DataCamp EDA in R

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README

- This is an example of how I work through a DataCamp lesson - no matter what the subject. It's a little more work when there are videos involved. Time to completion about 2 hours.
- I am pretty sure that you won't really understand what's going on without doing it at this level of granularity and with the original data set.
- This is also a way of keeping the DataCamp lessons interesting because otherwise I'd sometimes get very bored with the pace and/or the subject matter. Gotta keep things buzzing!
- As a classroom assignment, this file has been sanitized for use as a practice exercise. The complete file is available as a PDF in the `ds205/pdf/` directory in GitHub.

Emacs setup (optional)

Hide emphatic characters like ~, *

To **not** see the emphatic characters like ~ or * or / in the Org file text, run the following code chunk (or put the code in your `/.emacs` file): if successful, you should see `"t"` in the minibuffer.

```
(setq-default org-hide-emphasis-markers t)
```

This will only work for new buffers. If you don't put it in your `/.emacs` file, the command will only work for the current Emacs session.

Close and reopen this file to see an effect.

Change your theme

- In Emacs, type `M-x custom-themes`
- In the buffer that appears, select `Leuven`
- Select `Apply and Save Setting`
- This will work immediately

Exploring categorical data

Import and view the data

- `[X]` Download the raw data `Comics data` from DataCamp to your PC into a directory `./data/`
- `[X]`

  Read the data set into an R data frame named `comics` and check the structure of the data frame.

```
comics <- read.csv(file="data/comics.csv", header=TRUE)
str(comics)
```

```
'data.frame':	23272 obs. of  11 variables:
 $ name        : chr  "Spider-Man (Peter Parker)" "Captain America (Steven Rogers)" "Wolve
 $ id          : chr  "Secret" "Public" "Public" "Public" ...
 $ align       : chr  "Good" "Good" "Neutral" "Good" ...
 $ eye         : chr  "Hazel Eyes" "Blue Eyes" "Blue Eyes" "Blue Eyes" ...
 $ hair        : chr  "Brown Hair" "White Hair" "Black Hair" "Black Hair" ...
 $ gender      : chr  "Male" "Male" "Male" "Male" ...
 $ gsm         : chr  NA NA NA NA ...
 $ alive       : chr  "Living Characters" "Living Characters" "Living Characters" "Living
 $ appearances : int  4043 3360 3061 2961 2258 2255 2072 2017 1955 1934 ...
 $ first_appear: chr  "Aug-62" "Mar-41" "Oct-74" "Mar-63" ...
 $ publisher   : chr  "marvel" "marvel" "marvel" "marvel" ...
```

- [ ]

  Print the first 10 rows of the dataset.

```
head(comics, 10)
```

```
                                    name      id   align        eye       hair
1              Spider-Man (Peter Parker)  Secret    Good Hazel Eyes Brown Hair
2        Captain America (Steven Rogers)  Public    Good  Blue Eyes White Hair
3  Wolverine (James \\"Logan\\" Howlett)  Public Neutral  Blue Eyes Black Hair
4    Iron Man (Anthony \\"Tony\\" Stark)  Public    Good  Blue Eyes Black Hair
5                    Thor (Thor Odinson) No Dual    Good  Blue Eyes Blond Hair
6              Benjamin Grimm (Earth-616)  Public    Good  Blue Eyes    No Hair
7               Reed Richards (Earth-616)  Public    Good Brown Eyes Brown Hair
8              Hulk (Robert Bruce Banner)  Public    Good Brown Eyes Brown Hair
9               Scott Summers (Earth-616)  Public Neutral Brown Eyes Brown Hair
10             Jonathan Storm (Earth-616)  Public    Good  Blue Eyes Blond Hair
   gender  gsm             alive appearances first_appear publisher
1    Male <
Living Characters        4043       Aug-62    marvel
2    Male <
Living Characters        3360       Mar-41    marvel
3    Male <
Living Characters        3061       Oct-74    marvel
4    Male <
Living Characters        2961       Mar-63    marvel
5    Male <
Living Characters        2258       Nov-50    marvel
6    Male <
Living Characters        2255       Nov-61    marvel
7    Male <
Living Characters        2072       Nov-61    marvel
8    Male <
Living Characters        2017       May-62    marvel
9    Male <
Living Characters        1955       Sep-63    marvel
10   Male <
Living Characters        1934       Nov-61    marvel
```

- [ ]

  What happens when you only enter the name of the data frame in the console? What is the default maximum value of rows displayed? Enter the command below to print this value.

```
getOption("max.print")
```

```
[1] 99999
```

- [ ]

  Unlike the data shown in the video, the data frame you are currently working with is not a `data.frame` but a "`tibble`".

