3. ggplot2 그래픽 패키지

3. ggplot2 패키지를 알아보자

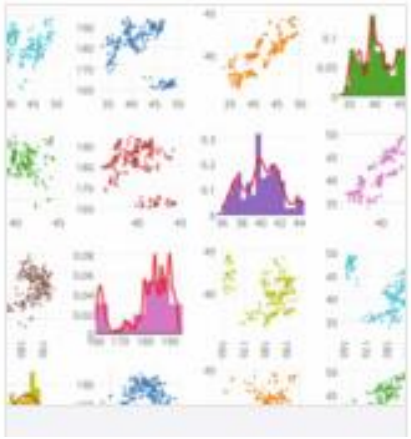
더 다양한 시각화 https://plot.ly/r/

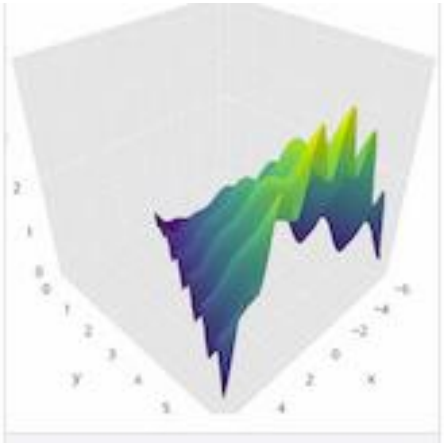
plotly는 Interactive 그래프를 그려주는 라이브러리입니다

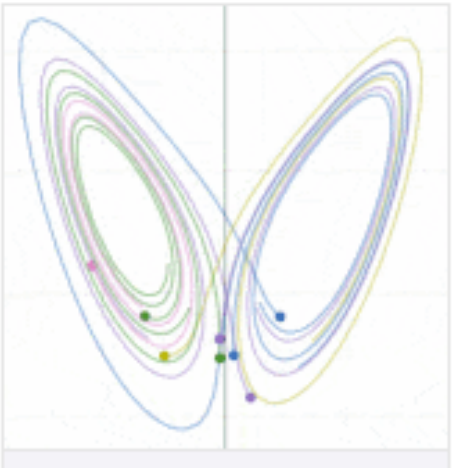
Scala, R, Python, Javascript, MATLAB 등에서 사용할 수 있습니다

시각화를 위해 D3.js를 사용하고 있습니다

사용해보면 사용이 쉽고, 세련된 느낌을 받습니다

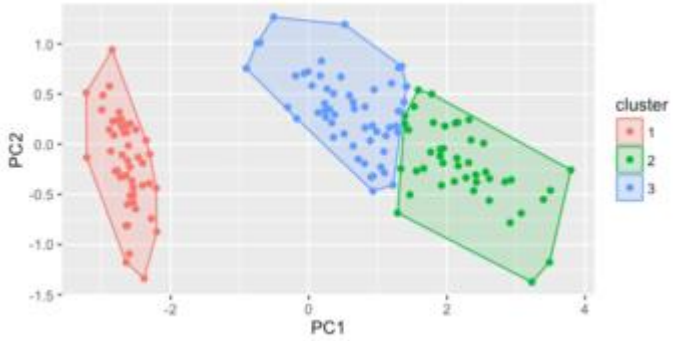


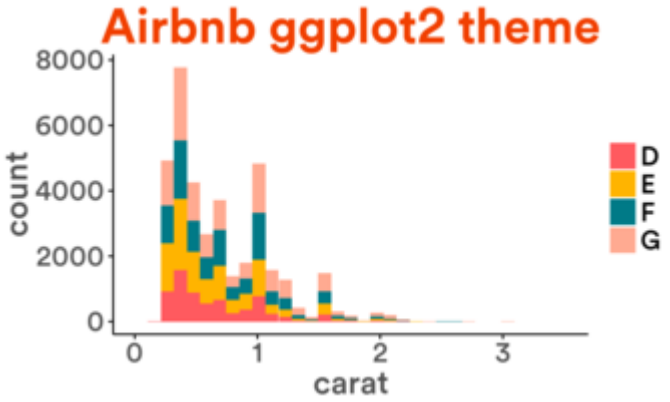


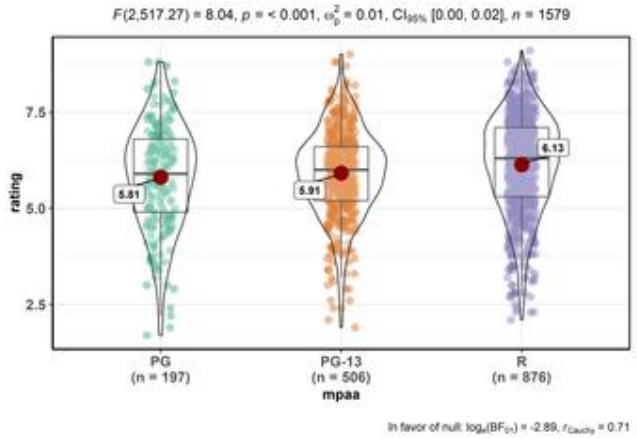


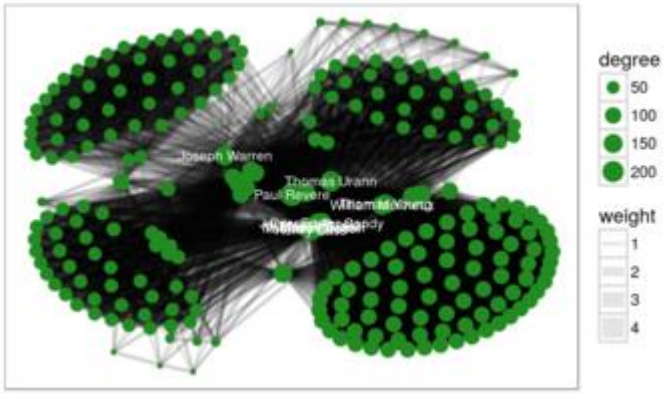
3. ggplot2 패키지를 알아보자

더 다양한 시각화 http://www.ggplot2-exts.org/gallery/









3. ggplot2 패키지를 알아보자

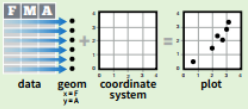
cheatsheat (치트키?) 구글에서 ggplot2 cheatsheat를 검색해 보자

Data Visualization with ggplot2 Cheat Sheet

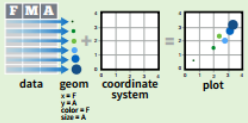
RStudio

Basics

ggplot2 is based on the **grammar of graphics**, the idea that you can build every graph from the same components: a **data** set, a **coordinate system**, and **geoms**—visual marks that represent data points.



To display values, map variables in the data to visual properties of the geom (**aesthetics**) like **size**, **color**, and **x** and **y** locations.



Complete the template below to build a graph.

```
ggplot(data = <DATA>) +
  <GEOM_FUNCTION>(
    mapping = aes(<MAPPINGS>),
    stat = <STAT>,
    position = <POSITION>
  ) +
  <COORDINATE_FUNCTION> +
  <FACET_FUNCTION> +
  <SCALE_FUNCTION> +
  <THEME_FUNCTION>
```

Required

Not required, sensible defaults supplied

ggplot(data = mpg, **aes**(x = cty, y = hwy))

Geoms - Use a geom function to represent data points, use the geom's aesthetic properties to represent variables. Each function returns a layer.

Graphical Primitives

a <- ggplot(economics, aes(date, unemploy))
b <- ggplot(seals, aes(x = long, y = lat))

a + **geom_blank()**
(Useful for expanding limits)

b + **geom_curve**(aes(yend = lat + 1, xend=long+1,curvature=z)) - x, xend, y, yend, alpha, angle, color, curvature, linetype, size

a + **geom_path**(lineend="butt", linejoin="round', linemitre=1)
x, y, alpha, color, group, linetype, size

a + **geom_polygon**(aes(group = group))
x, y, alpha, color, fill, group, linetype, size

b + **geom_rect**(aes(xmin = long, ymin=lat, xmax= long + 1, ymax = lat + 1)) - xmax, xmin, ymax, ymin, alpha, color, fill, linetype, size

a + **geom_ribbon**(aes(ymin=unemploy - 900, ymax=unemploy + 900)) - x, ymax, ymin
alpha, color, fill, group, linetype, size

Line Segments

common aesthetics: x, y, alpha, color, linetype, size

b + **geom_abline**(aes(intercept=0, slope=1))
b + **geom_hline**(aes(yintercept = lat))
b + **geom_vline**(aes(xintercept = long))
b + **geom_segment**(aes(yend=lat+1, xend=long+1))
b + **geom_spoke**(aes(angle = 1:1155, radius = 1))

One Variable

Continuous

c <- ggplot(mpg, aes(hwy)); c2 <- ggplot(mpg)

c + **geom_area(stat = "bin")**
x, y, alpha, color, fill, linetype, size

c + **geom_density**(kernel = "gaussian")
x, y, alpha, color, fill, group, linetype, size, weight

c + **geom_dotplot()**
x, y, alpha, color, fill

Two Variables

Continuous X, Continuous Y

e <- ggplot(mpg, aes(cty, hwy))

e + **geom_label**(aes(label = cty), nudge_x = 1, nudge_y = 1, check_overlap = TRUE)
x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

e + **geom_jitter**(height = 2, width = 2)
x, y, alpha, color, fill, shape, size

e + **geom_point()**
x, y, alpha, color, fill, shape, size, stroke

e + **geom_quantile()**
x, y, alpha, color, group, linetype, size, weight

e + **geom_rug**(sides = "bl")
x, y, alpha, color, linetype, size

e + **geom_smooth**(method = lm)
x, y, alpha, color, fill, group, linetype, size, weight

e + **geom_text**(aes(label = cty), nudge_x = 1, nudge_y = 1, check_overlap = TRUE)
x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

Discrete X, Continuous Y

f <- ggplot(mpg, aes(class, hwy))

f + **geom_col()**
x, y, alpha, color, fill, group, linetype, size

f + **geom_boxplot()**
x, y, lower, middle, upper, ymax, ymin, alpha, color, fill, group, linetype, shape, size, weight

f + **geom_dotplot**(binaxis = "y", stackdir = "center")
x, y, alpha, color, fill, group

f + **geom_violin**(scale = "area")
x, y, alpha, color, fill, group, linetype, size, weight

Discrete X, Discrete Y

Continuous Bivariate Distribution

h <- ggplot(diamonds, aes(carat, price))

h + **geom_bin2d**(binwidth = c(0.25, 500))
x, y, alpha, color, fill, linetype, size, weight

h + **geom_density2d()**
x, y, alpha, colour, group, linetype, size

h + **geom_hex()**
x, y, alpha, colour, fill, size

Continuous Function

i <- ggplot(economics, aes(date, unemploy))

i + **geom_area()**
x, y, alpha, color, fill, linetype, size

i + **geom_line()**
x, y, alpha, color, group, linetype, size

i + **geom_step**(direction = "hv")
x, y, alpha, color, group, linetype, size

Visualizing error

df <- data.frame(grp = c("A", "B"), fit = 4:5, se = 1:2)
j <- ggplot(df, aes(grp, fit, ymin = fit-se, ymax = fit+se))

j + **geom_crossbar**(fatten = 2)
x, y, ymax, ymin, alpha, color, fill, group, linetype, size

j + **geom_errorbar()**
x, ymax, ymin, alpha, color, group, linetype, size, width (also **geom_errorbarh()**)

j + **geom_linerange()**
x, ymin, ymax, alpha, color, group, linetype, size

j + **geom_pointrange()**
x, y, ymin, ymax, alpha, color, fill, group, linetype, shape, size

Maps

data <- data.frame(murder = USArrests$Murder, state = tolower(rownames(USArrests)))
map <- map_data("state")

3. ggplot2 패키지를 알아보자

1. 평면 세팅 ggplot(data= , aes(x = , y =))

주요 함수

ggplot(data = 데이터 셋명) : 데이터를 불러오는 역할

mapping = aes(x = , y =) : x축, y축의 꾸미기로 사용한다

geom_function() : 어떤 그래프를 그릴지 정하는 함수

mapping = aes(항목1=값1, 항목2=값2)

: geom_function() 의 옵션으로 꾸미기로 사용한다.

position(x, y), color(색상), fill(채우기), shape(모양), linetype(선 형태),

size(크기) 등

3. ggplot2 패키지를 알아보자

산점도 – 변수 간 관계 표현하기

```
# ggplot2 패키지 설치하기
install.packages("ggplot2")
library(ggplot2)
```

1. R 시각화 패키지인 ggplot2 패키지 설치
2. library(ggplot2)로 패키지 로드하기

```
# 1단계 배경설정(축)
ggplot(data=mpg, aes(x = displ, y = hwy))

# 배경에 산점도 추가
ggplot(data=mpg, aes(x = displ, y = hwy)) + geom_point()

# x축 범위 3~6으로 지정
ggplot(data=mpg, aes(x = displ, y = hwy)) + geom_point() + xlim(3,6)

# x축 범위 3~6, y축 범위 10~30으로 지정
ggplot(data=mpg, aes(x = displ, y = hwy)) + geom_point() + xlim(3,6) + ylim(10,30)
```

1. 평면 세팅

ggplot(diamonds, aes(x = , y =))

```r
# ggplot2 패키지 설치하기
install.packages("ggplot2")
library(ggplot2)

# 1단계 배경설정(축)
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ggplot(data=mpg, aes(x = displ, y = hwy)) + geom_point() + xlim(3,6) + ylim(10,30)
```

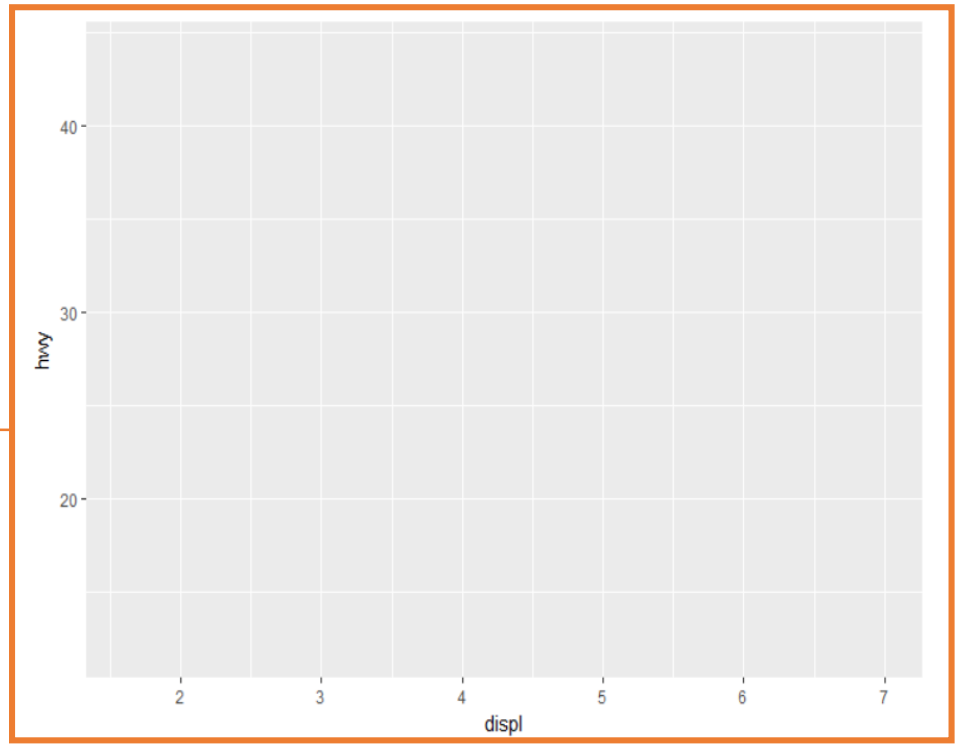

+ geom_point( )

```
# ggplot2 패키지 설치하기
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library(ggplot2)

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ggplot(data=mpg, aes(x = displ, y = hwy)) + geom_point() + xlim(3,6) + ylim(10,30)
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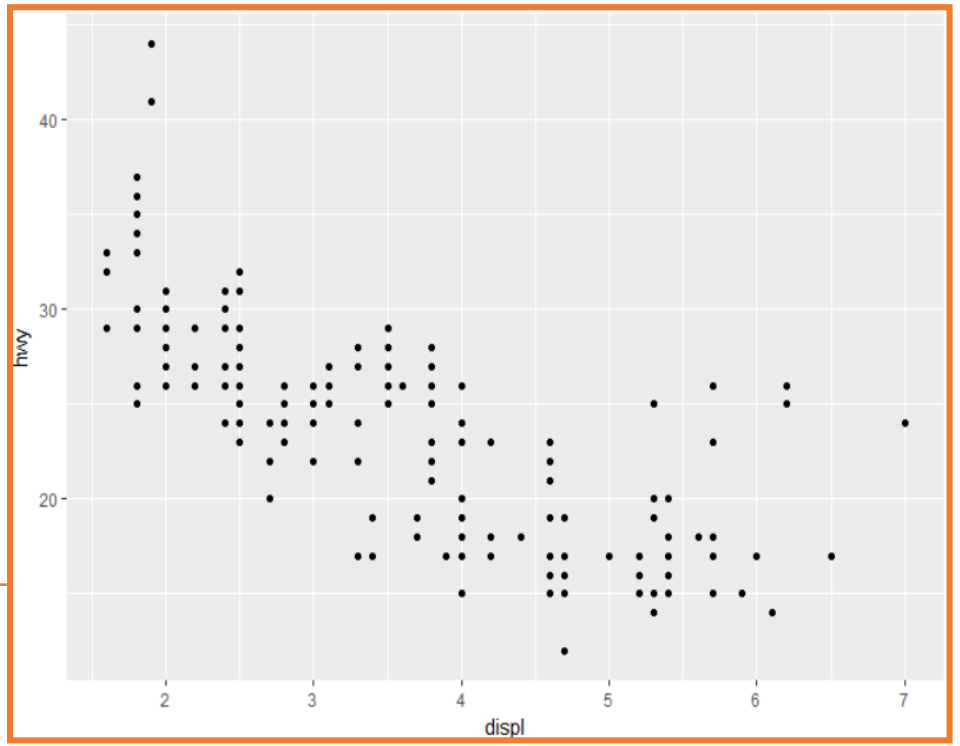

3. ggplot2 패키지를 알아보자

산점도 – 변수 간 관계 표현하기

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# x축 범위 3~6, y축 범위 10~30으로 지정
ggplot(data=mpg, aes(x = displ, y = hwy)) + geom_point() + xlim(3,6) + ylim(10,30)
```

