Assignment 4

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v tibble  3.1.4     v dplyr   1.0.7
## v tidyr   1.1.4     v stringr 1.4.0
## v purrr   0.3.4     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x purrr::map()    masks maps::map()
```

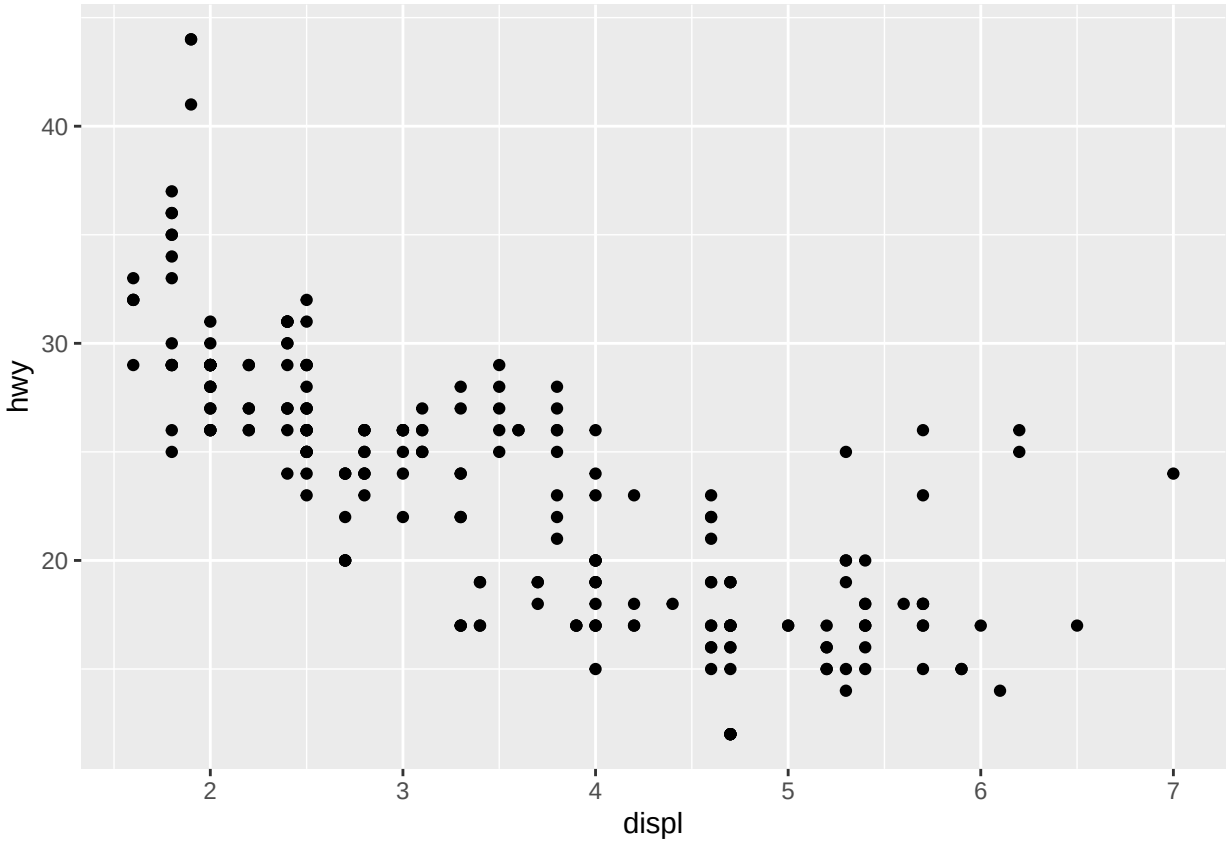
Data Visualization Article Notes:

```
ggplot2::mpg
```

```
## # A tibble: 234 x 11
##    manufacturer model      displ  year   cyl trans drv     cty   hwy fl    class
##    <chr>        <chr>      <dbl> <int> <int> <chr> <chr> <int> <int> <chr> <chr>
##  1 audi         a4           1.8  1999     4 auto~ f        18    29 p     comp~
##  2 audi         a4           1.8  1999     4 manu~ f        21    29 p     comp~
##  3 audi         a4           2    2008     4 manu~ f        20    31 p     comp~
##  4 audi         a4           2    2008     4 auto~ f        21    30 p     comp~
##  5 audi         a4           2.8  1999     6 auto~ f        16    26 p     comp~
##  6 audi         a4           2.8  1999     6 manu~ f        18    26 p     comp~
##  7 audi         a4           3.1  2008     6 auto~ f        18    27 p     comp~
##  8 audi         a4 quattro   1.8  1999     4 manu~ 4        18    26 p     comp~
##  9 audi         a4 quattro   1.8  1999     4 auto~ 4        16    25 p     comp~
## 10 audi         a4 quattro   2    2008     4 manu~ 4        20    28 p     comp~
## # ... with 224 more rows
```

-data frame found in ggplot2 (a rectangular collection of variables & observations) -mpg contains observations collected on diff. models of cars

```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy))
```

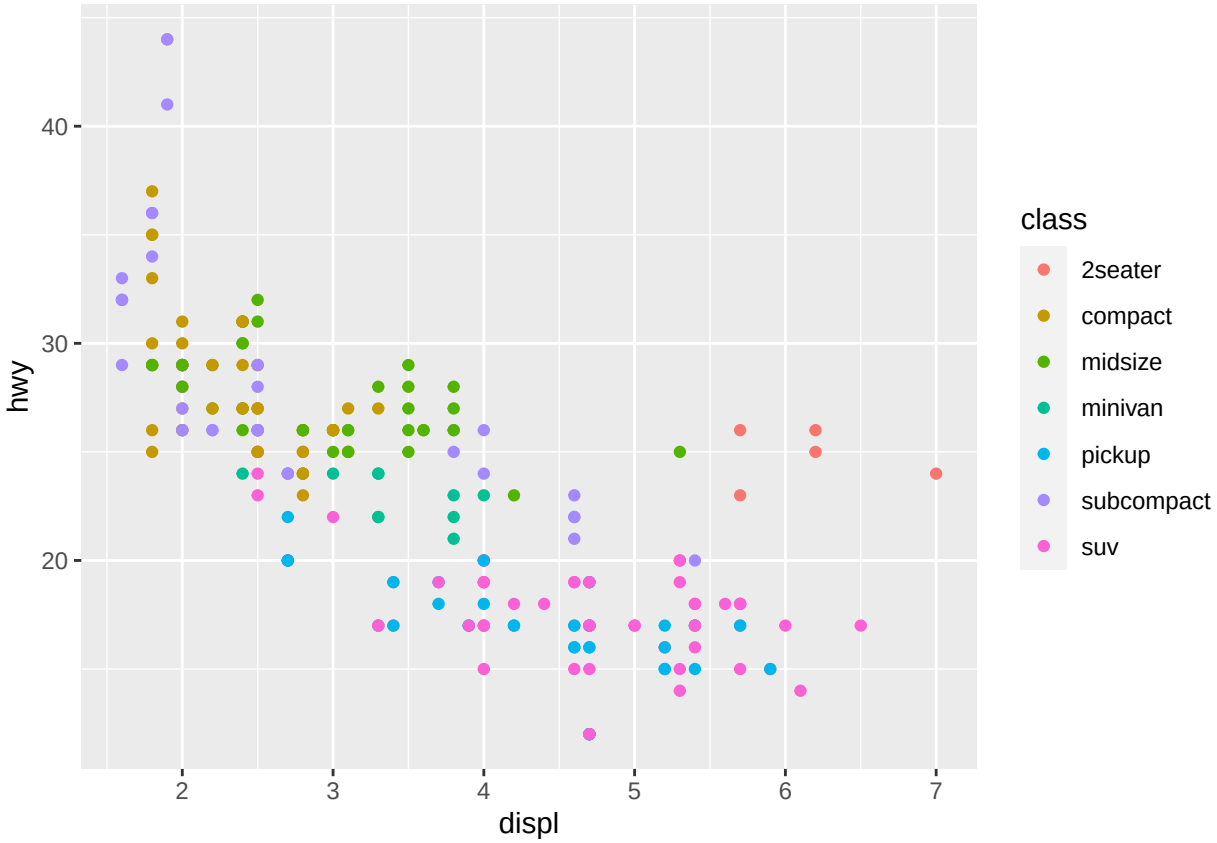



```
ggplot(data = mpg)
```

-plot mpg & specify what's on each axis -ggplot(data=mpg) creates an empty graph but u have to add layers -geom_point() adds layer of points to plot (creates scatterplot)

CODE PRESET: ggplot(data =) + (mapping = aes()) -replace bracketed sections in code below w/ dataset -aesthetic: visual property of objects in plot (size, shape, color, etc.) -> referred to as level

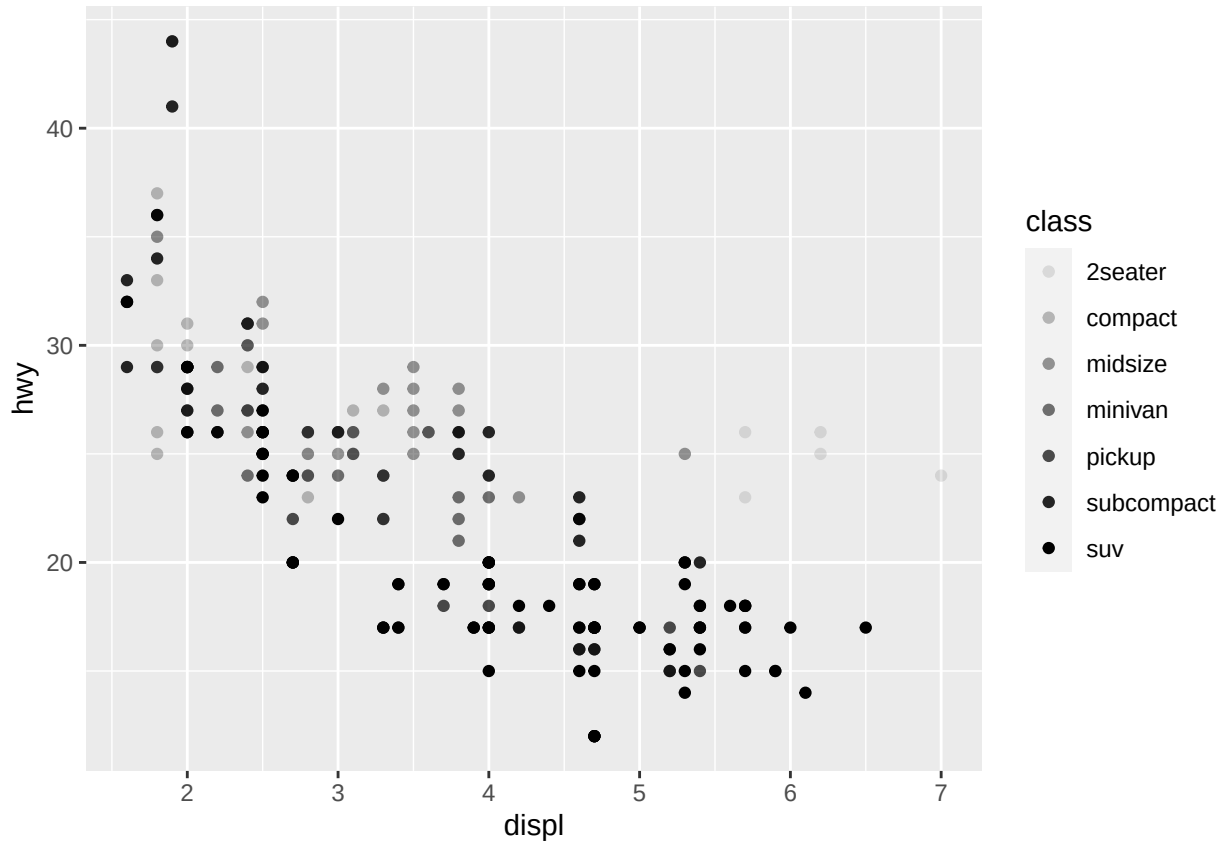
```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, color = class))
```



-maps the colors of each point to the class variable (reveals class of each car)