  More importantly, the tibble contains `factor` variables where the `comics` data frame has `character` variables.

  Re-import `comics.csv` into `comics` so that the characters in the data frame become `factor` variables. *Tip: check the `read.csv` help.*

```
comics <- read.csv(file="data/comics.csv",
                   header=TRUE,
                   stringsAsFactors=TRUE )
str(comics)
```

```
'data.frame':	23272 obs. of  11 variables:
 $ name        : Factor w/ 23272 levels "'Spinner (Earth-616)",..: 19830 3335 22769 9647 2
 $ id          : Factor w/ 4 levels "No Dual","Public",..: 3 2 2 2 1 2 2 2 2 2 ...
 $ align       : Factor w/ 4 levels "Bad","Good","Neutral",..: 2 2 3 2 2 2 2 2 3 2 ...
 $ eye         : Factor w/ 26 levels "Amber Eyes","Auburn Hair",..: 11 5 5 5 5 5 6 6 6 5 .
 $ hair        : Factor w/ 28 levels "Auburn Hair",..: 7 27 3 3 4 14 7 7 7 4 ...
 $ gender      : Factor w/ 3 levels "Female","Male",..: 2 2 2 2 2 2 2 2 2 2 ...
 $ gsm         : Factor w/ 6 levels "Bisexual Characters",..: NA NA NA NA NA NA NA NA NA N
 $ alive       : Factor w/ 2 levels "Deceased Characters",..: 2 2 2 2 2 2 2 2 2 2 ...
 $ appearances : int  4043 3360 3061 2961 2258 2255 2072 2017 1955 1934 ...
 $ first_appear: Factor w/ 1606 levels "1935, October",..: 874 1278 1513 1296 1424 1432 14
 $ publisher   : Factor w/ 2 levels "dc","marvel": 2 2 2 2 2 2 2 2 2 2 ...
```

Working with factors - levels, NAs, contingency

- [ ]

  Let's look at `factor levels`.

  - Store the variables `align` and `id` of the data frame in vectors of that name.
  - Print the `levels` of the `align` and `id` columns that indicate how good and hidden a superhero is.
  - Can you do this in 3 lines (instead of 4) using vectorization?

```
align <- comics$align
id <- comics$id
levels(c(align,id)) ## using vectorization
```

```
[1] "Bad"                "Good"               "Neutral"
[4] "Reformed Criminals" "No Dual"            "Public"
[7] "Secret"             "Unknown"
```

- `[ ]`

  In the video, you're told that `levels` has ignored `NA` values.

  How many `NA` values does `align` and `id` have?

  Tip: use the `is.na` function to find out

  ```
  sum(is.na(align))
  sum(is.na(id))
  ```

  ```
  [1] 3413
  [1] 5783
  ```

- `[ ]`

  Print the contingency `table` for `align` and `id`, which shows how these two categorical variables are connected.[1]

  ```
  tbl <- table(align, id)
  tbl
  ```

  ```
                      id
  align                  No Dual Public Secret Unknown
    Bad                     474   2172   4493       7
    Good                    647   2930   2475       0
    Neutral                 390    965    959       2
    Reformed Criminals        0      1      1       0
  ```

- `[ ]`

  How many good superheroes are there, who are also good? The answer, from the table, is 4493. Which command gets you this number, too?

  ```
  names(table(align == "Bad" & id == "Secret")) ## find the name
  table(align == "Bad" & id == "Secret")[2] ## extract element
  ```

