ggplot2 Quickref

SOURCE: http://r-statistics.co/ggplot2-cheatsheet.html

Basics tasks

Legend

Plot text and annotation

Multiple plots

Geom layers

- Tiles

Not finding what you were looking for? Let me know!

Basic tasks

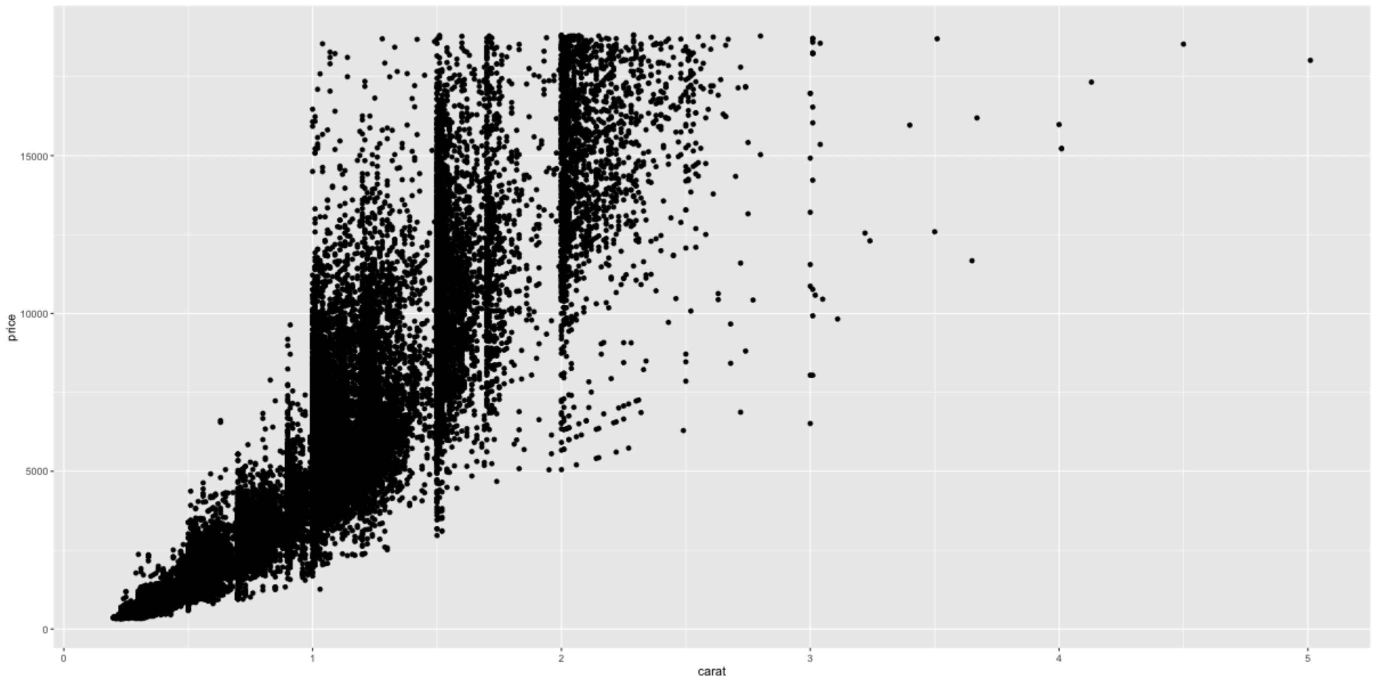
Basic plot setup

```
gg <- ggplot(df, aes(x=xcol, y=ycol))
```

`df` must be a dataframe that contains all information to make the ggplot. Plot will show up only after adding the geom layers.