```
# Left
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, alpha = class))
```

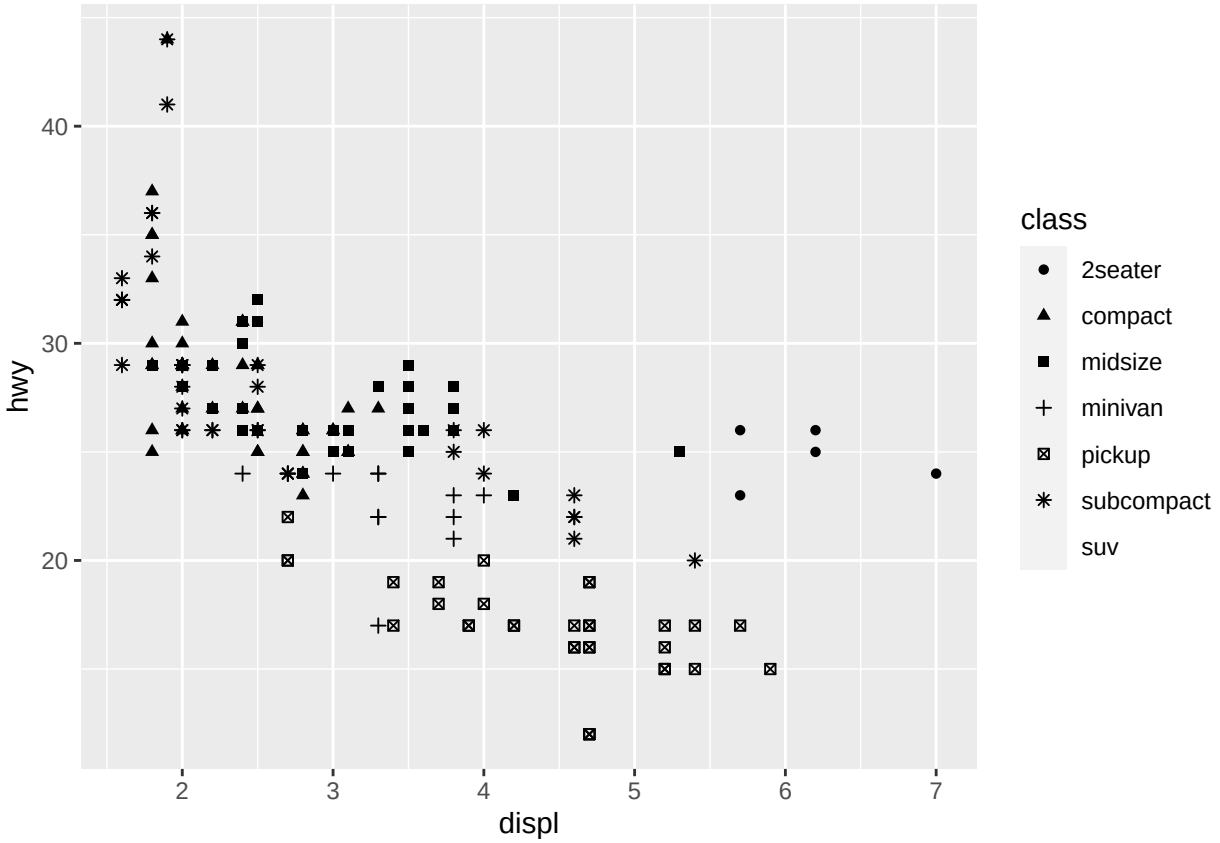
```
## Warning: Using alpha for a discrete variable is not advised.
```




```
# Right
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, shape = class))
```

```
## Warning: The shape palette can deal with a maximum of 6 discrete values because
## more than 6 becomes difficult to discriminate; you have 7. Consider
## specifying shapes manually if you must have them.
```

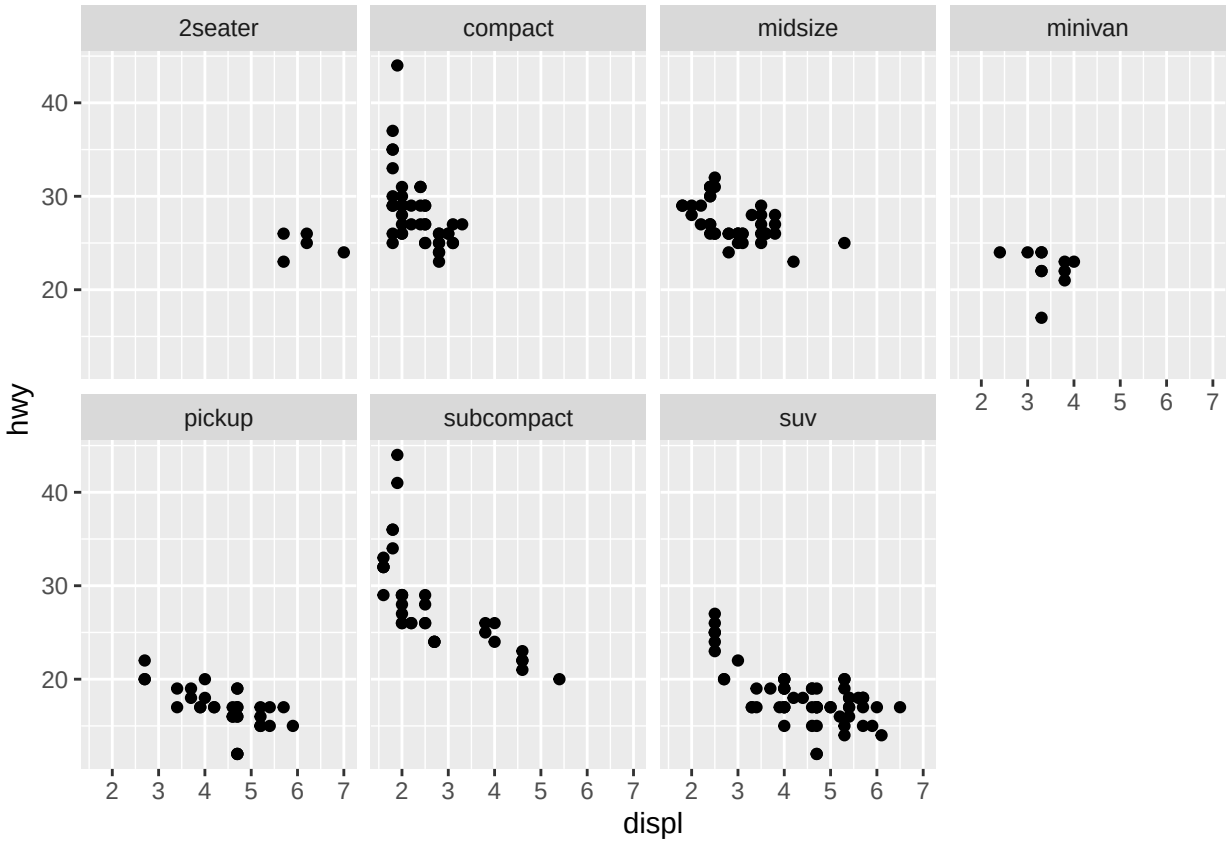
```
## Warning: Removed 62 rows containing missing values (geom_point).
```



-mapping class to alpha controls transperancy of points -mapping class to shape controls shape of points -you use aes() to associate the name of the aesthetic with a variable to display -+ signs have to be at end of line not the beginning (check above)

-facets: sunplots that each display one subset of data

