

Quick tutorial on ggplot2

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ggplot2 has been my most used graphical tool for all my data analysis projects. So I thought my first blog post would be a short tutorial on how to use it to create plots.

ggplot2

ggplot2 is such a powerful R package for visualization. I personally admire the clarity and aesthetic of the plots. It was created by Hadley Wickham in 2005. It is one of the best maintained R packages. So let's get started:

Installation

There are three ways this can be

1. By installing whole tidyverse:

```
install.packages("tidyverse")
```

2. Install just ggplot2: This being the most used.

```
install.packages("ggplot2")
```

3. Or the the development version from GitHub; install.packages("devtools")

```
devtools::install_github("tidyverse/ggplot2")
```

Usage

In order to start of: you first write `ggplot()`, then inside supply a dataset; then use `aes()` which provides aesthetic mappings that describes how variables in the data are mapped to visual properties of geoms. Then, you can start adding layers such as `geom_smooth()`, `geom_jitter()`, `geom_line()`, `ggtitle()`... and scales like `scale_linetype_manual()` (in the below code you will see how this allows us to add an additional element on the legend tab), faceting specifications (you can have multiple panels based on a variable, split the plot using `facets`).

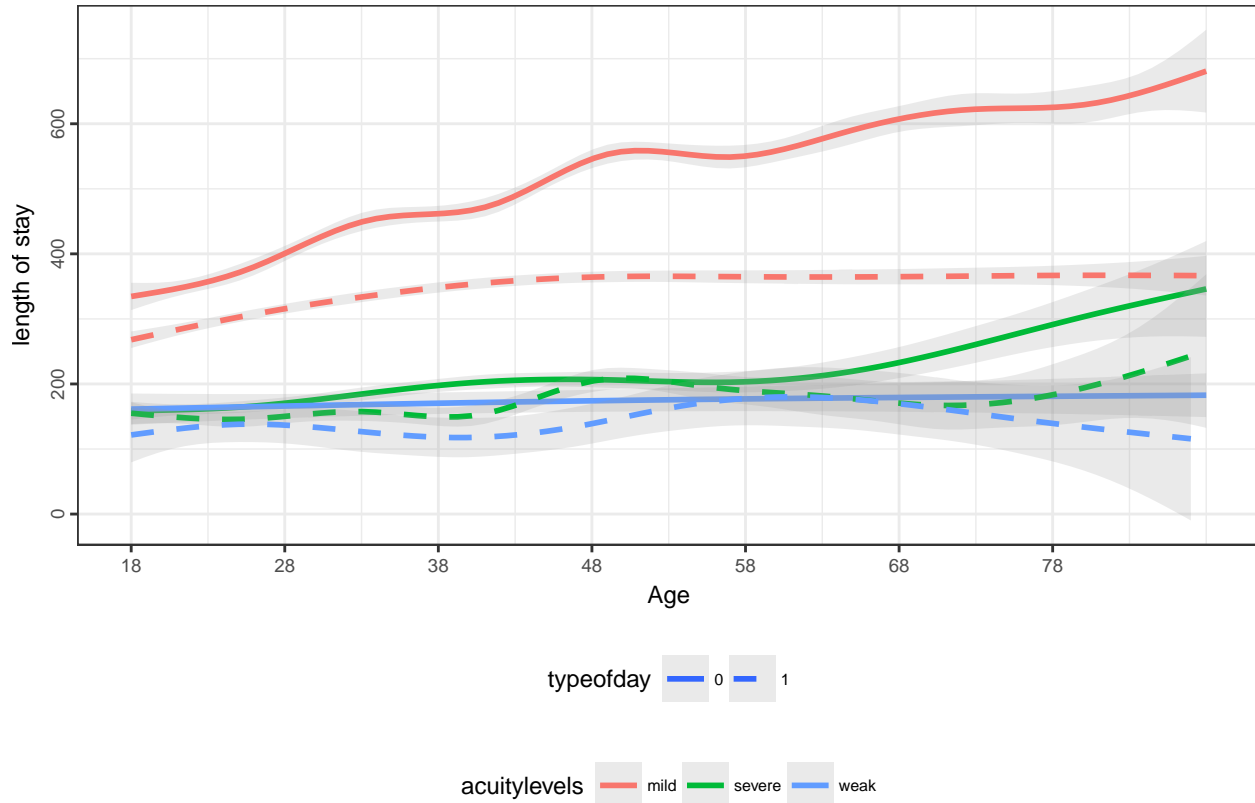
Example 1:

This data I am using here was used to measure the association between a typical patient's emergency department "ED" LOS (length of stay until discharge or hospital admission) and factors that potentially contribute to LOS measured over a one-year period. It was collected from DAP-2016.

