

# R Notebook

This is an R Markdown Notebook. When you execute code within the notebook, the results appear beneath the code.

Try executing this chunk by clicking the *Run* button within the chunk or by placing your cursor inside it and pressing *Cmd+Shift+Enter*.

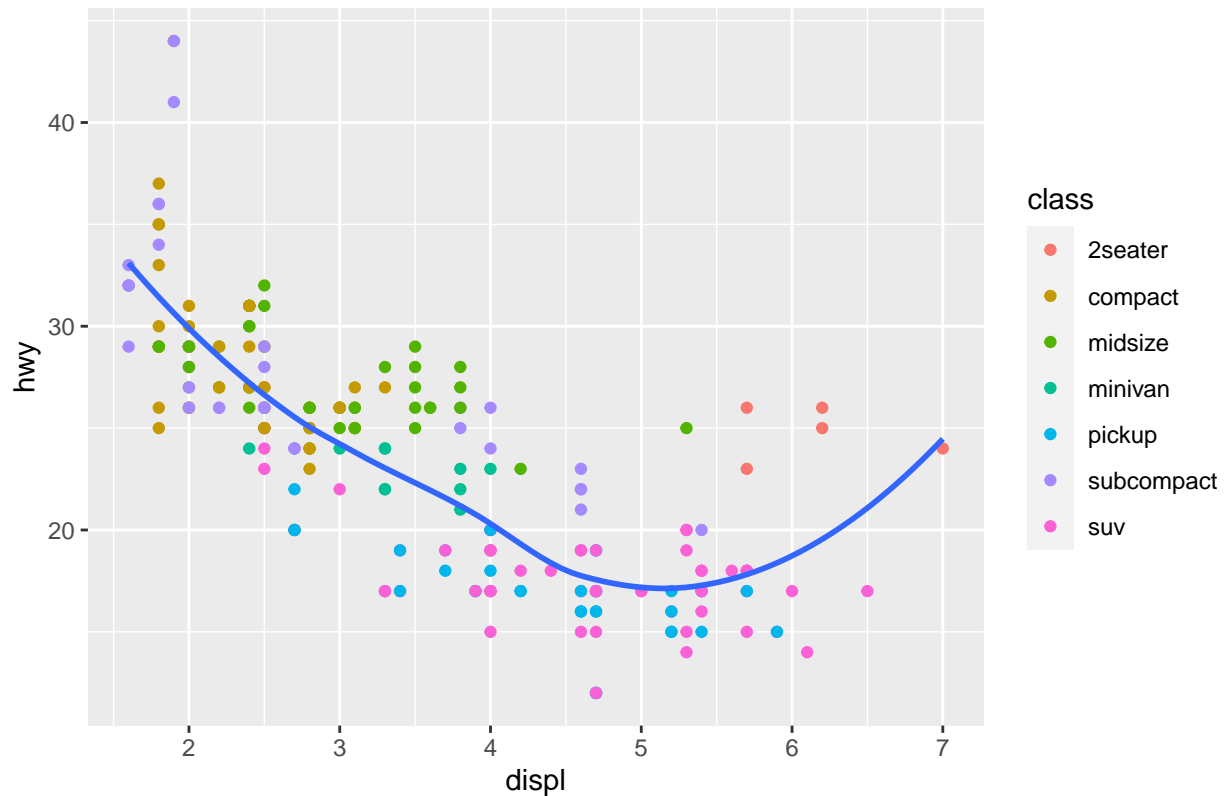
```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.2 --
## v ggplot2 3.4.0      v purrr   1.0.1
## v tibble  3.1.8      v dplyr   1.0.10
## v tidyr   1.2.1      v stringr 1.5.0
## v readr   2.1.3      v forcats 0.5.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

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'
```

Fuel efficiency generally decreases with engine size

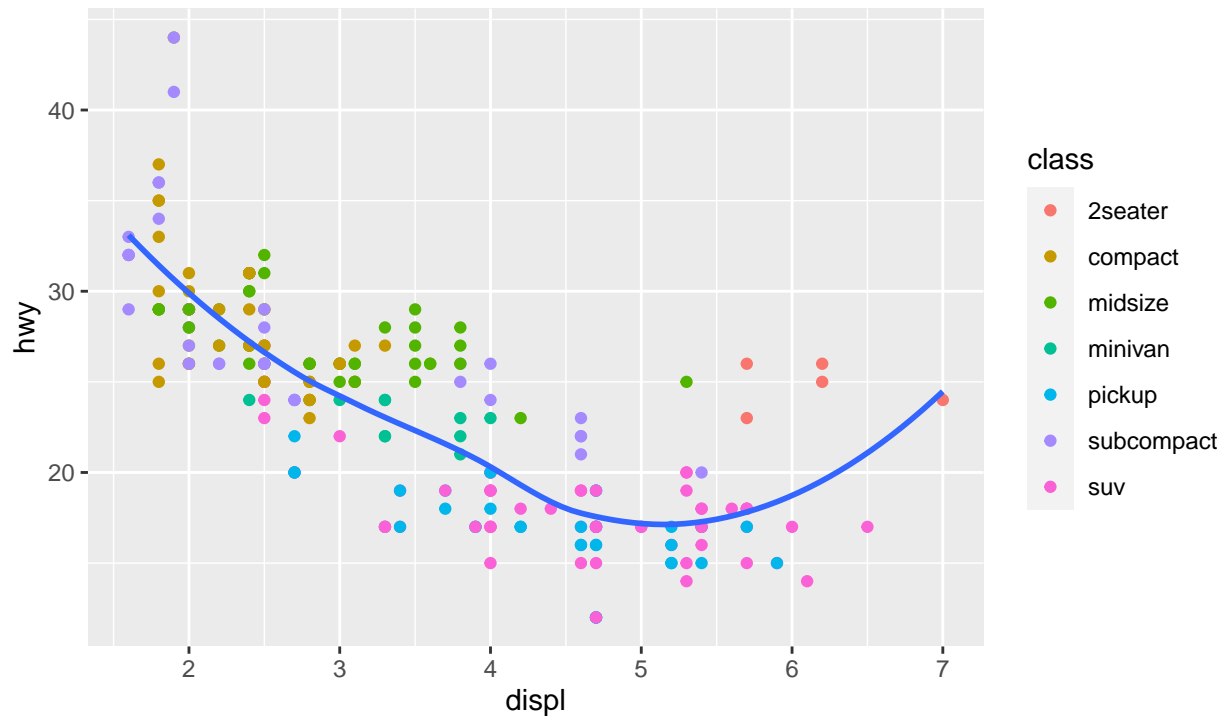


```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(color = class)) +  
  geom_smooth(se = FALSE) +  
  labs(  
    title = "Fuel efficiency generally decreases with engine size",  
    subtitle = "Two seaters (sports cars) are an exception because of their light weight",  
    caption = "Data from fueleconomy.gov"  
  )
```

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

Fuel efficiency generally decreases with engine size

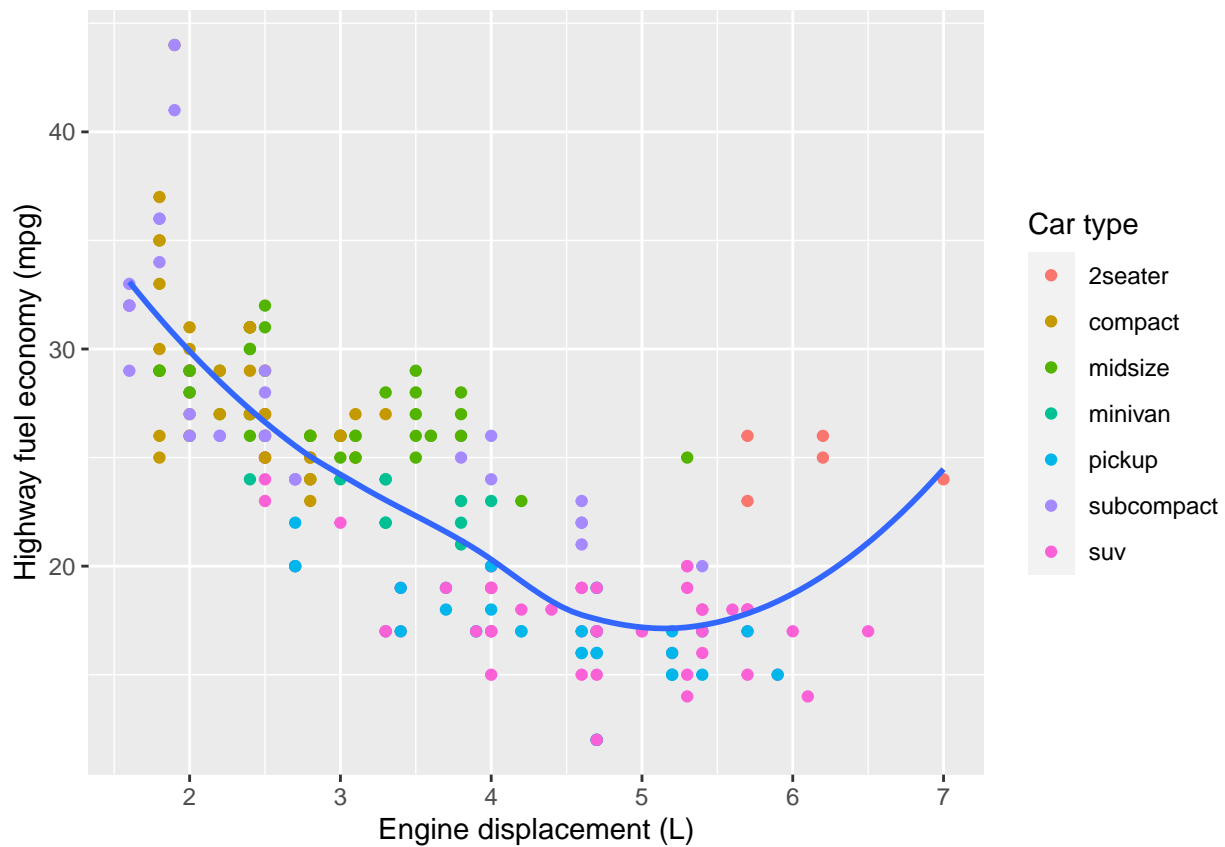
Two seaters (sports cars) are an exception because of their light weight



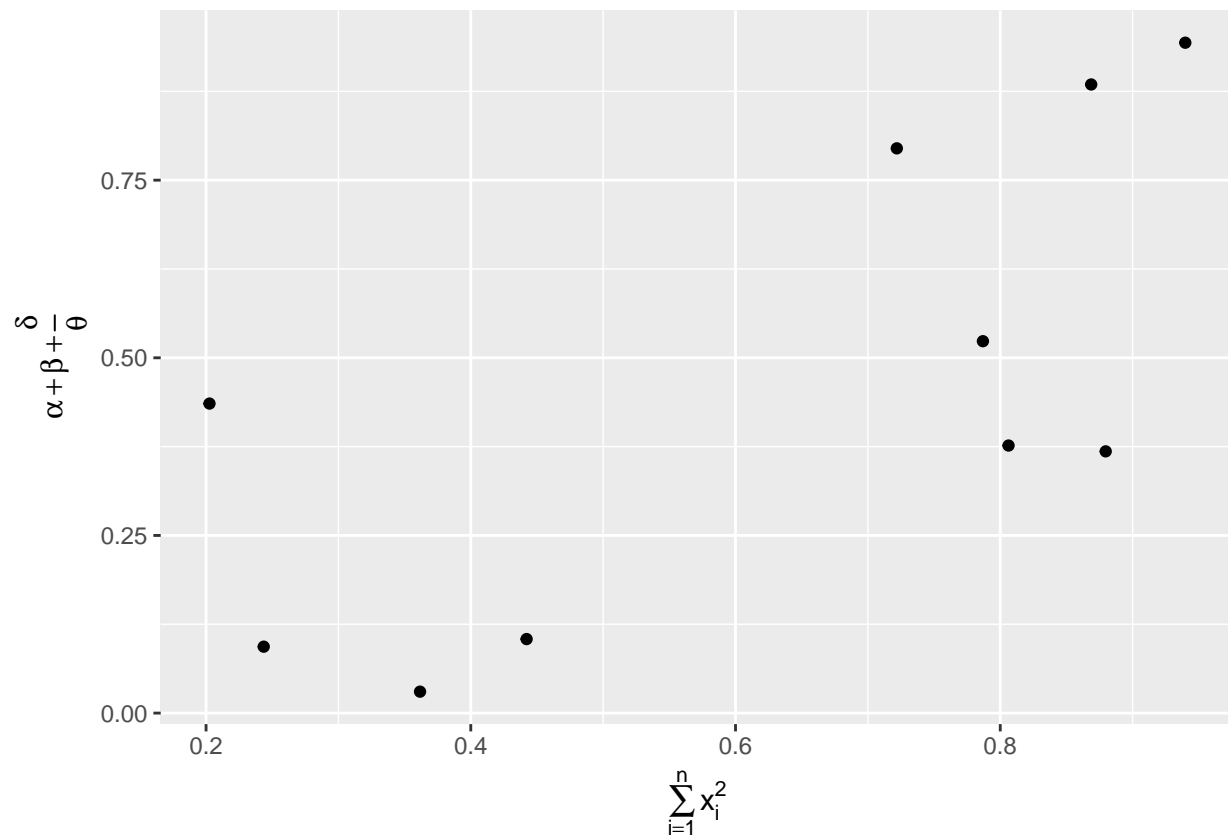
Data from fueleconomy.gov

```
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'
```

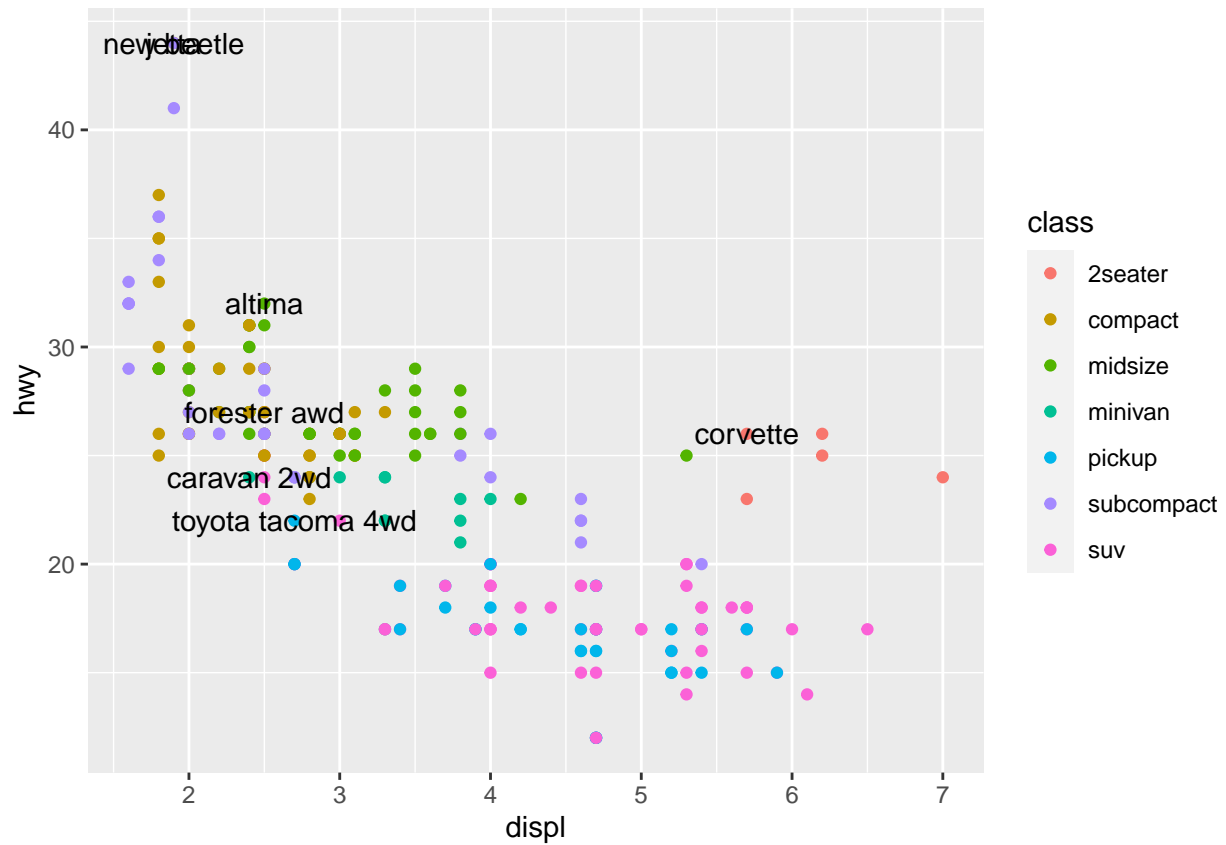


```
df <- tibble(
  x = runif(10),
  y = runif(10)
)
ggplot(df, aes(x, y)) +
  geom_point() +
  labs(
    x = quote(sum(x[i] ^ 2, i == 1, n)),
    y = quote(alpha + beta + frac(delta, theta))
  )
```