```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy)) +
  facet_wrap(~ class, nrow = 2)
```

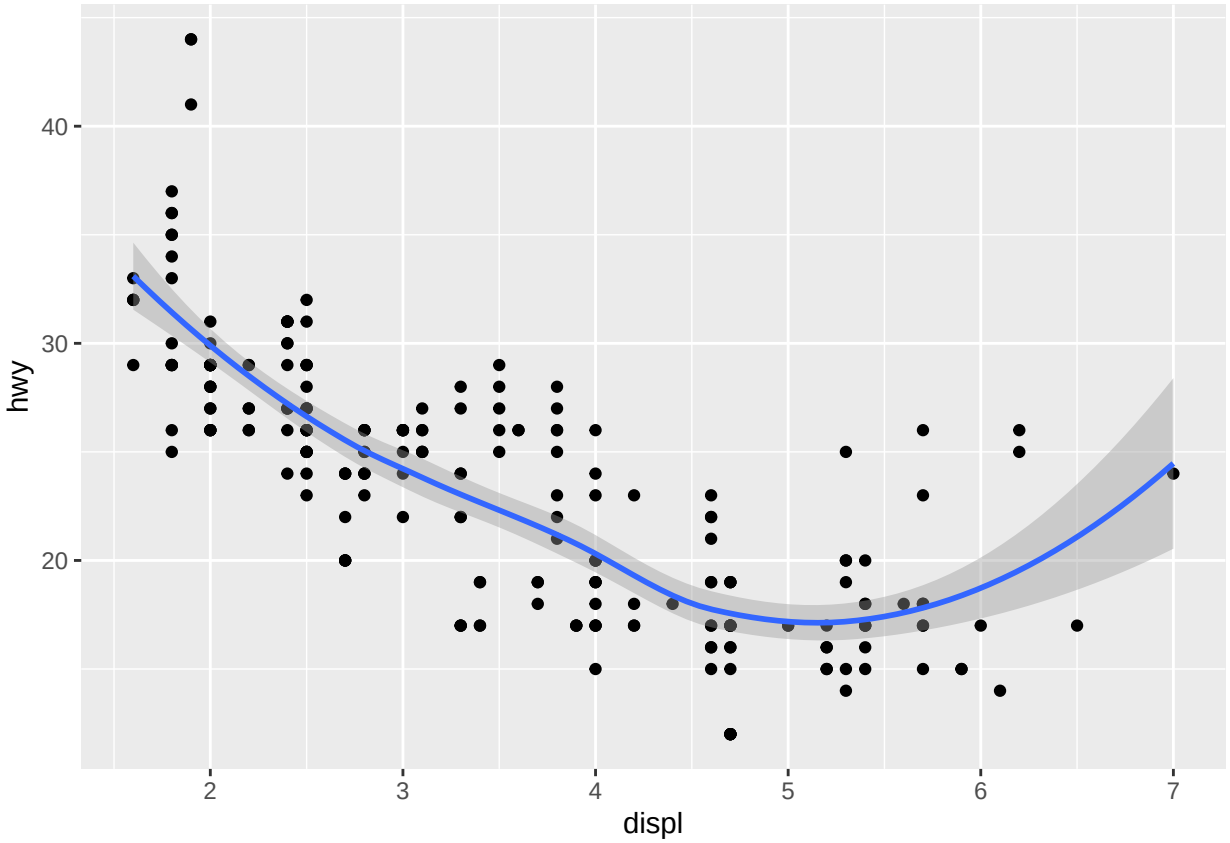


-add facet_grid() to plot on combination of 2 variables -use a . instead of a variable name if u don't wanna facet in row/column dimension

-geom: geometrical object that plot uses to represent data

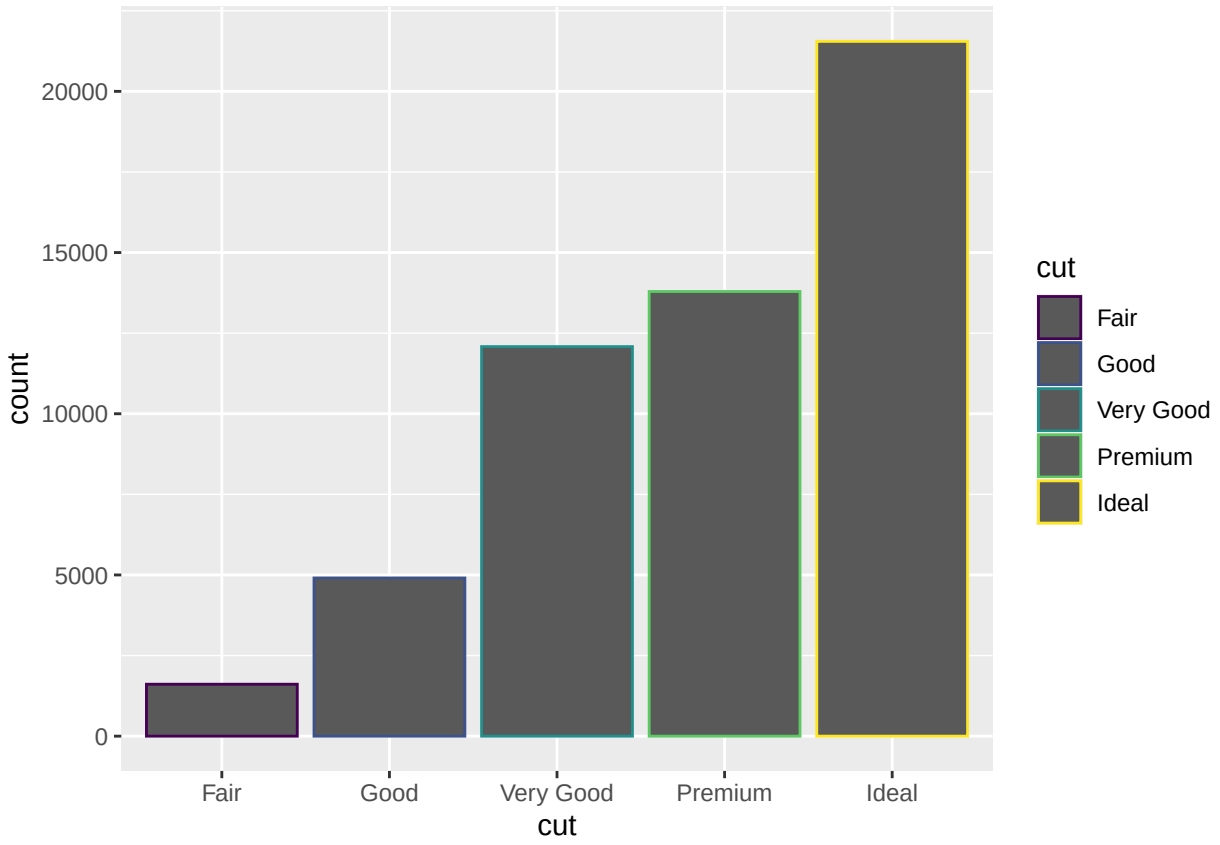
```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy)) +
  geom_smooth(mapping = aes(x = displ, y = hwy))
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```

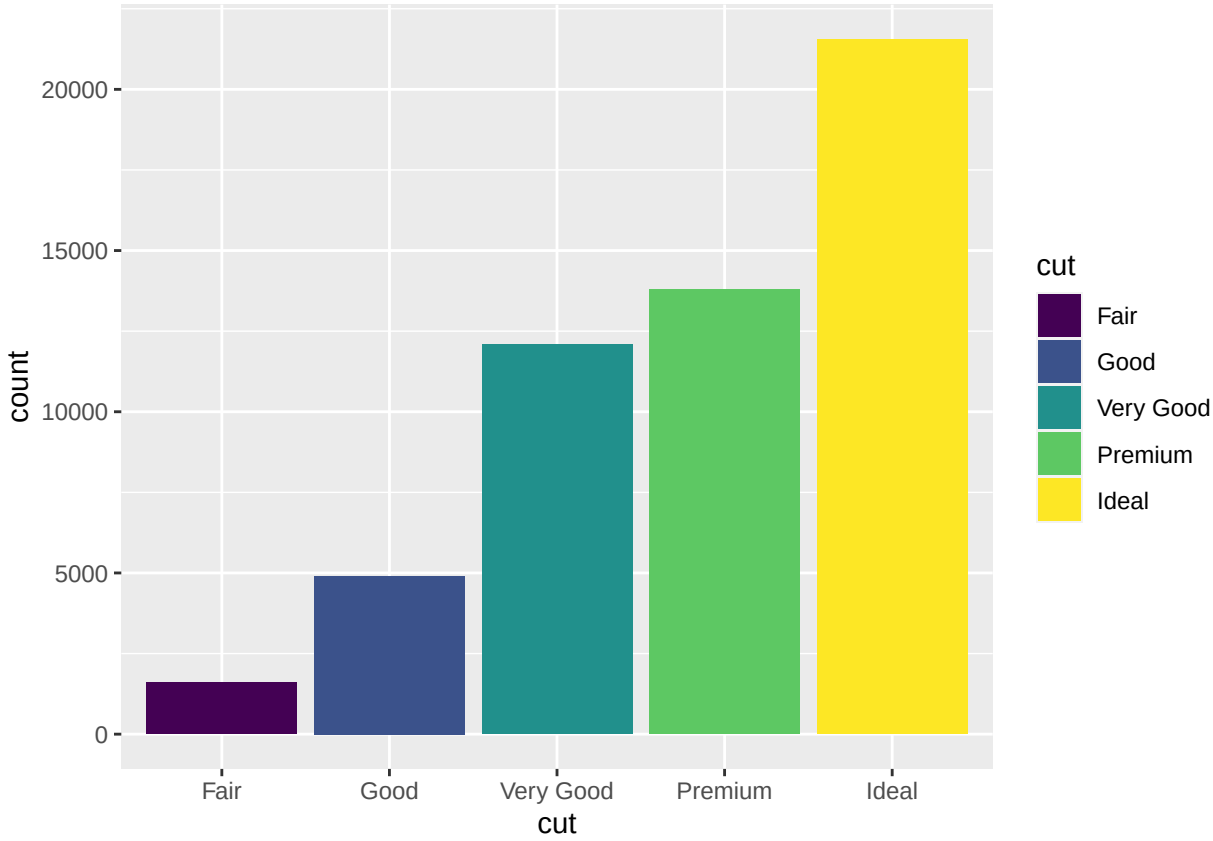


-lets you display multiple geoms in same plot

```
ggplot(data = diamonds) +
  geom_bar(mapping = aes(x = cut, colour = cut))
```




```
ggplot(data = diamonds) +
  geom_bar(mapping = aes(x = cut, fill = cut))
```



-allows you to change colors on bar graphs

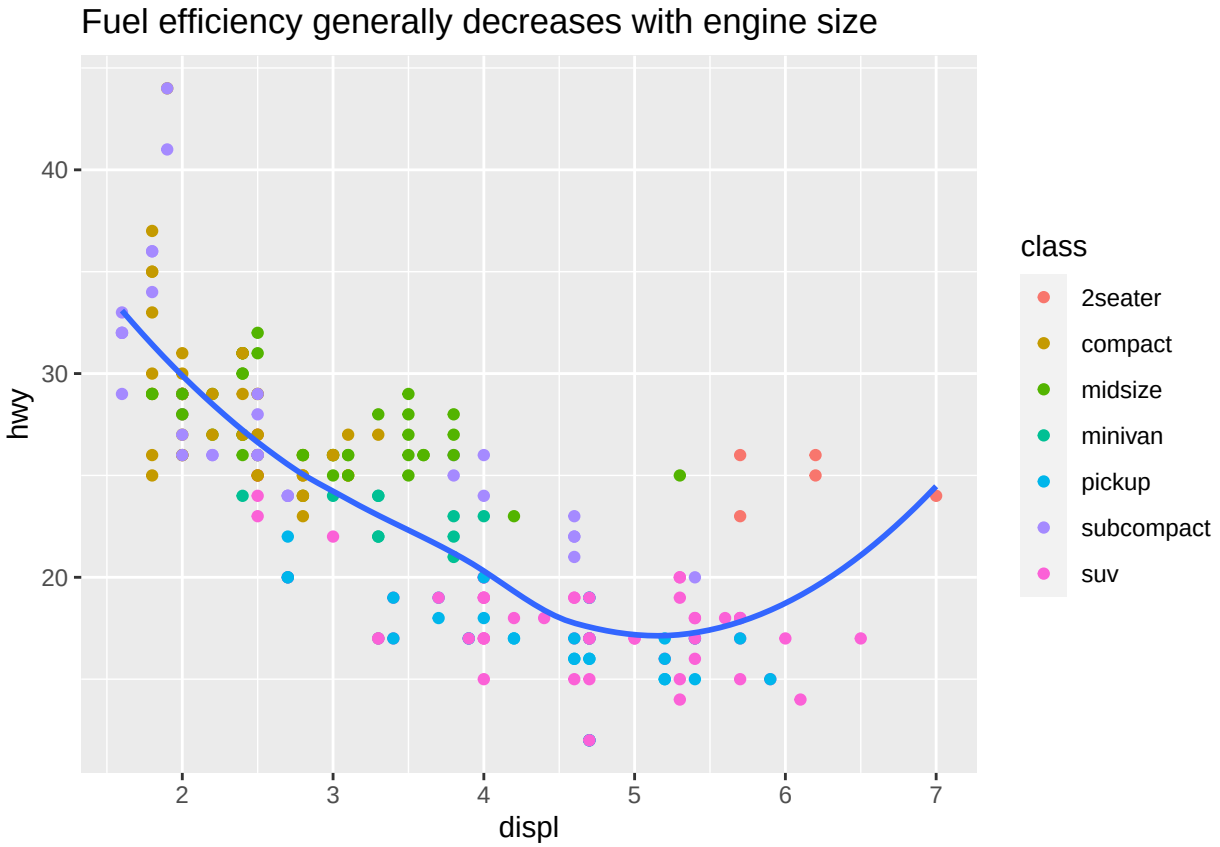
-coord_flip() switches the x and y axes -> useful for horizontal box plots

Graphics for Communication Article Notes:

-Label, Annotations, Scales

```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(color = class)) +
  geom_smooth(se = FALSE) +
  labs(title = "Fuel efficiency generally decreases with engine size")
```