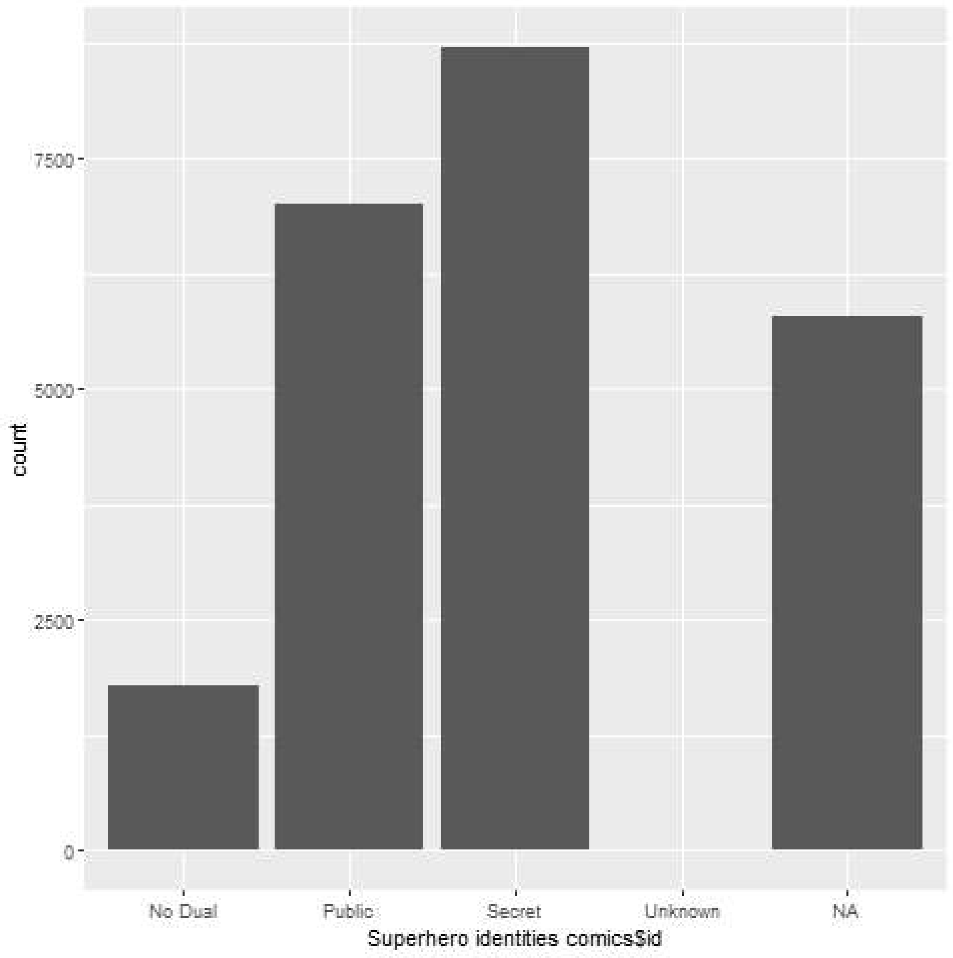
  ```
  [1] "FALSE" "TRUE"
  TRUE
  4493
  ```

Barplots

- `[ ]` Create a directory `./img/` for the plots.
- `[ ]`

  Make a barplot of the superhero identities (`x = comics$id`).

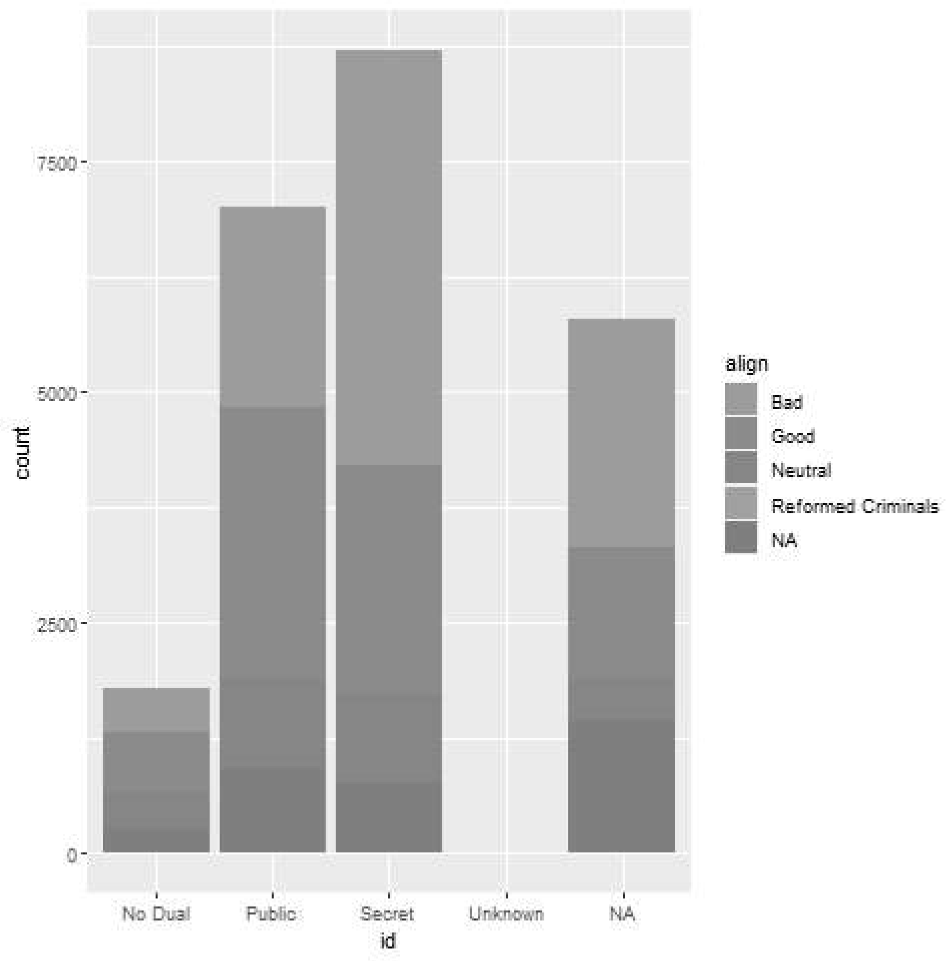
```
library(ggplot2)
ggplot(data = comics, aes(x = id)) +
  geom_bar() +
  xlab("Superhero identities comics$id")
```



