (from `spec()`) for the problematic columns, or set `guess_max = Inf` (takes much longer):

```
stop_for_problems(ufo)
```

Missing data with the `vizdat`/`naniar` packages

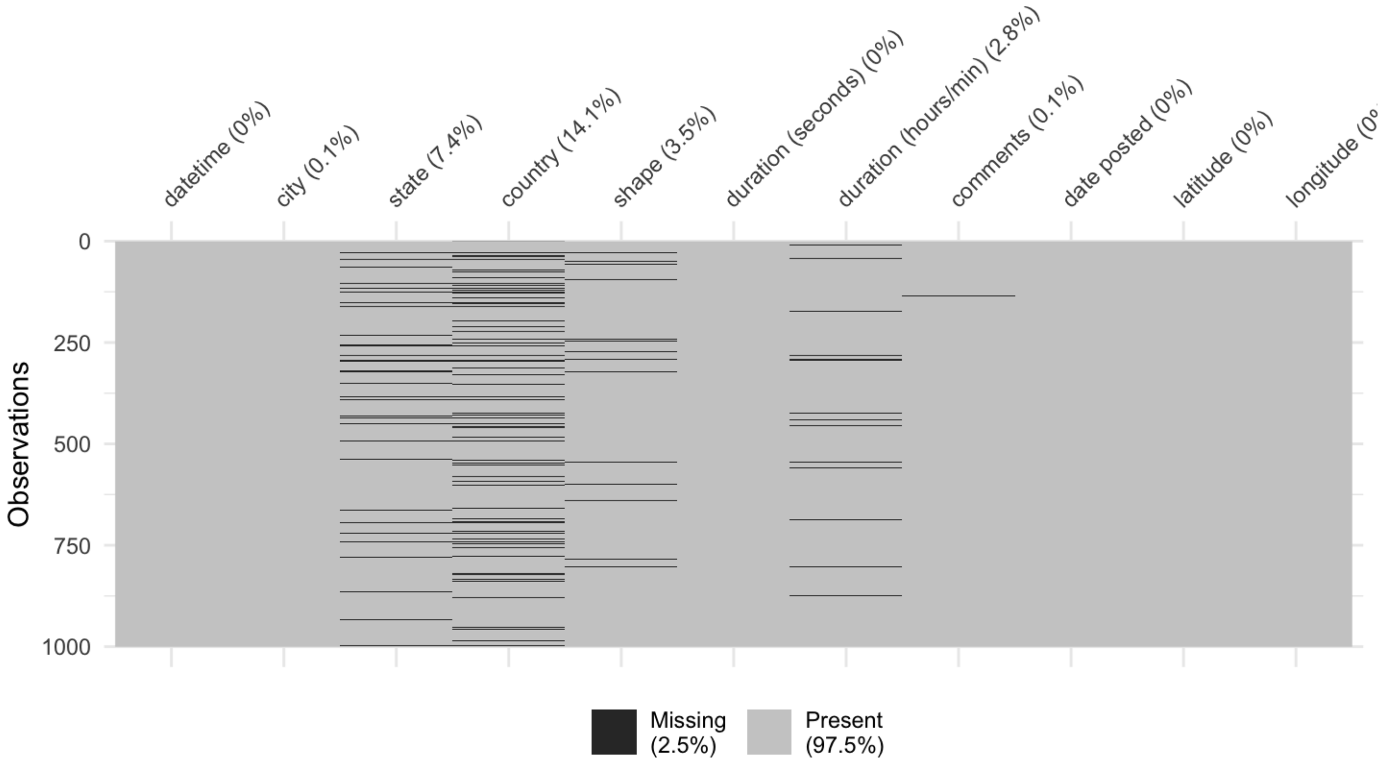
The `vis_dat` function can give you an overview

```
library(visdat) # only so many rows can be visualized are good
ufo_samp = ufo %>% sample_n(size = 1000)
vis_dat(ufo_samp)
```