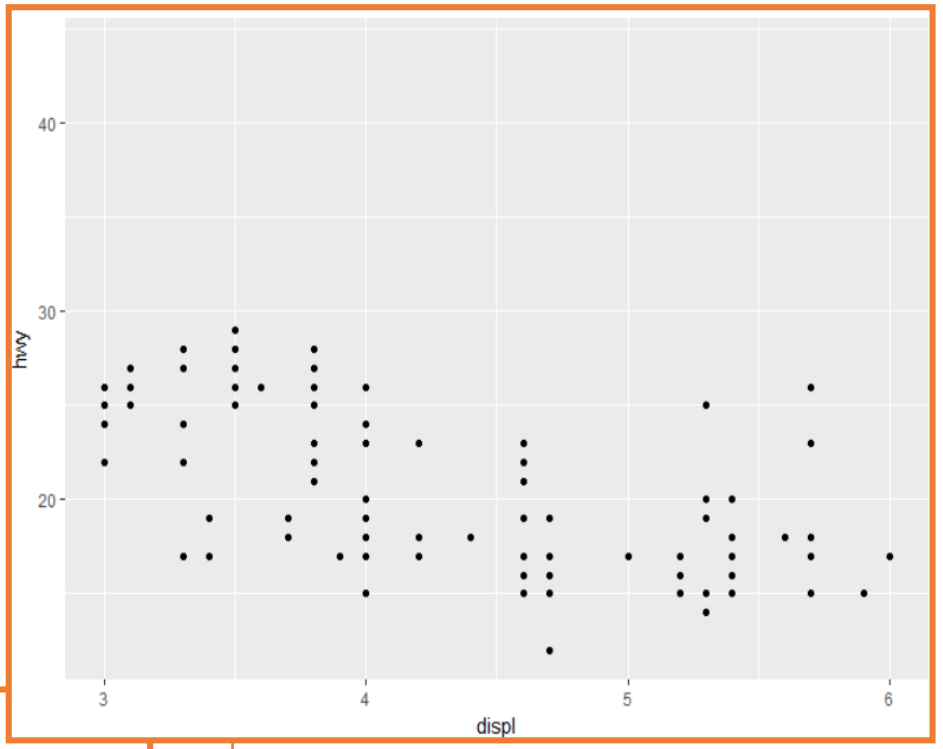


```
ggplot(data =   ,  aes( x =   , y = ) )  +  geom_points + xlim( , )  + ylim(  , )
```

3. ggplot2 패키지를 알아보자

산점도 – 변수 간 관계 표현하기

```
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```

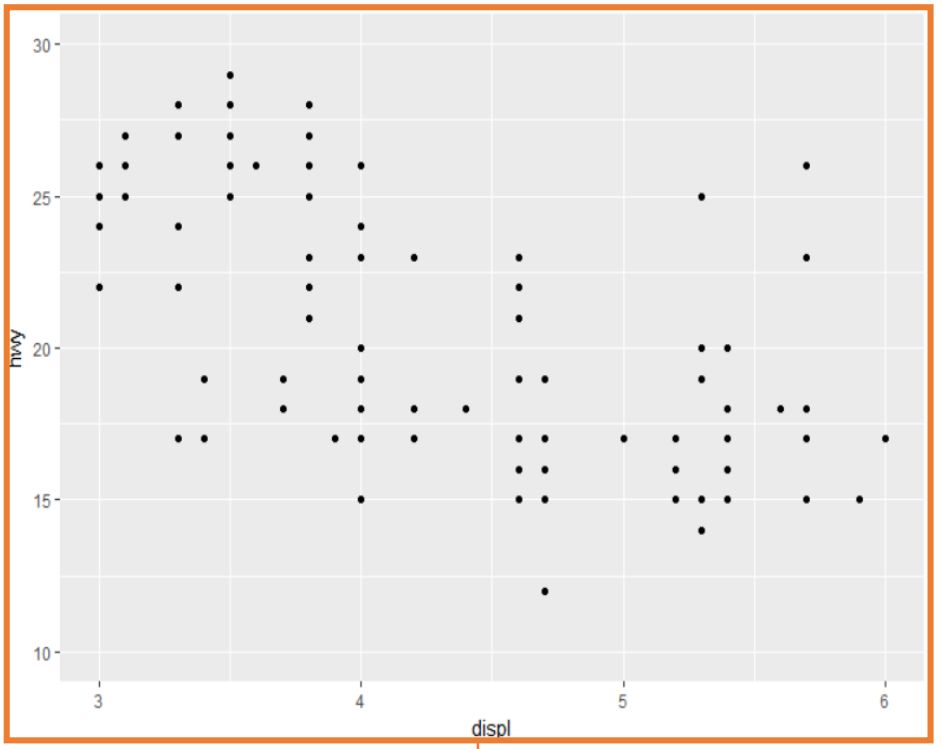

ggplot(mpg, aes(displ, hwy))

3. ggplot2 패키지를 알아보자

```
str(mpg)
dplyr::glimpse(mpg)
head(mpg)
# 연속형 변수일 때 컬러
ggplot(data = mpg, aes( x = displ, y = hwy,  color = cty )  ) +
  geom_point(size = 2)

# 범주형 변수일 때 컬러
ggplot(data = mpg, aes( x = displ, y = hwy,  color = drv )  ) +
  geom_point(size = 2)
```

```
> dplyr::glimpse(mpg)
Observations: 234
Variables: 11
$ manufacturer <chr> "audi", "audi", "audi", "audi", "a
$ model        <chr> "a4", "a4", "a4", "a4", "a4", "a4"
$ displ        <dbl> 1.8, 1.8, 2.0, 2.0, 2.8, 2.8, 3.1,
$ year         <int> 1999, 1999, 2008, 2008, 1999, 1999
$ cyl          <int> 4, 4, 4, 4, 6, 6, 6, 4, 4, 4, 4, 6
$ trans        <chr> "auto(l5)", "manual(m5)", "manual(
$ drv          <chr> "f", "f", "f", "f", "f", "f", "f",
$ cty          <int> 18, 21, 20, 21, 16, 18, 18, 18, 16
$ hwy          <int> 29, 29, 31, 30, 26, 26, 27, 26, 25
$ fl           <chr> "p", "p", "p", "p", "p", "p", "p",
$ class        <chr> "compact", "compact", "compact", "
```

3. ggplot2 패키지를 알아보자

```
str(mpg)
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head(mpg)
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```
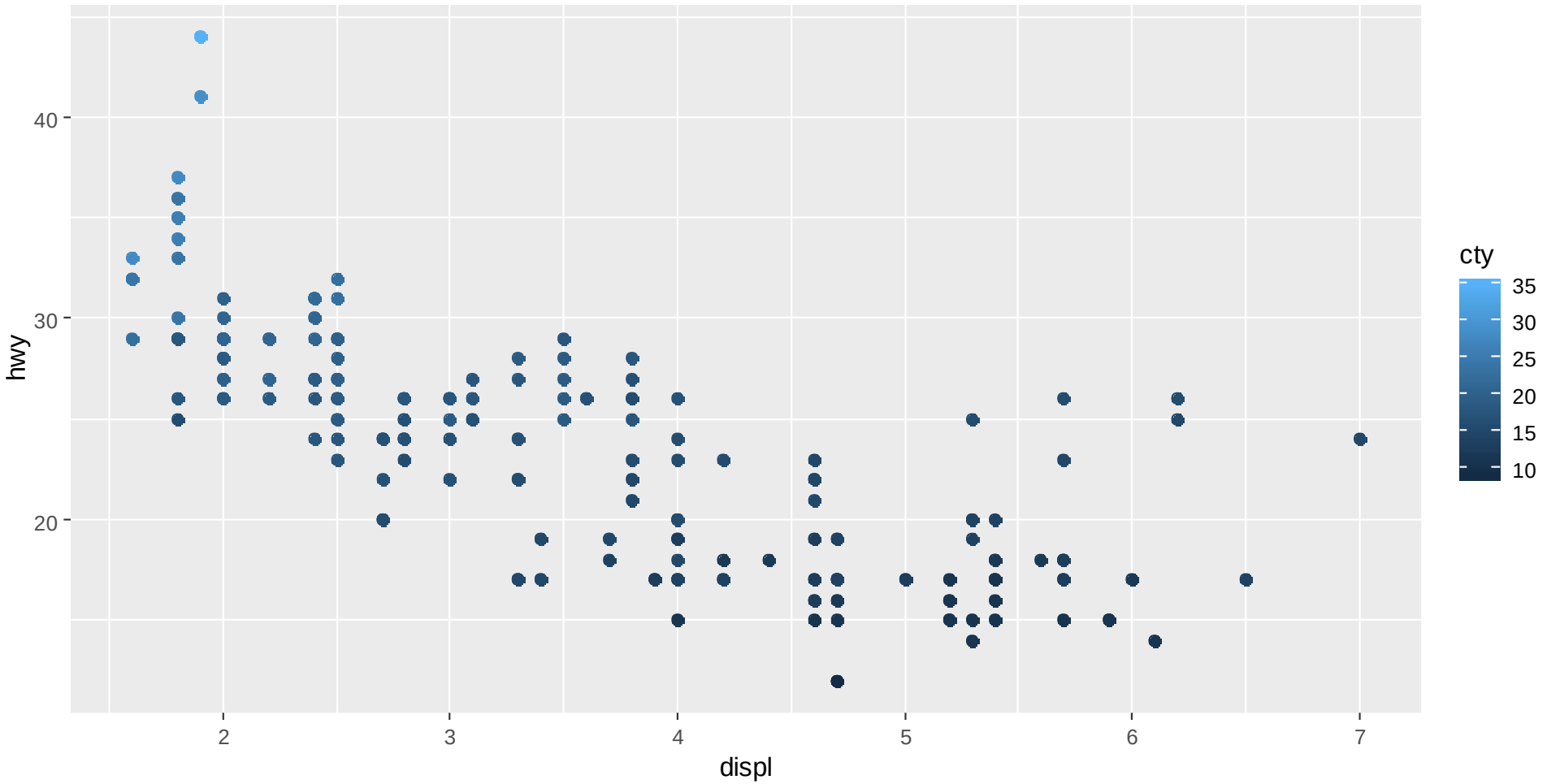

3. ggplot2 패키지를 알아보자



3. ggplot2 패키지를 알아보자

```
str(mpg)
dplyr::glimpse(mpg)
head(mpg)
# 연속형 변수일 때 컬러
ggplot(data = mpg, aes( x = displ, y = hwy,  color = cty )  ) +
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```
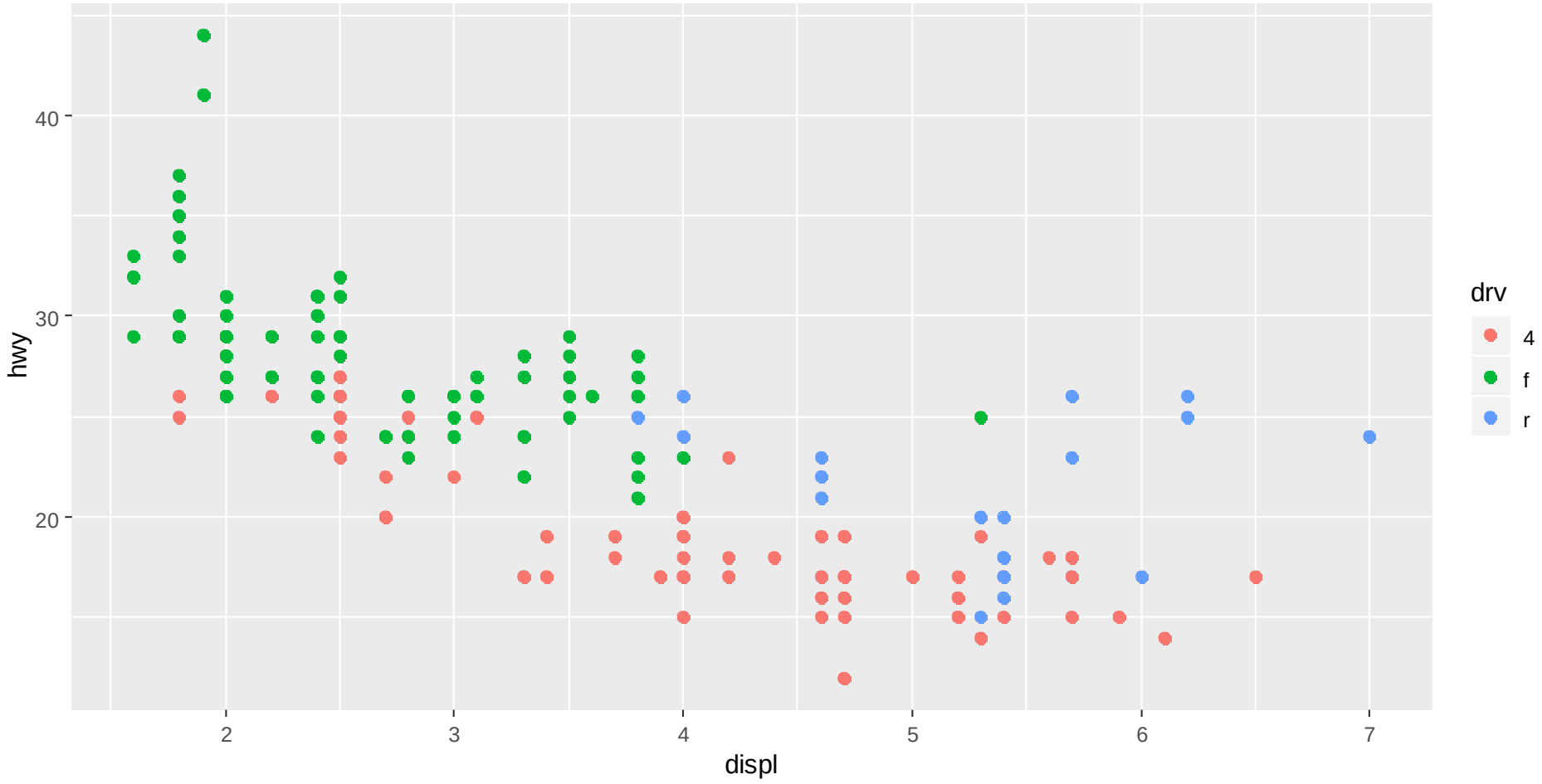
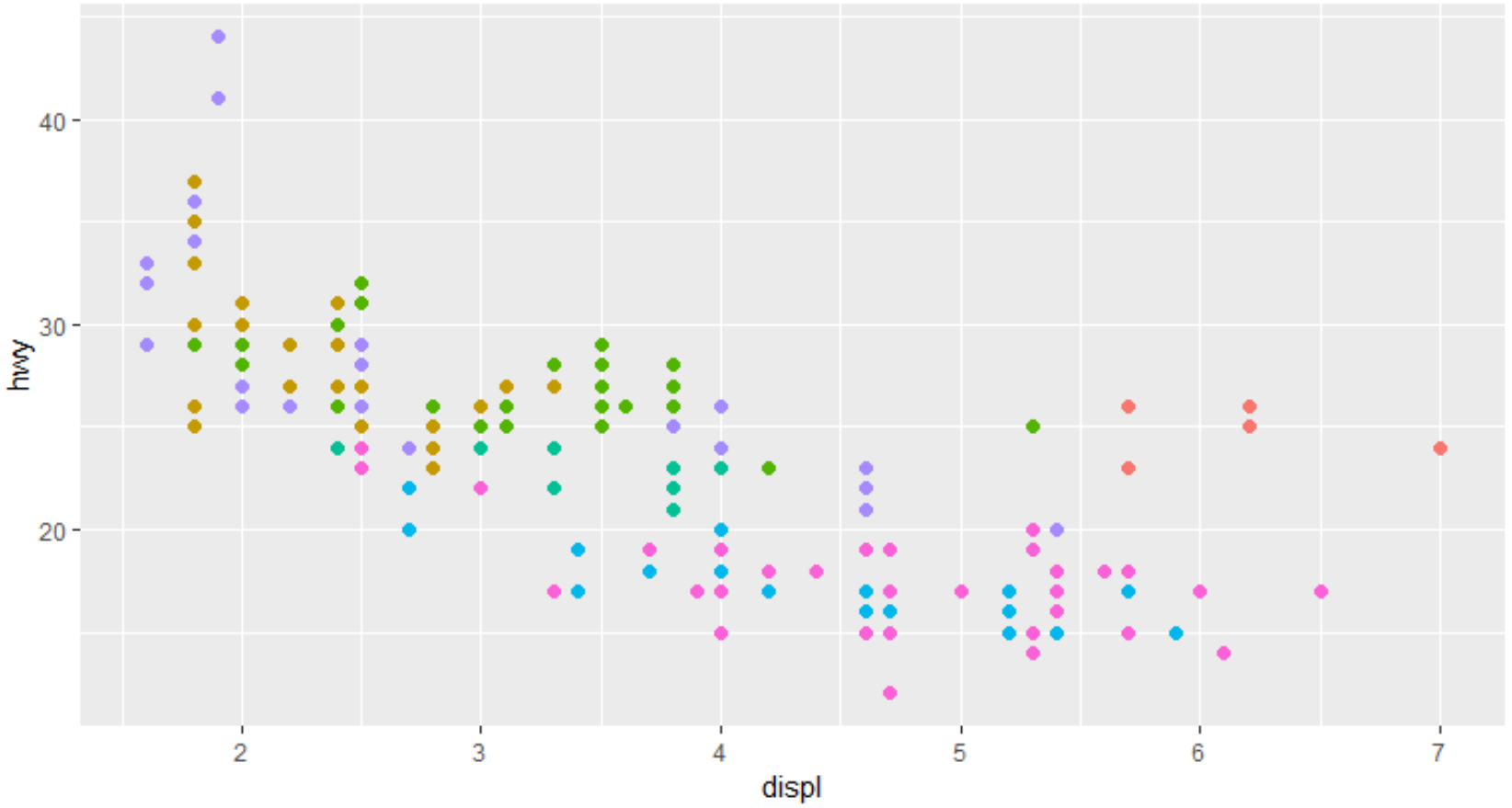

3. ggplot2 패키지를 알아보자



3. ggplot2 패키지를 알아보자

```
# aes( ) 는 geom_point 에도 매길 수 있어요
ggplot(data = mpg, aes( x = displ, y = hwy)  ) +
  geom_point(aes(color=class))
```



3. ggplot2 패키지를 알아보자