- [ ]

  Make a *stacked* barplot that shows superhero identities (`x = comics$id`) and superhero goodness (`fill = comics$align`).

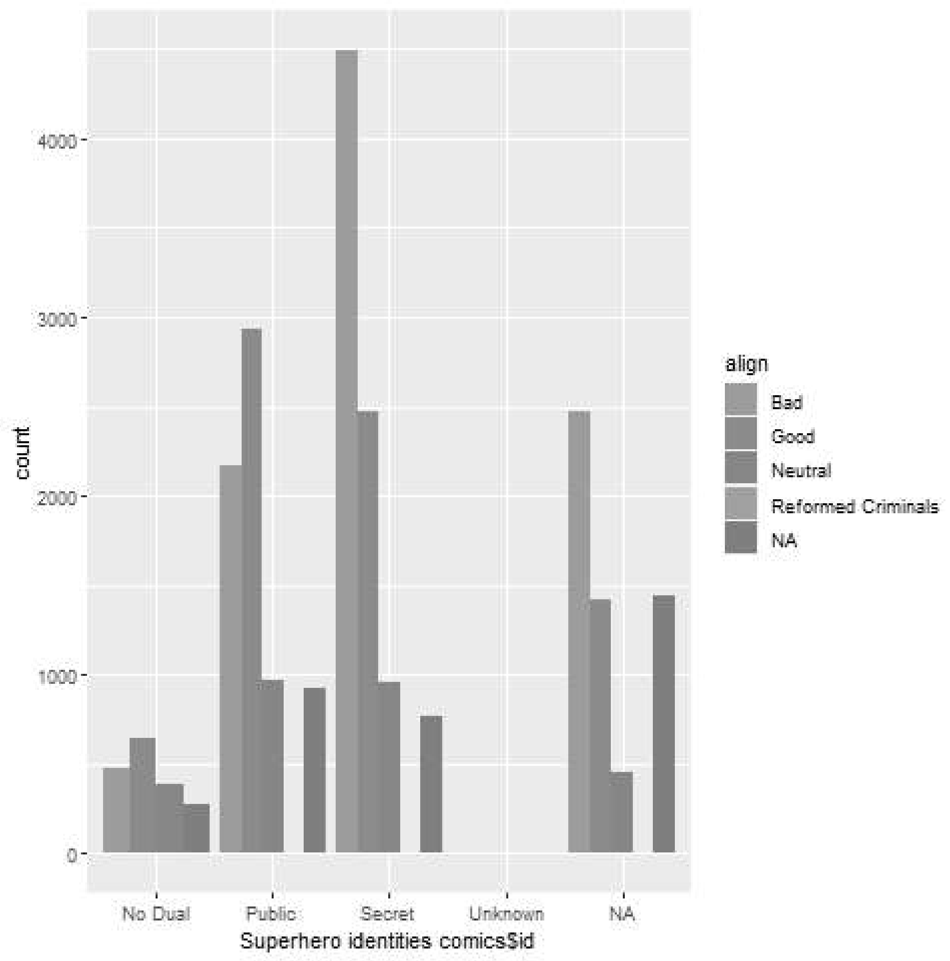
```
library(ggplot2)
ggplot(data = comics, aes(x = id, fill = align)) +
  geom_bar()
```



- [ ]

  Make a *side-by-side* barplot that shows superhero identities (`x = comics$id`) and superhero goodness (`fill = comics$align`).