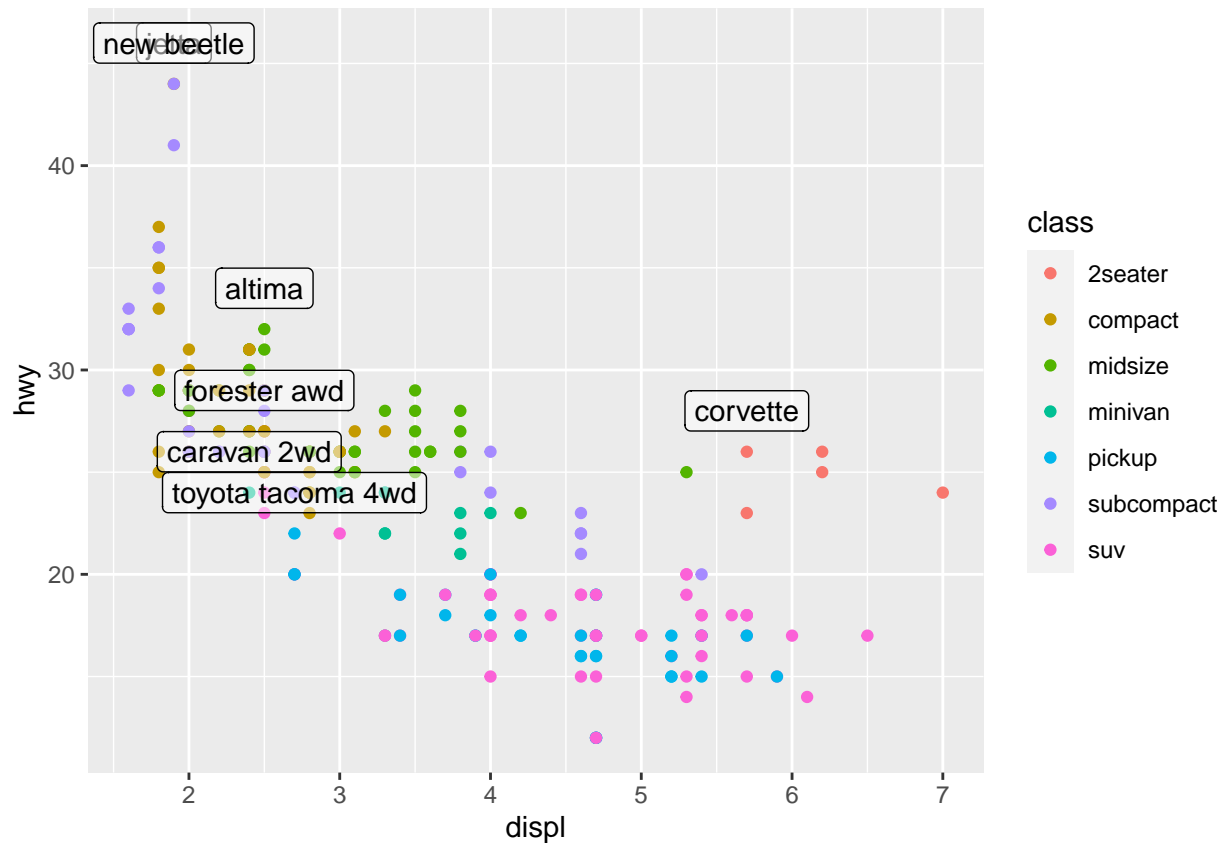


```
best_in_class <- mpg %>%
  group_by(class) %>%
  filter(row_number(desc(hwy)) == 1)

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



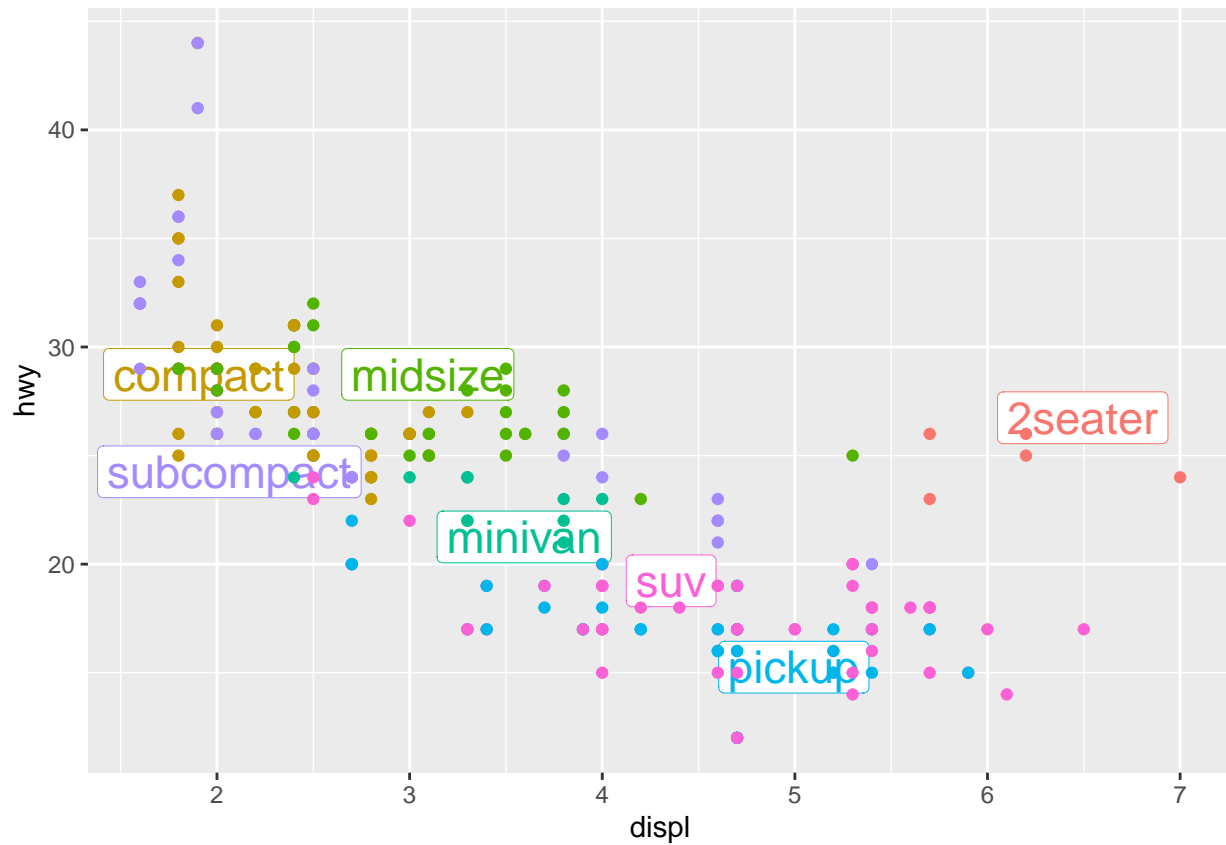
```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class)) +
  geom_label(aes(label = model), data = best_in_class, nudge_y = 2, alpha = 0.5)
```



```
# install.packages('ggrepel')
```

```
class_avg <- mpg %>%
  group_by(class) %>%
  summarise(
    displ = median(displ),
    hwy = median(hwy)
  )

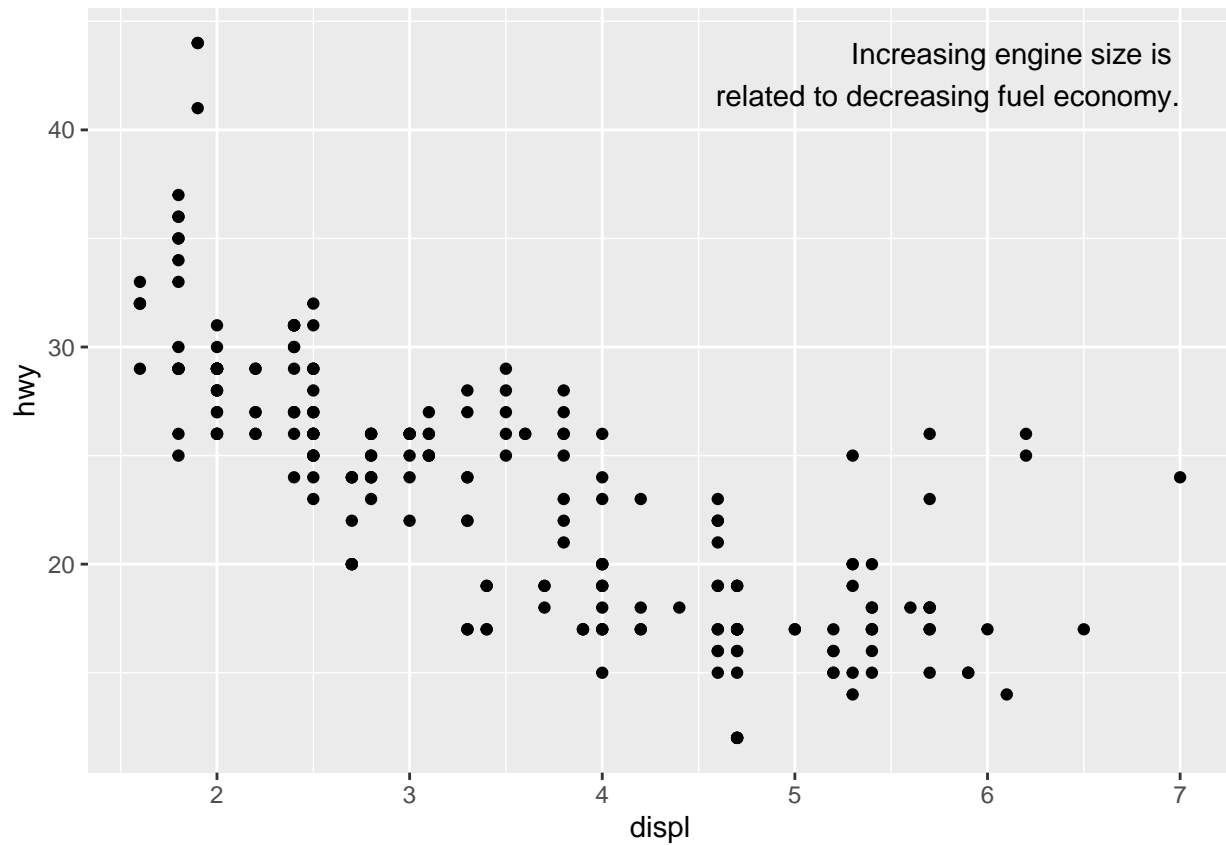
ggplot(mpg, aes(displ, hwy, colour = class)) +
  ggrepel::geom_label_repel(aes(label = class),
    data = class_avg,
    size = 6,
    label.size = 0,
    segment.color = NA
  ) +
  geom_point() +
  theme(legend.position = "none")
```



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

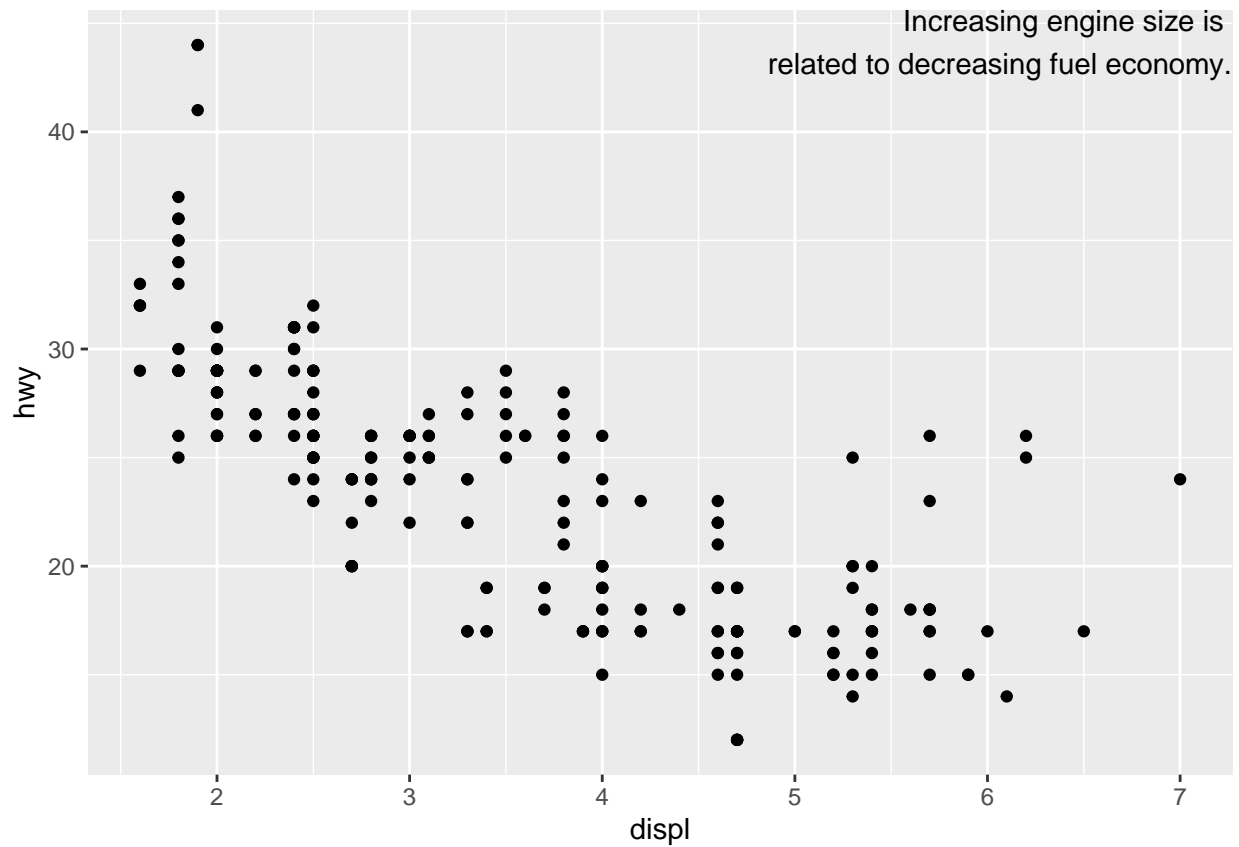
ggplot(mpg, aes(displ, hwy)) +
  geom_point() +
  geom_text(aes(label = label), data = label, vjust = "top", hjust = "right")
```