```
# aes( ) 는 geom_point 에도 매길 수 있어요
ggplot(data = mpg, aes( x = displ, y = hwy)  ) +
  geom_point(aes(color=class))
```

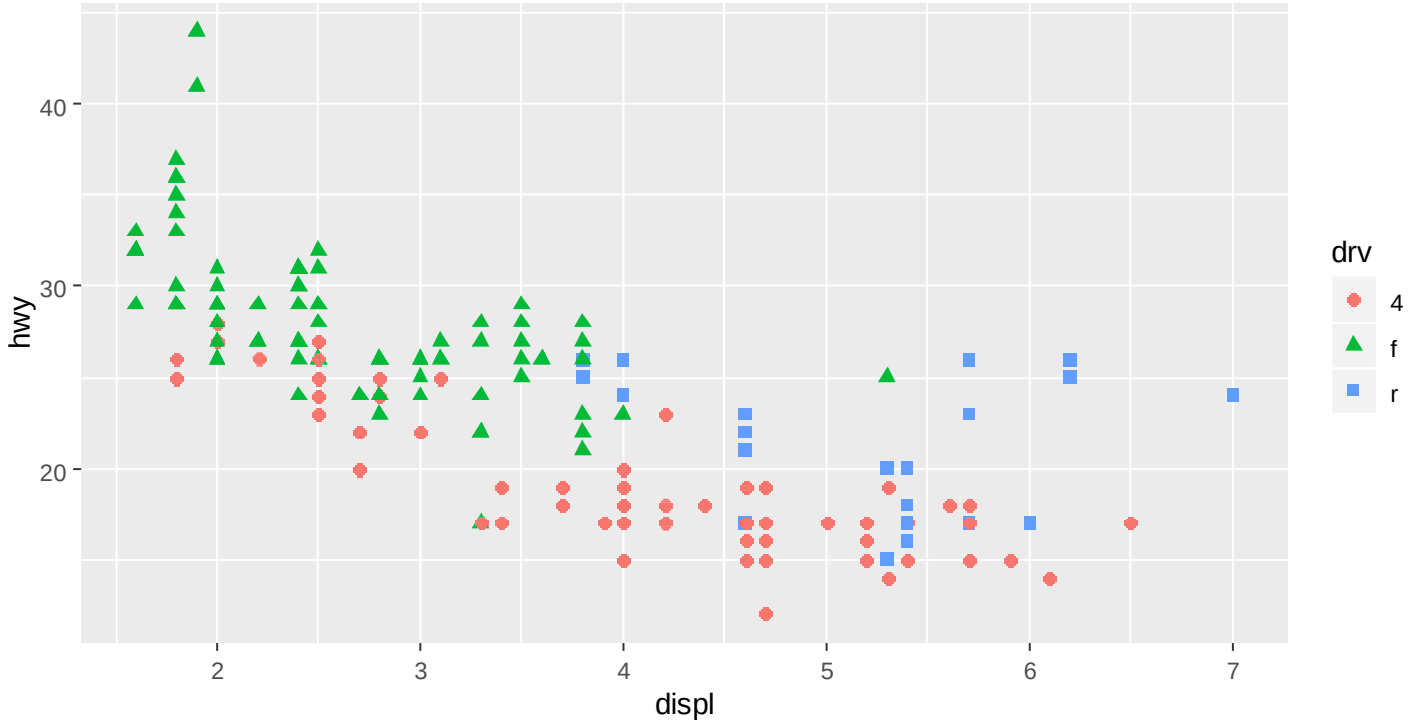
```
# 코드를 재사용하기 쉽게
p <- ggplot(data = mpg, aes( x = displ, y = hwy))
p +  geom_point(aes(color=class))


q <- geom_point(aes(color=class))
p + q
```

Geometry

name	description
geom_point	Scatterplot
geom_bar	Bar plot
geom_histogram	Histogram
geom_density	Prabablity distribution plot
geom_boxplot	Box and whiskers plot
geom_text	Textual annotations in a plot
geom_errorbar	Error bars

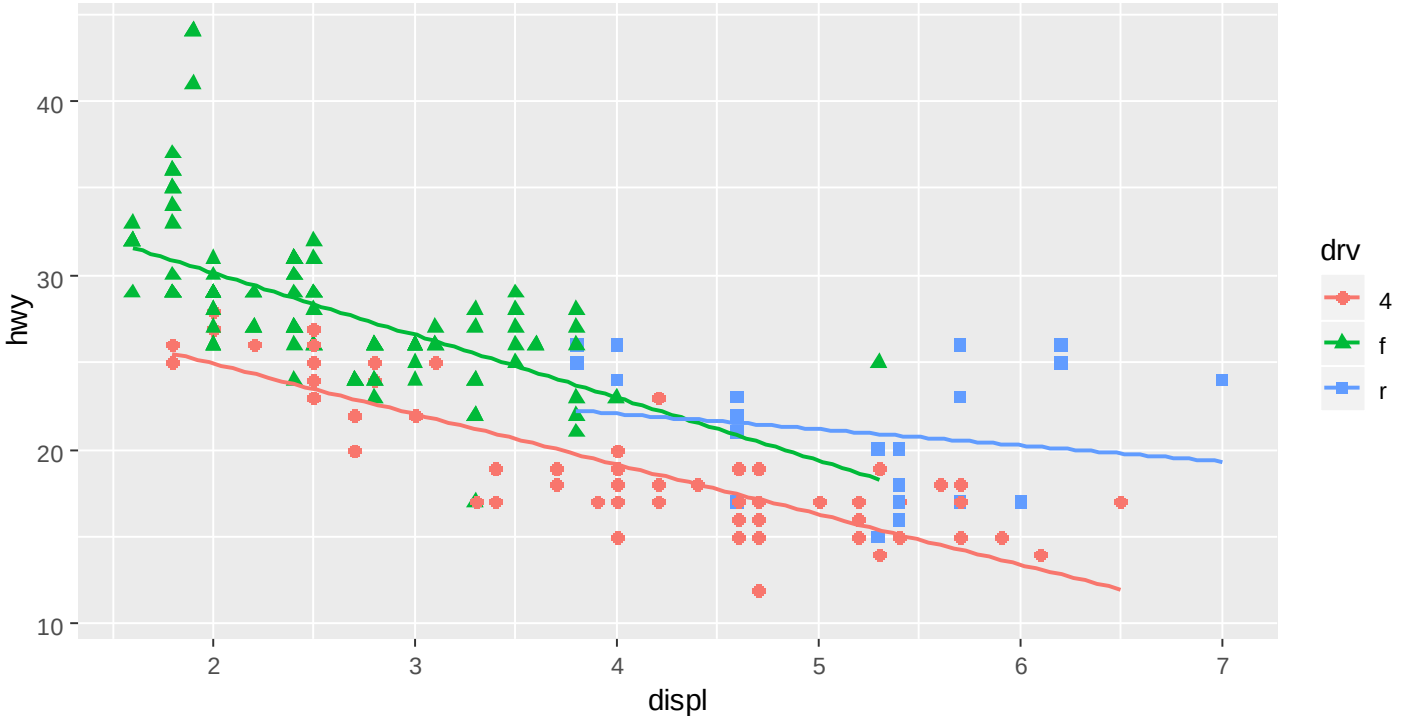
3. ggplot2 패키지를 알아보자

```
# shape
ggplot(data = mpg,
       aes(x = displ, y = hwy,  color = drv, shape = drv )) +
  geom_point(size = 2)


# geom_smooth() to fit linear regressions for each level
ggplot(data = mpg, aes(x = displ, y = hwy,  color = drv, shape = drv )) +
  geom_point(size = 2)  +
  geom_smooth(method="lm")
```



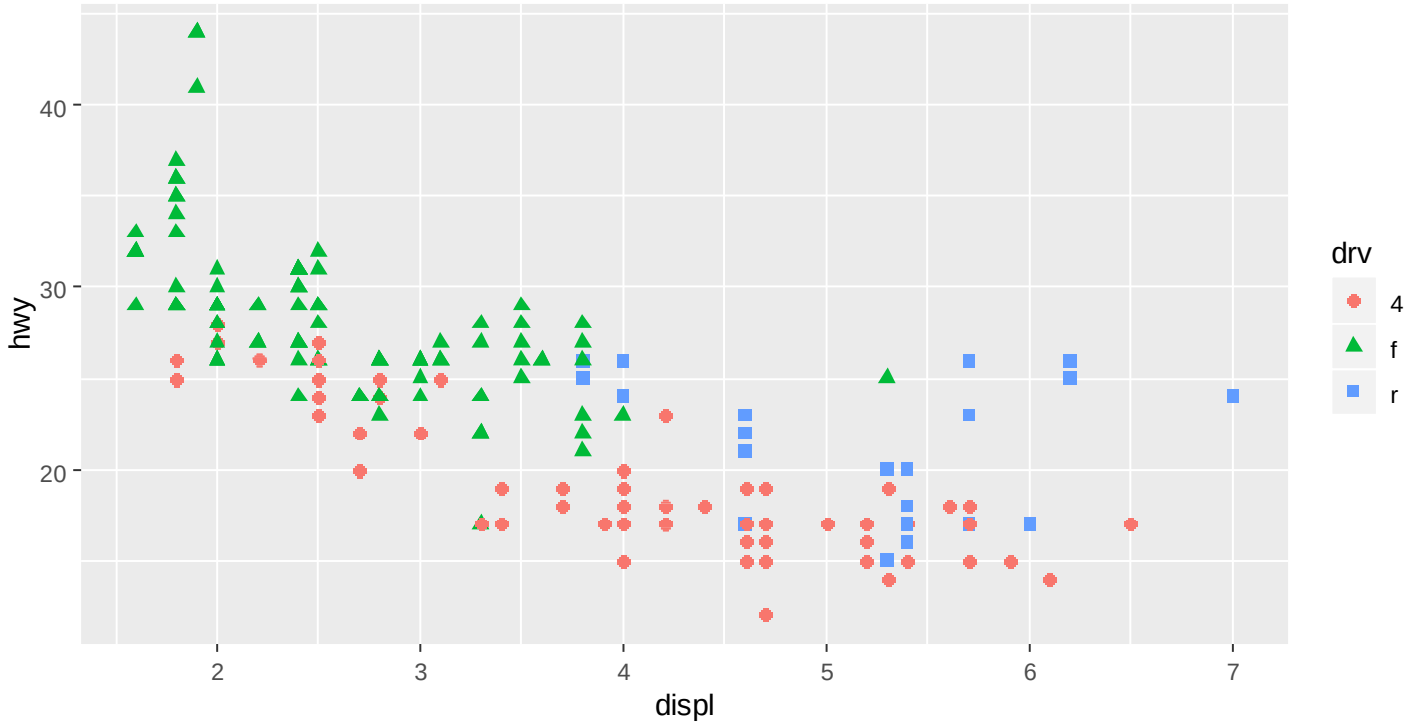
3. ggplot2 패키지를 알아보자

```r
# shape
ggplot(data = mpg,
       aes(x = displ, y = hwy,  color = drv, shape = drv )) +
  geom_point(size = 2)


# geom_smooth() to fit linear regressions for each level
ggplot(data = mpg, aes(x = displ, y = hwy,  color = drv, shape = drv )) +
  geom_point(size = 2)  +
  geom_smooth(method="lm")
```



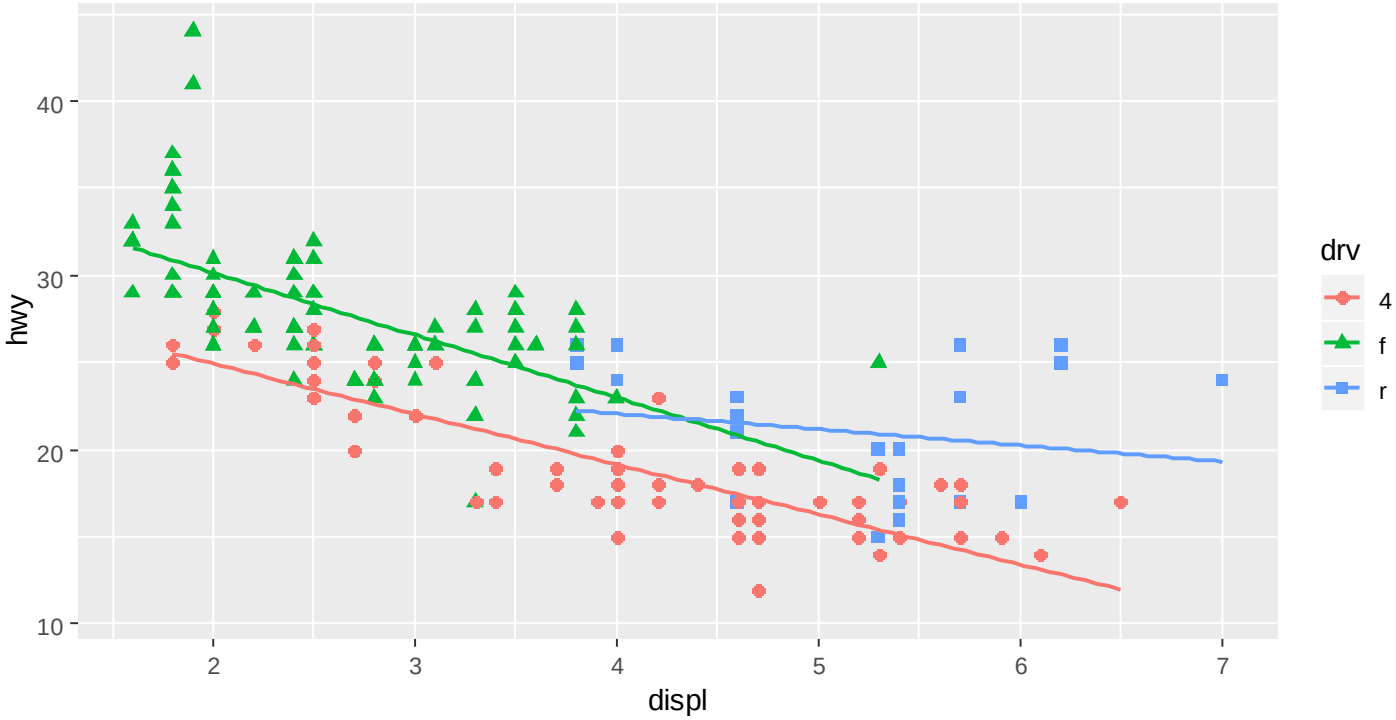
3. ggplot2 패키지를 알아보자

```
p2 <- ggplot(data = mpg,
       aes(x = displ, y = hwy,  color = drv, shape = drv )) +
    geom_point(size = 2)
p2

p2 + geom_smooth(method="lm")

p2 + geom_smooth(method="lm") +
  theme_dark()
```



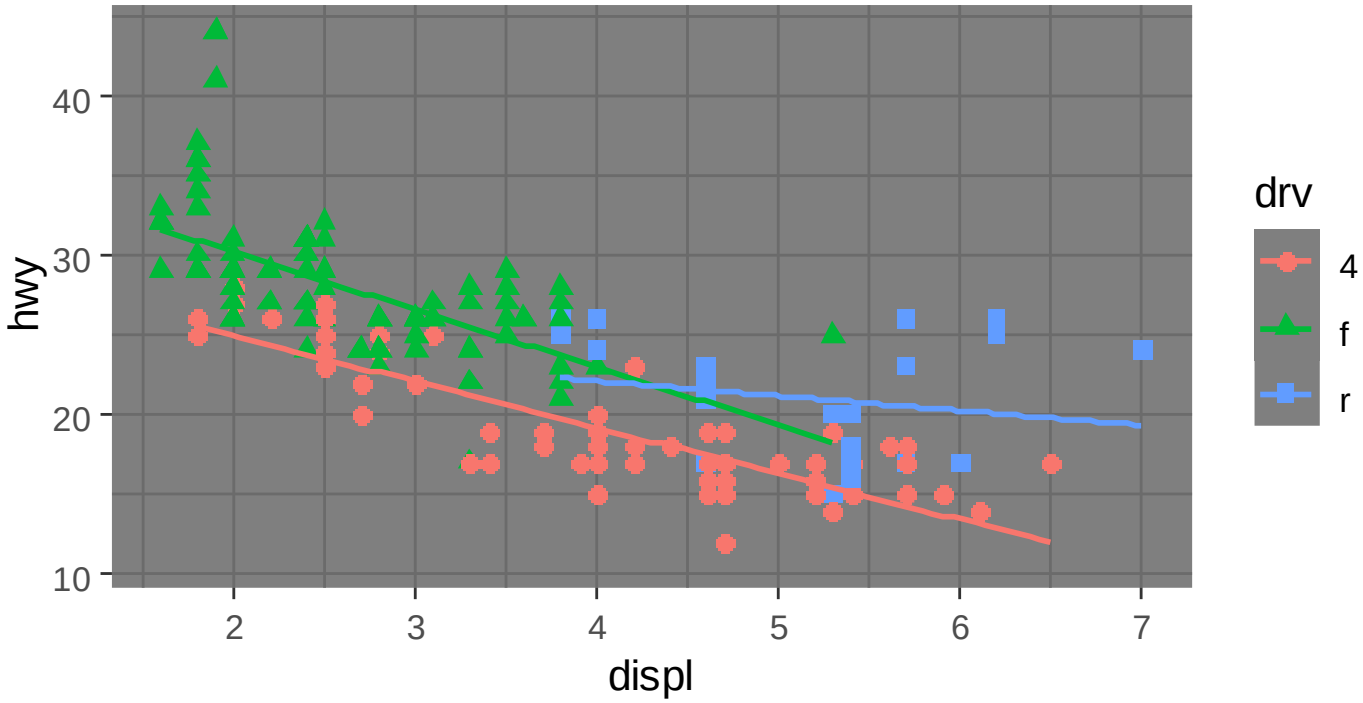
3. ggplot2 패키지를 알아보자