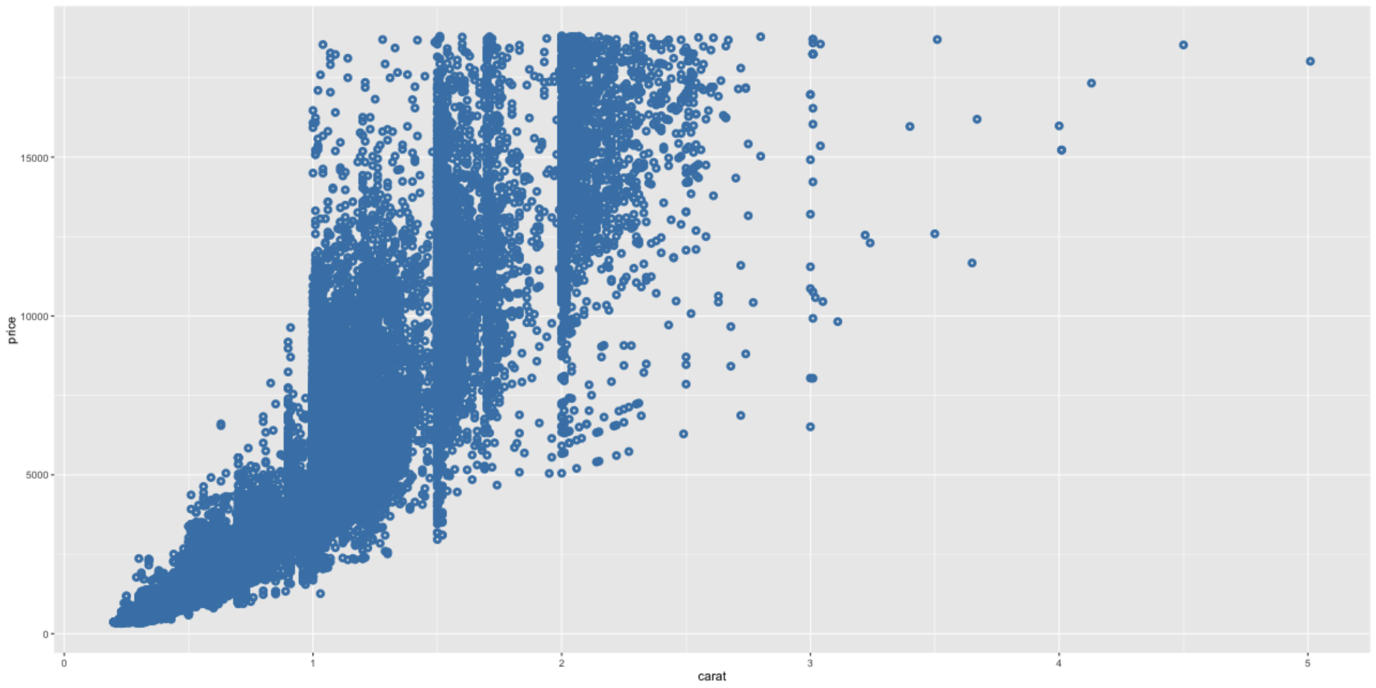
Scatterplot

```
library(ggplot2)
gg <- ggplot(diamonds, aes(x=carat, y=price))
gg + geom_point()
```