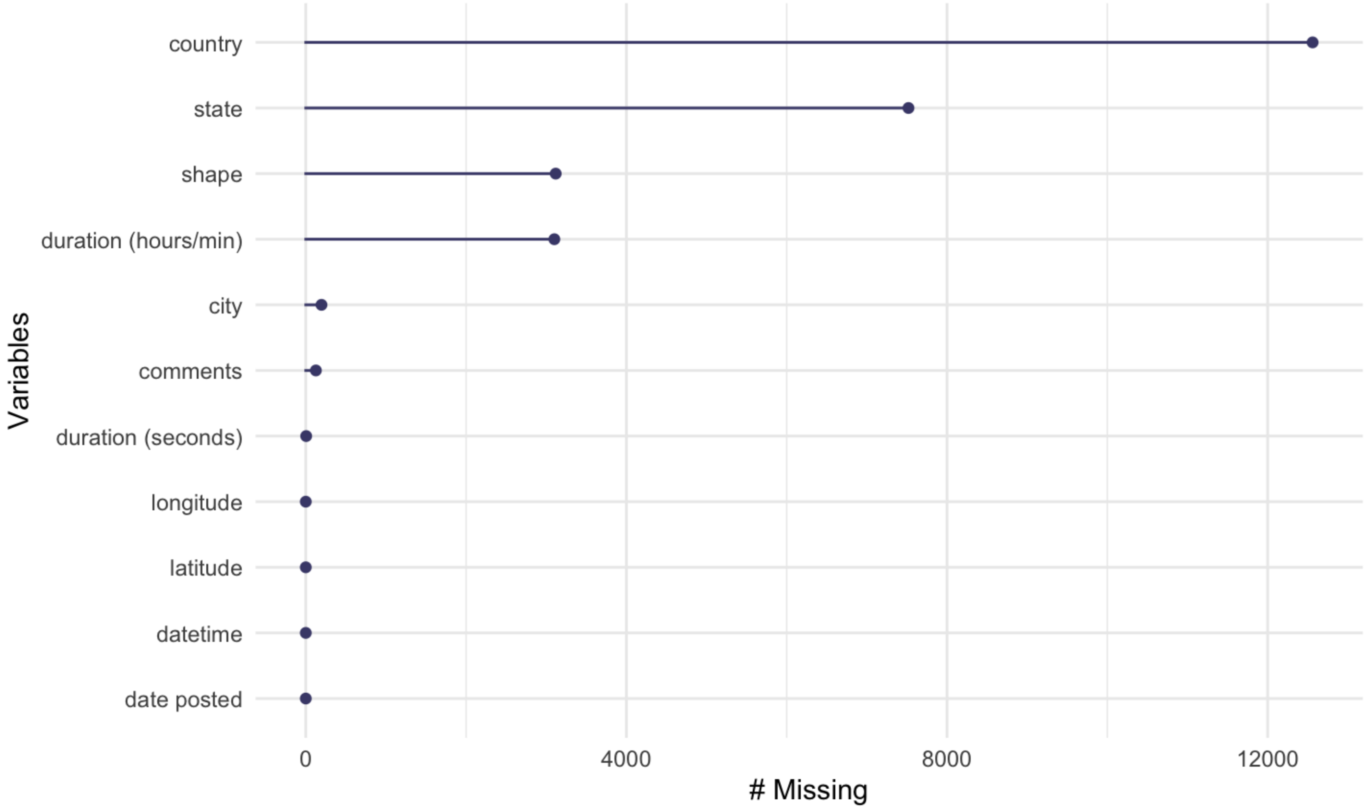
Missing data with the `vizdat`/`naniar` packages

```
vis_miss(ufo_samp)
```



Missing data with the `vizdat`/`naniar` packages

```
library(naniar)
gg_miss_var(ufo)
```



Missing data with the `vizdat`/`naniar` packages

`miss_case_summary` which rows have missing data

```
miss_case_summary(ufo)
```

```
# A tibble: 88,875 x 3
    case n_miss pct_miss
   <int>  <int>    <dbl>
 1   877      6     54.5
 2  1712      6     54.5
 3  5613      6     54.5
 4  7515      6     54.5
 5  7625      6     54.5
 6 10156      6     54.5
 7 16634      6     54.5
 8 18240      6     54.5
 9 19813      6     54.5
10 19908      6     54.5
# … with 88,865 more rows
```

Missing data with the `vizdat`/`naniar` packages

`miss_var_summary` which variables have missing data

```
miss_var_summary(ufo)
```

```
# A tibble: 11 x 3
   variable             n_miss pct_miss
   <chr>                 <int>    <dbl>
 1 country               12561 14.1
 2 state                  7519  8.46
 3 shape                  3118  3.51
 4 duration (hours/min)   3101  3.49
 5 city                    196  0.221
 6 comments                126  0.142
 7 duration (seconds)        5  0.00563
 8 datetime                  0  0
 9 date posted               0  0
10 latitude                  0  0
11 longitude                 0  0
```

After hours of cleaning…

More ways to save: write_rds

If you want to save **one** object, you can use `readr::write_rds` to save to a compressed `rds` file:

```
write_rds(ufo, path = "ufo_dataset.rds", compress = "xz")
```

More ways to save: `read_rds`

To read this back in to R, you need to use `read_rds`, but **need to assign it**:

```
ufo3 = read_rds(path = "ufo_dataset.rds")
identical(ufo, ufo3) # test if they are the same
```

```
[1] TRUE
```

More ways to save: `save`

The `save` command can save a set of `R` objects into an “R data file”, with the extension `.rda` or `.RData`.

```
x = 5
save(ufo, x, file = "ufo_data.rda")
```

More ways to save: load

The opposite of `save` is `load`. The `ls()` command lists the items in the workspace/environment and `rm` removes them

Data Output

While its nice to be able to read in a variety of data formats, it’s equally important to be able to output data somewhere.

`write_delim()`: Write a data frame to a delimited file “This is about twice as fast as write.csv(), and never writes row names.”

```
args(readr::write_delim)
```

```
function (x, path, delim = " ", na = "NA", append = FALSE, col_names = !append
    quote_escape = "double")
NULL
```

Data Output

`x`: A data frame to write to disk

`path`: the file name where you want to R object written. It can be an absolute path, or a filename (which writes the file to your working directory)

`delim`: what character separates the columns?

- “,” = .csv - Note there is also a `write_csv()` function
- " = tab delimited

Data Output

For example, we can write back out the `ufo` dataset with the new column name:

```
write_csv(ufo[1:100,], path = "ufo_first100.csv")
```

Lab

Link to Lab