```
p2 <- ggplot(data = mpg,
       aes(x = displ, y = hwy,  color = drv, shape = drv )) +
    geom_point(size = 2)
p2

p2 + geom_smooth(method="lm")

p2 + geom_smooth(method="lm") +
  theme_dark()
```



+ theme_ *** ( )

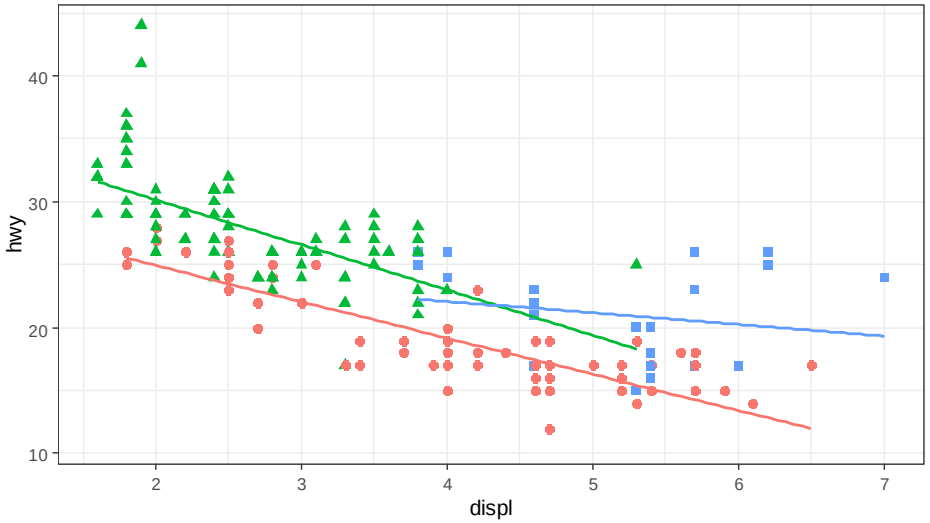
```
p2 <- ggplot(data = mpg,
       aes(x = displ, y = hwy,  color = drv, shape = drv )) +
    geom_point(size = 2)
p2

p2 + geom_smooth(method="lm")

p2 + geom_smooth(method="lm") +
  theme_dark()
```

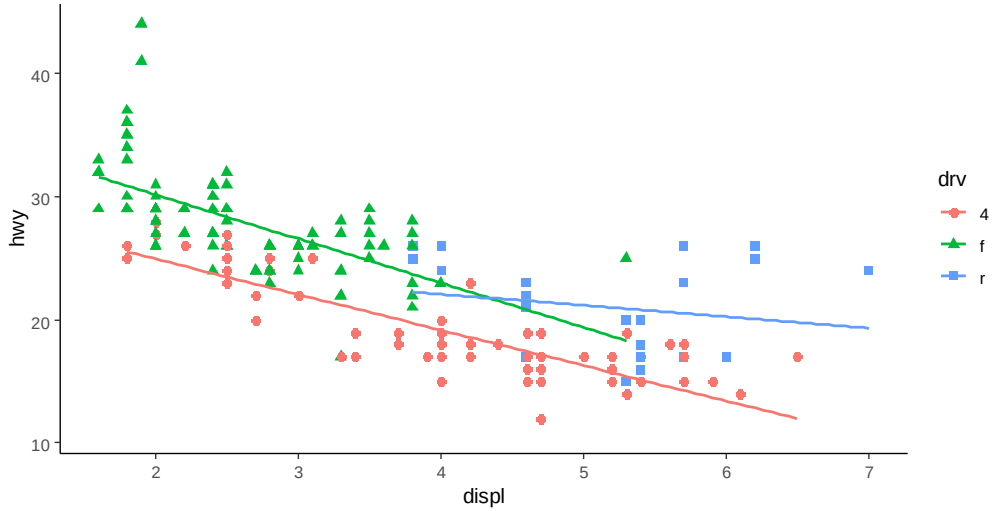


3. ggplot2 패키지를 알아보자

```r
p3 <-
  ggplot(data = mpg,
         aes(x = displ, y = hwy,  color = drv, shape = drv )) +
  geom_point(size = 2)  +
  geom_smooth(method="lm")

p3 + theme_dark()
p3 + theme_bw()
p3 + theme_classic()
```

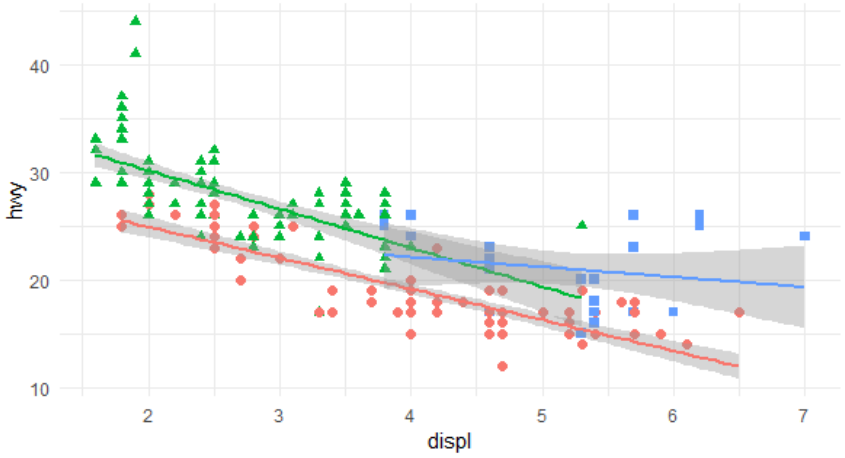




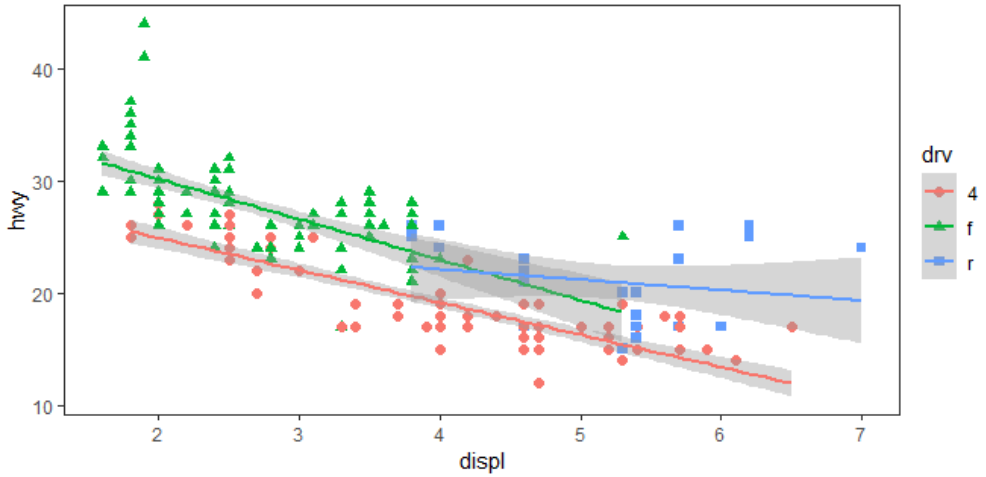
3. ggplot2 패키지를 알아보자

```
help(theme_bw)   # 또는   ?theme_bw
```

```
p3 + theme_gray()    # default
p3 + theme_linedraw()
p3 + theme_light()
p3 + theme_minimal()
p3 + theme_void()
p3 + theme_test()
```



Theme_minimal( )

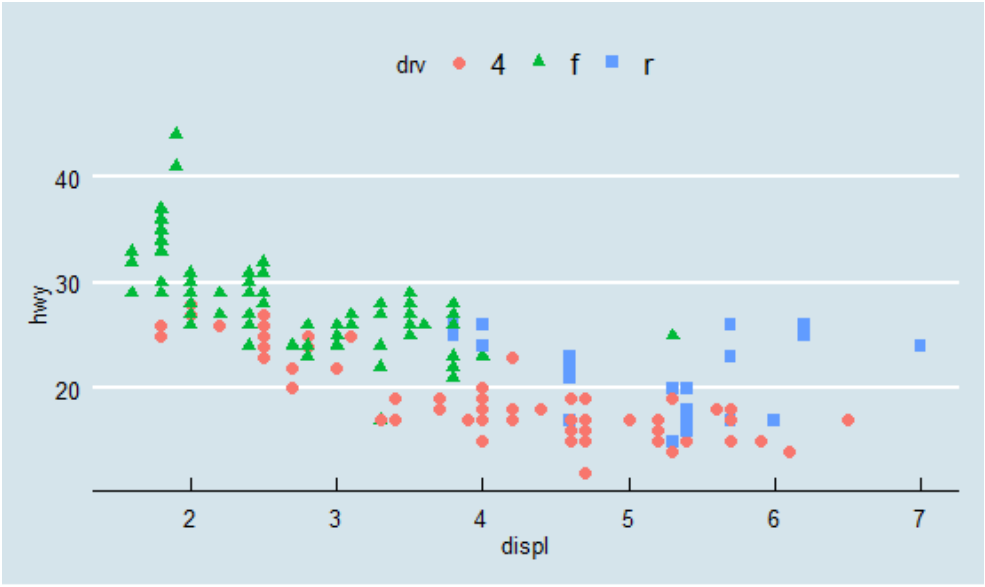


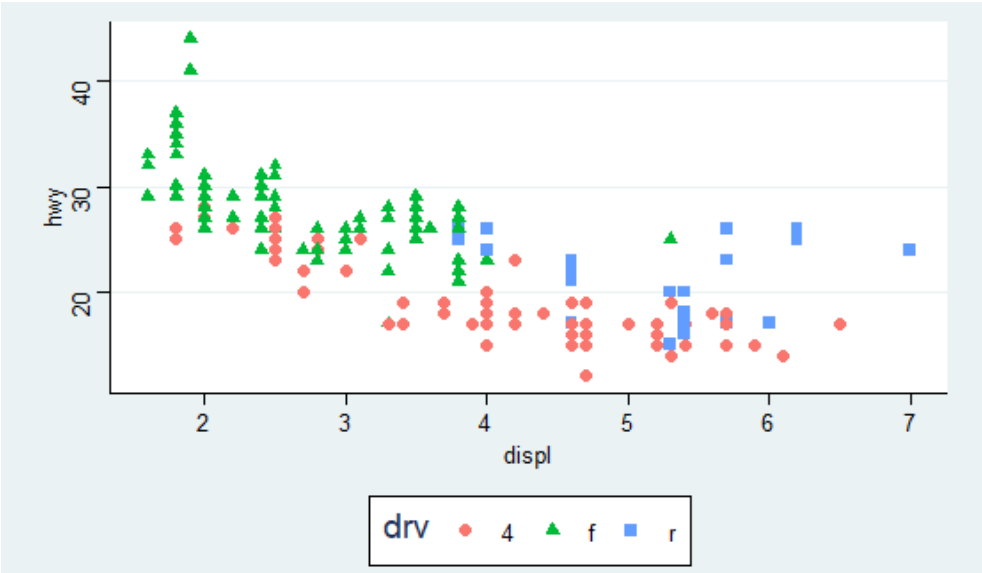
Theme_test( )

3. ggplot2 패키지를 알아보자

```
install.packages("ggthemes")
library("ggthemes")
?ggthemes
p2 + theme_wsj()
p2 + theme_economist()

p2 + theme_excel_new()
p2 + theme_fivethirtyeight()
p2 + theme_solarized_2()
p2 + theme_stata()
```





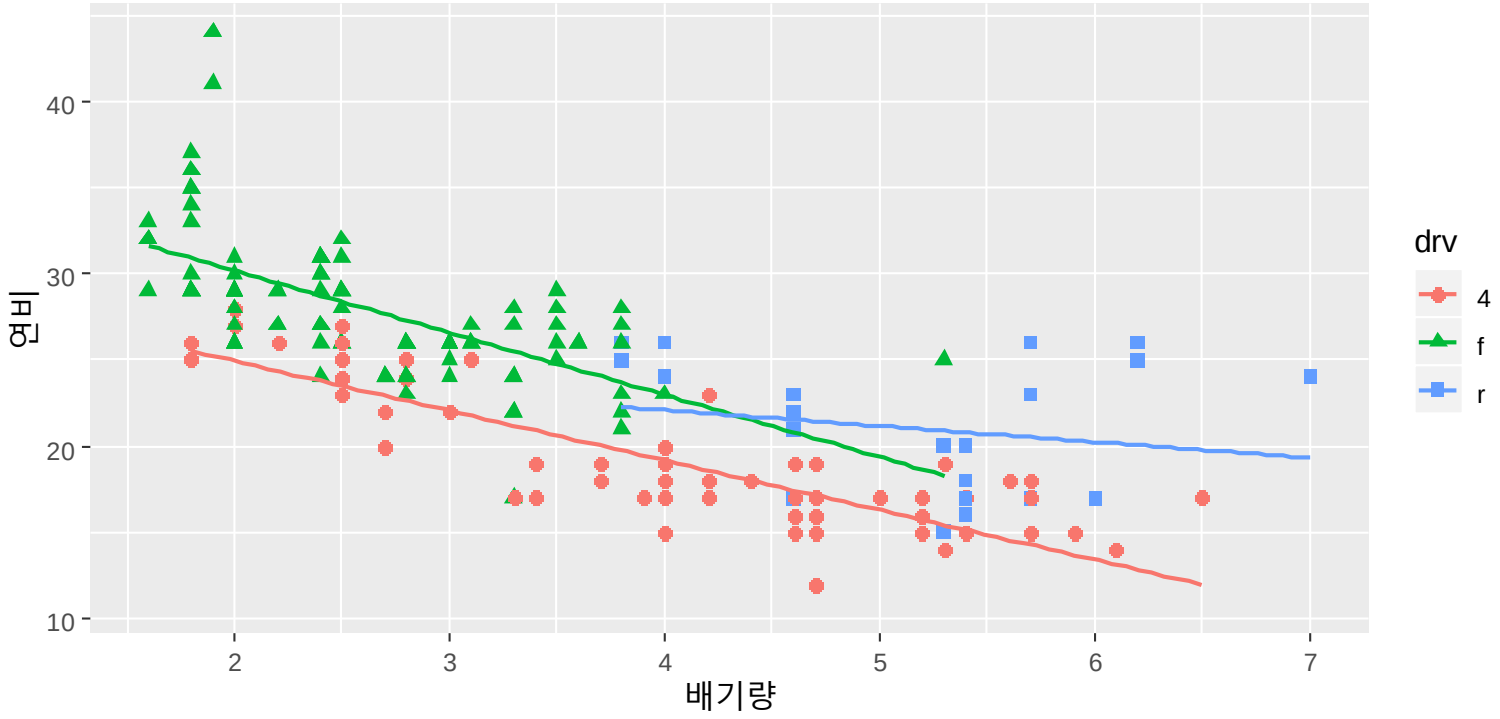
4. 라벨

+ labs(title=" ", x=" ", y=" ")

```
p3 + labs(title="< 배기량에 따른 고속도로 연비 비교 >", x = "배기량", y = "연비")
```

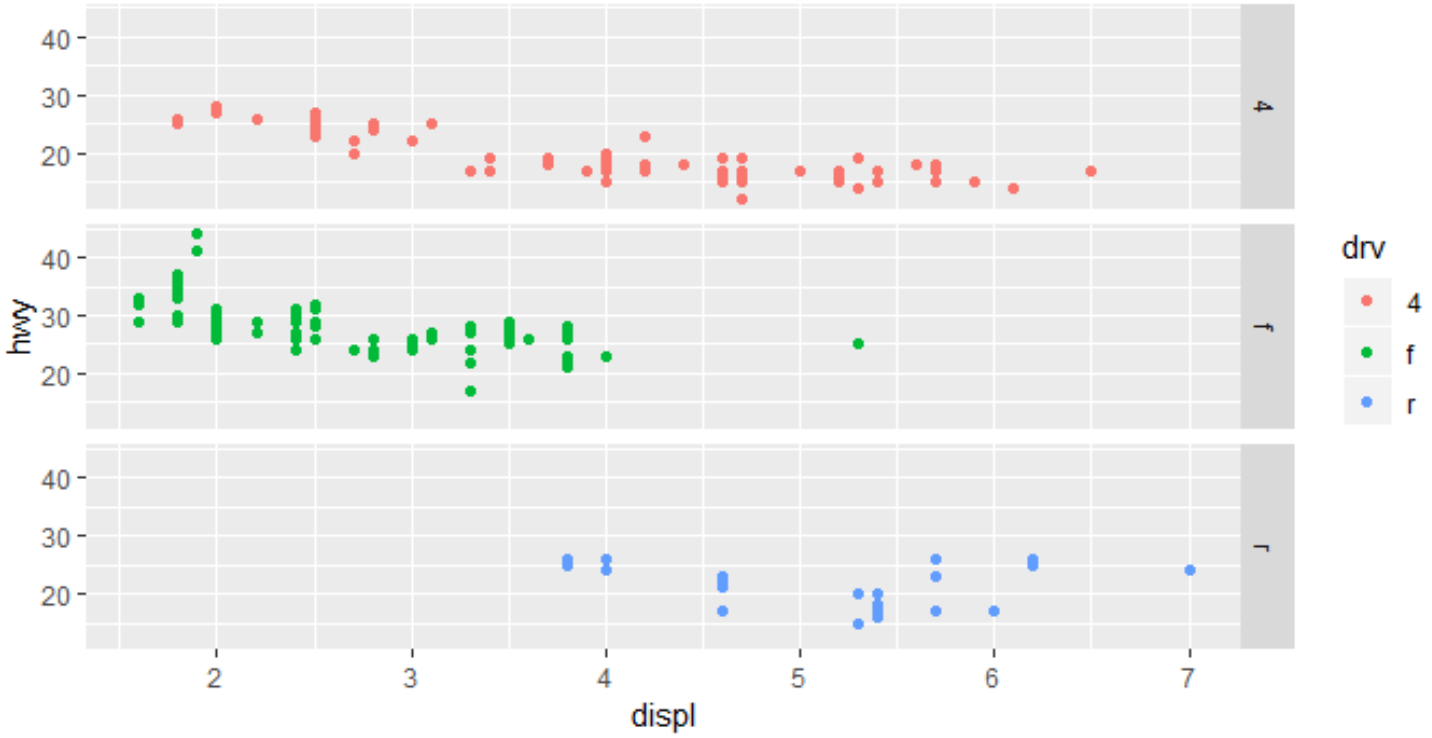
```
ggplot(data = mpg, aes(x = displ, y = hwy,  color = drv, shape = drv )) +
  geom_point(size = 2)  +
  geom_smooth(method="lm") +
  labs(title="< 배기량에 따른 고속도로 연비 비교 >", x = "배기량", y = "연비")
```

< 배기량에 따른 고속도로 연비 비교 >



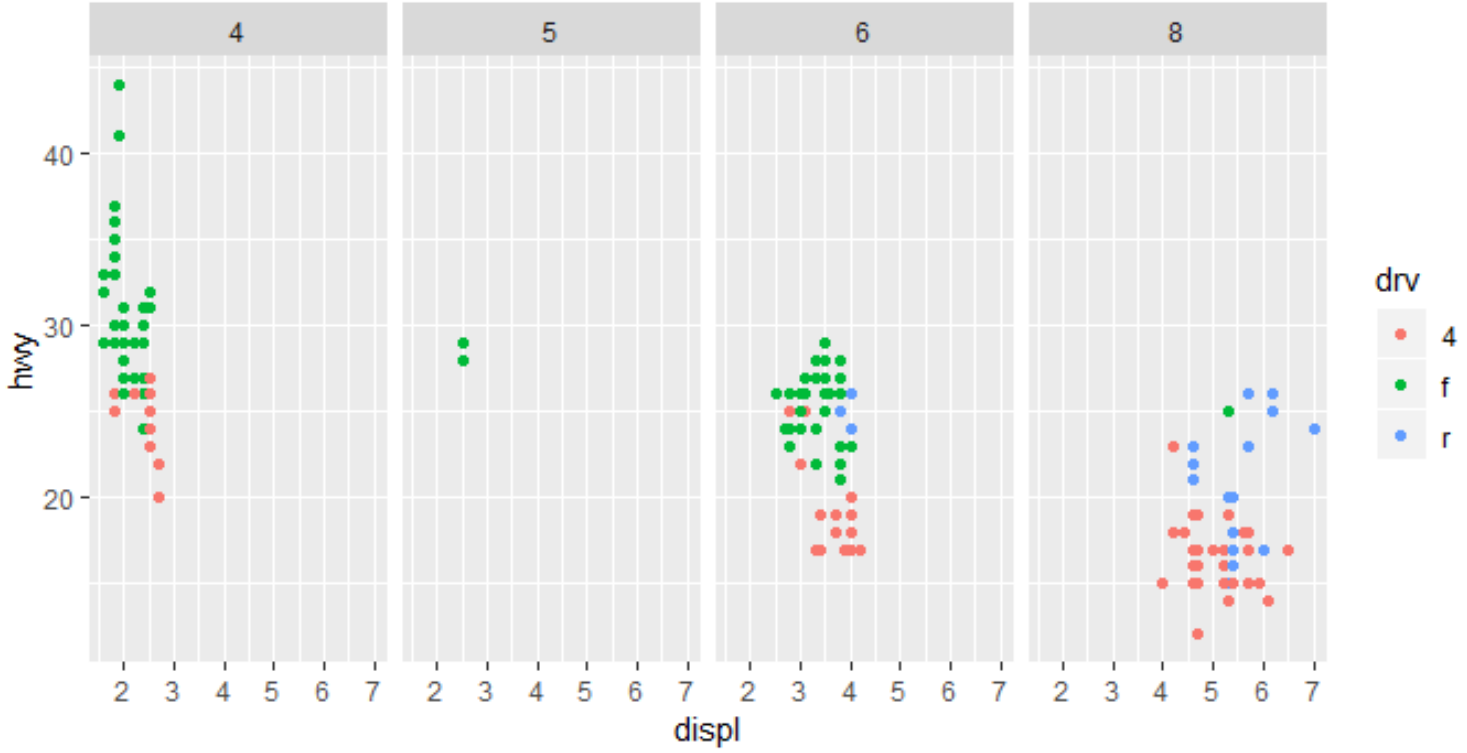
+ facet_grid(drv~ cut)