Static - point size, shape, color and boundary thickness

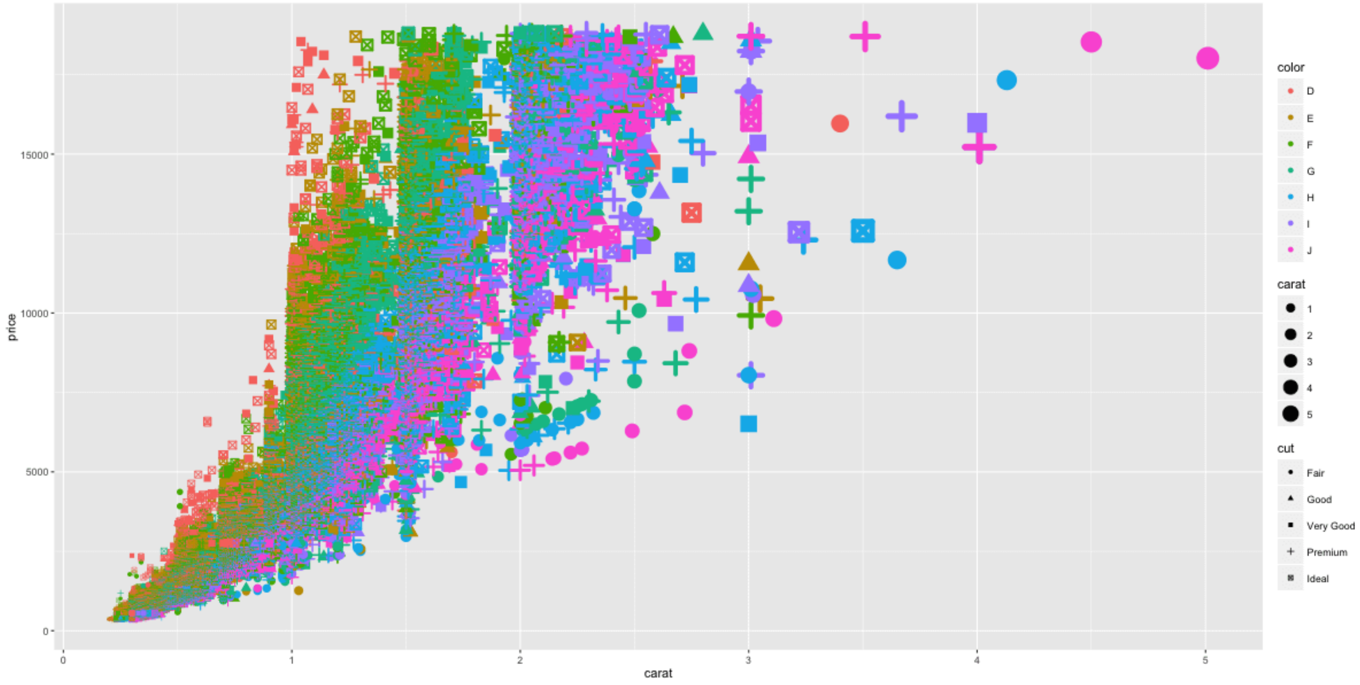
```
gg + geom_point(size=1, shape=1, color="steelblue", stroke=2)
# 'stroke' controls the thickness of point boundary
```



Dynamic - point size, shape, color and boundary thickness

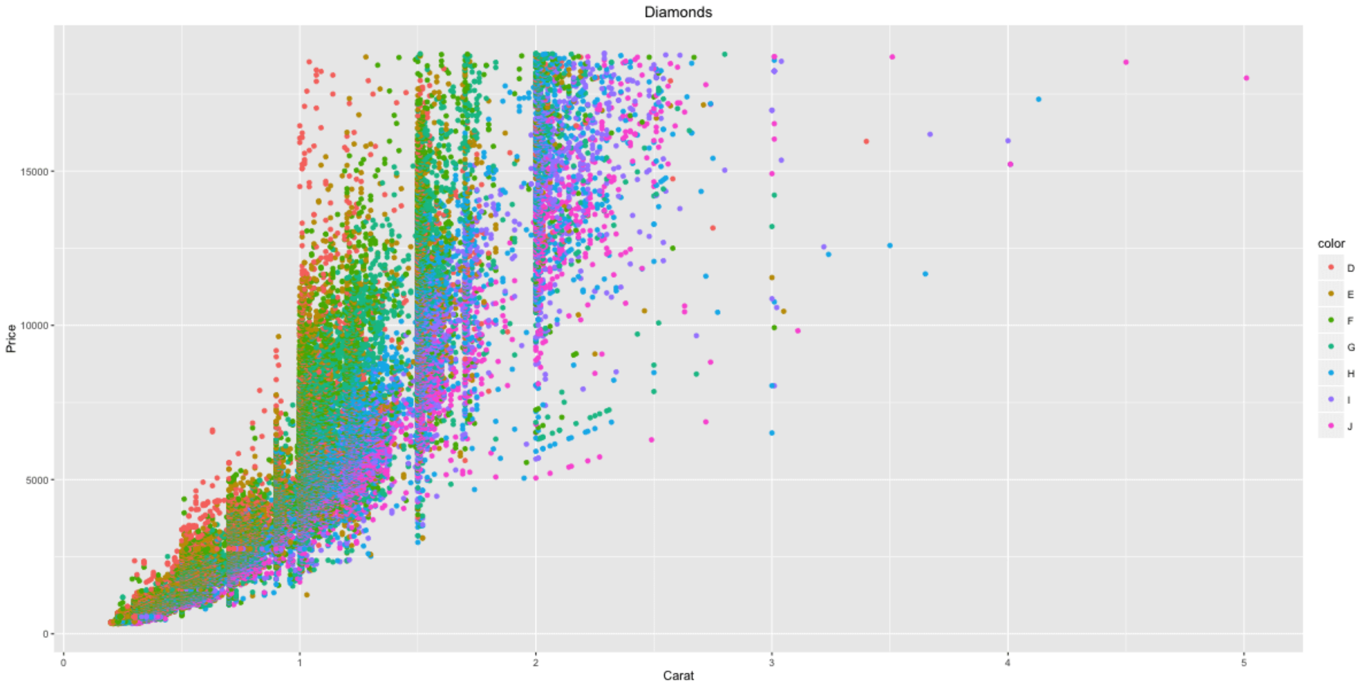
Make the aesthetics vary based on a variable in `df`.

```
gg + geom_point(aes(size=carat, shape=cut, color=color, stroke=carat))  # carat, cut and color are variables in `diamonds`
```