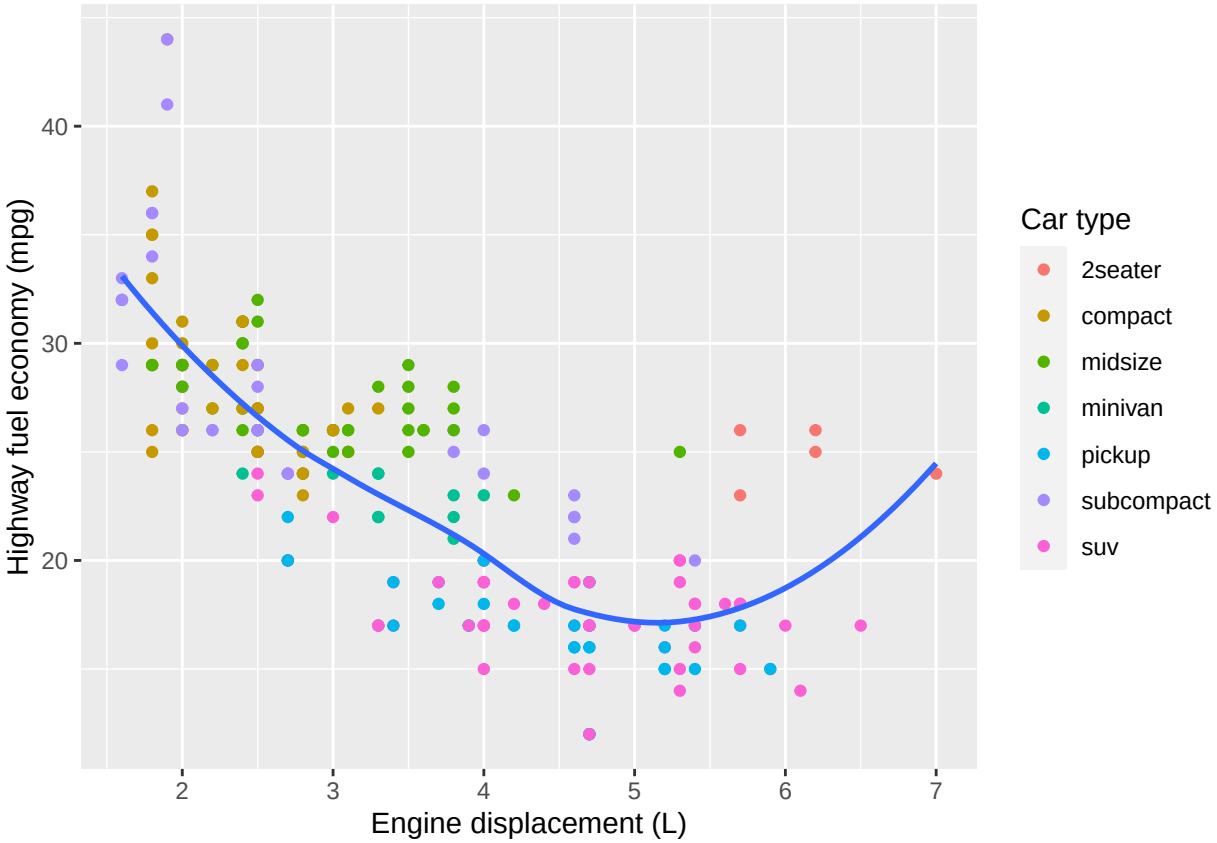
```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



-labs() function lets you add labels (used to add title here)^ -plot title should summarize main finding instead of saying vs

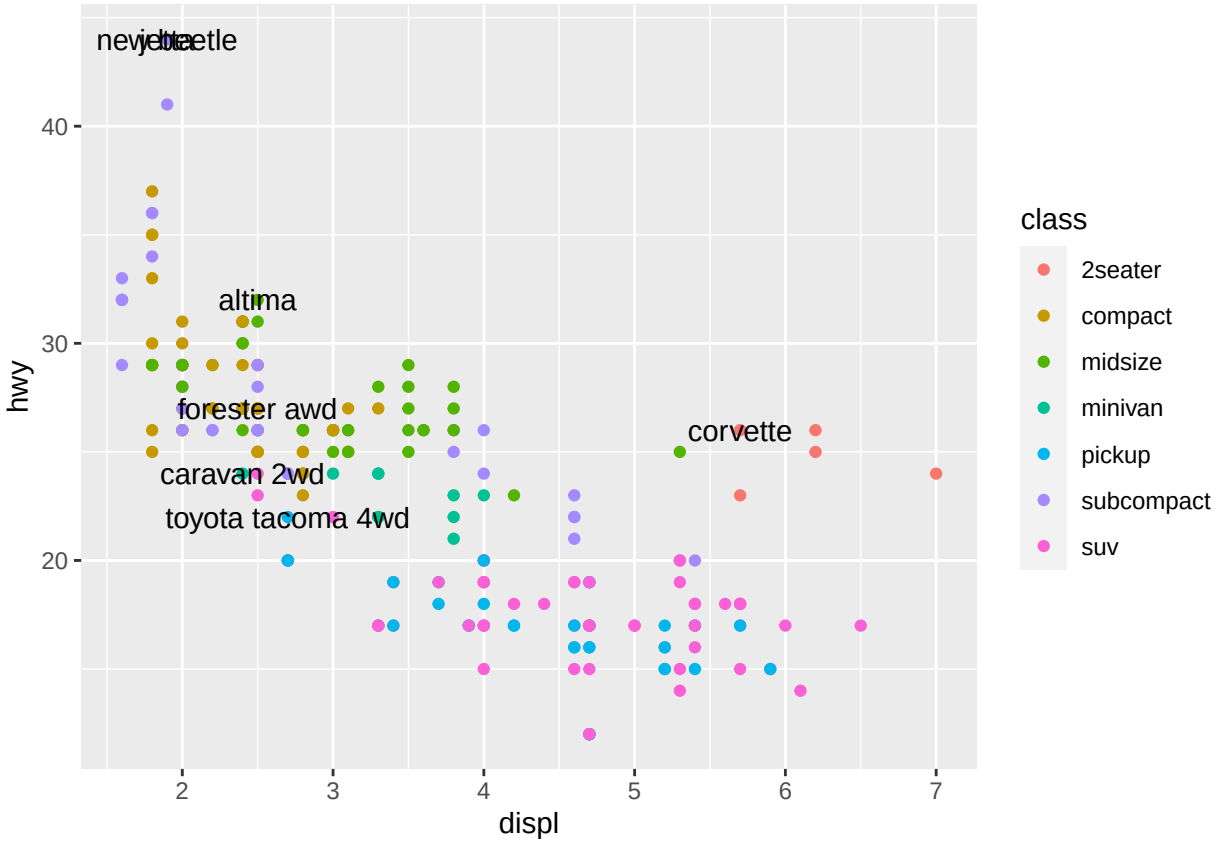
```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class)) +
  geom_smooth(se = FALSE) +
  labs(
    x = "Engine displacement (L)",
    y = "Highway fuel economy (mpg)",
    colour = "Car type"
  )
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



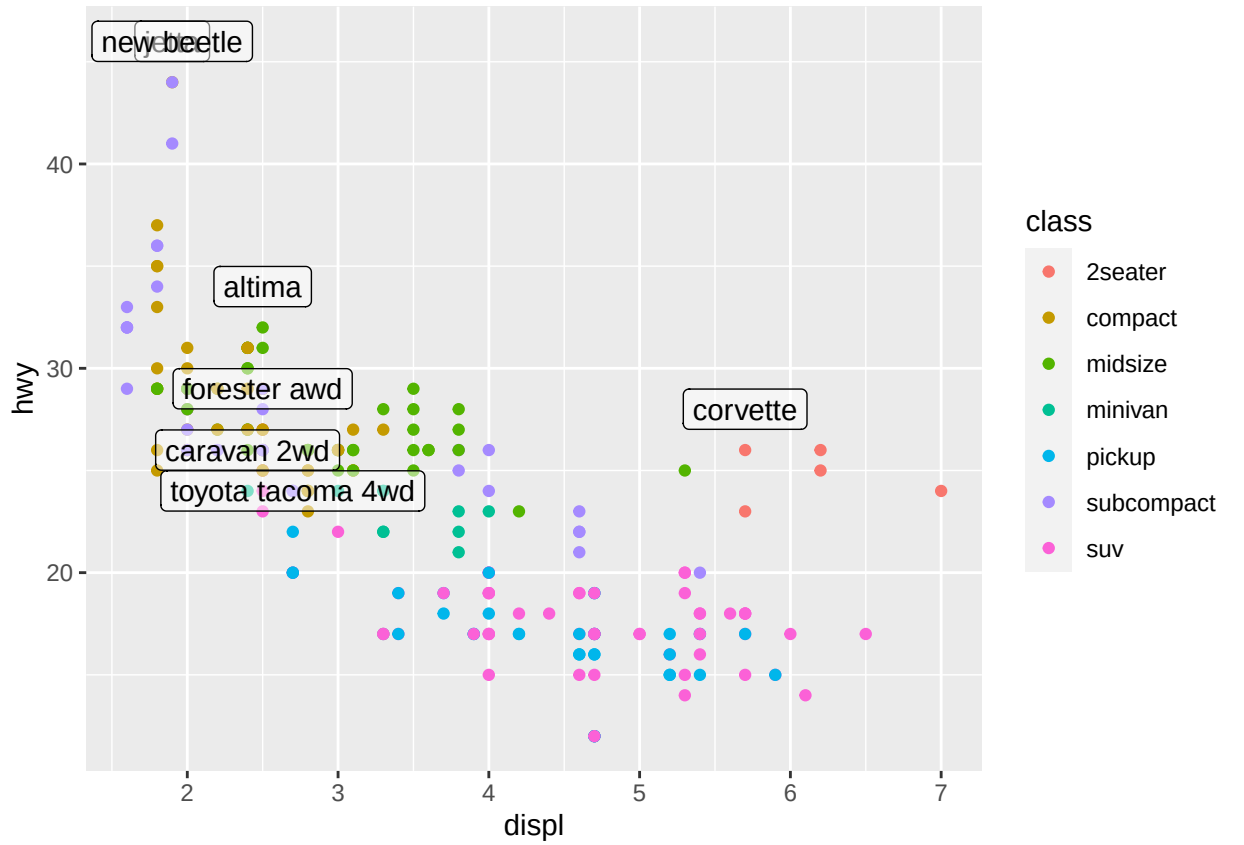
-labs() also let's you replace axis & legend titles

```
best_in_class <- mpg %>%
  group_by(class) %>%
  filter(row_number(desc(hwy)) == 1)

ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class)) +
  geom_text(aes(label = model), data = best_in_class)
```



-pulls out most efficient car in each class w/ dplyr then labels it -text makes it a little messy with the overlap