```
d <- ggplot(mpg, aes(x=displ, y=hwy, color = drv)) +
          geom_point()
d                    # drv 이므로 d
d + facet_grid(drv ~ .)        # Faceted by drv, by 행
d + facet_grid(. ~ cyl)        # Faceted by cyl, by 열
d + facet_grid(drv ~ cyl)
```



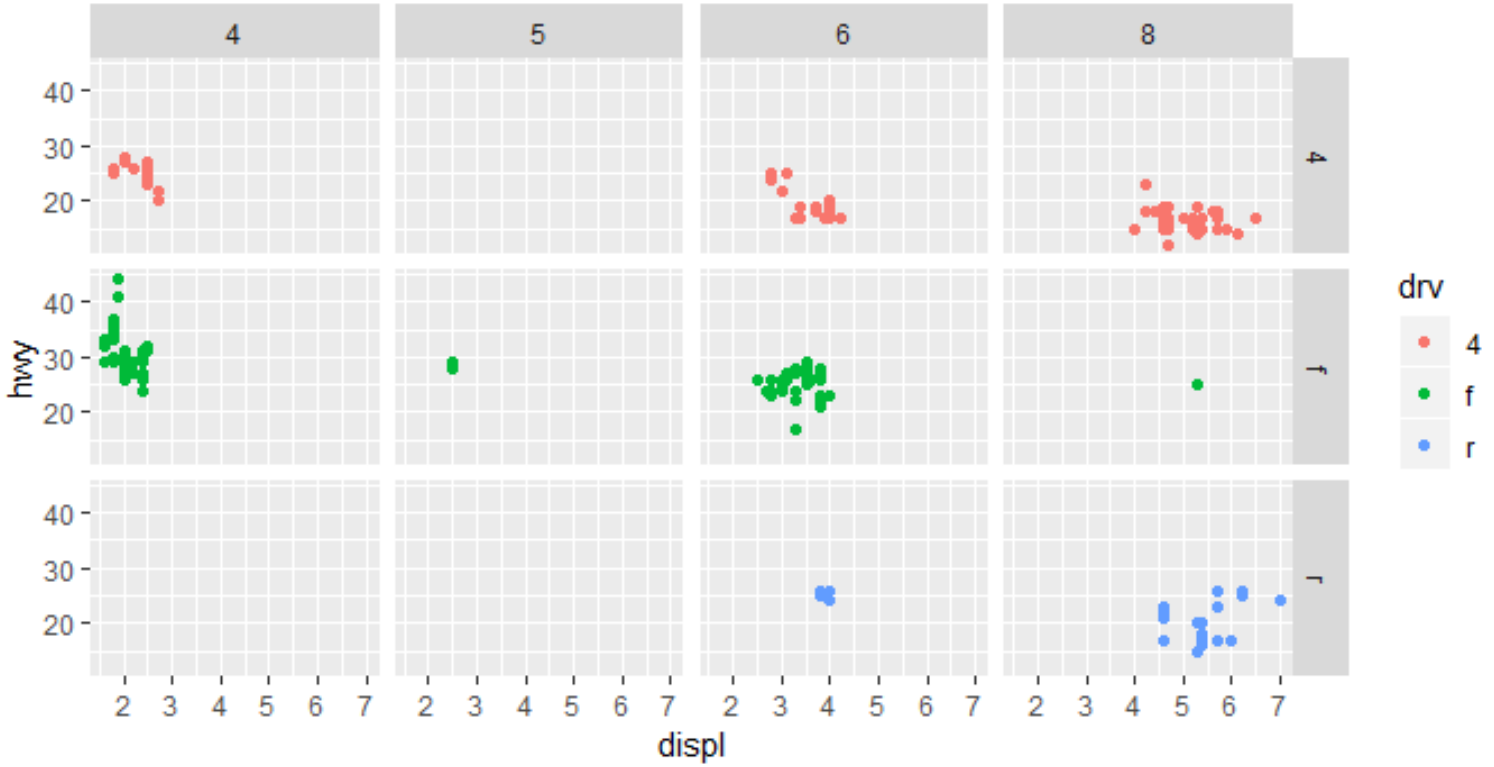
3. ggplot2 패키지를 알아보자

```
d <- ggplot(mpg, aes(x=displ, y=hwy, color = drv)) +
        geom_point()
d                    # drv 이므로 d
d + facet_grid(drv ~ .)          # Faceted by drv, by 행
d + facet_grid(. ~ cyl)          # Faceted by cyl, by 열
d + facet_grid(drv ~ cyl)
```



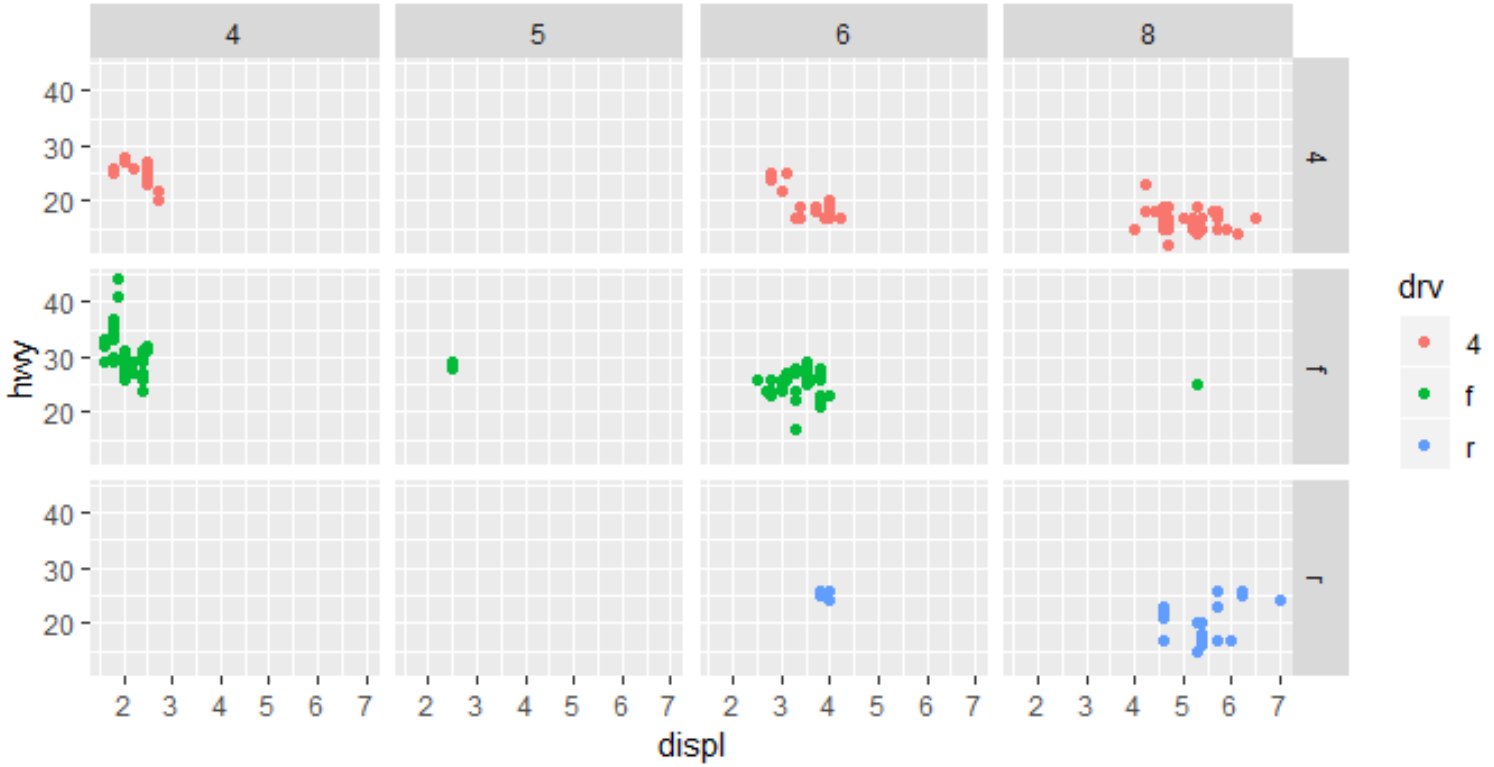
3. ggplot2 패키지를 알아보자

```
d <- ggplot(mpg, aes(x=displ, y=hwy, color = drv)) +
            geom_point()
d                       # drv 이므로 d
d + facet_grid(drv ~ .)          # Faceted by drv, by 행
d + facet_grid(. ~ cyl)          # Faceted by cyl, by 열
d + facet_grid(drv ~ cyl)
```



3. ggplot2 패키지를 알아보자

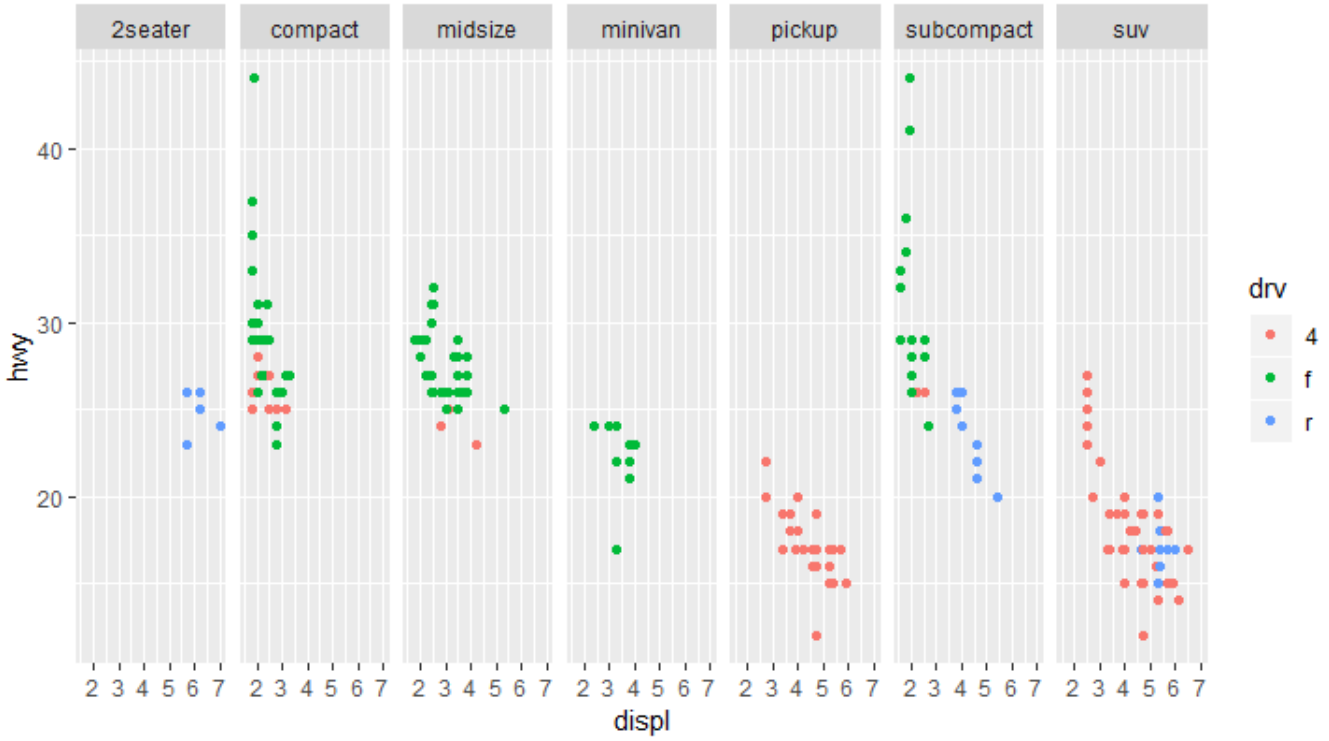
```
d <- ggplot(mpg, aes(x=displ, y=hwy, color = drv)) +
            geom_point()
d                       # drv 이므로 d
d + facet_grid(drv ~ .)          # Faceted by drv, by 행
d + facet_grid(. ~ cyl)          # Faceted by cyl, by 열
d + facet_grid(drv ~ cyl)
```



3. ggplot2 패키지를 알아보자

```
#  행 또 는  열 의  개 수 가  많 아 지 면  wrap  을
d + facet_grid( ~ class )
d + facet_wrap( ~ class )

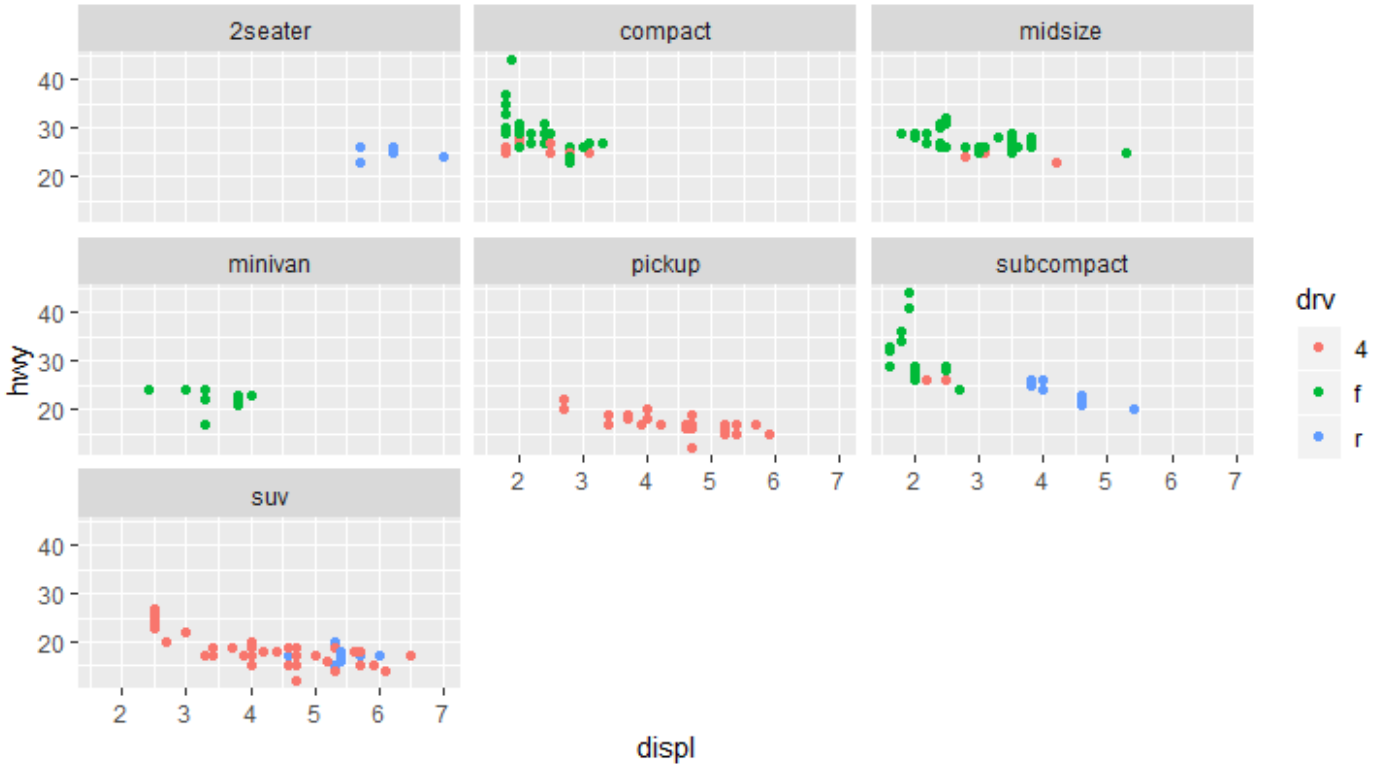
d + facet_wrap( ~ class, nrow=2)
d + facet_wrap( ~ class, ncol=4)
```



3. ggplot2 패키지를 알아보자

```
#  행 또 는  열 의  개 수 가  많 아 지 면  wrap  을
d + facet_grid( ~ class )
d + facet_wrap( ~ class )