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

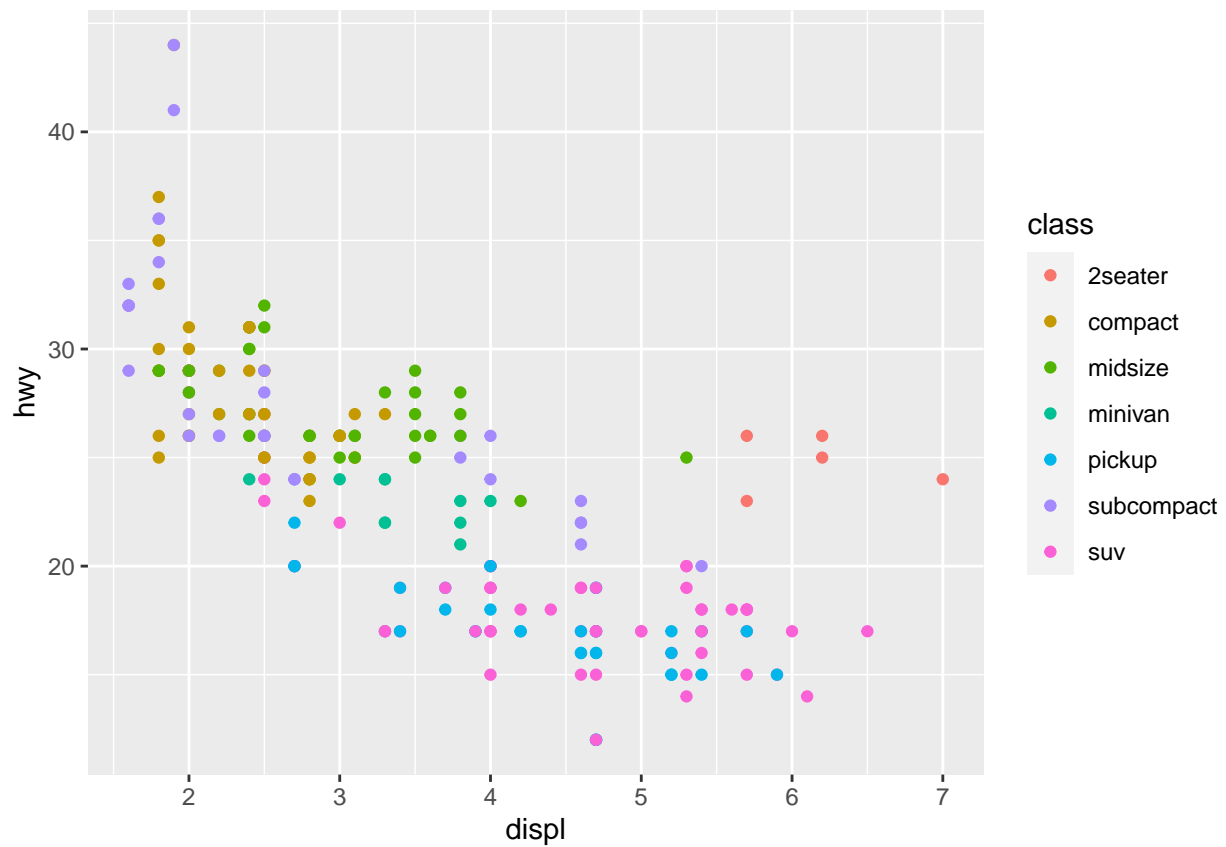
ggplot(mpg, aes(displ, hwy)) +
  geom_point() +
  geom_text(aes(label = label), data = label, vjust = "top", hjust = "right")
```



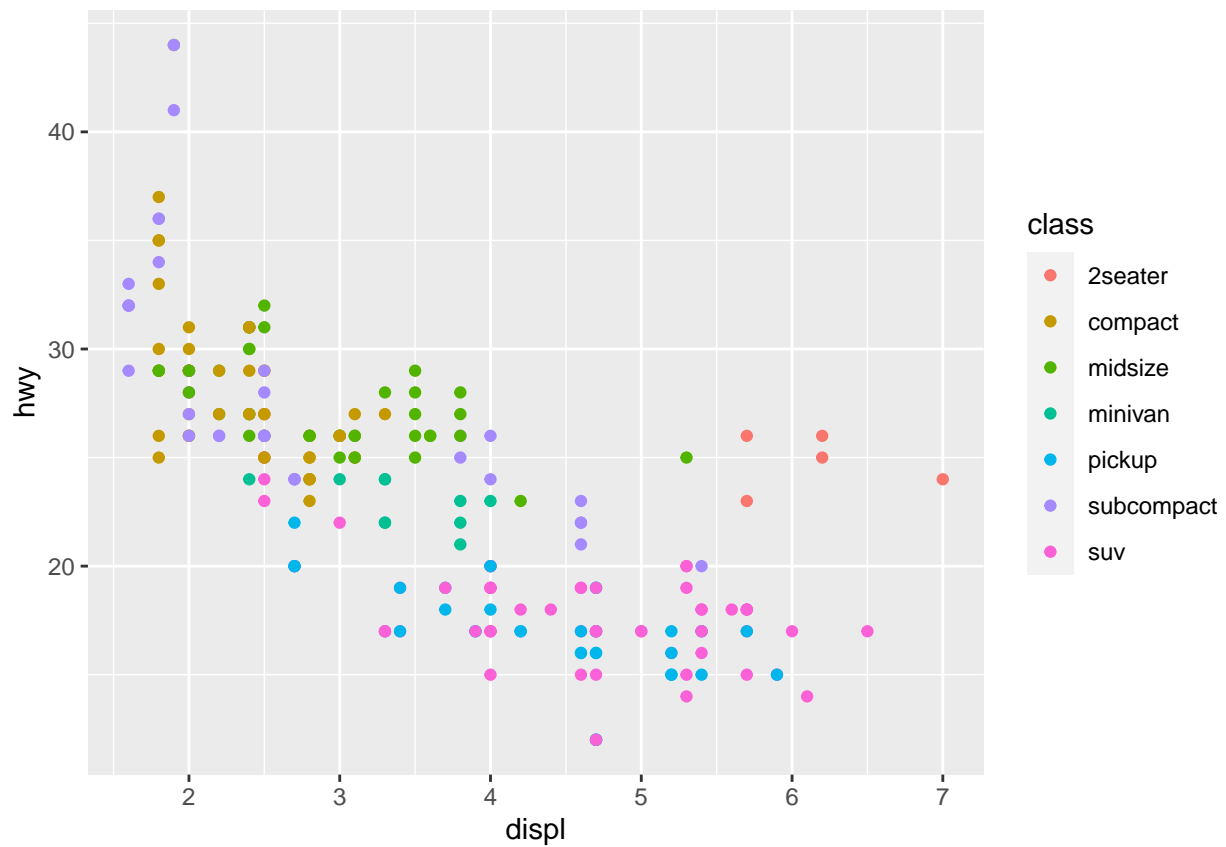
```
"Increasing engine size is related to decreasing fuel economy." %>%
  stringr::str_wrap(width = 40) %>%
  writeLines()
```

```
## Increasing engine size is related to
## decreasing fuel economy.
```

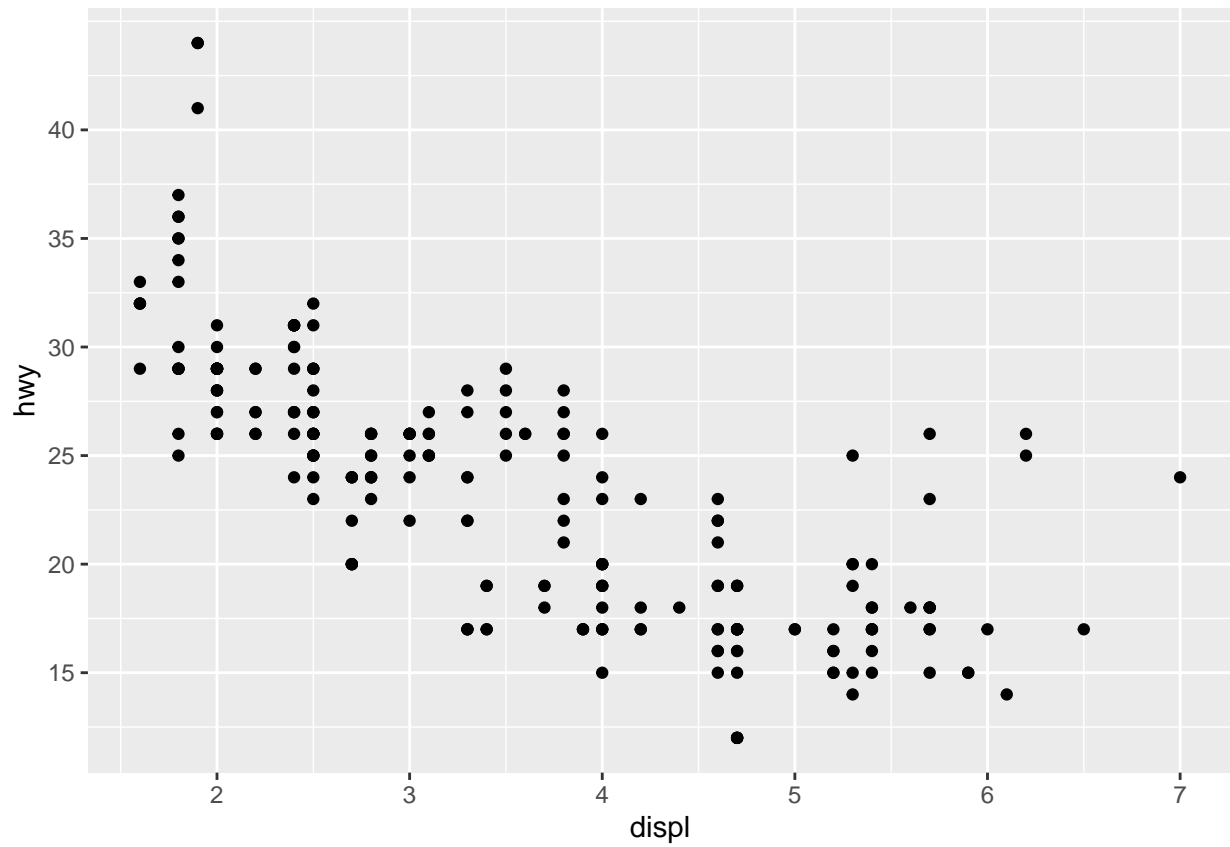
```
ggplot(mpg, aes(displ, hwy)) +
  geom_point(aes(colour = class))
```



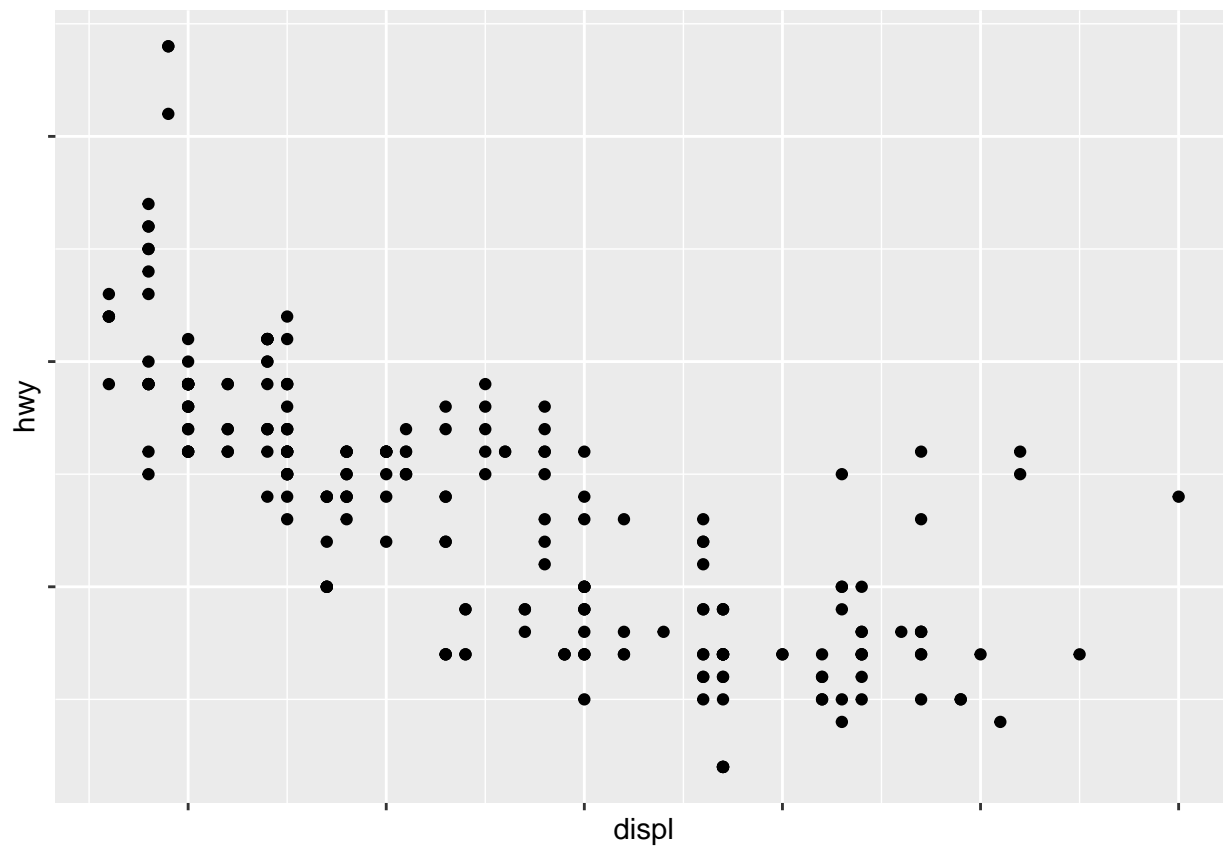
```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(colour = class)) +  
  scale_x_continuous() +  
  scale_y_continuous() +  
  scale_colour_discrete()
```



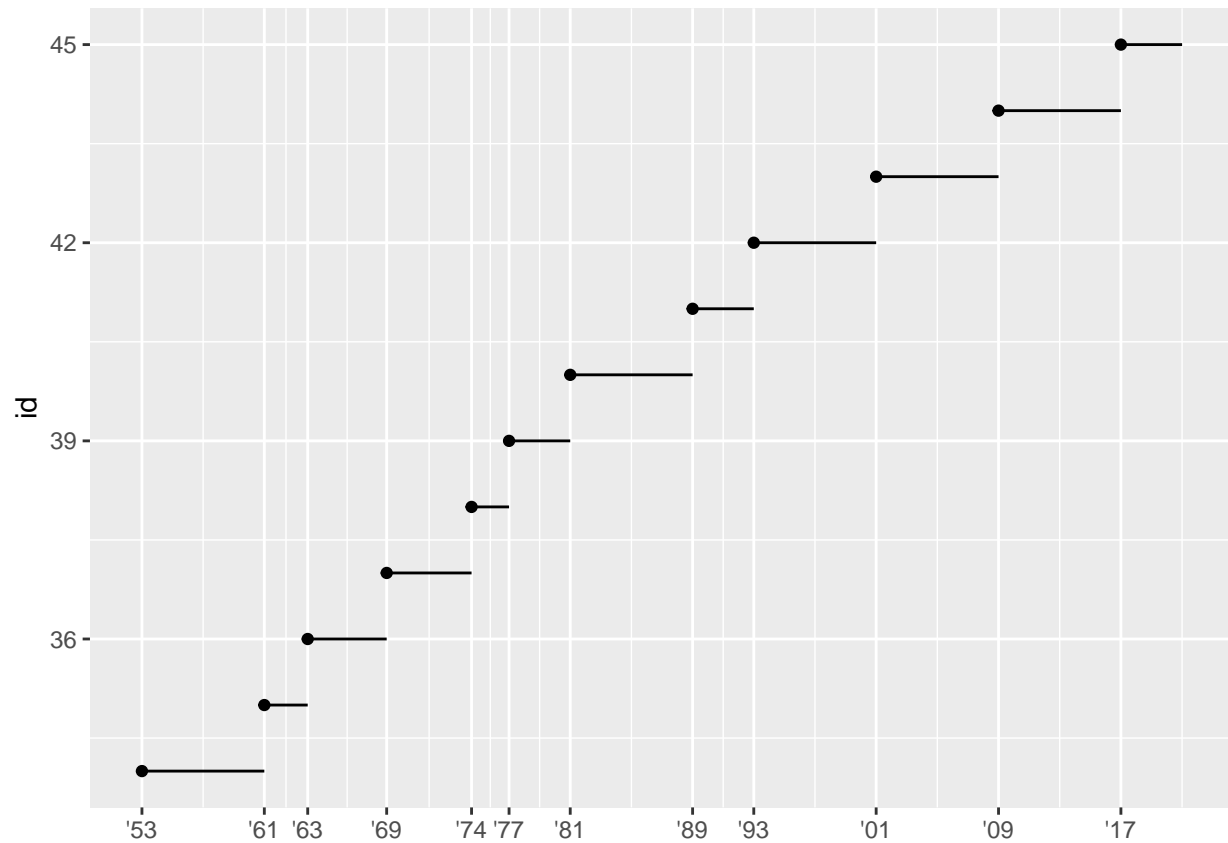
```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point() +  
  scale_y_continuous(breaks = seq(15, 40, by = 5))
```



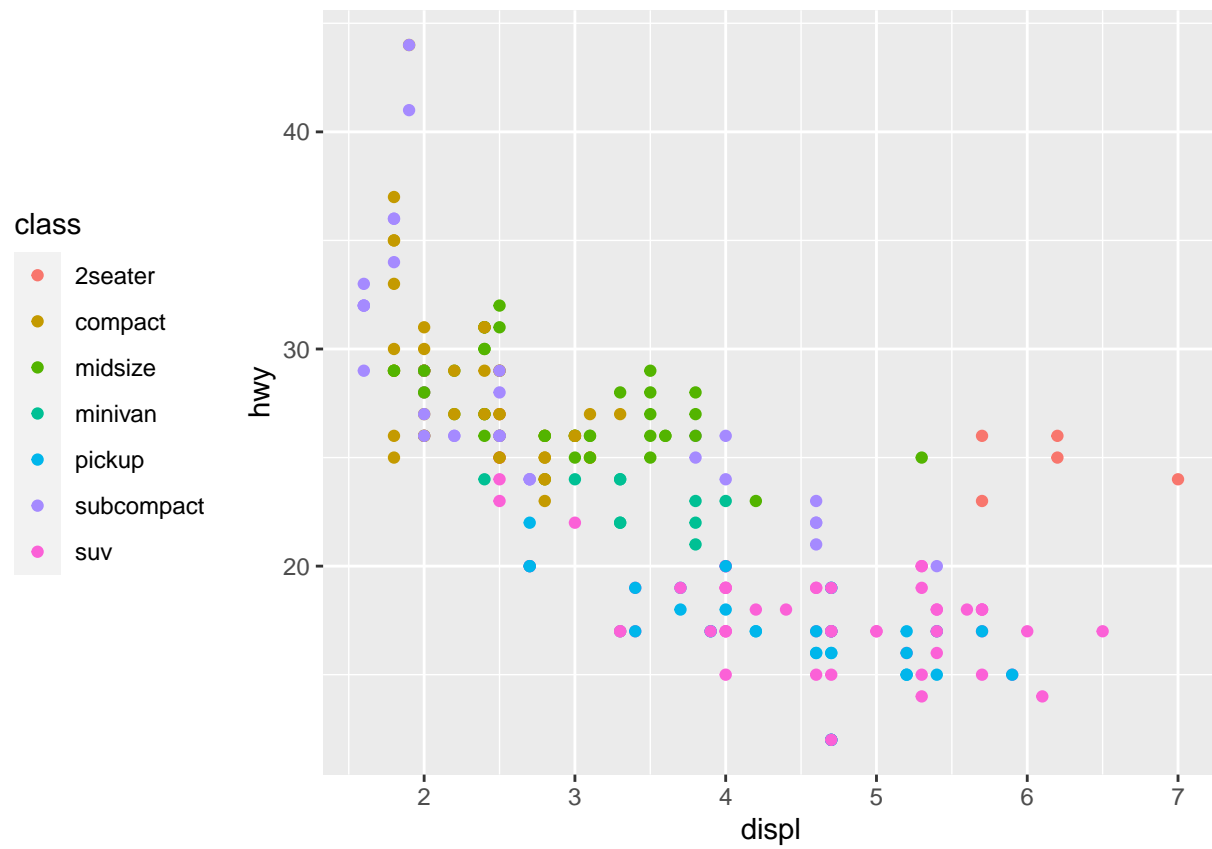
```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point() +  
  scale_x_continuous(labels = NULL) +  
  scale_y_continuous(labels = NULL)
```