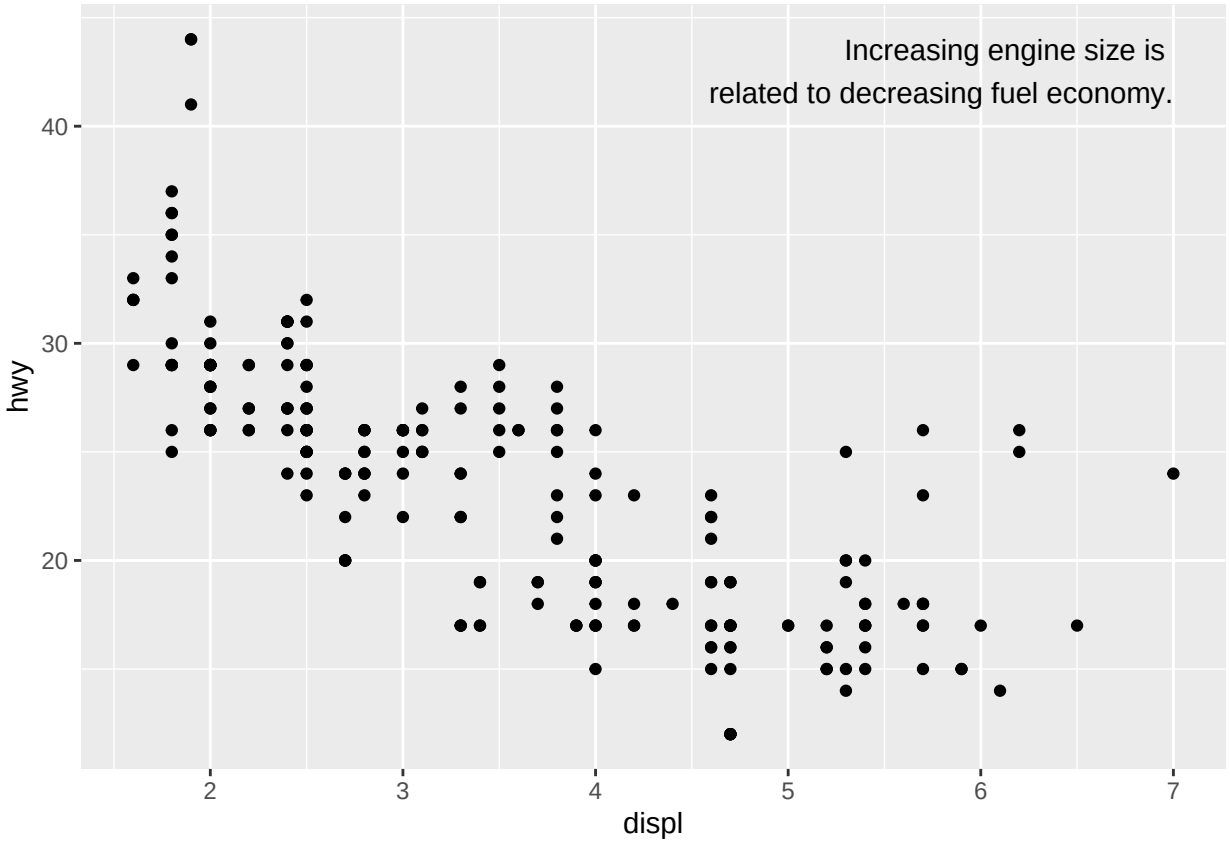
```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class)) +
  geom_label(aes(label = model), data = best_in_class, nudge_y = 2, alpha = 0.5)
```



-using label puts rectangles behind text "{r} ggplot(mpg, aes(displ, hwy)) + geom_point(aes(colour = class)) + geom_point(size = 3, shape = 1, data = best_in_class) + ggrepel::geom_label_repel(aes(label = model), data = best_in_class)

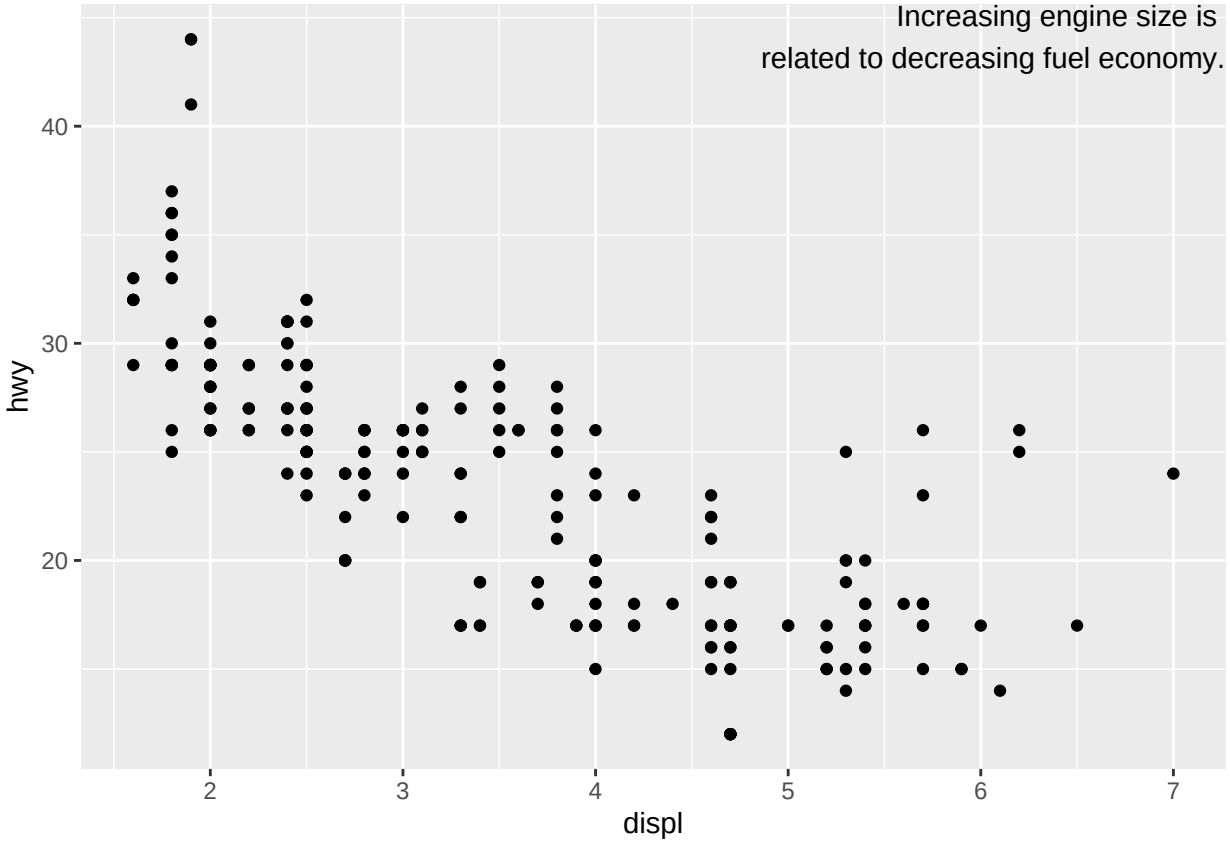
-not working but ggrepel package automatically adjusts labels to remove overlap

```r
label <- mpg %>%
  summarise(
    displ = max(displ),
    hwy = max(hwy),
    label = "Increasing engine size is \nrelated to decreasing fuel economy."
  )

ggplot(mpg, aes(displ, hwy)) +
  geom_point() +
  geom_text(aes(label = label), data = label, vjust = "top", hjust = "right")
```



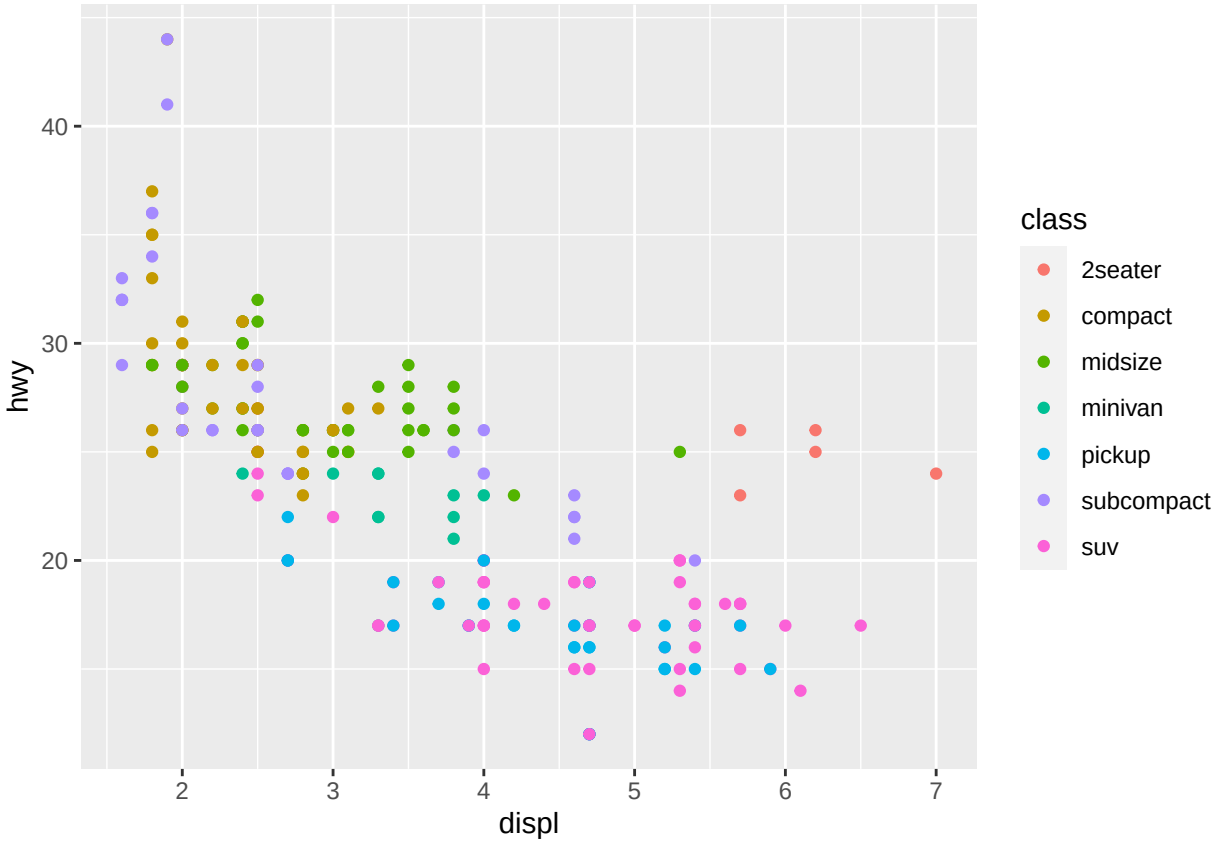
-computes maximum value of x and y

```
label <- tibble(
  displ = Inf,
  hwy = Inf,
  label = "Increasing engine size is \nrelated to decreasing fuel economy."
)

ggplot(mpg, aes(displ, hwy)) +
  geom_point() +
  geom_text(aes(label = label), data = label, vjust = "top", hjust = "right")
```