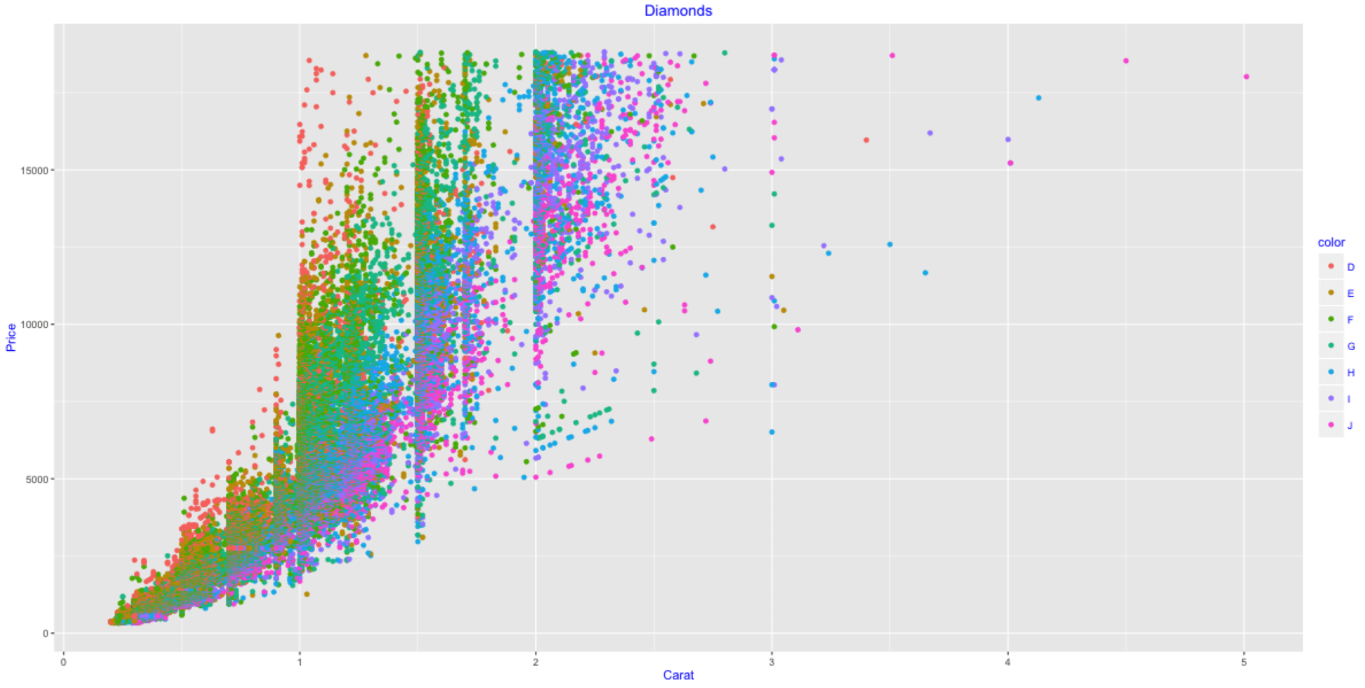
Add Title, X and Y axis labels

```
gg1 <- gg + geom_point(aes(color=color))
gg2 <- gg1 + labs(title="Diamonds", x="Carat", y="Price")  # ggtitle("title") also changes the title.
print(gg2)
```