```
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")
```

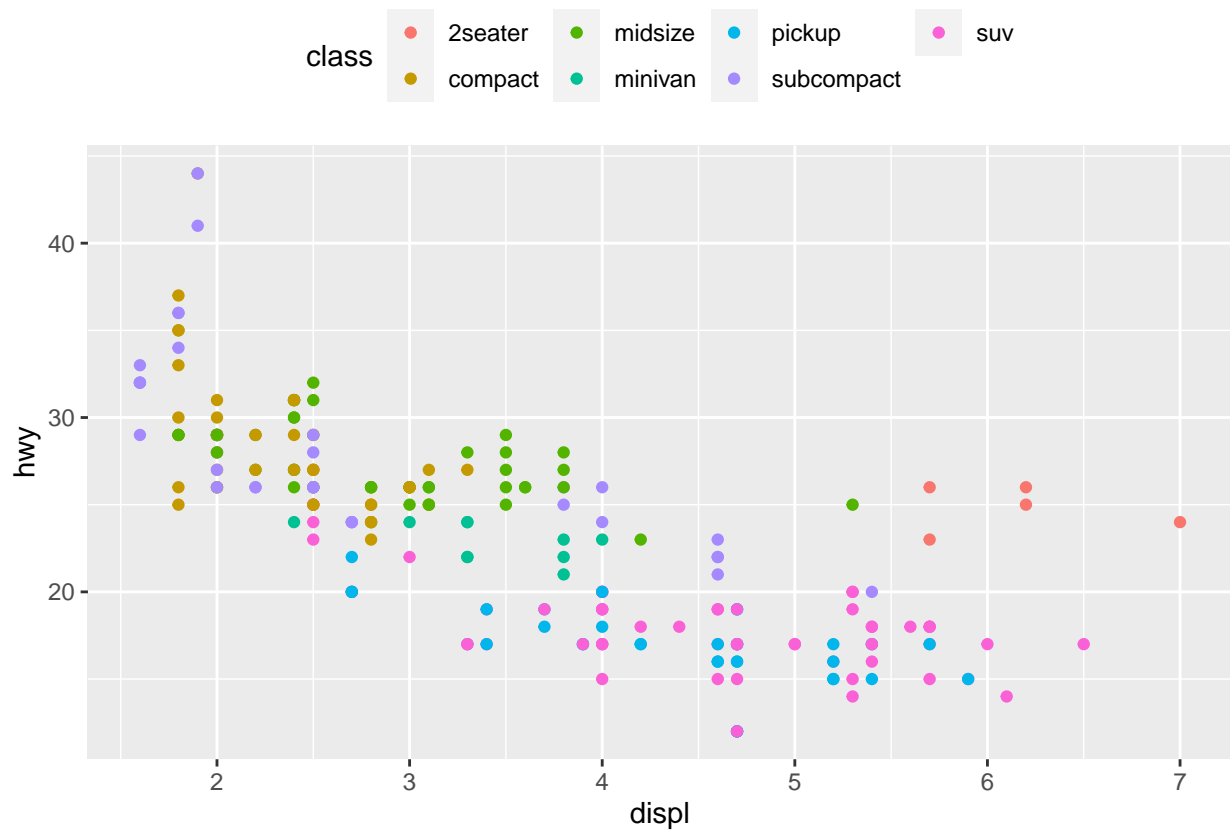


```
base <- ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(colour = class))  
  
base + theme(legend.position = "left")
```

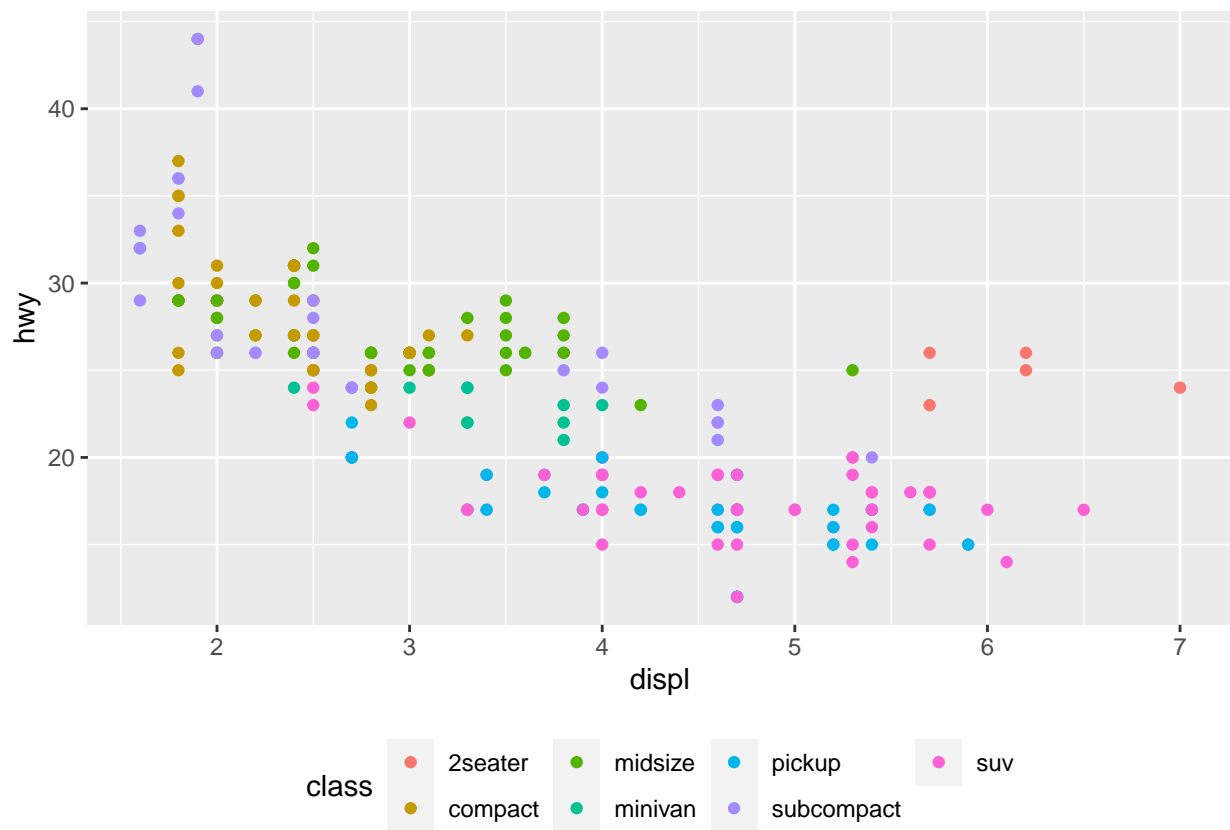


```
base + theme(legend.position = "top")
```

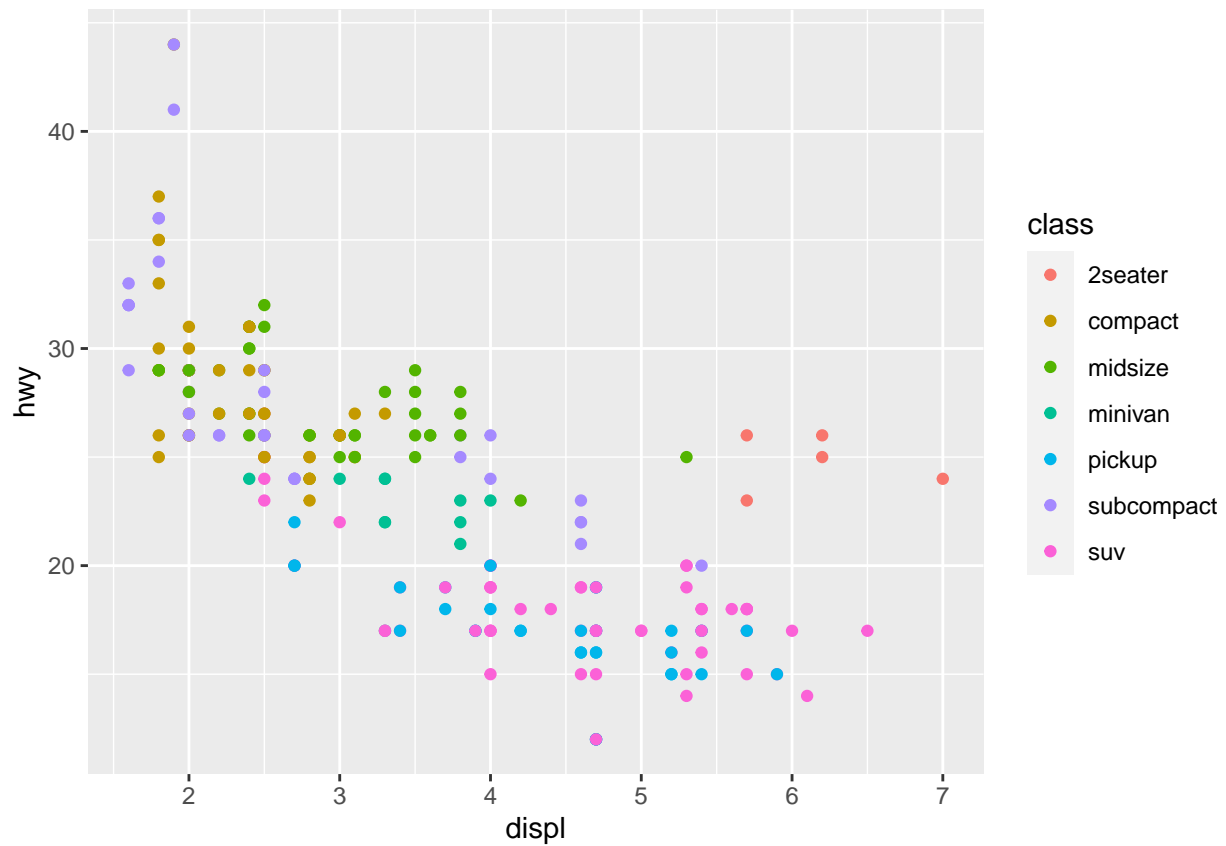