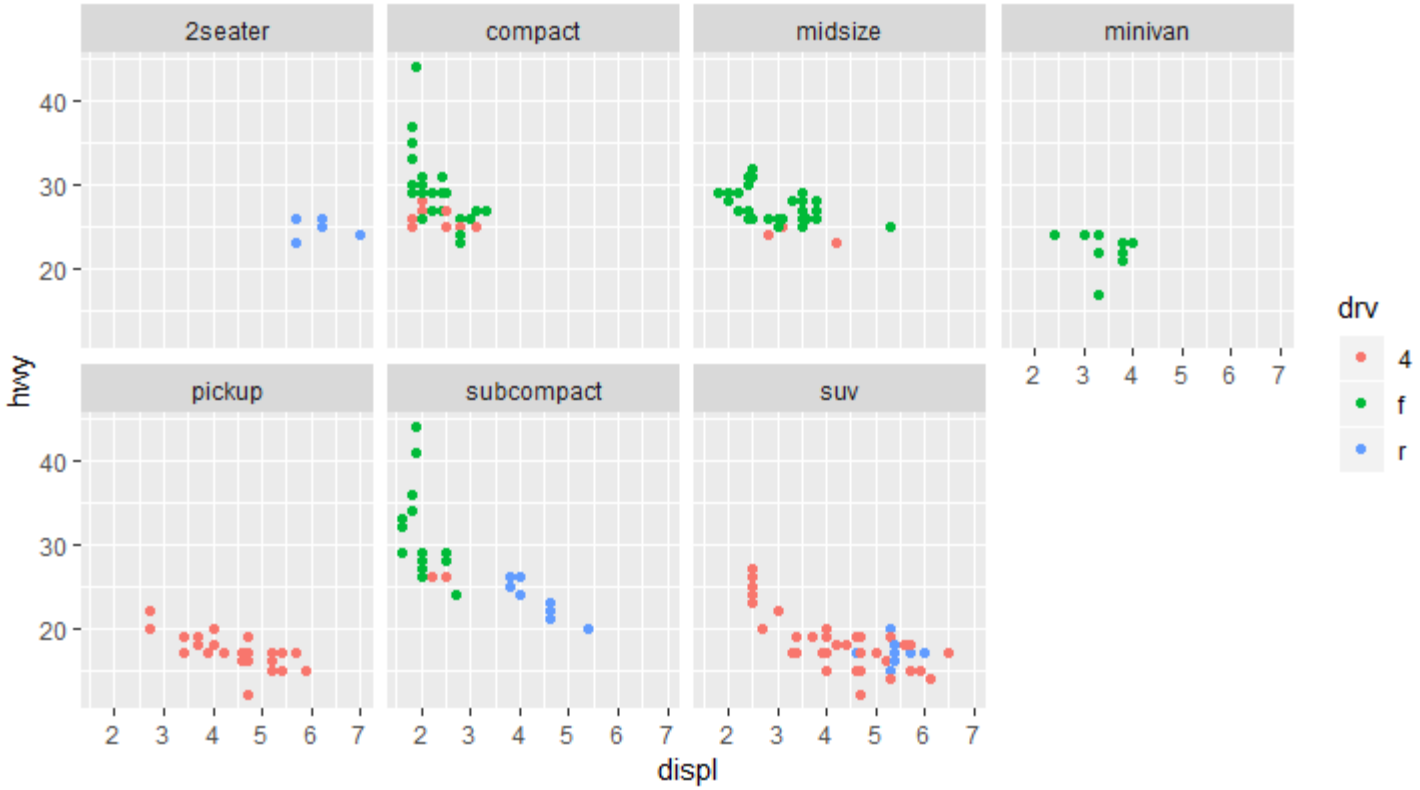
d + facet_wrap( ~ class, nrow=2)
d + facet_wrap( ~ class, ncol=4)
```



3. ggplot2 패키지를 알아보자

```
#  행 또 는  열 의  개 수 가  많 아 지 면  wrap  을
d + facet_grid( ~ class )
d + facet_wrap( ~ class )

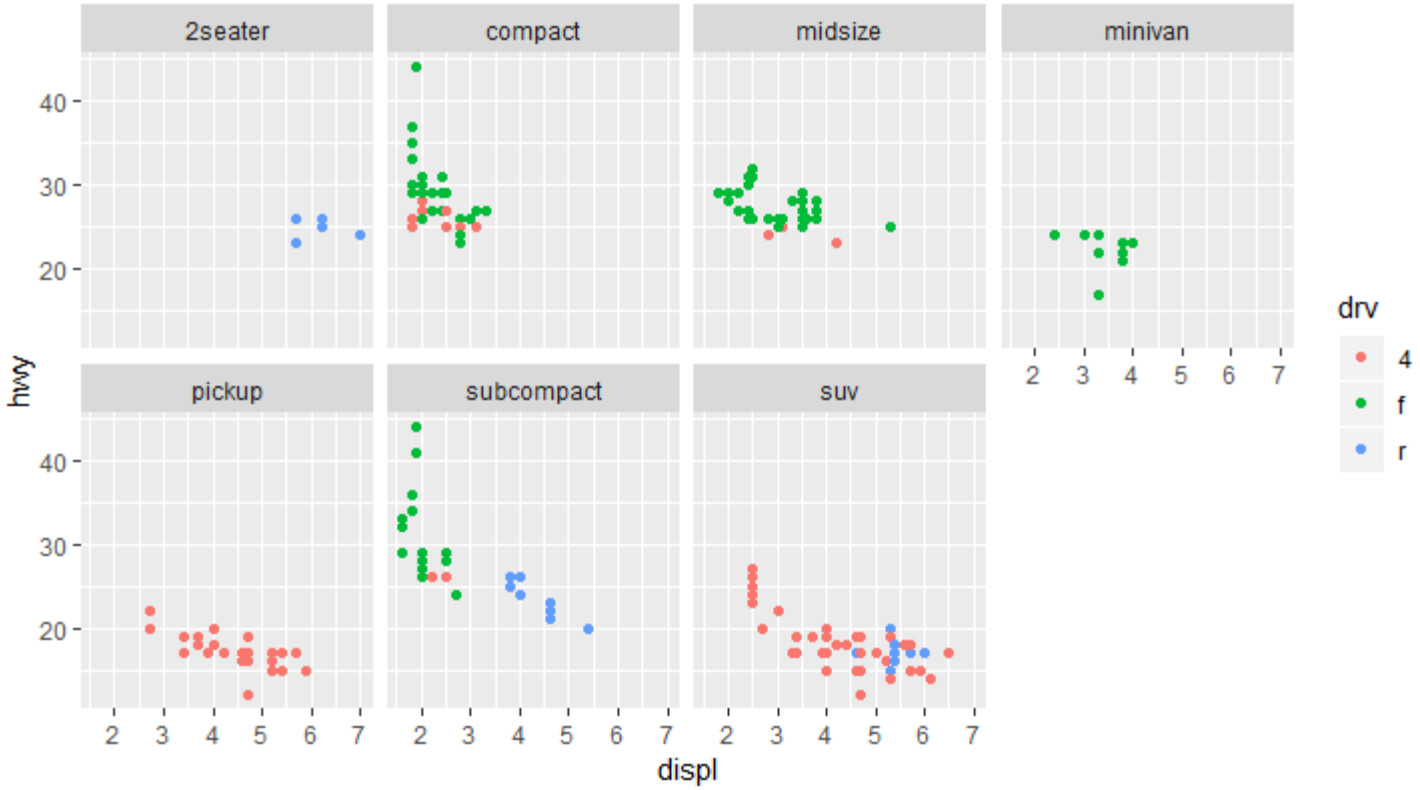
d + facet_wrap( ~ class, nrow=2)
d + facet_wrap( ~ class, ncol=4)
```



3. ggplot2 패키지를 알아보자

```
#  행 또 는  열 의  개 수 가  많 아 지 면  wrap  을
d + facet_grid( ~ class )
d + facet_wrap( ~ class )

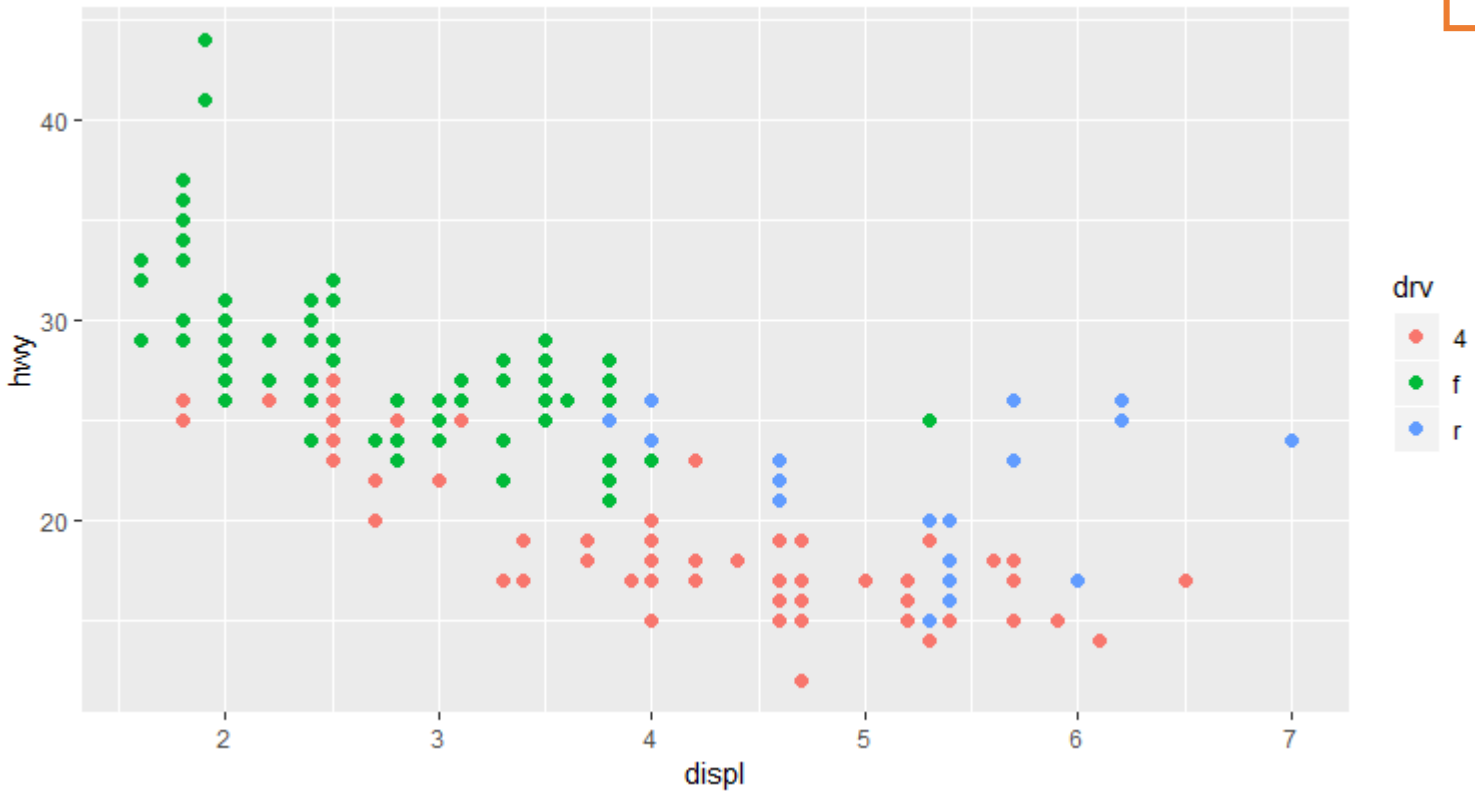
d + facet_wrap( ~ class, nrow=2)
d + facet_wrap( ~ class, ncol=4)
```



3. ggplot2 패키지를 알아보자

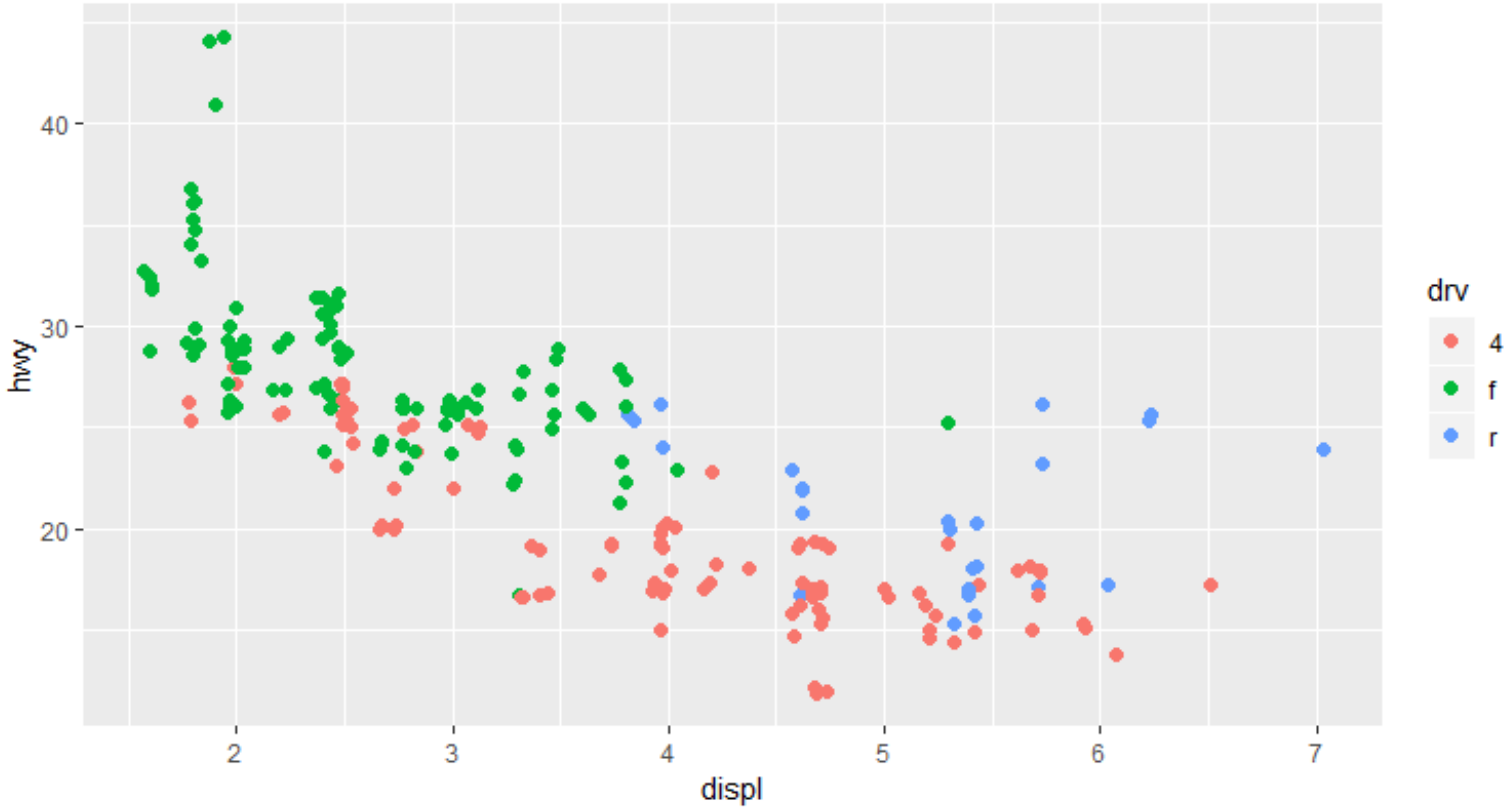
```
# jitter
ggplot(data = mpg, aes( x=displ, y=hwy, color=drv)) +
  geom_point(size = 2)
ggplot(data = mpg, aes( x=displ, y=hwy, color=drv)) +
  geom_point(size = 2, position = "jitter")
```

```
> dplyr:: glimpse(mpg)
Observations: 234
Variables: 11
```



3. ggplot2 패키지를 알아보자