Change color of all text

```
gg2 + theme(text=element_text(color="blue"))  # all text
turns blue.
```



Change title, X and Y axis label and text size

`plot.title`: Controls plot title. `axis.title.x`: Controls X axis title `axis.title.y`: Controls Y axis title `axis.text.x`: Controls X axis text `axis.text.y`: Controls y axis text

```
gg3 <- gg2 + theme(plot.title=element_text(size=25),
axis.title.x=element_text(size=20),
axis.title.y=element_text(size=20),
axis.text.x=element_text(size=15),
axis.text.y=element_text(size=15))
print(gg3)
```

Change title face, color, line height

```
gg3 + labs(title="Plot Title\nSecond Line of Plot Title") +
theme(plot.title=element_text(face="bold", color="steelblue",
lineheight=1.2))
```

Change point color

```
gg3 + scale_colour_manual(name='Legend', values=c('D'='grey',
'E'='red', 'F'='blue', 'G'='yellow', 'H'='black',
'I'='green', 'J'='firebrick'))
```

Adjust X and Y axis limits

Method 1: Zoom in

```
gg3 + coord_cartesian(xlim=c(0,3), ylim=c(0, 5000)) +
geom_smooth()  # zoom in
```

Method 2: Deletes the points outside limits

```
gg3 + xlim(c(0,3)) + ylim(c(0, 5000)) + geom_smooth()  #
deletes the points
#> Warning messages:
#> 1: Removed 14714 rows containing non-finite values
(stat_smooth).
#> 2: Removed 14714 rows containing missing values
(geom_point).
```

Method 3: Deletes the points outside limits

```
gg3 + scale_x_continuous(limits=c(0,3)) +
scale_y_continuous(limits=c(0, 5000)) + geom_smooth()  #
deletes the points outside limits
#> Warning message:
#> Removed 14714 rows containing missing values (geom_point).
```

Notice the change in smoothing line because of deleted points. This could sometimes be misleading in your analysis.

Change X and Y axis labels

```
gg3 + scale_x_continuous(labels=c("zero", "one", "two",
"three", "four", "five")) + scale_y_continuous(breaks=seq(0,
20000, 4000))  # if Y is continuous, if X is a factor
```

Use `scale_x_discrete` instead, if X variable is a factor.

Rotate axis text

```
gg3 + theme(axis.text.x=element_text(angle=45),
axis.text.y=element_text(angle=45))
```

Flip X and Y Axis

```
gg3 + coord_flip()  # flips X and Y axis.
```

Grid lines and panel background

```
gg3 + theme(panel.background = element_rect(fill =
'springgreen'),
  panel.grid.major = element_line(colour = "firebrick",
size=3),
  panel.grid.minor = element_line(colour = "blue", size=1))
```

Plot margin and background

```
gg3 + theme(plot.background=element_rect(fill="yellowgreen"),
plot.margin = unit(c(2, 4, 1, 3), "cm")) # top, right,
bottom, left
```