```
base + theme(legend.position = "bottom")
```

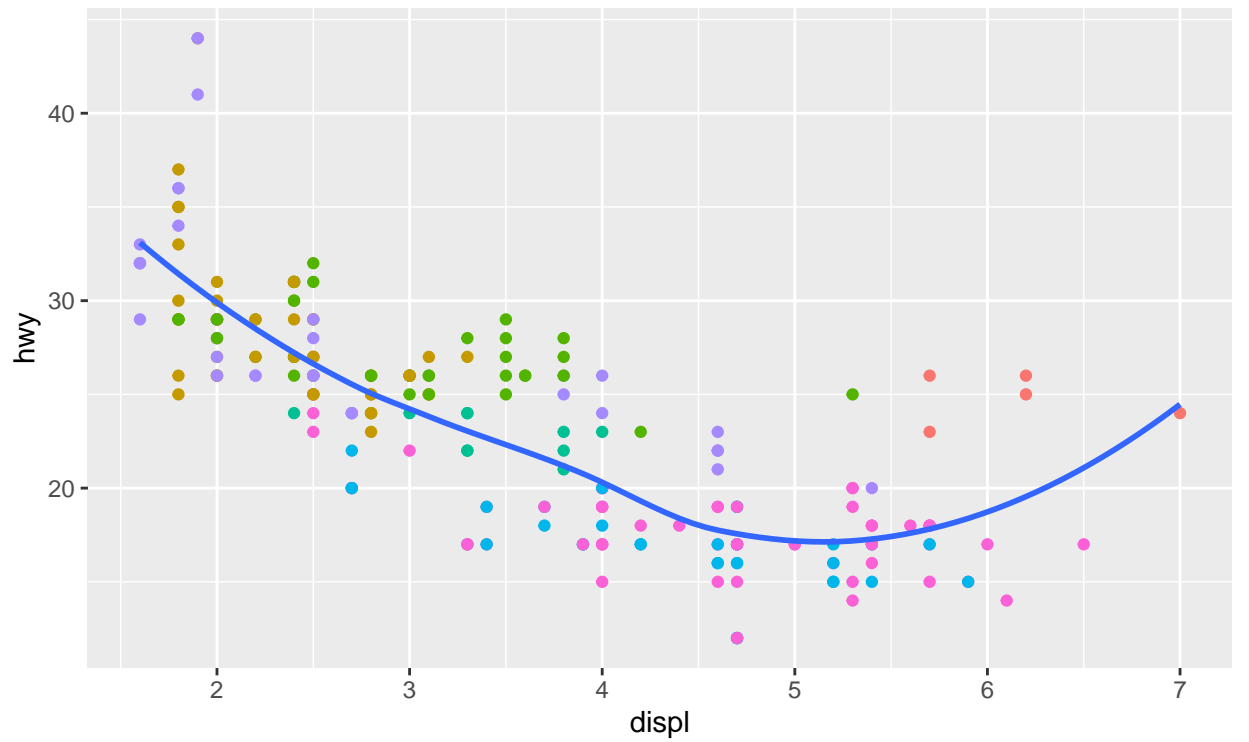


```
base + theme(legend.position = "right") # the default
```



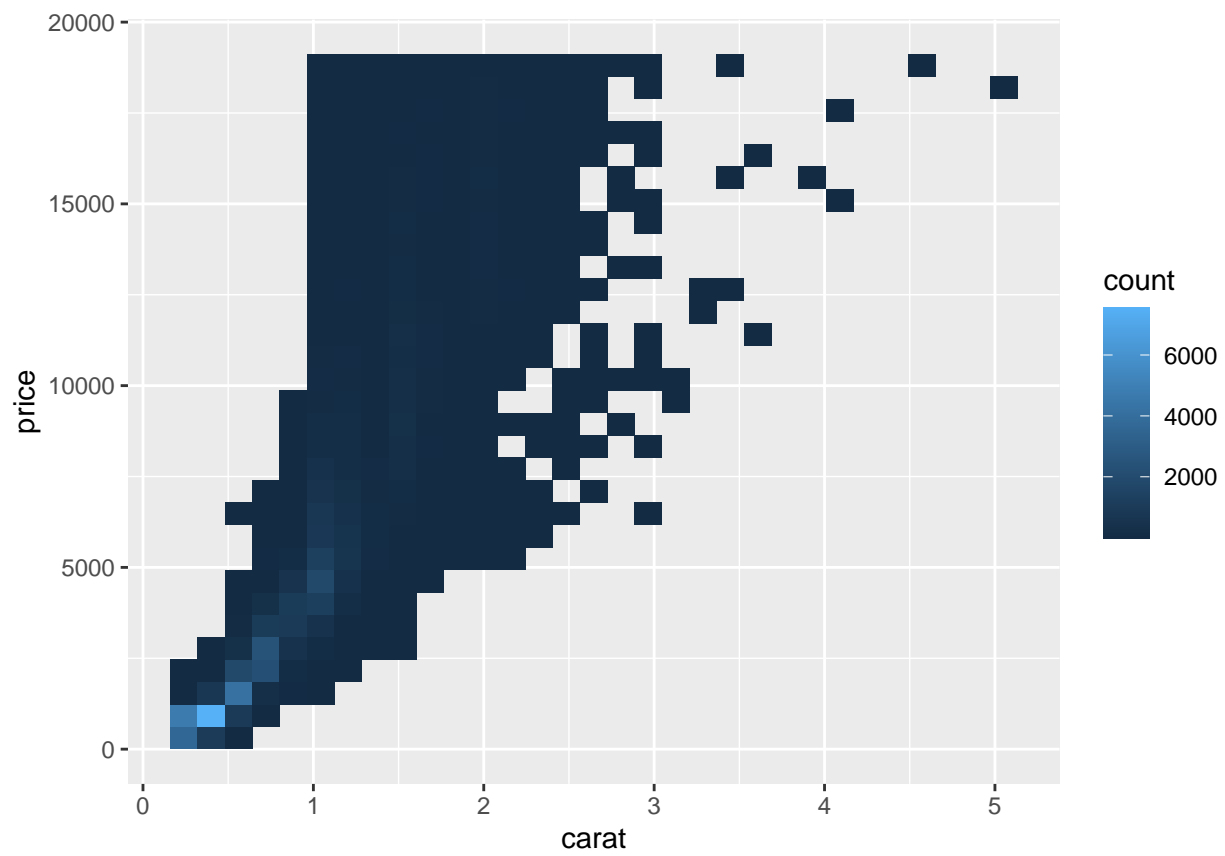
```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(colour = class)) +  
  geom_smooth(se = FALSE) +  
  theme(legend.position = "bottom") +  
  guides(colour = guide_legend(nrow = 1, override.aes = list(size = 4)))
```

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

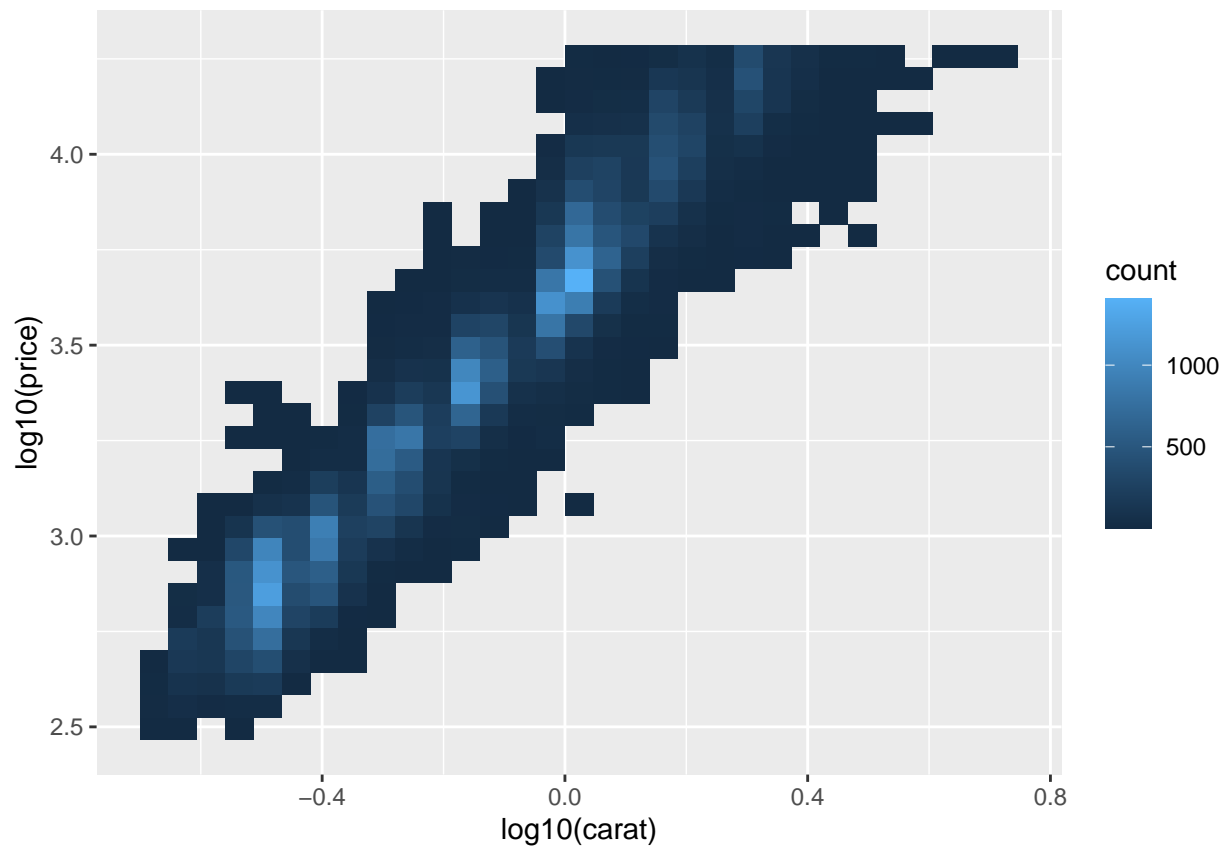


class 2seater compact midsize minivan pickup subcompact suv

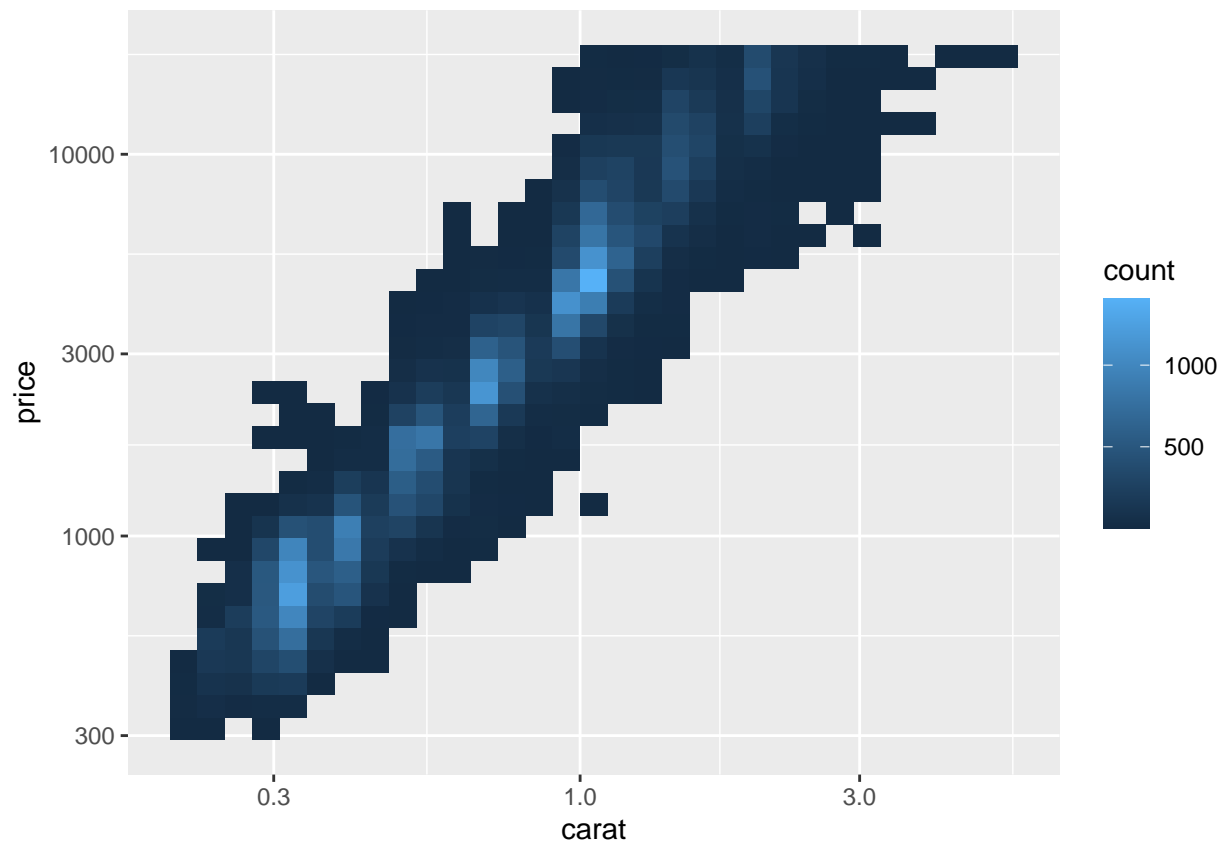
```
ggplot(diamonds, aes(carat, price)) +  
  geom_bin2d()
```



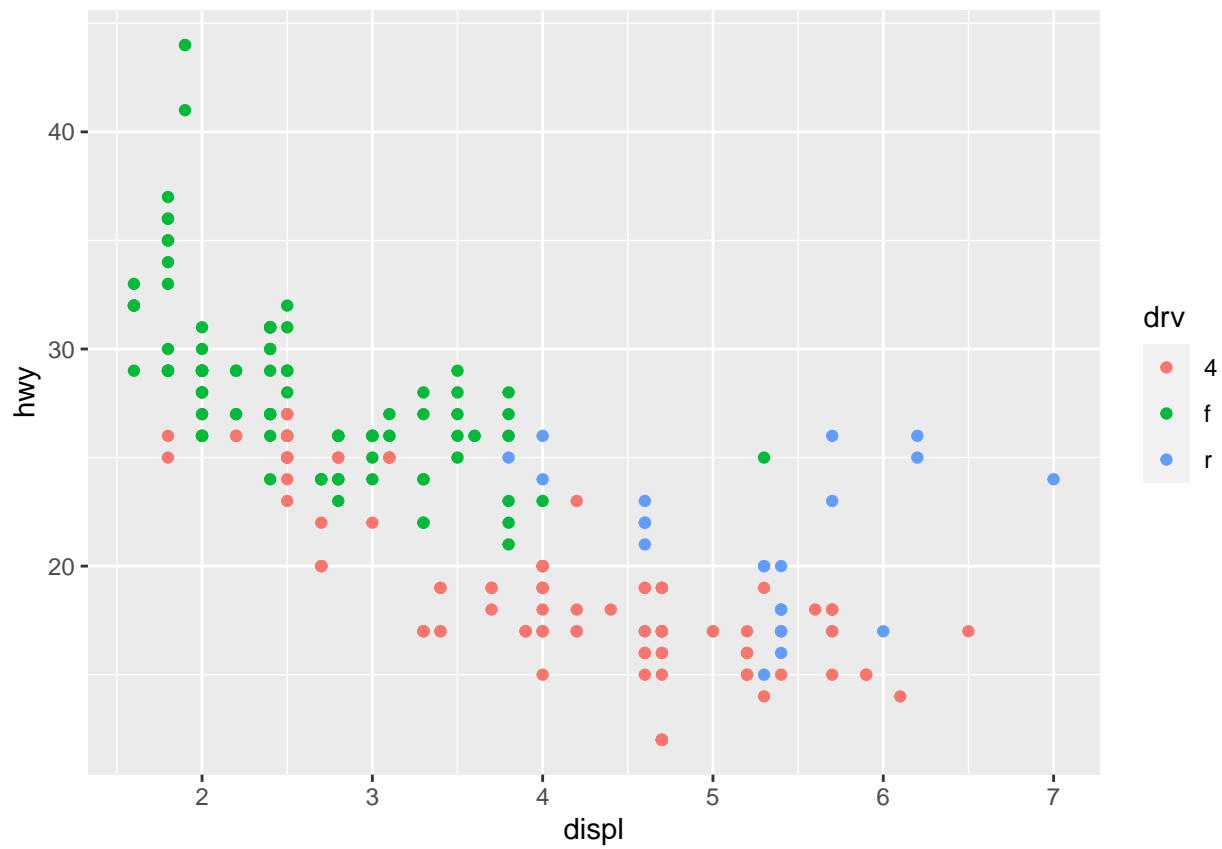
```
ggplot(diamonds, aes(log10(carat), log10(price))) +  
  geom_bin2d()
```



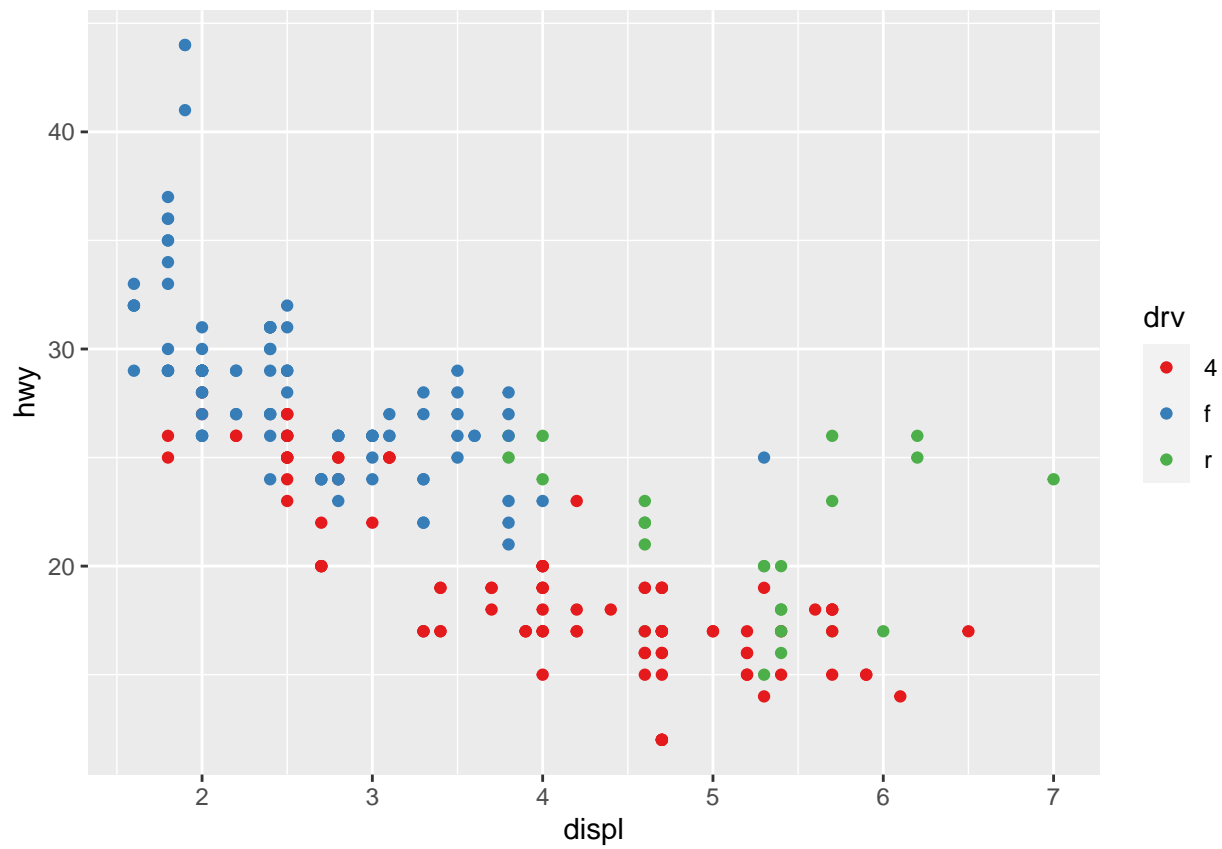
```
ggplot(diamonds, aes(carat, price)) +  
  geom_bin2d() +  
  scale_x_log10() +  
  scale_y_log10()
```