```
# jitter
ggplot(data = mpg, aes( x=displ, y=hwy, color=drv)) +
  geom_point(size = 2)
ggplot(data = mpg, aes( x=displ, y=hwy, color=drv)) +
  geom_point(size = 2, position = "jitter")
```

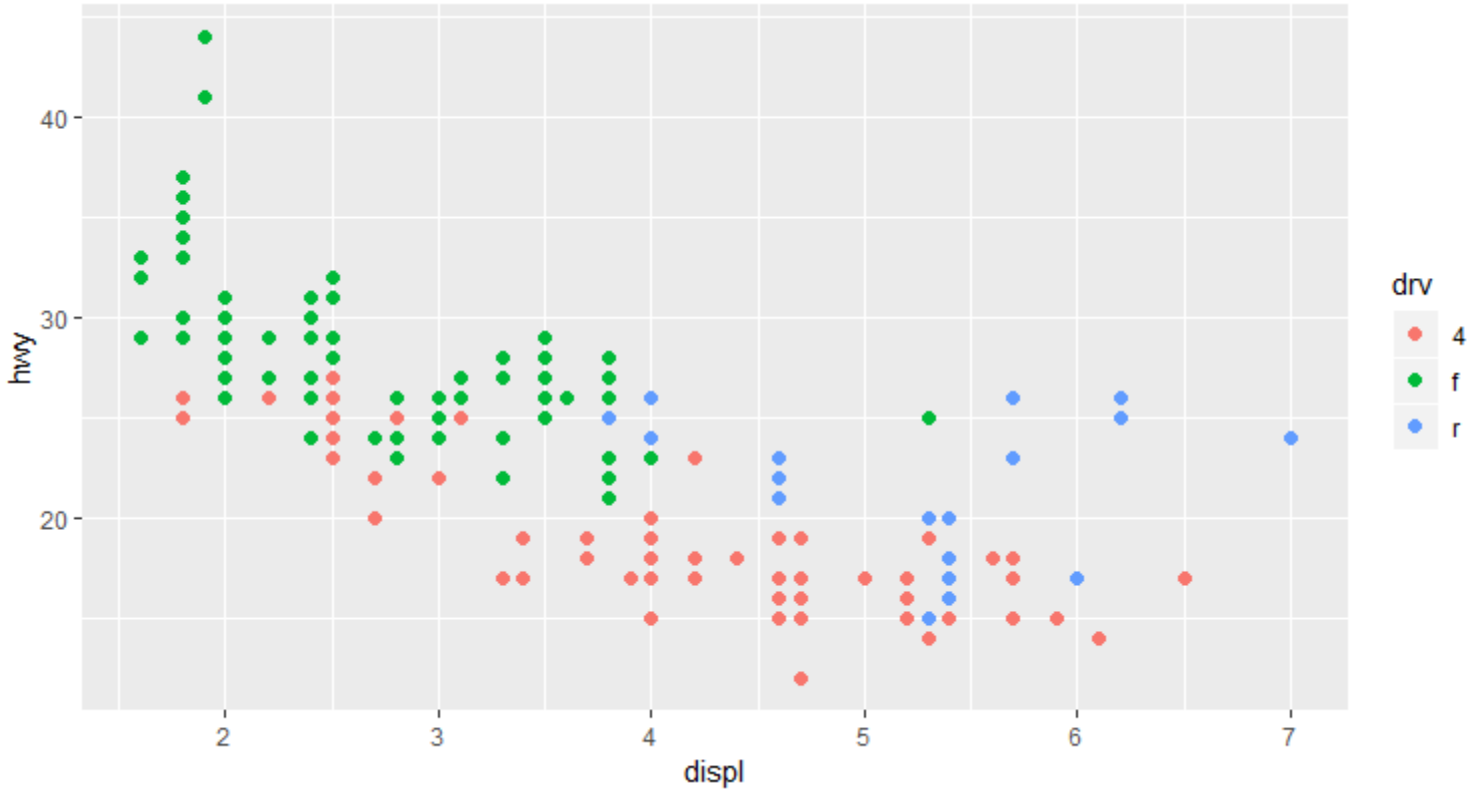


Geometry

name	description
geom_point	Scatterplot
geom_bar	Bar plot
geom_histogram	Histogram
geom_density	Prabablity distribution plot
geom_boxplot	Box and whiskers plot
geom_text	Textual annotations in a plot
geom_errorbar	Error bars

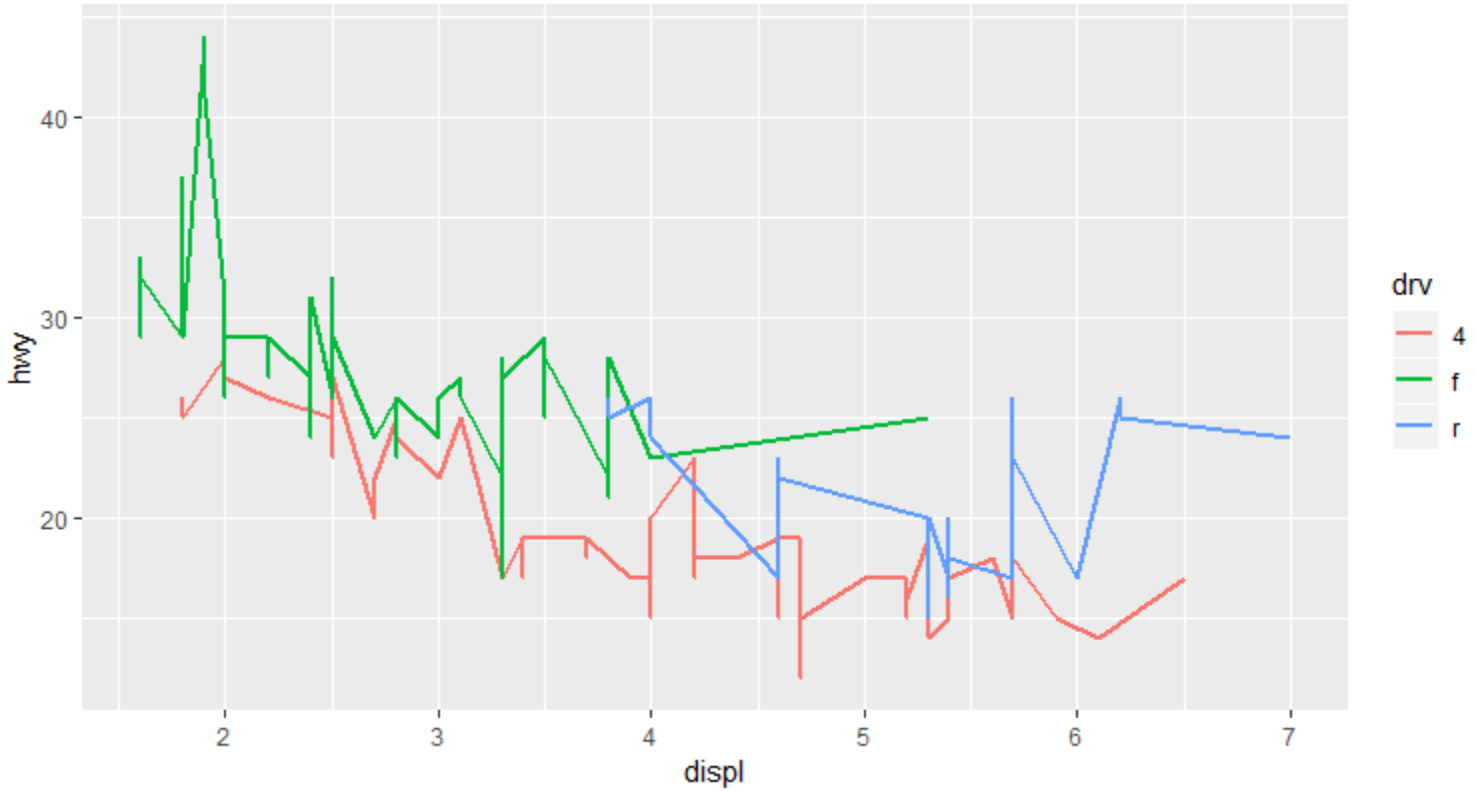
3. ggplot2 패키지를 알아보자

```
p1 <- ggplot(data = mpg, aes( x=displ, y=hwy, color=drv))
p1 +  geom_point(size = 2)
p1 +  geom_line()
p1 +  geom_point(size = 2) + geom_line()
```



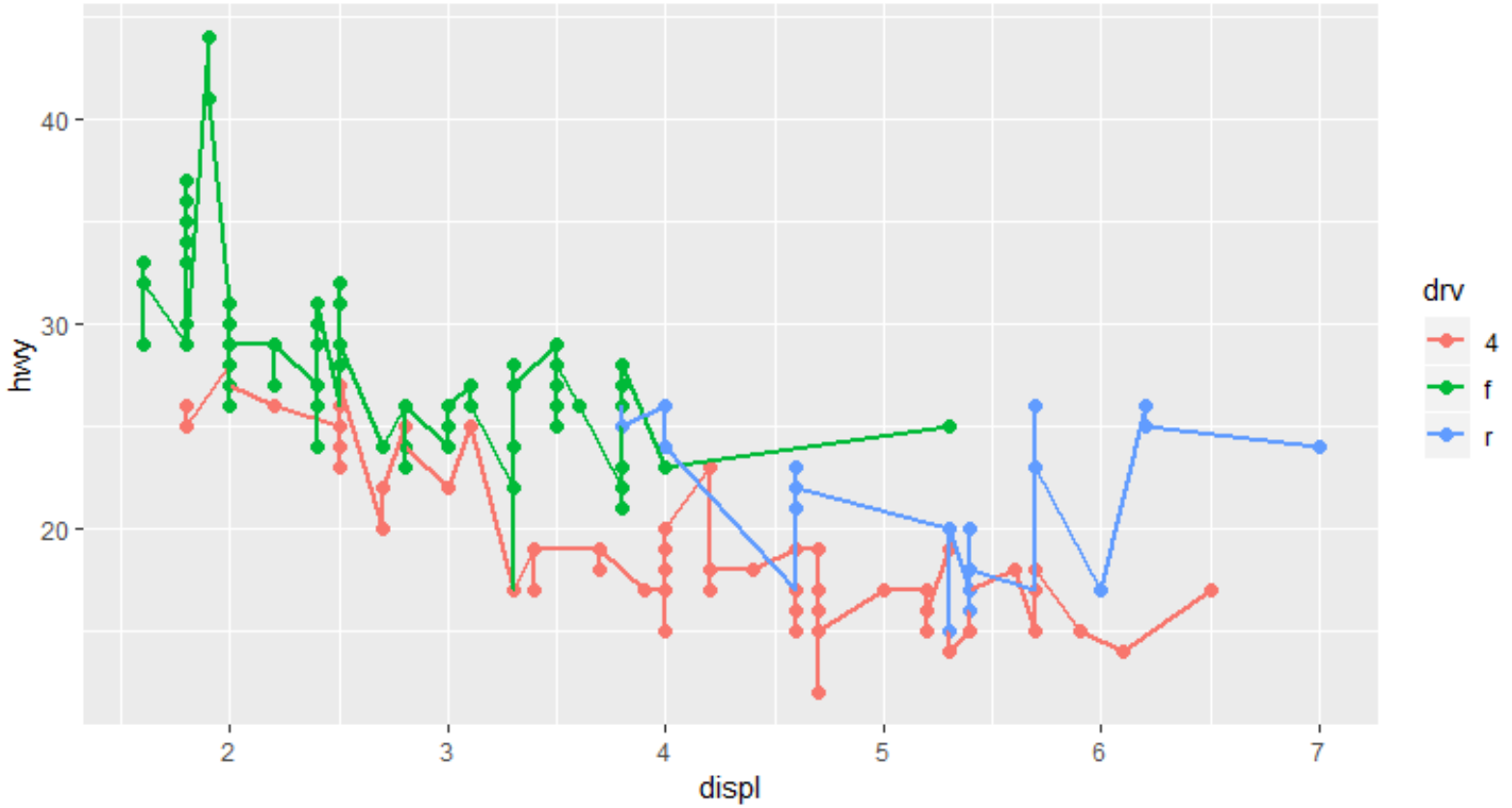
3. ggplot2 패키지를 알아보자

```
p1 <- ggplot(data = mpg, aes( x=displ, y=hwy, color=drv))
p1 +  geom_point(size = 2)
p1 +  geom_line()
p1 +  geom_point(size = 2) + geom_line()
```



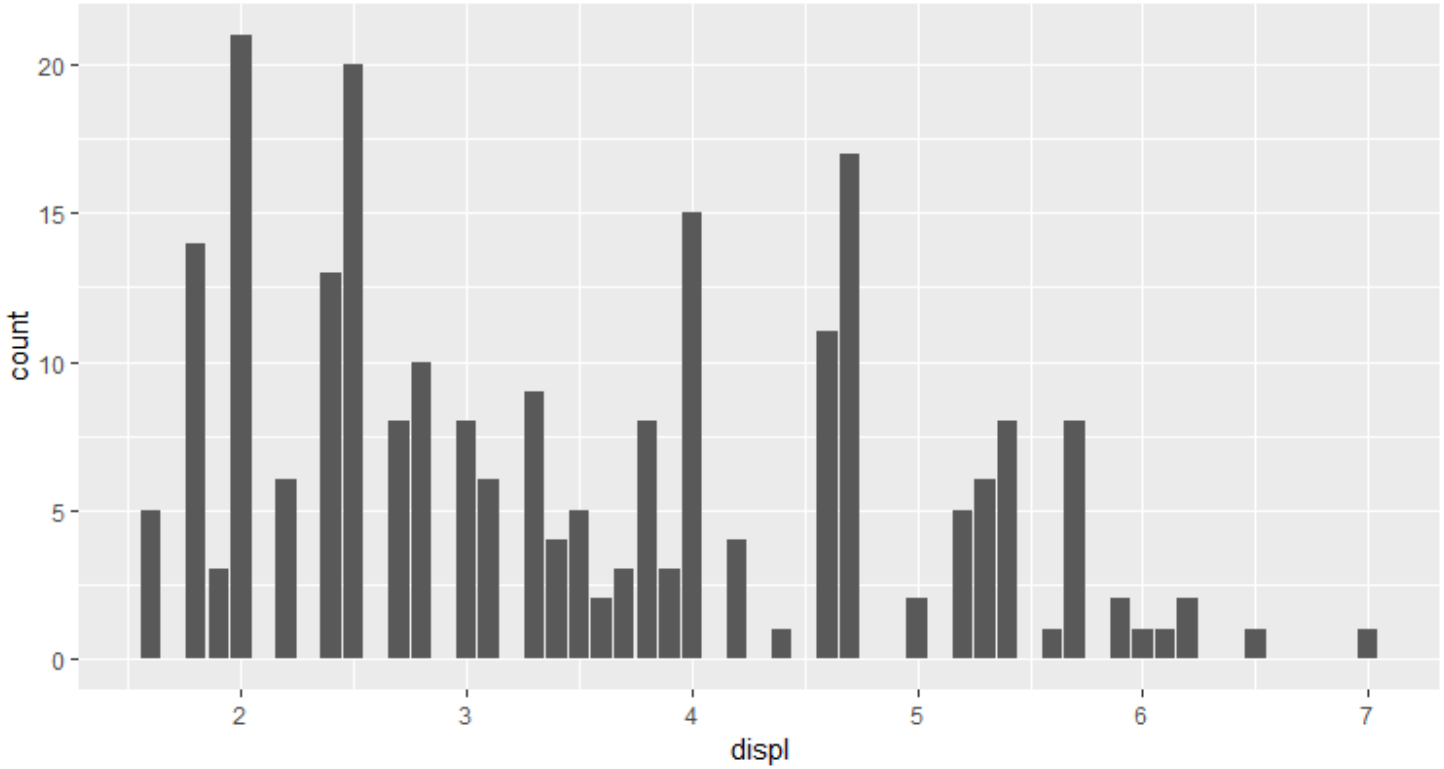
3. ggplot2 패키지를 알아보자

```
p1 <- ggplot(data = mpg, aes( x=displ, y=hwy, color=drv))
p1 +  geom_point(size = 2)
p1 +  geom_line()
p1 +  geom_point(size = 2) + geom_line()
```



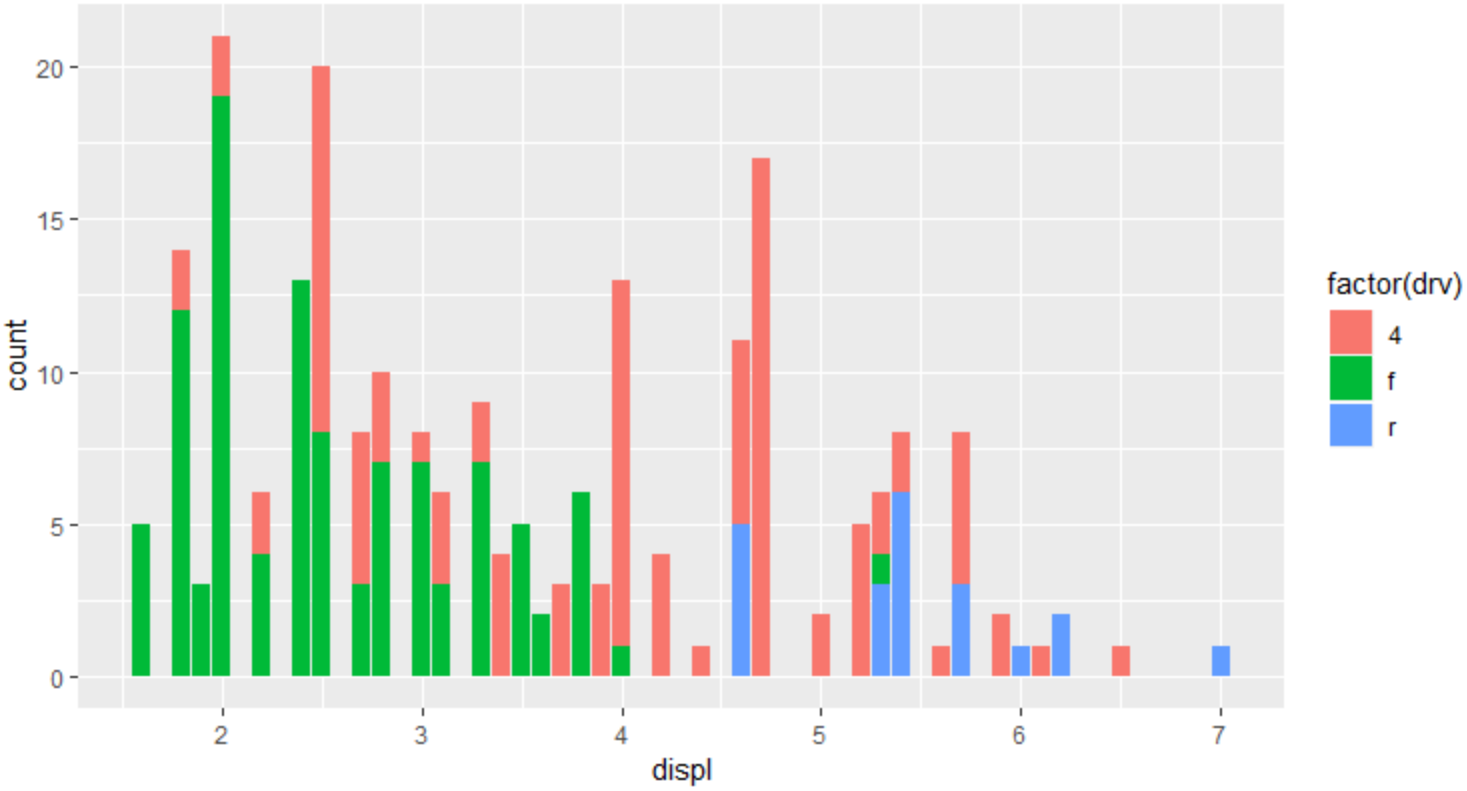
3. ggplot2 패키지를 알아보자