Colors

The whole list of colors are displayed at your R console in the `color()` function. Here are few of my suggestions for nice looking colors and backgrounds:

- steelblue (points and lines)
- firebrick (point and lines)
- springgreen (fills)
- violetred (fills)
- tomato (fills)
- skyblue (bg)
- sienna (points, lines)
- slateblue (fills)
- seagreen (points, lines, fills)
- sandybrown (fills)
- salmon (fills)
- saddlebrown (lines)
- royalblue (fills)
- orangered (point, lines, fills)
- olivedrab (points, lines, fills)
- midnightblue (lines)
- mediumvioletred (points, lines, fills)
- maroon (points, lines, fills)
- limegreen (fills)
- lawngreen (fills)
- forestgreen (lines, fills)
- dodgerblue (fills, bg)
- dimgray (grids, secondary bg)

- deeppink (fills)
- darkred (lines, points)

If you are looking for consistent colors, the `RColorBrewer` package has predefined color palettes

Legend

Hide legend

```
gg3 + theme(legend.position="none")  # hides the legend
```

Change legend title

```
gg3 + scale_color_discrete(name="")  # Remove legend title
(method1)
p1 <- gg3 + theme(legend.title=element_blank())  # Remove
```

```
legend title (method)
p2 <- gg3 + scale_color_discrete(name="Diamonds")  # Change
legend title
library(gridExtra)
grid.arrange(p1, p2, ncol=2)  # arrange
```

Change legend and point color

```
gg3 + scale_colour_manual(name='Legend', values=c('D'='grey',
'E'='red', 'F'='blue', 'G'='yellow', 'H'='black',
'I'='green', 'J'='firebrick'))
```

Change legend position

Outside plot

```r
p1 <- gg3 + theme(legend.position="top")  # top / bottom / left / right
```

Inside plot

```r
p2 <- gg3 + theme(legend.justification=c(1,0), legend.position=c(1,0))  # legend justification is the anchor point on the legend, considering the bottom left of legend as (0,0)
gridExtra::grid.arrange(p1, p2, ncol=2)
```

Change order of legend items

```
df$newLegendColumn <- factor(df$legendcolumn,
levels=c(new_order_of_legend_items), ordered = TRUE)
```

Create a new factor variable used in the legend, ordered as you need. Then use this variable instead in the plot.

Legend title, text, box, symbol

- `legend.title` - Change legend title
- `legend.text` - Change legend text
- `legend.key` - Change legend box
- `guides` - Change legend symbols

```
gg3 + theme(legend.title = element_text(size=20, color =
"firebrick"), legend.text = element_text(size=15),
legend.key=element_rect(fill='steelblue')) + guides(colour =
guide_legend(override.aes = list(size=2, shape=4, stroke=2)))
# legend title color and size, box color, symbol color, size
and shape.
```

Plot text and annotation

Add text in chart

```
#> Not Run: gg + geom_text(aes(xcol, ycol,
label=round(labelCol), size=3))  # general format
gg + geom_text(aes(label=color, color=color), size=4)
```

Annotation

```
#> gg3 + annotate("mytext", x=xpos, y=ypos, label="My text")
# Not run: General Format
library(grid)
my_grob = grobTree(textGrob("My Custom Text", x=0.8, y=0.2,
gp=gpar(col="firebrick", fontsize=25, fontface="bold")))
gg3 + annotation_custom(my_grob)
```

Multiple plots

Multiple chart panels

```
p1 <- gg1 + facet_grid(color ~ cut)  # arrange in a grid. More space for plots.
```

Free X and Y axis scales

By setting `scales='free'`, the scales of both X and Y axis is freed. Use `scales='free_x'` to free only X-axis and `scales='free_y'` to free only Y-axis.

```
p2 <- gg1 + facet_wrap(color ~ cut, scales="free")  # free the x and y axis scales.
```

Arrange multiple plots

```
library(gridExtra)
grid.arrange(p1, p2, ncol=2)
```

Geom layers

Add smoothing line

```
gg3 + geom_smooth(aes(color=color))  # method could be -
'lm', 'loess', 'gam'
```