```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(color = drv))
```

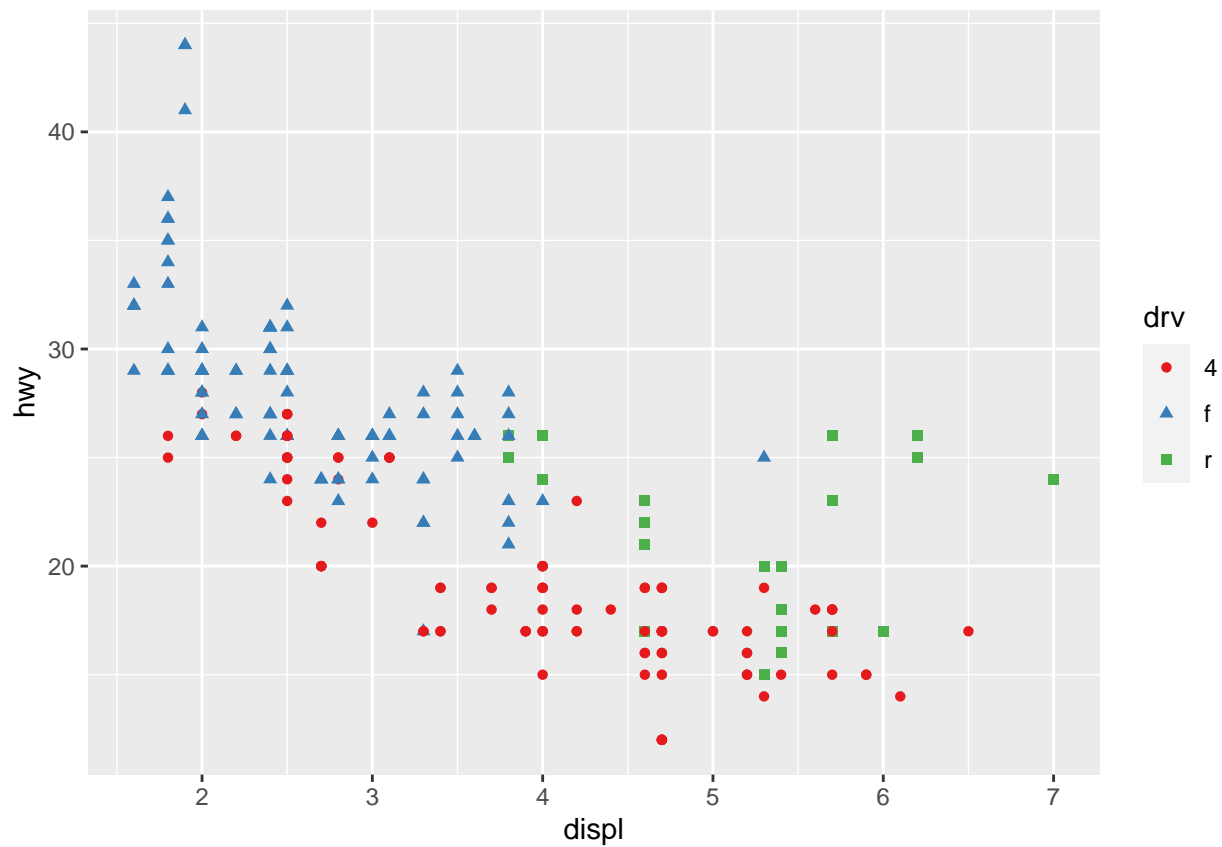


```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(color = drv)) +  
  scale_colour_brewer(palette = "Set1")
```

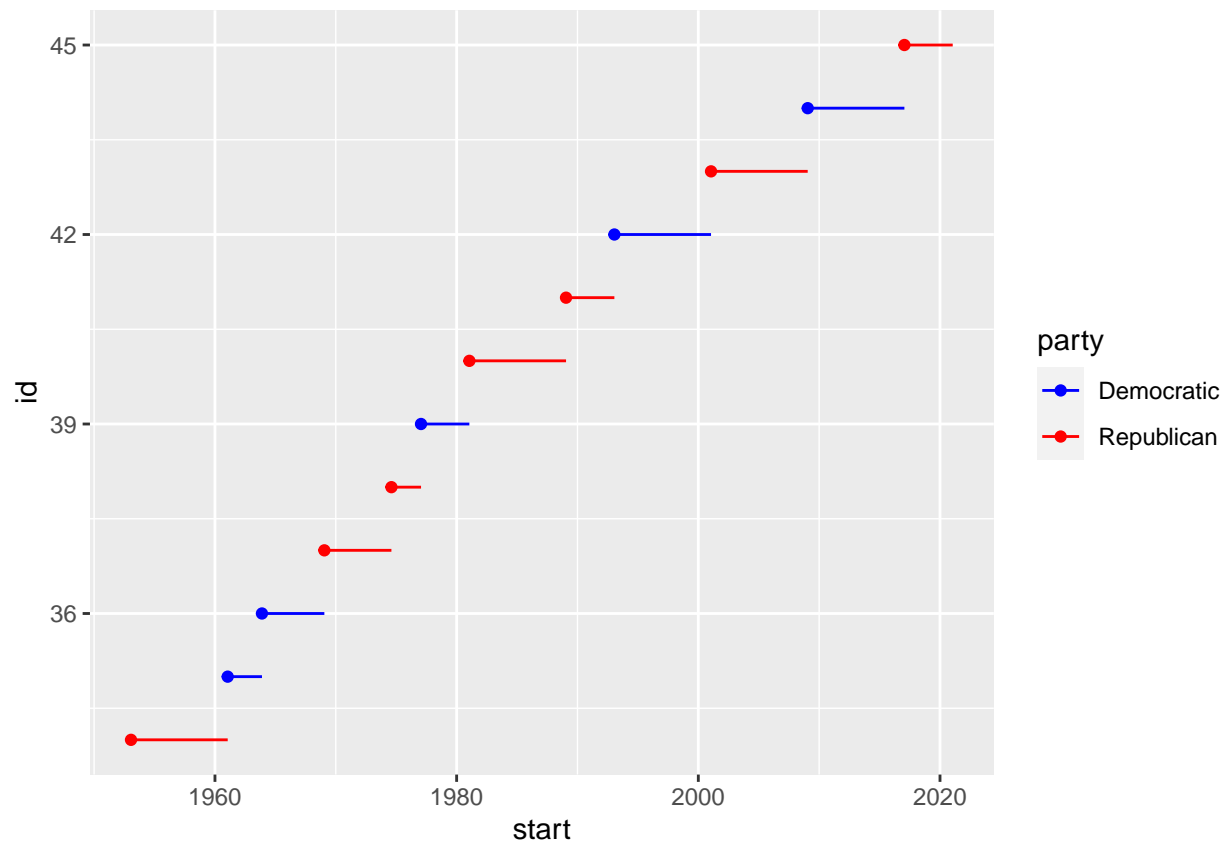


```
ggplot(mpg, aes(displ, hwy)) +  
  geom_point(aes(color = drv, shape = drv)) +  
  scale_colour_brewer(palette = "Set1")
```



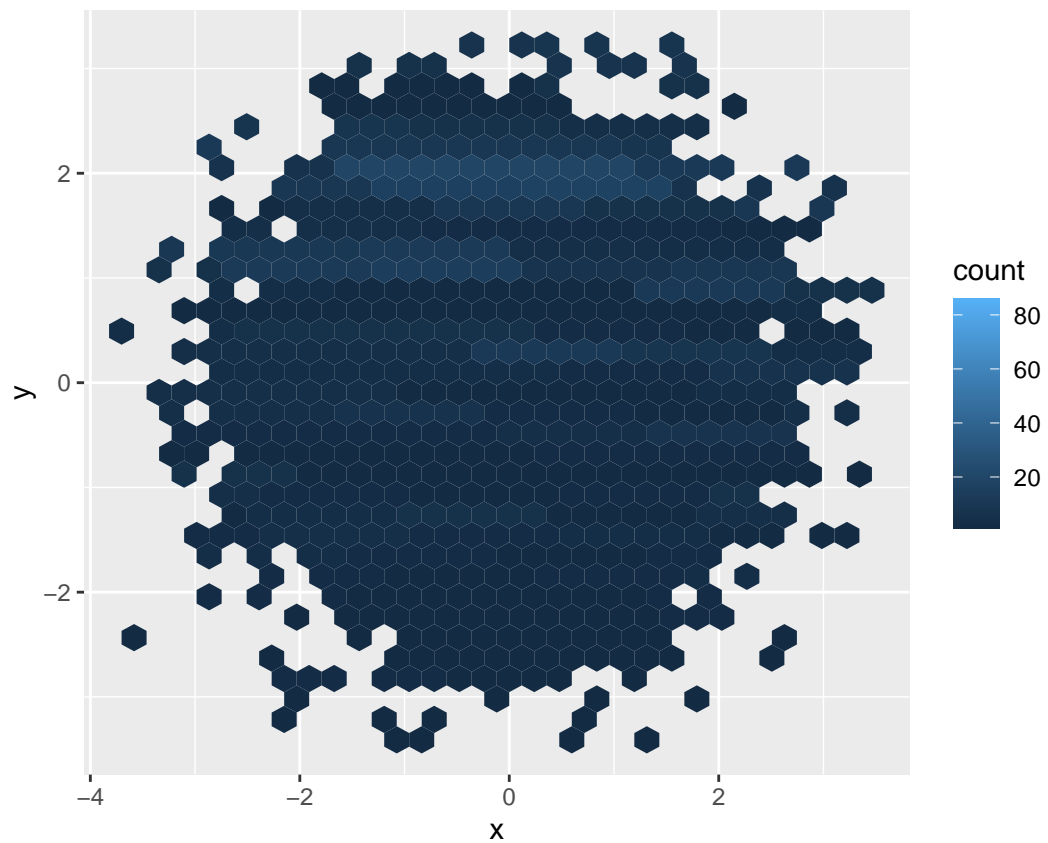


```
presidential %>%
  mutate(id = 33 + row_number()) %>%
  ggplot(aes(start, id, colour = party)) +
    geom_point() +
    geom_segment(aes(xend = end, yend = id)) +
    scale_colour_manual(values = c(Republican = "red", Democratic = "blue"))
```