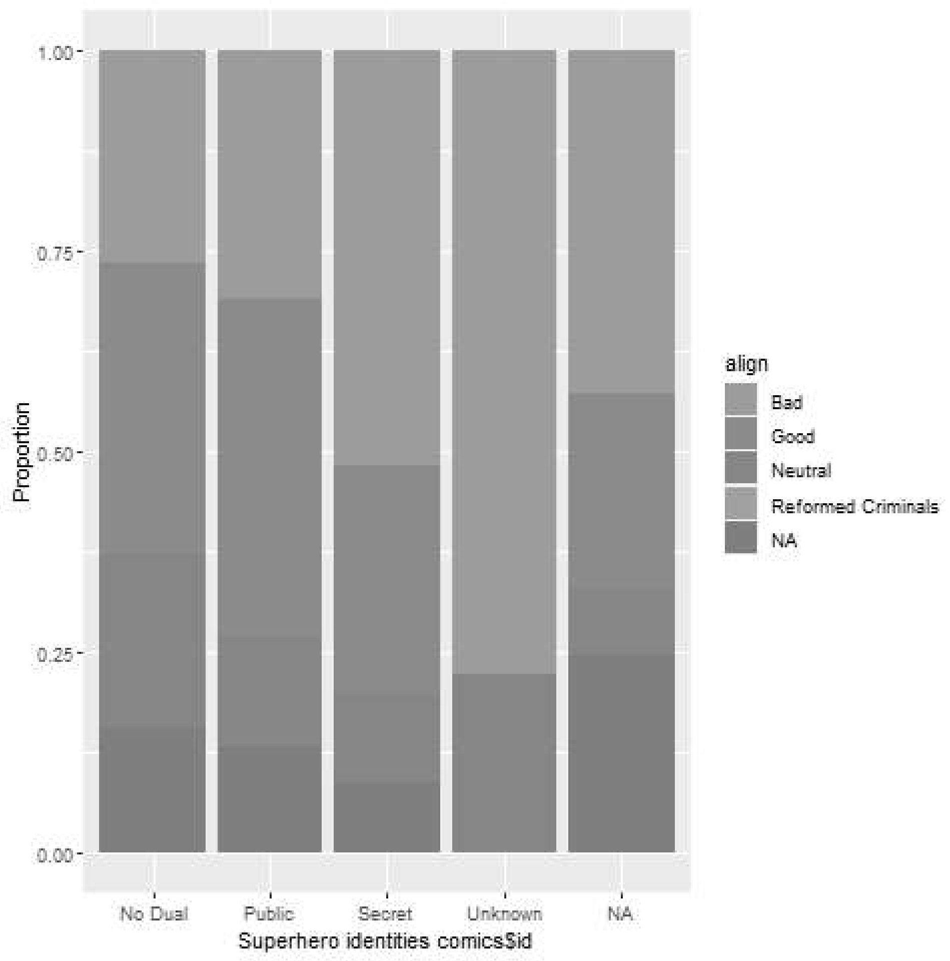
```
library(ggplot2)
ggplot(data = comics, aes(x = id, fill = align)) +
  geom_bar(position = "dodge") +
  xlab("Superhero identities comics$id")
```



- [ ]

  Make a *stacked* barplot that shows the *proportion* (not the *count*) of superhero identities (`x = comics$id`) and superhero goodness (`fill = comics$align`).

```
library(ggplot2)
ggplot(data = comics, aes(x = id, fill = align)) +
  geom_bar(position = "fill") +
  xlab("Superhero identities comics$id") +
  ylab("Proportion")
```



- [ ] Go back over the last three plots and add text:
  - x labels (barplot bar1, stacked / side-by-side bar2, bar3)
  - y labels (proportional barchart bar4)
  - plot titles

Footnotes:

[1] German lesson! The German word for contingency, "zusammenhängen", means "hang together".

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