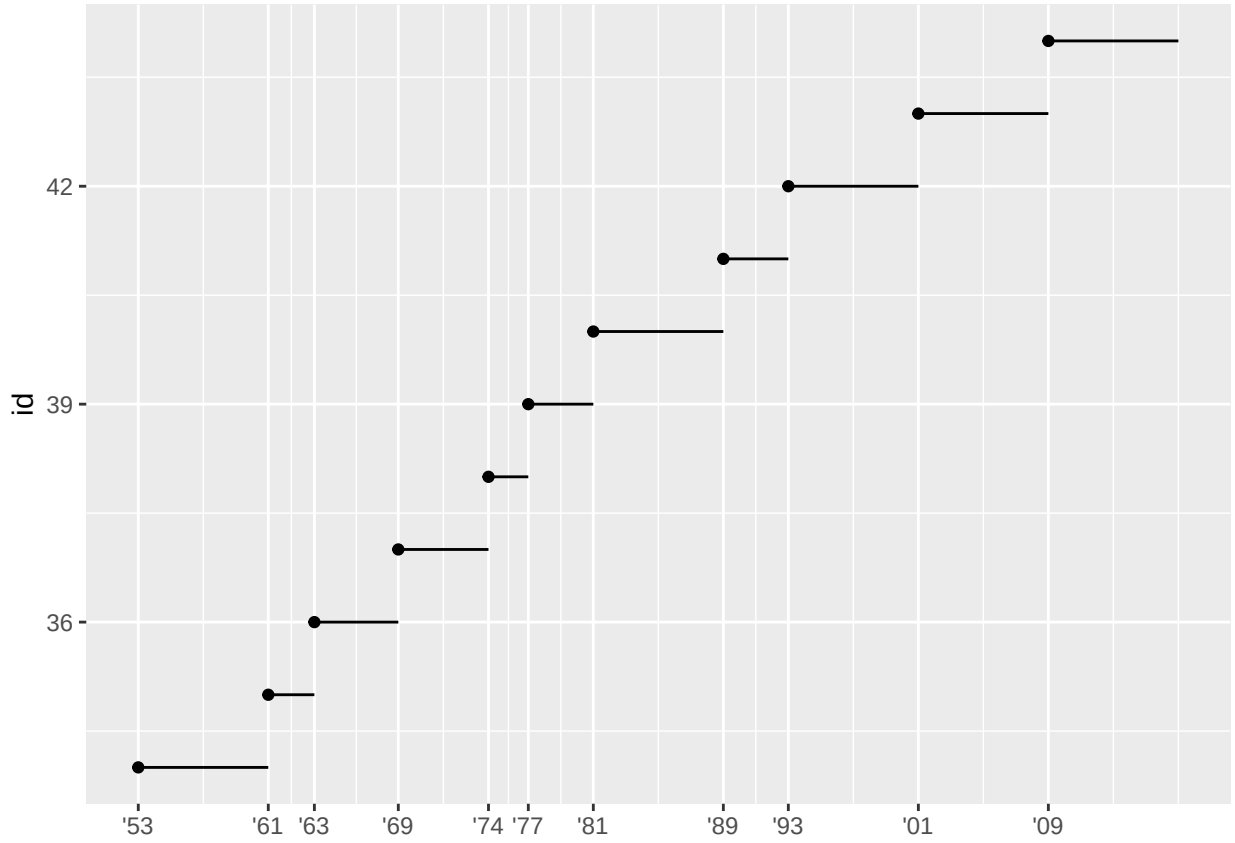
-moves text exactly on borders of plot using +Inf and -Inf

```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class))
```



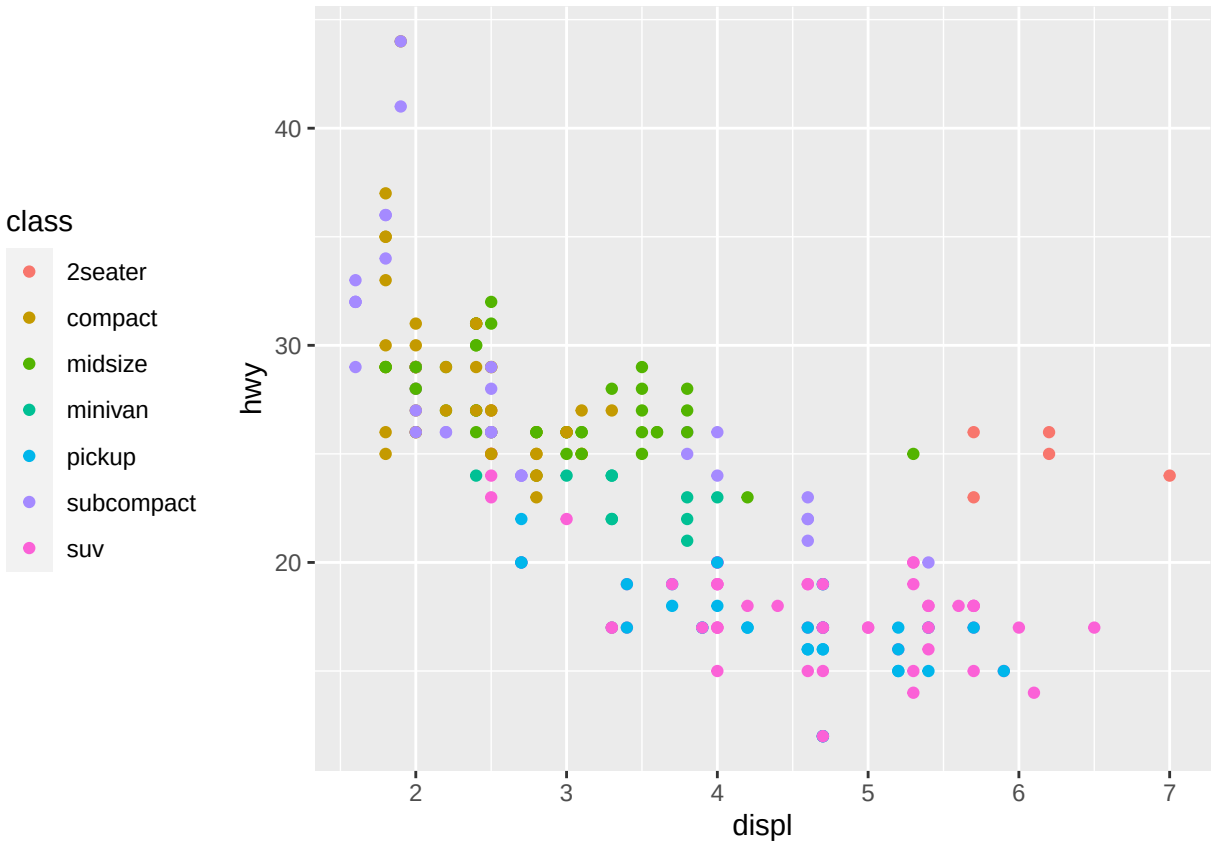
-ggplot2 atuomatically adds scales for you -breaks controls position of ticks or values associated w/ keys -labels control text associated w/ each tick/key -breaks & lablels can also control appearance of legends -breaks can be used when there's relatively little data & want to highlight exactly where observations occur

```
presidential %>%
  mutate(id = 33 + row_number()) %>%
  ggplot(aes(start, id)) +
    geom_point() +
    geom_segment(aes(xend = end, yend = id)) +
    scale_x_date(NULL, breaks = presidential$start, date_labels = "'%y")
```

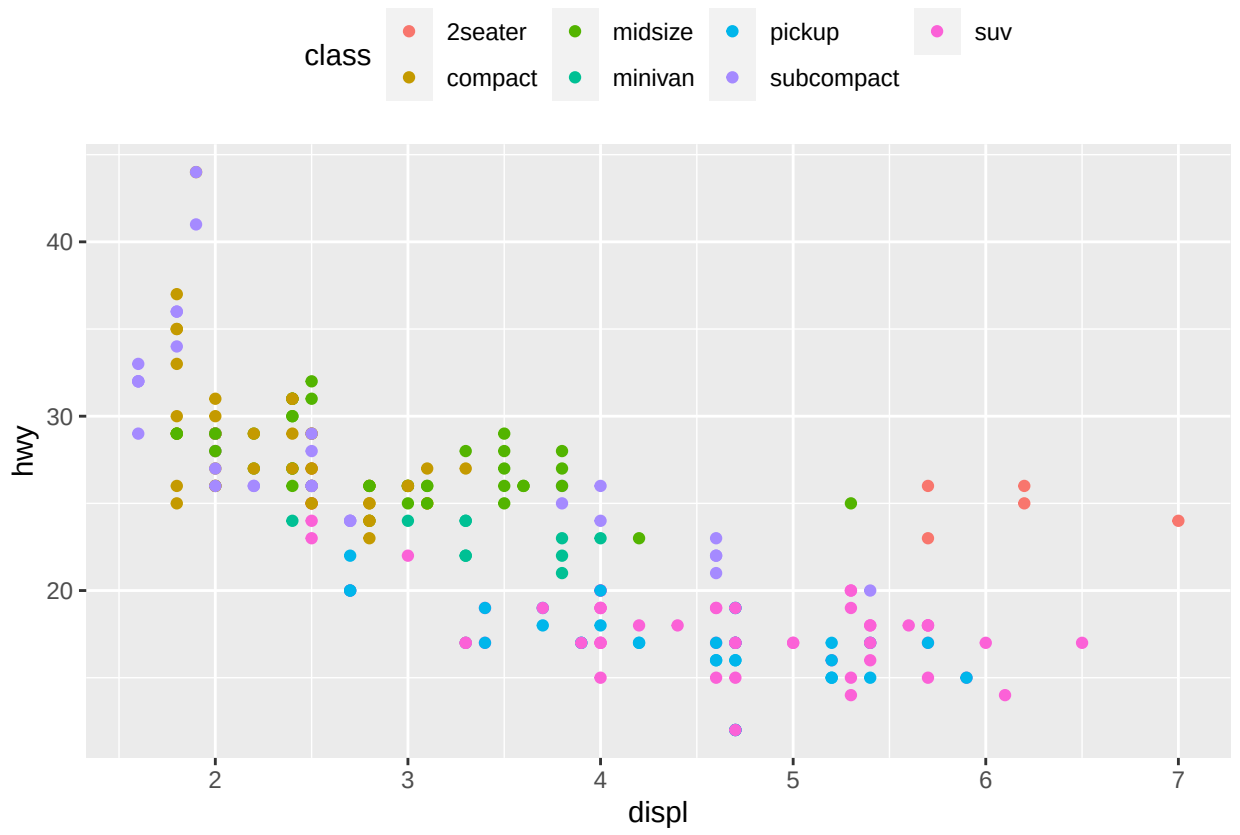


-theme() setting can be used to control overall position of legend

```
base <- ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class))

base + theme(legend.position = "left")
```

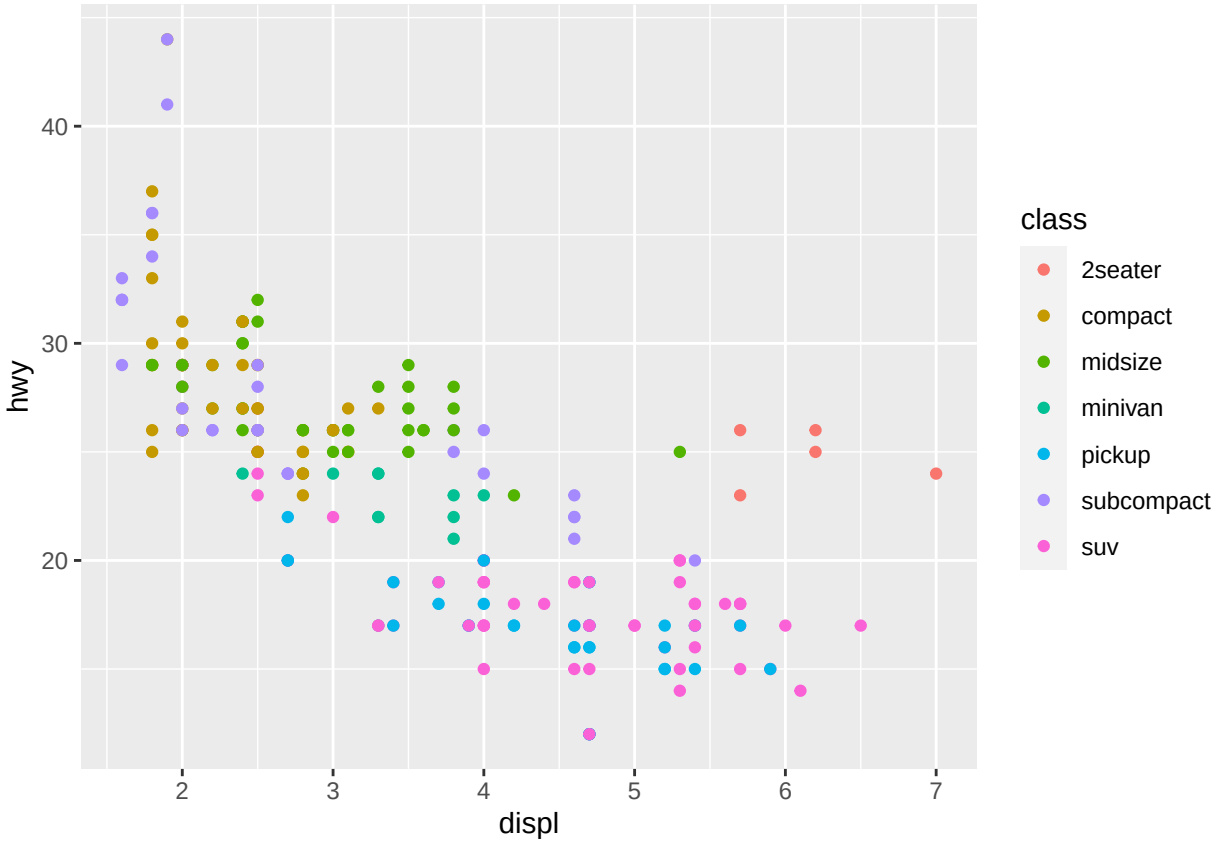



```
base + theme(legend.position = "top")
```




```
base + theme(legend.position = "bottom")
```