```
#install.packages('viridis')
```

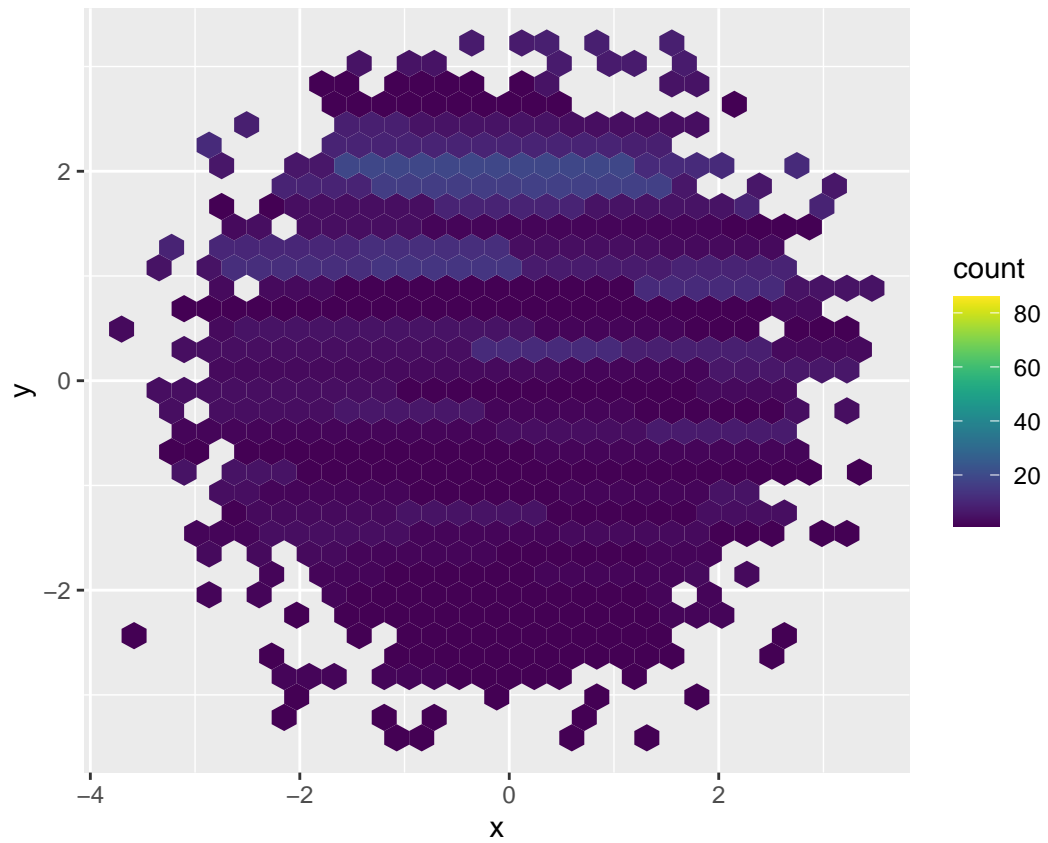
```
df <- tibble(  
  x = rnorm(10000),  
  y = rnorm(10000)  
)  
ggplot(df, aes(x, y)) +  
  geom_hex() +  
  coord_fixed()
```



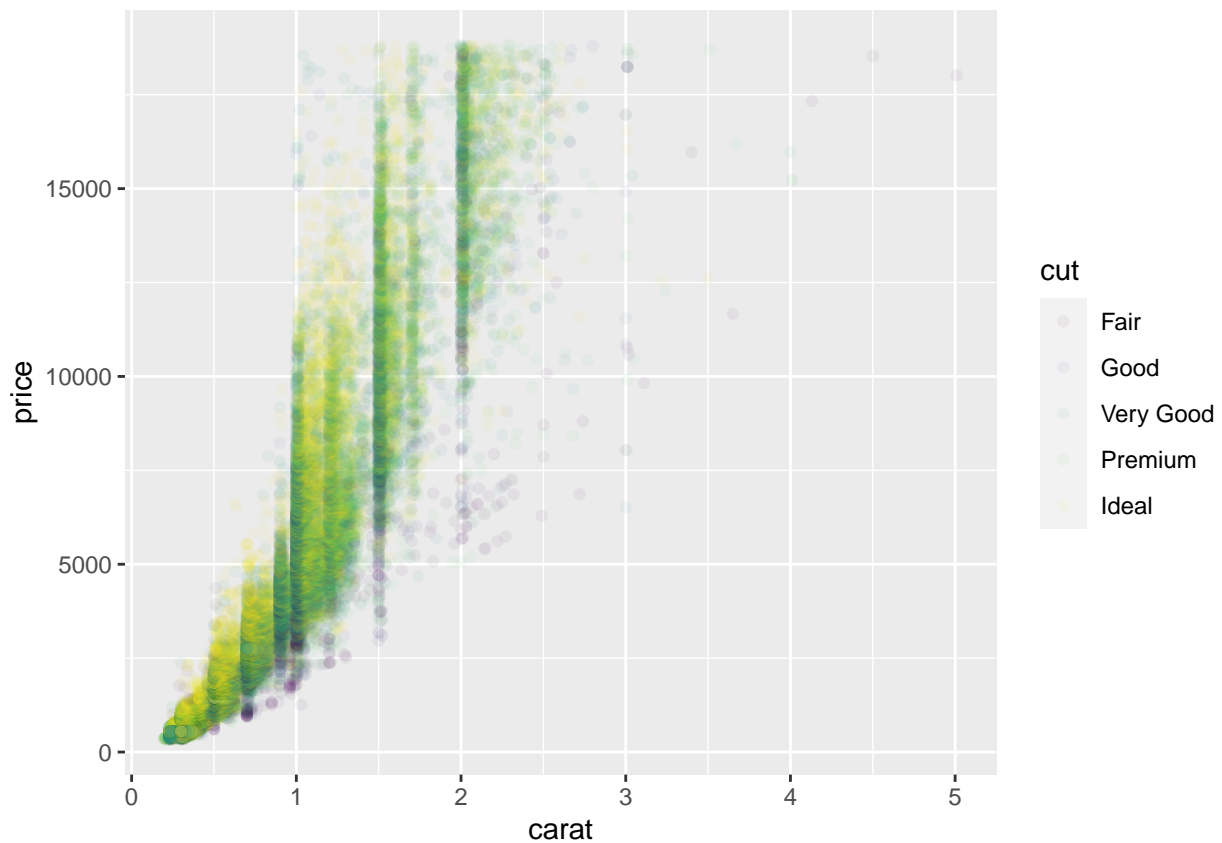
```
library('viridis')
```

```
## Loading required package: viridisLite
```

```
ggplot(df, aes(x, y)) +  
  geom_hex() +  
  viridis::scale_fill_viridis() +  
  coord_fixed()
```

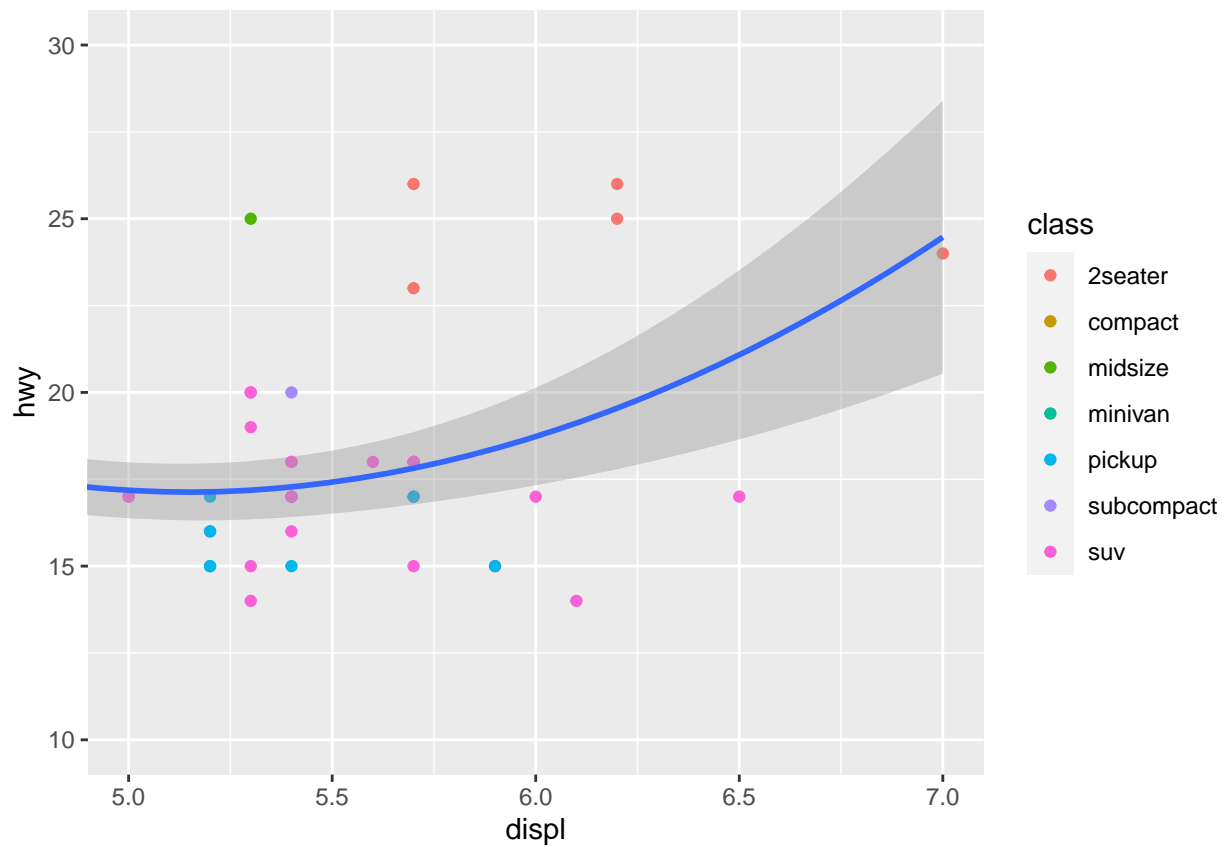


```
ggplot(diamonds, aes(carat, price)) +  
  geom_point(aes(colour = cut), alpha = 1/20)
```



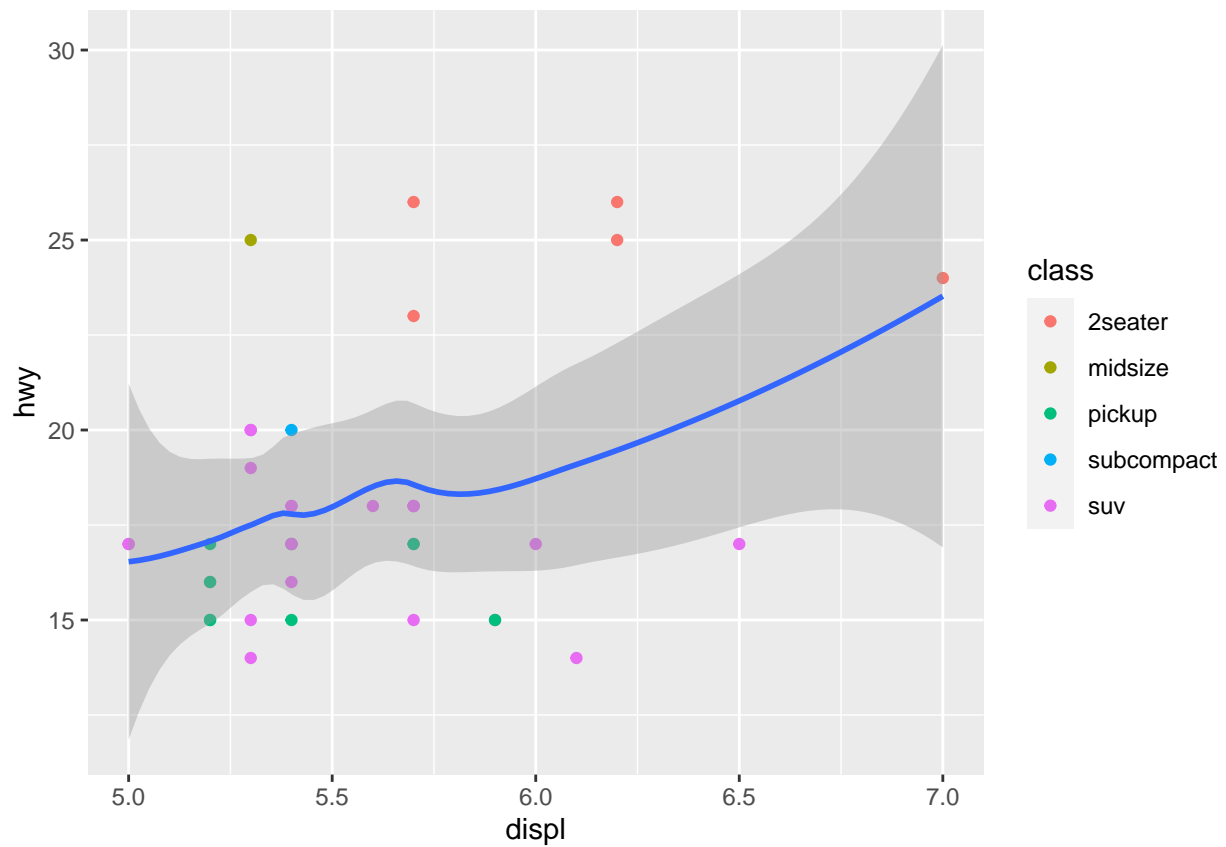
```
ggplot(mpg, mapping = aes(displ, hwy)) +  
  geom_point(aes(color = class)) +  
  geom_smooth() +  
  coord_cartesian(xlim = c(5, 7), ylim = c(10, 30))
```

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



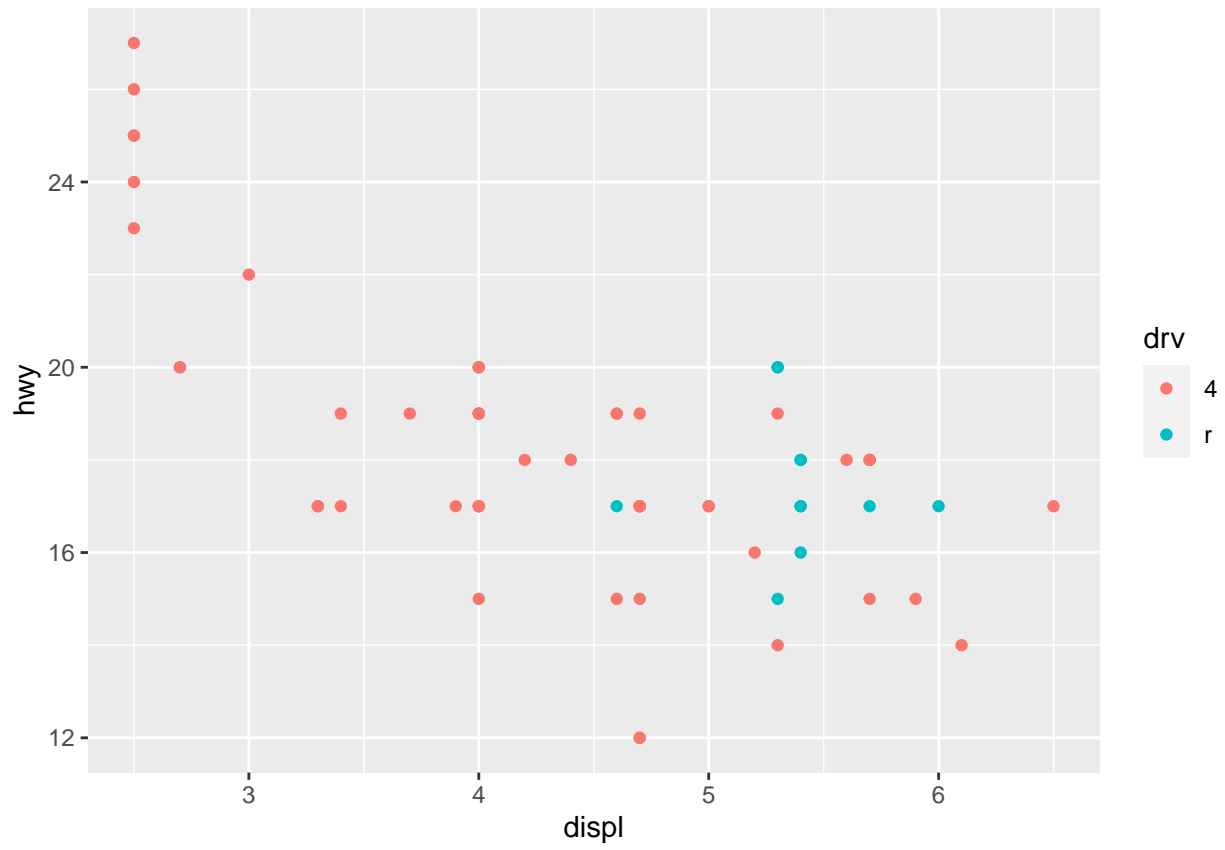
```
mpg %>%
  filter(displ >= 5, displ <= 7, hwy >= 10, hwy <= 30) %>%
  ggplot(aes(displ, hwy)) +
  geom_point(aes(color = class)) +
  geom_smooth()