Add horizontal / vertical line

```
p1 <- gg3 + geom_hline(yintercept=5000, size=2,
linetype="dotted", color="blue") # linetypes: solid, dashed,
dotted, dotdash, longdash and twodash
p2 <- gg3 + geom_vline(xintercept=4, size=2,
color="firebrick")
p3 <- gg3 + geom_segment(aes(x=4, y=5000, xend=4, yend=10000,
size=2, lineend="round"))
p4 <- gg3 + geom_segment(aes(x=carat, y=price, xend=carat,
yend=price-500, color=color), size=2) +
coord_cartesian(xlim=c(3, 5))  # x, y: start points. xend,
yend: end points
gridExtra::grid.arrange(p1,p2,p3,p4, ncol=2)
```

Add bar chart

```
# Frequency bar chart: Specify only X axis.
gg <- ggplot(mtcars, aes(x=cyl))
gg + geom_bar()  # frequency table
gg <- ggplot(mtcars, aes(x=cyl))
p1 <- gg + geom_bar(position="dodge", aes(fill=factor(vs)))
# side-by-side
p2 <- gg + geom_bar(aes(fill=factor(vs)))  # stacked
gridExtra::grid.arrange(p1, p2, ncol=2)
```

```
# Absolute bar chart: Specify both X adn Y axis. Set
stat="identity"
df <- aggregate(mtcars$mpg, by=list(mtcars$cyl), FUN=mean)  #
mean of mpg for every 'cyl'
names(df) <- c("cyl", "mpg")
head(df)
#>   cyl    mpg
#> 1   4  26.66
#> 2   6  19.74
#> 3   8  15.10

gg_bar <- ggplot(df, aes(x=cyl, y=mpg)) + geom_bar(stat =
"identity")  # Y axis is explicit. 'stat=identity'
print(gg_bar)
```

Distinct color for bars

```
gg_bar <- ggplot(df, aes(x=cyl, y=mpg)) + geom_bar(stat =
"identity", aes(fill=cyl))
print(gg_bar)
```

Change color and width of bars

```
df$cyl <- as.factor(df$cyl)
gg_bar <- ggplot(df, aes(x=cyl, y=mpg)) + geom_bar(stat =
"identity", aes(fill=cyl), width = 0.25)
gg_bar + scale_fill_manual(values=c("4"="steelblue",
"6"="firebrick", "8"="darkgreen"))
```

Change color palette

```
library(RColorBrewer)
display.brewer.all(n=20, exact.n=FALSE)  # display available
color palettes
ggplot(mtcars, aes(x=cyl, y=carb, fill=factor(cyl))) +
geom_bar(stat="identity") + scale_fill_brewer(palette="Reds")
# "Reds" is palette name
```

Line chart

```
# Method 1:
gg <- ggplot(economics, aes(x=date))  # setup
gg + geom_line(aes(y=psavert), size=2, color="firebrick") +
geom_line(aes(y=uempmed), size=1, color="steelblue",
linetype="twodash")  # No legend
# available linetypes: solid, dashed, dotted, dotdash,
longdash and twodash
```

```
# Method 2:
library(reshape2)
df_melt <- melt(economics[, c("date", "psavert", "uempmed")],
id="date")  # melt by date.
gg <- ggplot(df_melt, aes(x=date))  # setup
gg + geom_line(aes(y=value, color=variable), size=1) +
scale_color_discrete(name="Legend")  # gets legend.
```

Line chart from timeseries

```
# One step method.
library(ggfortify)
autoplot(AirPassengers, size=2) + labs(title="AirPassengers")
```