```
ggplot(data=mpg, aes(x=displ)) +geom_bar()
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar()
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "dodge")
```



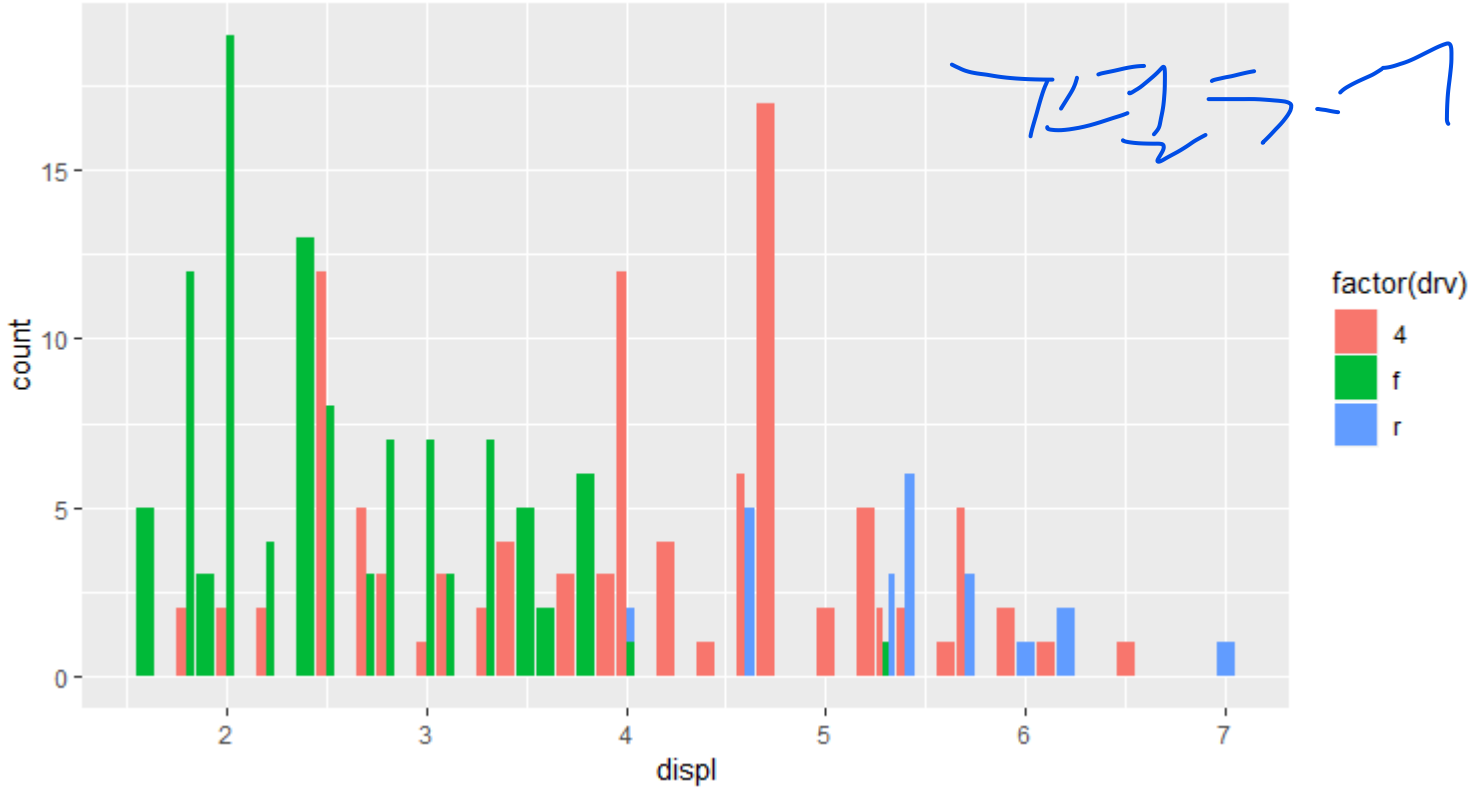
3. ggplot2 패키지를 알아보자

```
ggplot(data=mpg, aes(x=displ)) +geom_bar()
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar()
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "dodge")
```



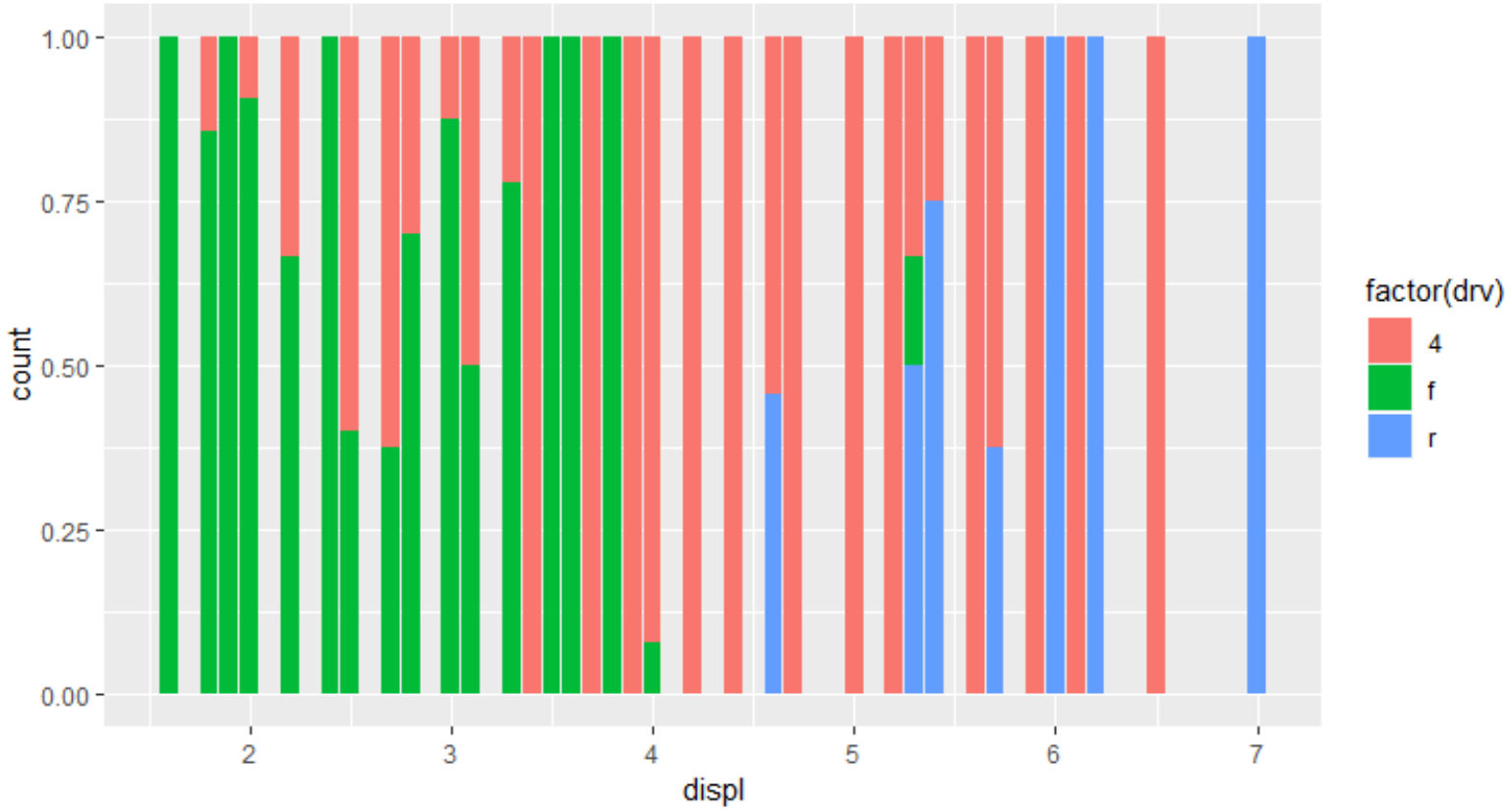
3. ggplot2 패키지를 알아보자

```
ggplot(data=mpg, aes(x=displ)) +geom_bar()
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar()
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "dodge")
```



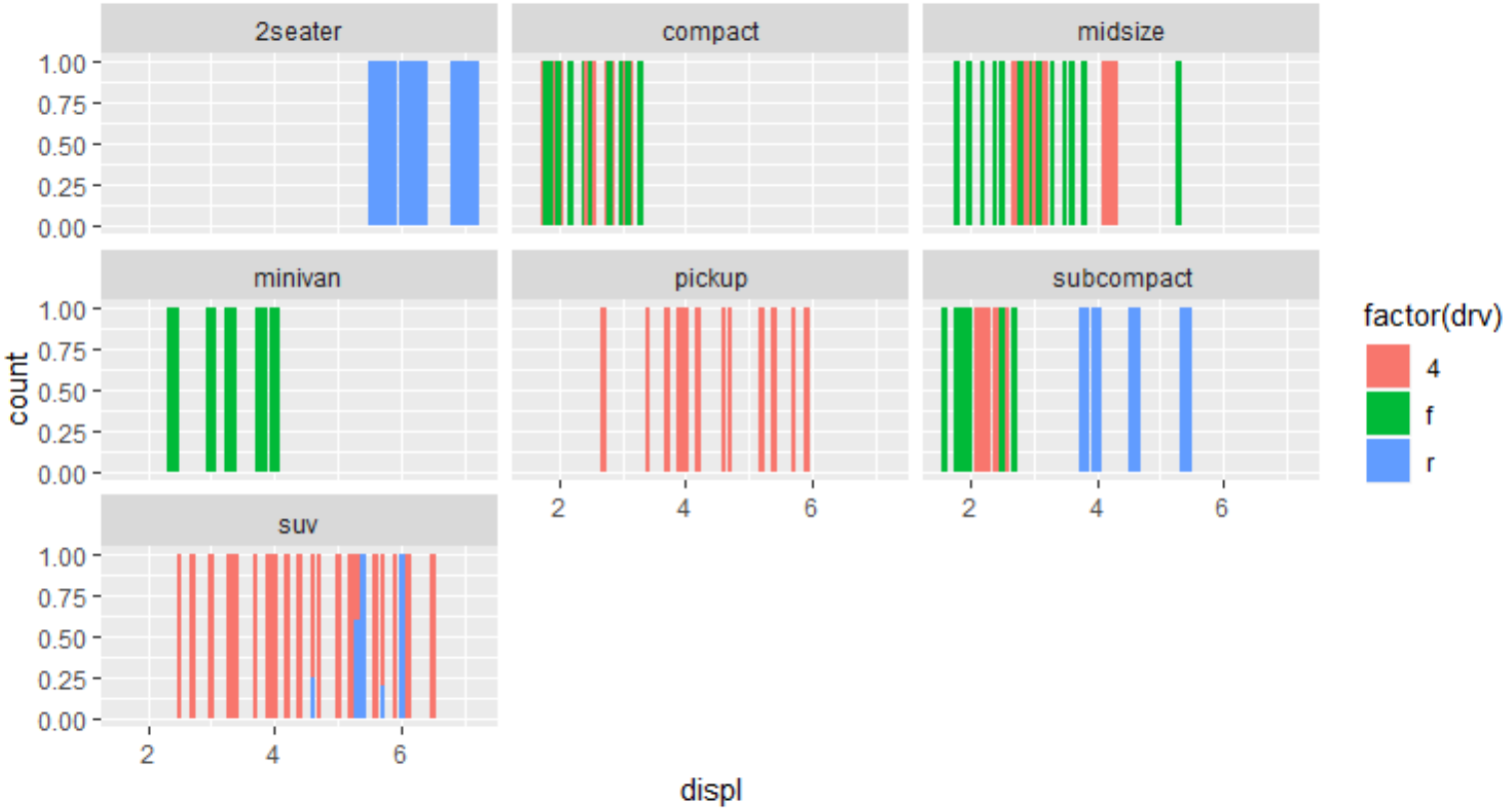
3. ggplot2 패키지를 알아보자

```
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "fill")
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "fill") +
  facet_wrap( ~ class)
```



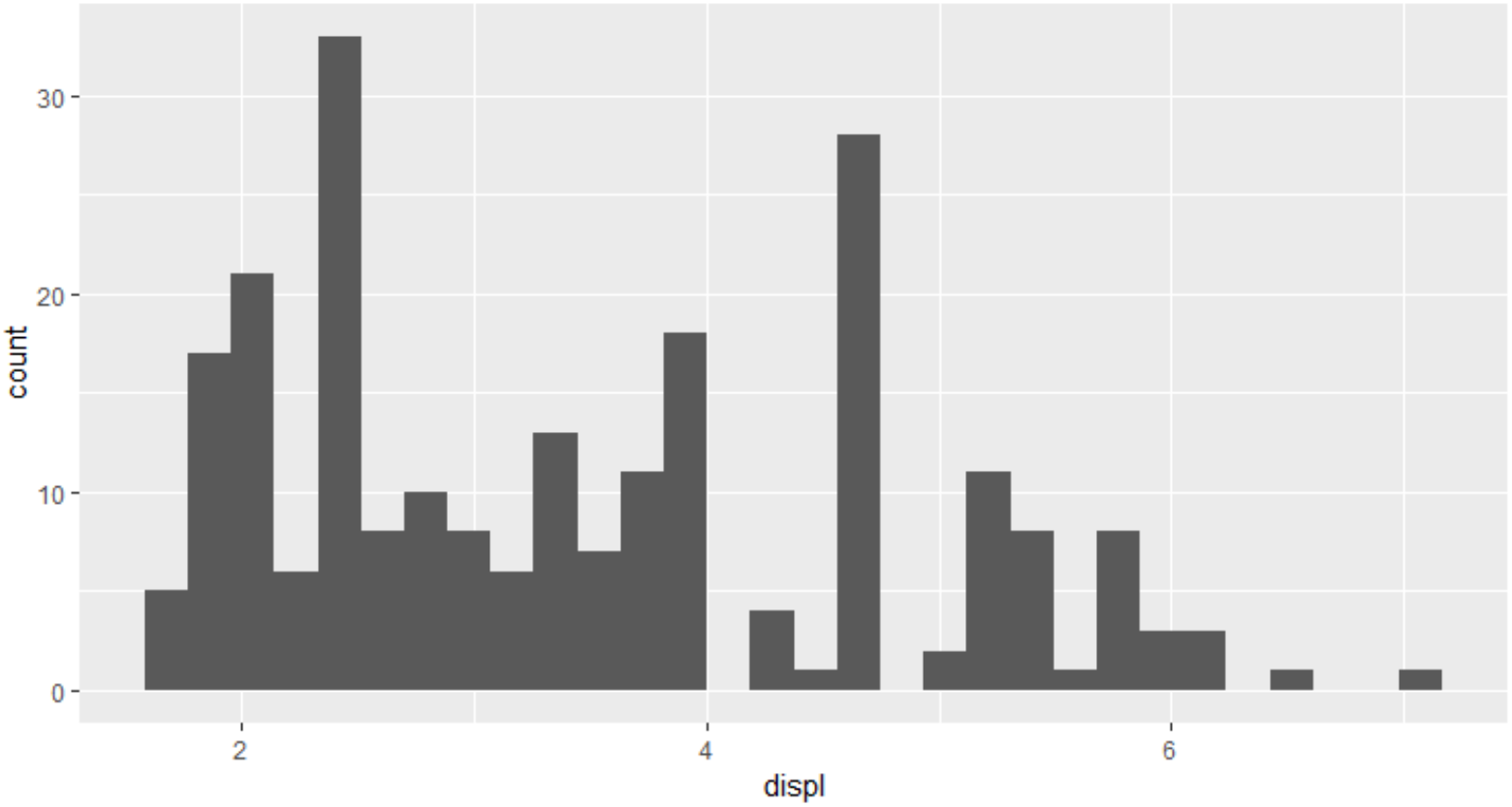
3. ggplot2 패키지를 알아보자

```
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "fill")
ggplot(data=mpg, aes(x=displ, fill=factor(drv))) +
  geom_bar(position = "fill") +
  facet_wrap( ~ class)
```



3. ggplot2 패키지를 알아보자

```
ggplot(data=mpg, aes(x=displ)) +geom_histogram()
ggplot(data=mpg, aes(x=displ)) +geom_histogram(fill="blue")
ggplot(data=mpg, aes(x=displ)) +
  geom_histogram(fill="blue", binwidth = 0.1)
```



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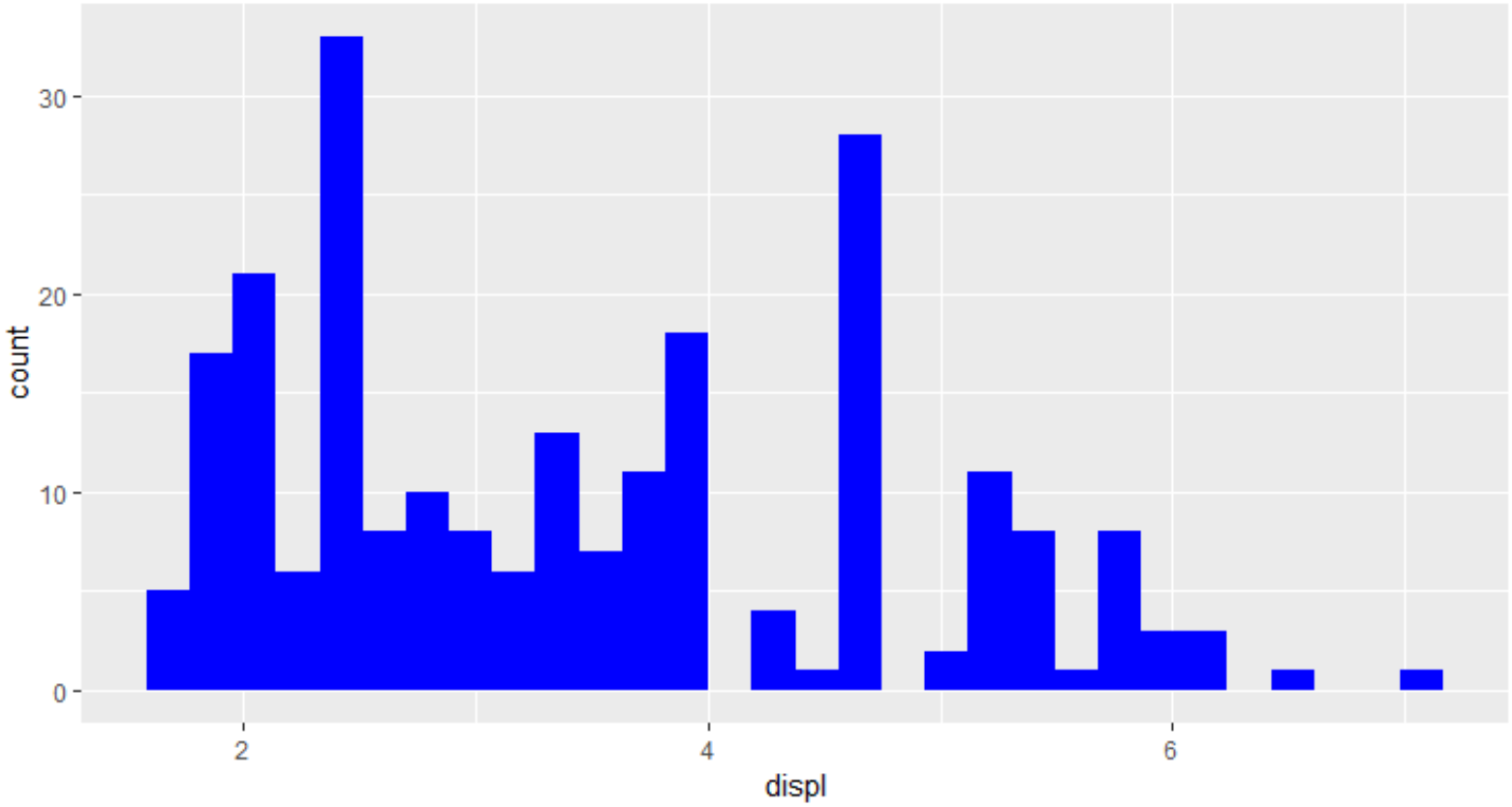

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```