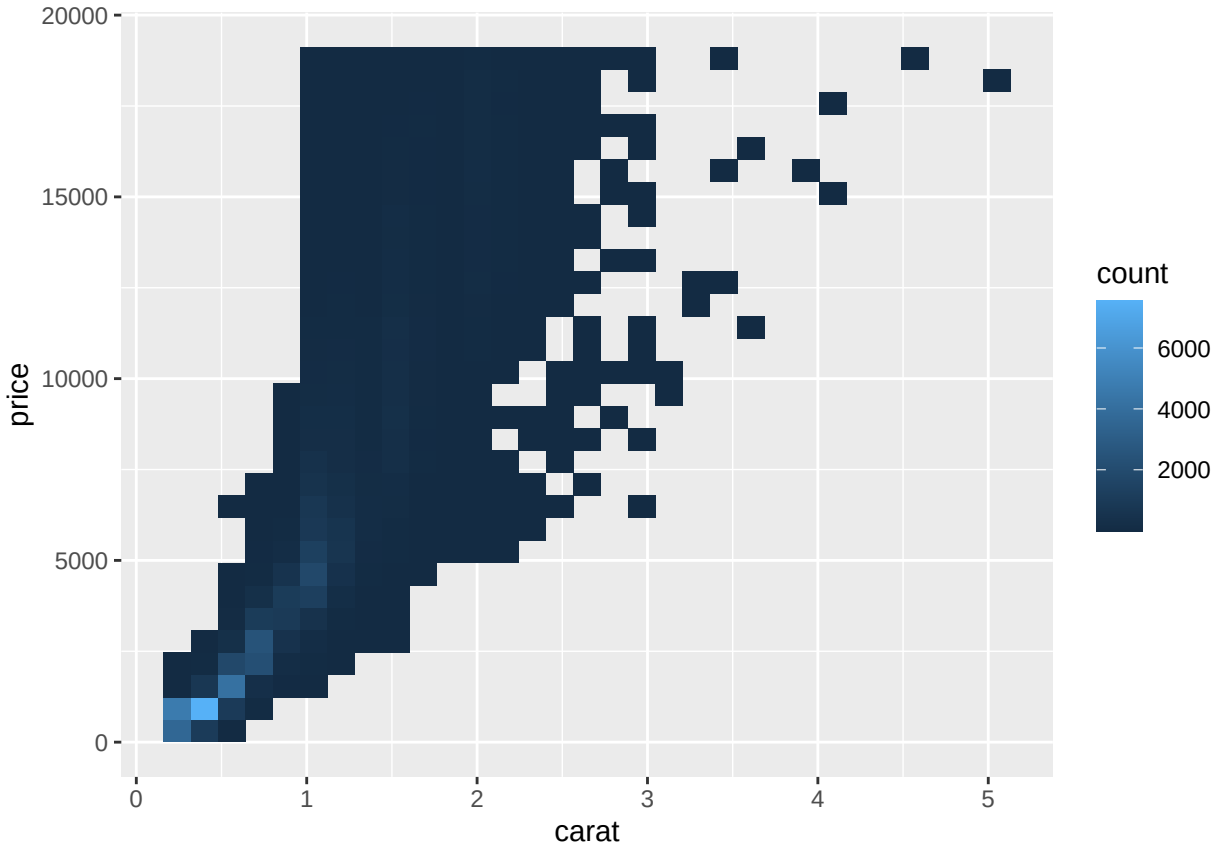

```
base + theme(legend.position = "right") # the default
```



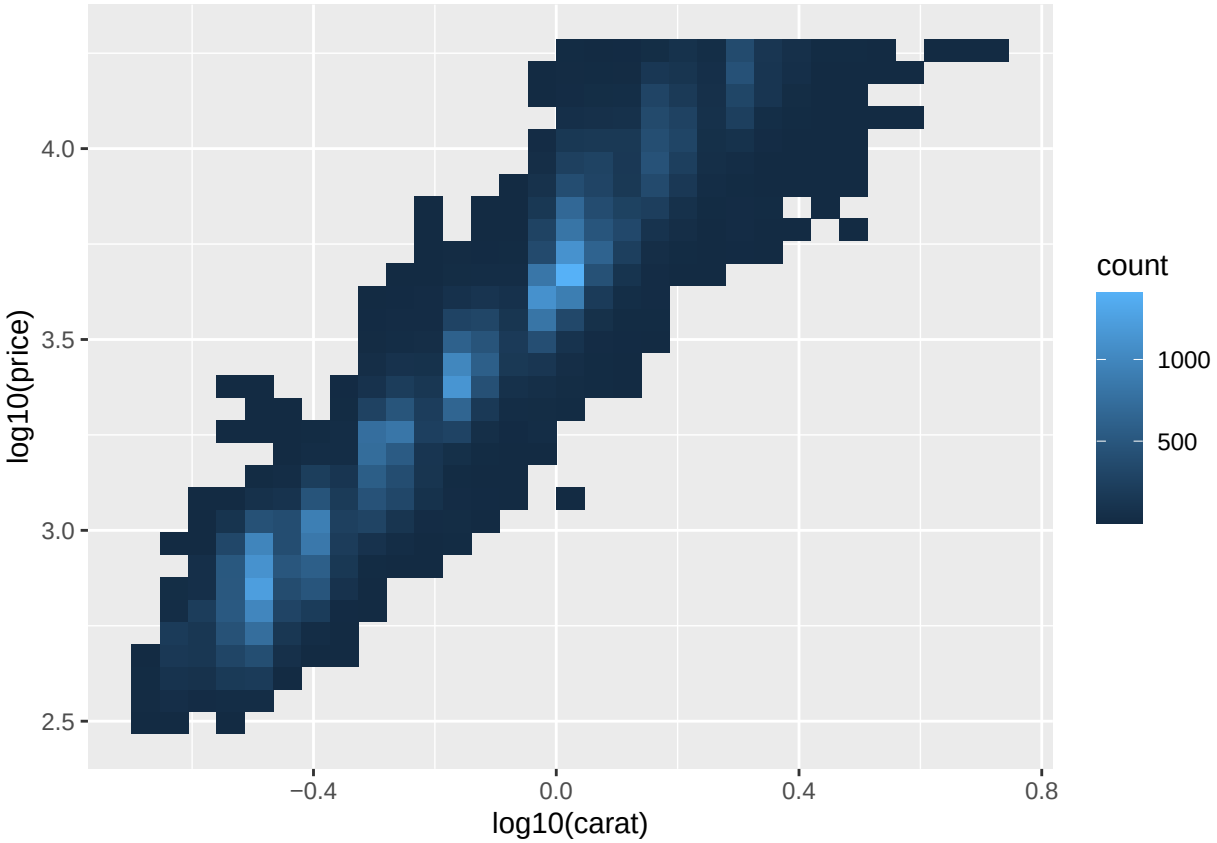
-legend.position = “none” would remove the legend

replacing a scale:

```
ggplot(diamonds, aes(carat, price)) +
  geom_bin2d()
```

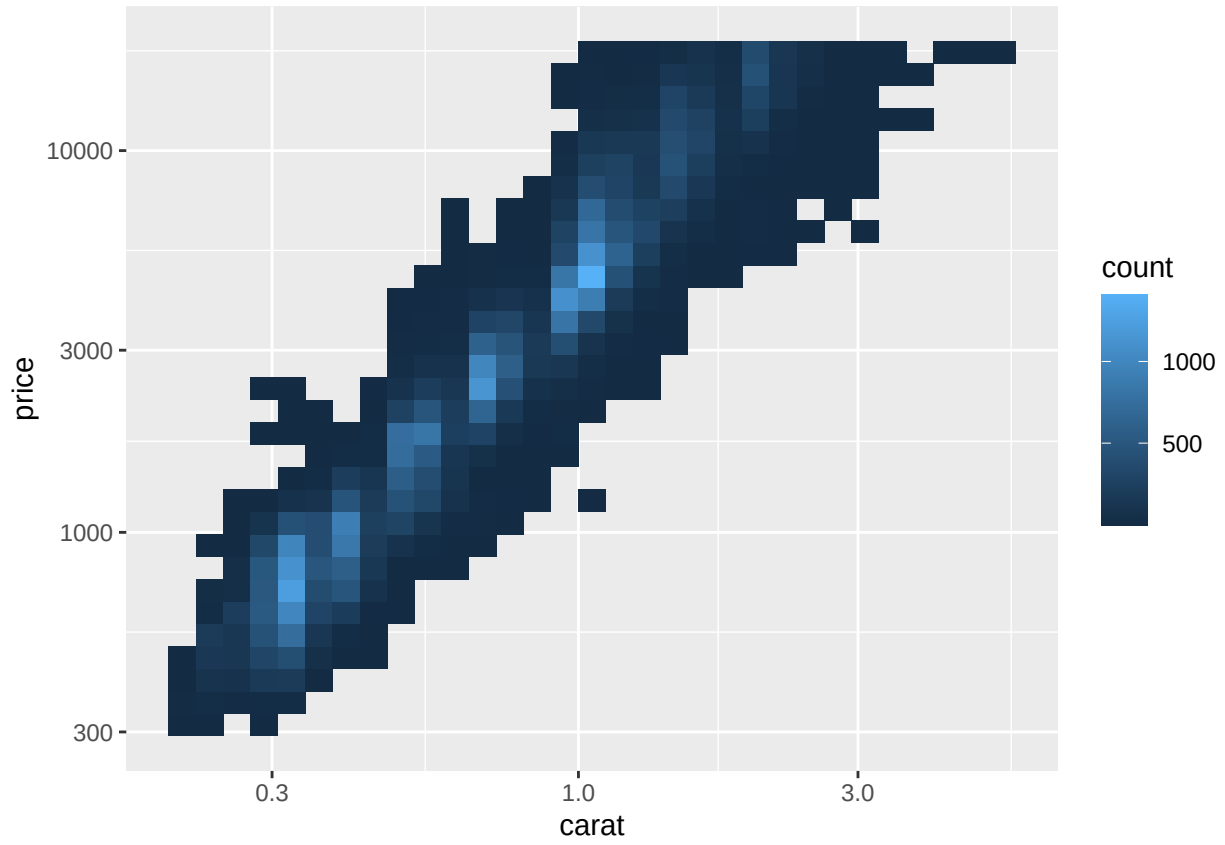



```
ggplot(diamonds, aes(log10(carat), log10(price))) +
  geom_bin2d()
```