Ribbons

Filled time series can be plotted using `geom_ribbon()`. It takes two compulsory arguments `ymin` and `ymax`.

```
# Prepare the dataframe
st_year <- start(AirPassengers)[1]
st_month <- "01"
st_date <- as.Date(paste(st_year, st_month, "01", sep="-"))
dates <- seq.Date(st_date, length=length(AirPassengers),
by="month")
df <- data.frame(dates, AirPassengers, AirPassengers/2)
```

```
head(df)
#>        dates AirPassengers AirPassengers.2
#> 1 1949-01-01           112            56.0
#> 2 1949-02-01           118            59.0
#> 3 1949-03-01           132            66.0
#> 4 1949-04-01           129            64.5
#> 5 1949-05-01           121            60.5
#> 6 1949-06-01           135            67.5
# Plot ribbon with ymin=0
gg <- ggplot(df, aes(x=dates)) + labs(title="AirPassengers")
+ theme(plot.title=element_text(size=30),
axis.title.x=element_text(size=20),
axis.text.x=element_text(size=15))
gg + geom_ribbon(aes(ymin=0, ymax=AirPassengers)) +
geom_ribbon(aes(ymin=0, ymax=AirPassengers.2), fill="green")
```

```
gg + geom_ribbon(aes(ymin=AirPassengers-20,
ymax=AirPassengers+20)) +
geom_ribbon(aes(ymin=AirPassengers.2-20,
ymax=AirPassengers.2+20), fill="green")
```

Area

`geom_area` is similar to `geom_ribbon`, except that the `ymin` is set to 0. If you want to make overlapping area plot, use the `alpha` aesthetic to make the top layer translucent.

```
# Method1: Non-Overlapping Area
df <- reshape2::melt(economics[, c("date", "psavert",
"uempmed")], id="date")
head(df, 3)
#>         date variable value
#> 1 1967-07-01  psavert  12.5
#> 2 1967-08-01  psavert  12.5
#> 3 1967-09-01  psavert  11.7
p1 <- ggplot(df, aes(x=date)) + geom_area(aes(y=value,
fill=variable)) + labs(title="Non-Overlapping - psavert and
uempmed")

# Method2: Overlapping Area
p2 <- ggplot(economics, aes(x=date)) +
geom_area(aes(y=psavert), fill="yellowgreen",
color="yellowgreen") + geom_area(aes(y=uempmed),
fill="dodgerblue", alpha=0.7, linetype="dotted") +
labs(title="Overlapping - psavert and uempmed")
gridExtra::grid.arrange(p1, p2, ncol=2)
```

Boxplot and Violin

The oulier points are controlled by the following aesthetics: * outlier.shape * outlier.stroke * outlier.size * outlier.colour

If the `notch` is turned on (by setting it TRUE), the below boxplot is produced. Else, you would get the standard rectangular boxplots.

```
p1 <- ggplot(mtcars, aes(factor(cyl), mpg)) +
geom_boxplot(aes(fill = factor(cyl)), width=0.5,
outlier.colour = "dodgerblue", outlier.size = 4,
outlier.shape = 16, outlier.stroke = 2, notch=T) +
labs(title="Box plot")  # boxplot
p2 <- ggplot(mtcars, aes(factor(cyl), mpg)) +
geom_violin(aes(fill = factor(cyl)), width=0.5, trim=F) +
labs(title="Violin plot (untrimmed)")  # violin plot
gridExtra::grid.arrange(p1, p2, ncol=2)
```

Density

```
ggplot(mtcars, aes(mpg)) + geom_density(aes(fill =
factor(cyl)), size=2) + labs(title="Density plot")  # Density
plot
```

Tiles

```
corr <- round(cor(mtcars), 2)
df <- reshape2::melt(corr)
gg <- ggplot(df, aes(x=Var1, y=Var2, fill=value,
label=value)) + geom_tile() + theme_bw() +
geom_text(aes(label=value, size=value), color="white") +
labs(title="mtcars - Correlation plot") +
theme(text=element_text(size=20), legend.position="none")

library(RColorBrewer)
p2 <- gg + scale_fill_distiller(palette="Reds")
p3 <- gg + scale_fill_gradient2()
gridExtra::grid.arrange(gg, p2, p3, ncol=3)
```