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



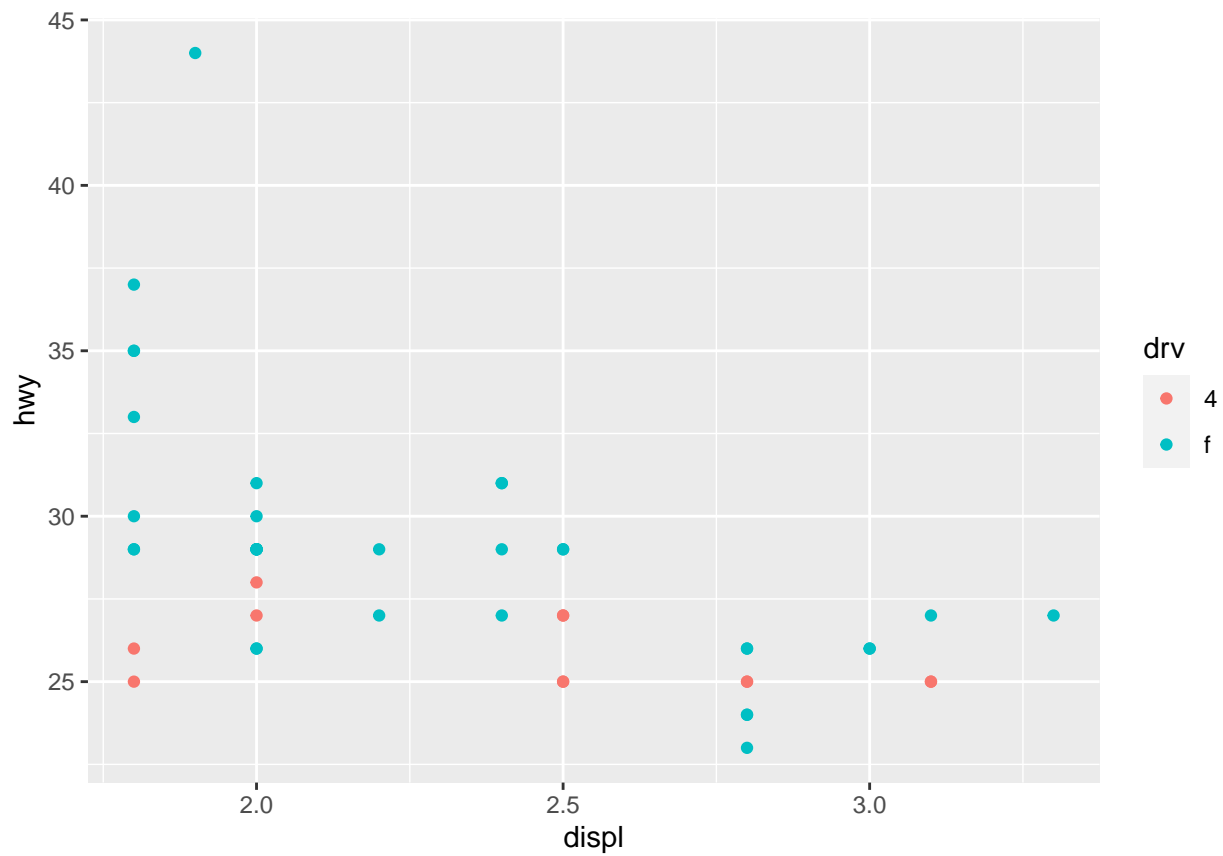
```
suv <- mpg %>% filter(class == "suv")
compact <- mpg %>% filter(class == "compact")

ggplot(suv, aes(displ, hwy, colour = drv)) +
  geom_point()
```



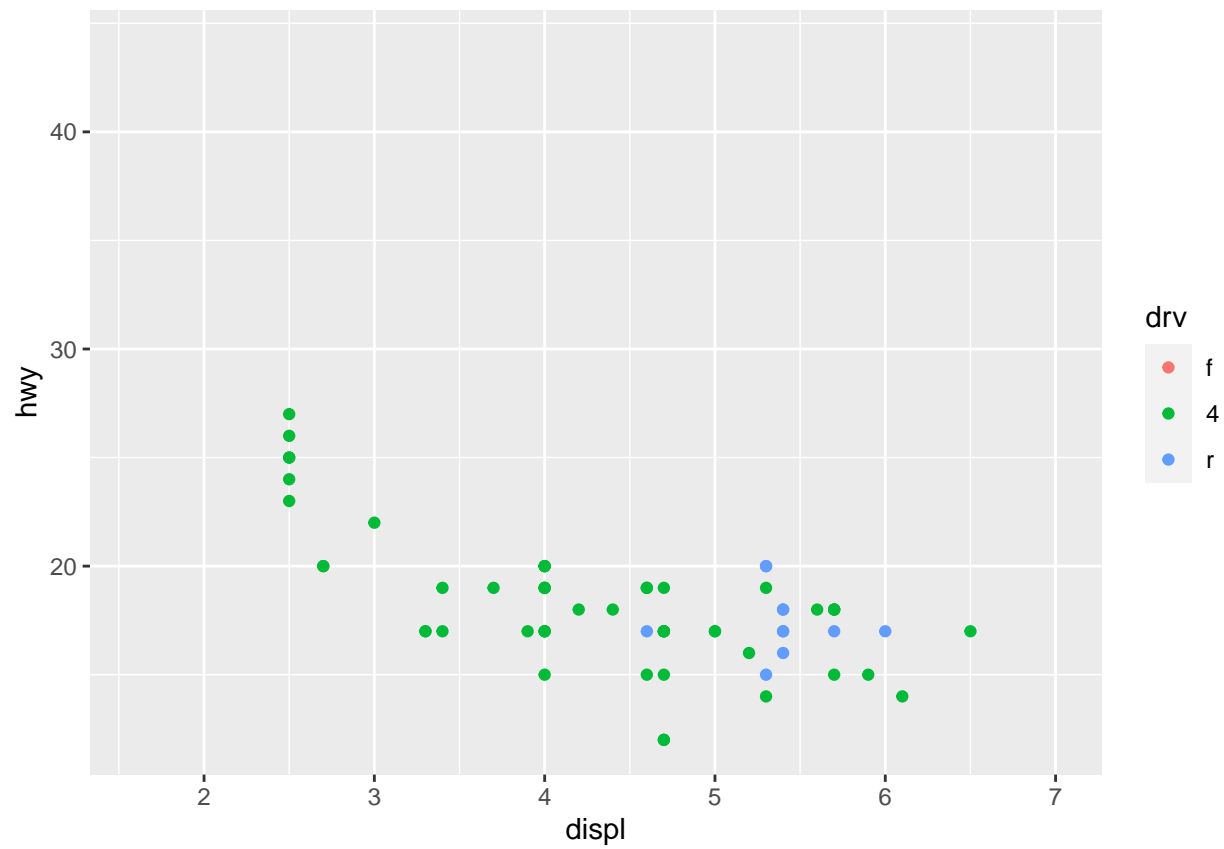
```
ggplot(compact, aes(displ, hwy, colour = drv)) +  
  geom_point()
```



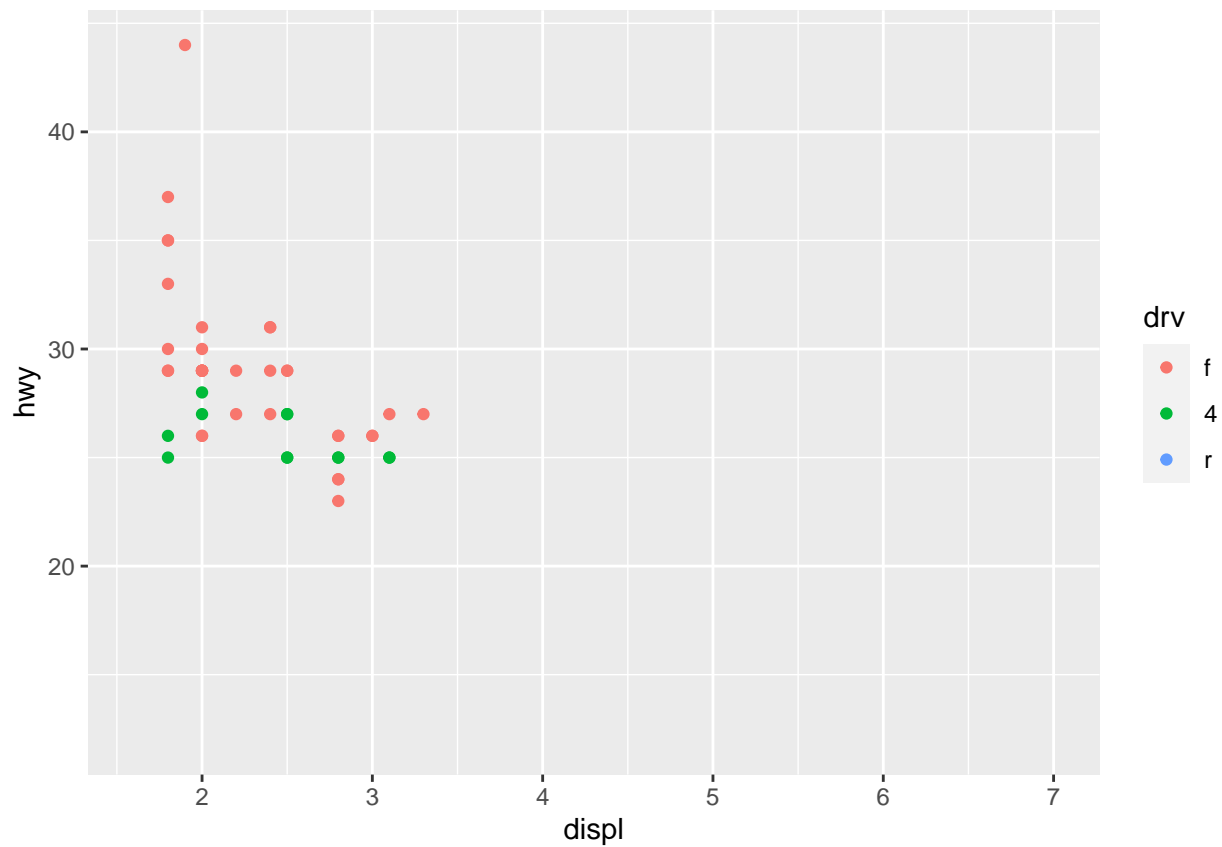


```
x_scale <- scale_x_continuous(limits = range(mpg$displ))
y_scale <- scale_y_continuous(limits = range(mpg$hwy))
col_scale <- scale_colour_discrete(limits = unique(mpg$drv))

ggplot(suv, aes(displ, hwy, colour = drv)) +
  geom_point() +
  x_scale +
  y_scale +
  col_scale
```

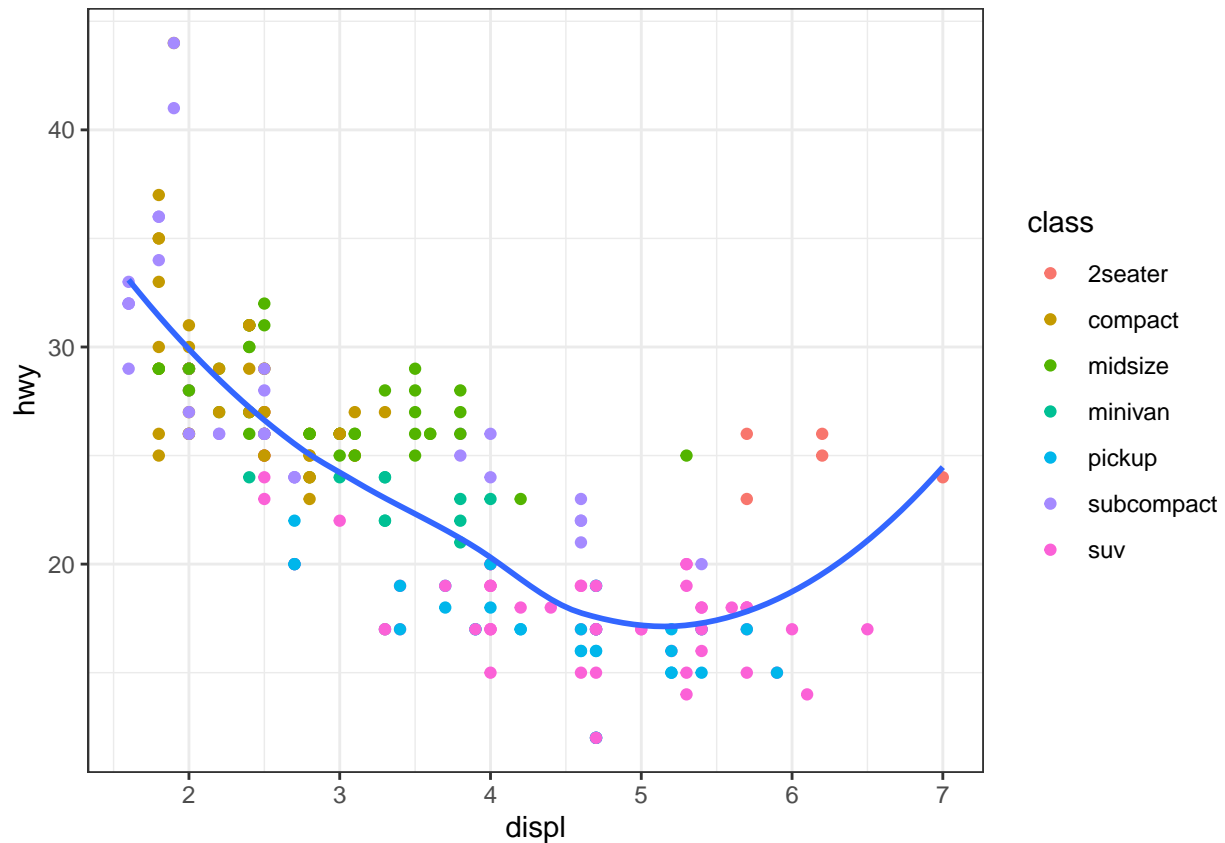


```
ggplot(compact, aes(displ, hwy, colour = drv)) +  
  geom_point() +  
  x_scale +  
  y_scale +  
  col_scale
```



```
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'
```



```
ggsave("my-plot.pdf")
```

```
## Saving 6.5 x 4.5 in image
```

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

```
getwd()
```

```
## [1] "/Users/miao/Documents/R_2023/Tutorial_R"
```

Add a new chunk by clicking the *Insert Chunk* button on the toolbar or by pressing *Cmd+Option+I*.

When you save the notebook, an HTML file containing the code and output will be saved alongside it (click the *Preview* button or press *Cmd+Shift+K* to preview the HTML file).

The preview shows you a rendered HTML copy of the contents of the editor. Consequently, unlike *Knit*, *Preview* does not run any R code chunks. Instead, the output of the chunk when it was last run in the editor is displayed.