For convenience I divided time of day in 3 common work shifts: 1 (11:00pm-6:59am), 2 (7am-2:59pm), and 3: (3:00pm-10:59pm). Similarly for acuity level, 1 (Weak), 2 & 3 (Mild); 4 & 5 (severe). TypeofDay (1: Weekend & 0: Weekdays)

```
ggplot(emergency.data, aes(x = age, y = los, group = interaction(acuitylevels,
  typeofday), colour = acuitylevels, linetype = factor(typeofday))) +
  geom_smooth(size = 1, alpha = 0.2) + ylab("length of stay") +
  ggtitle("Figure 1") + xlab("Age") + scale_linetype_manual("typeofday",
  values = c(1, 2, 3)) + theme_bw() + theme(axis.text.y = element_text(angle = 90,
  hjust = 0.5), plot.margin = rep(unit(0, "null"), 4), legend.position = "bottom",
  legend.box = "vertical", text = element_text(size = 9), legend.text = element_text(size = 6)) +
  scale_x_continuous(breaks = seq(18, 85, 10))
## `geom_smooth()` using method = 'gam'
```

Figure 1



As you can see in the code above, `aes()` gives us the x and y variables, and I introduced additional variables that will interact, acuity levels has three distinct colors (red, green and blue) and if you look closely `typeofday` show us that lines that are dotted represent 1, and lines that are continuous are 0. So this now makes the graph easy to read: for people with acuitylevel that is mild (red), they tend to have a higher length of stay during weekdays(continuous line that represent 0: Weekdays)

`geom_smooth` : smoothing method (function) to use, eg. `lm`, `glm`, `gam`, `loess`, `rlm`. For datasets with $n < 1000$ default is `loess`. For datasets with 1000 or more observations defaults to `gam`. Here the default was `gam`. In case you have a scatterplot with a lot of noise, seeing dominant pattern can be taxing. In this case adding a smoothed line to the plot with `geom_smooth()` would be greatly beneficial.

`scale_x_continuous()` here is giving limits of age range: from 18 to 85 with increments of 10.

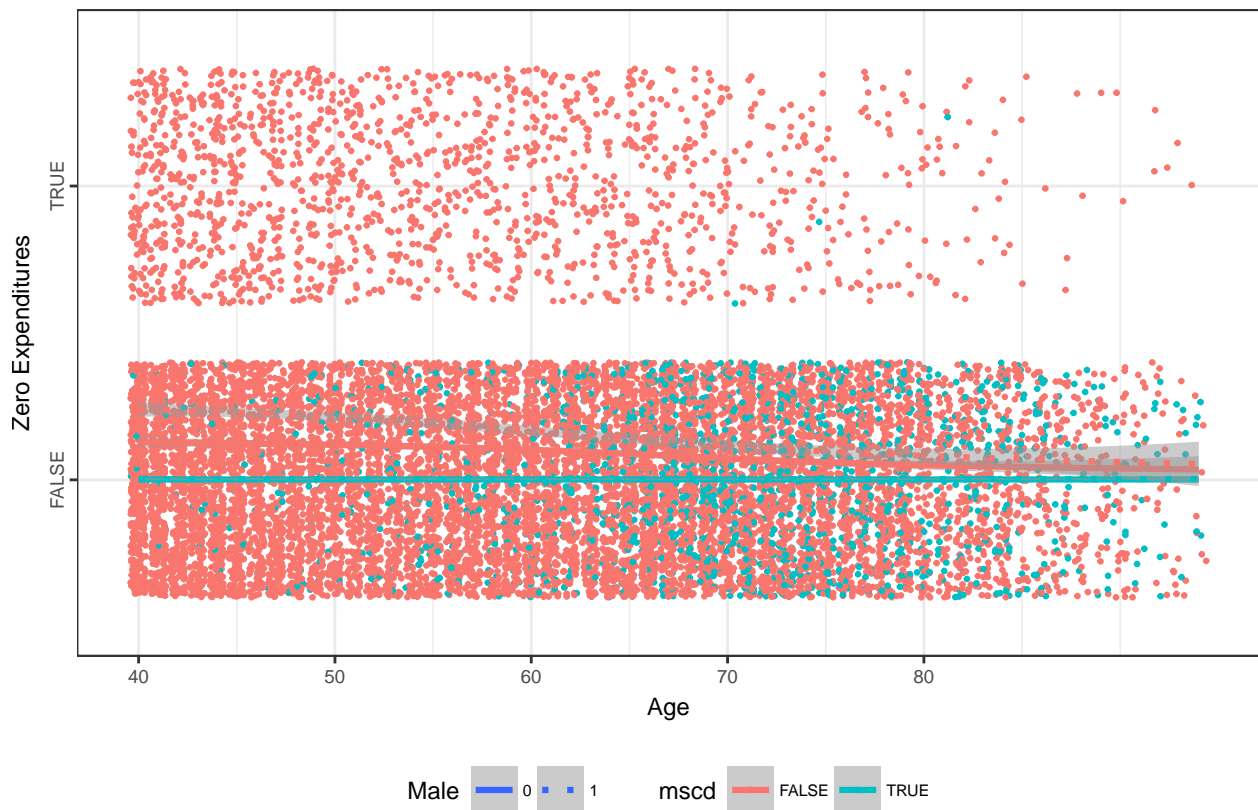
Example 2:

Below is a plot that illustrates the fraction of total medical expenditures that are attributable to having a major smoking-caused disease (MSCD) — including lung cancer, laryngeal cancer, COPD, CHD, stroke, and

other cancers — for different age, sex and demographic strata. The data comes from the National Medical Expenditure Survey (NMES)

```
ggplot(dat, aes(x = lastage, y = noexp, group = interaction(mscd,
  male), colour = mscd, linetype = factor(male))) + geom_jitter(size = 0.5) +
  geom_smooth(size = 1.1, alpha = 0.5) + ylab("Zero Expenditures") +
  ggtitle("Figure 2") + xlab("Age") + scale_linetype_manual("Male",
  values = c(1, 3)) + theme_bw() + theme(axis.text.y = element_text(angle = 90,
  hjust = 0.5), plot.margin = rep(unit(0, "null"), 4), legend.position = "bottom",
  legend.box = "horizontal", text = element_text(size = 9),
  legend.text = element_text(size = 6)) + scale_x_continuous(breaks = seq(40,
  80, 10))
```

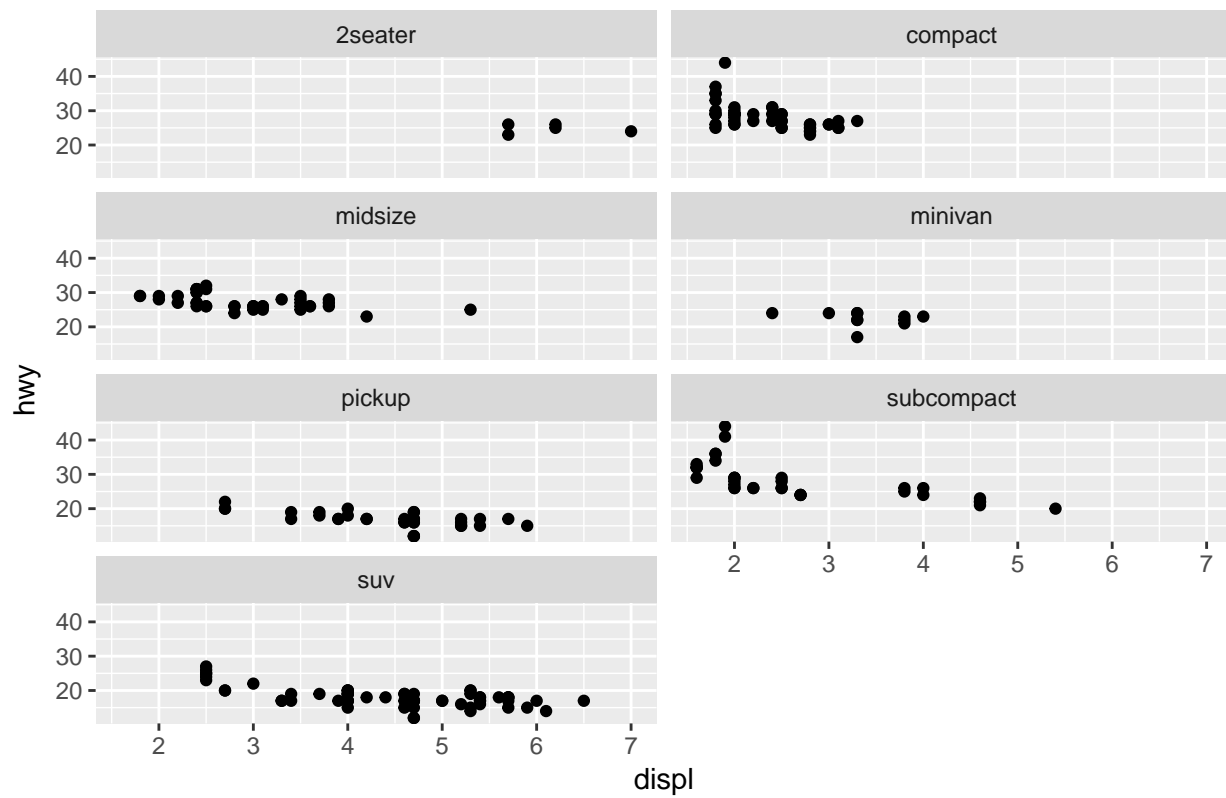
Figure 2



Lastly, a quick illustration of `facet_wrap` using the `mpg` data which is one of the R default data.

```
data("mtcars")
ggplot(mpg, aes(displ, hwy)) + ggtitle("Figure 3") + geom_point() +
  facet_wrap(~class, nrow = 4)
```

Figure 3



I hope you enjoyed this little tutorial about ggplot2