-here a log transformation performed -slight problem: axis labels changed

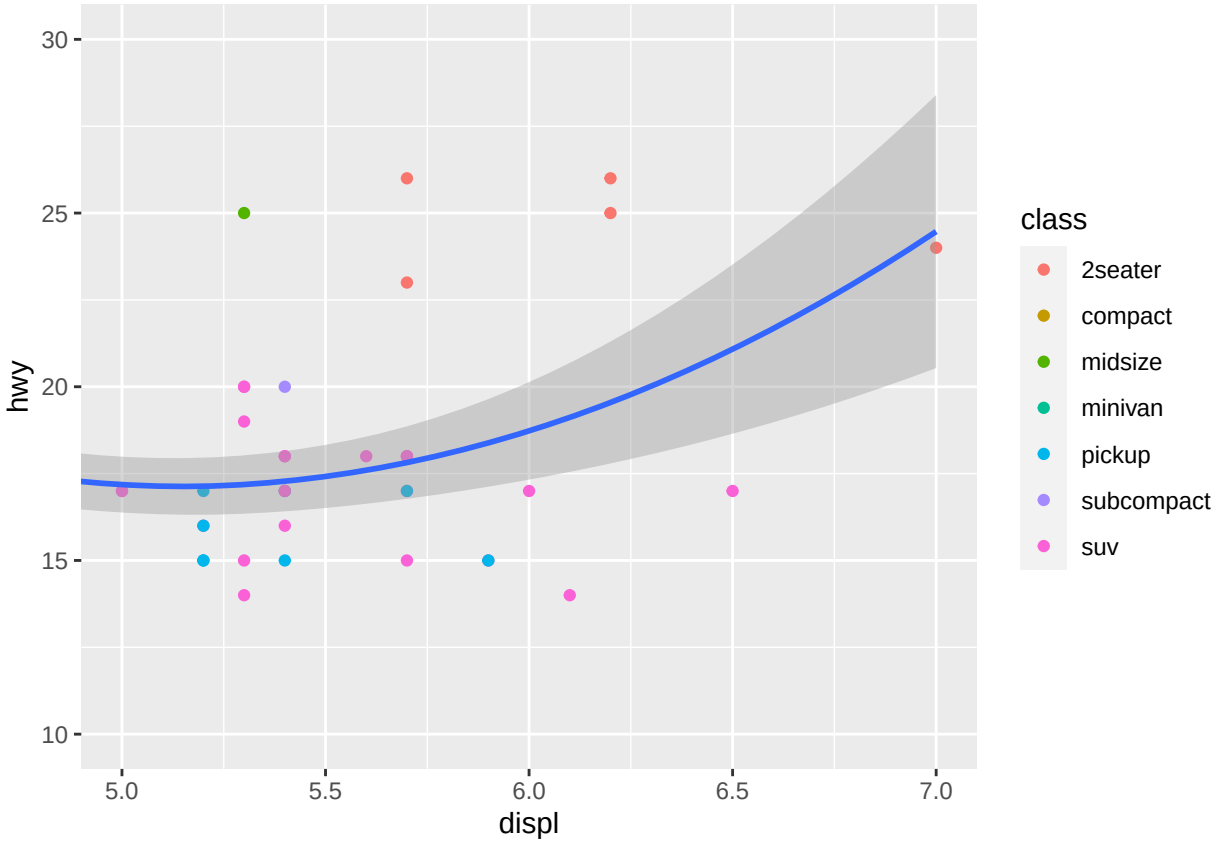
```
ggplot(diamonds, aes(carat, price)) +
  geom_bin2d() +
  scale_x_log10() +
  scale_y_log10()
```



-axis now have original labels

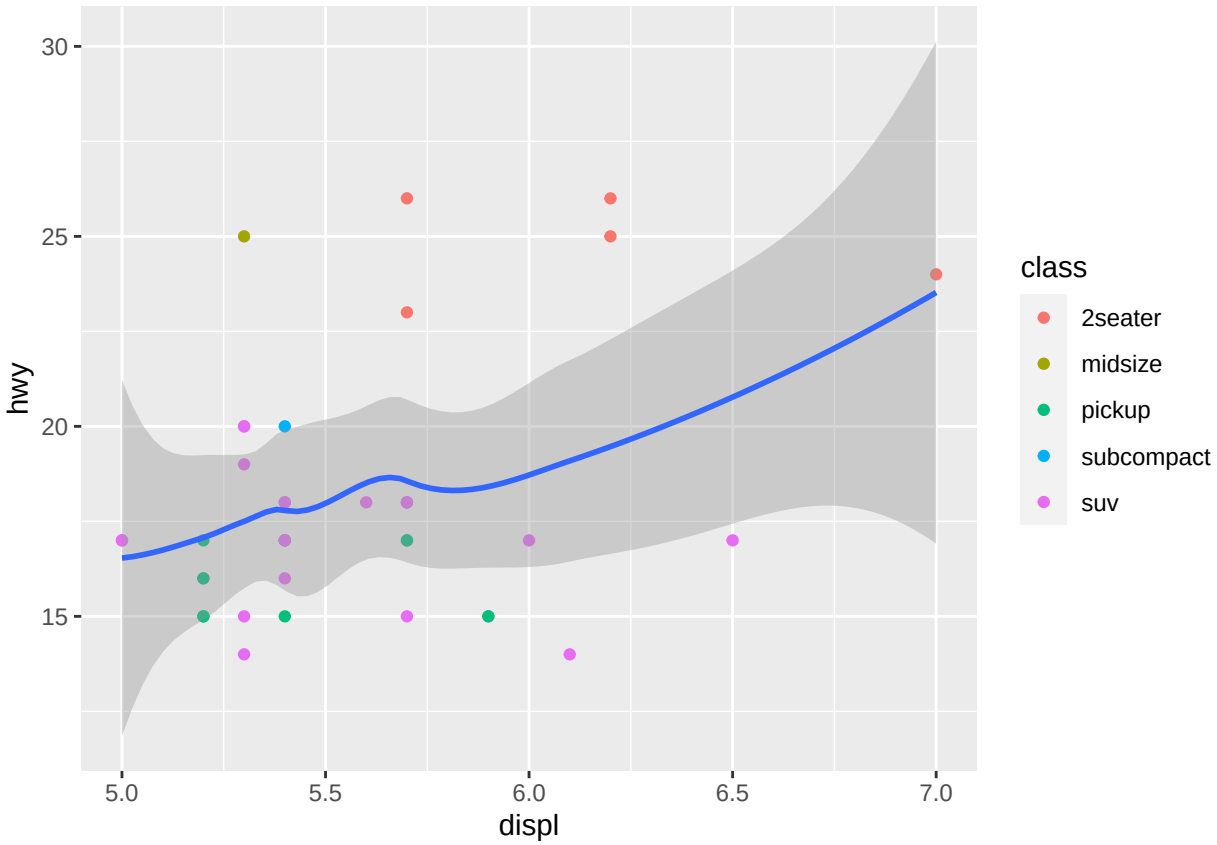
```
ggplot(mpg, mapping = aes(displ, hwy)) +
  geom_point(aes(color = class)) +
  geom_smooth() +
  coord_cartesian(xlim = c(5, 7), ylim = c(10, 30))
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```




```
mpg %>%
  filter(displ >= 5, displ <= 7, hwy >= 10, hwy <= 30) %>%
  ggplot(aes(displ, hwy)) +
  geom_point(aes(color = class)) +
  geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```

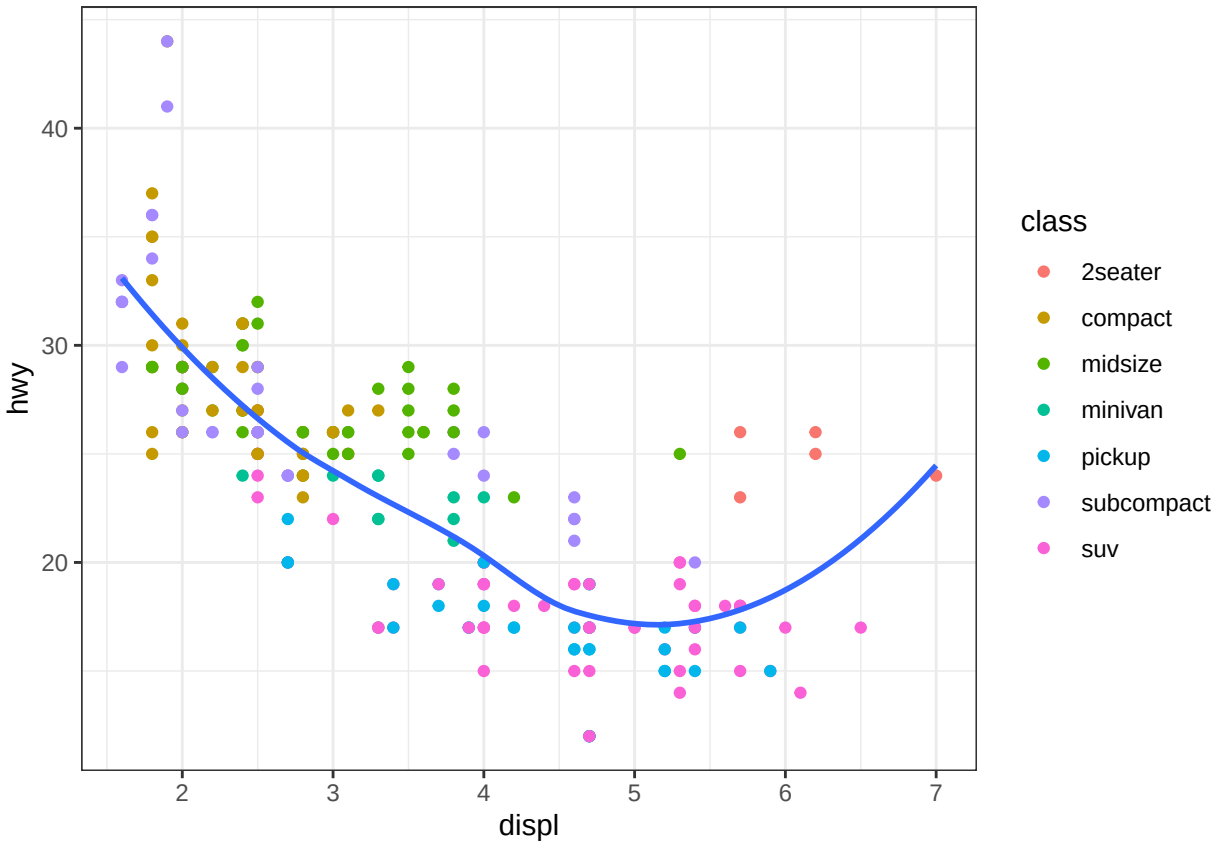


-3 ways to control plot limits -adjusting what data plotted -setting limits in each scale -setting xlim & ylim in coord_cartesian()

themes:

```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(color = class)) +
  geom_smooth(se = FALSE) +
  theme_bw()
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



-allows you to customize non-data elements in plot w/ a theme