# Different color palettes and CVD simulations

## 1.0 Introduction

In this report, we are going to see and discuss how different color palettes and an R package are used to plot the data values which is color-blind friendly and how a CVD simulation can be used to test visualized plots with respect to color-blindness.

## 2.0 Part 1

**Quantitative data color palette:**

*Fig 1.0: Tints color palette*

**Tints: Hex: #4a34d0 #5c49d0 #6e5ed0 #8377d0 #978dd0 #a7a0d0**

*Fig 2.0: Shades color palette*

**Shades: Hex: #0faaed #3b99b8 #2b7187 #235b6e #1b4654 #112d36**

*Fig 3.0: Tones color palette*

**Tones: Hex: #0f38ed #2042dd #324eca #4057bc #4e60ae #5f6a9e**

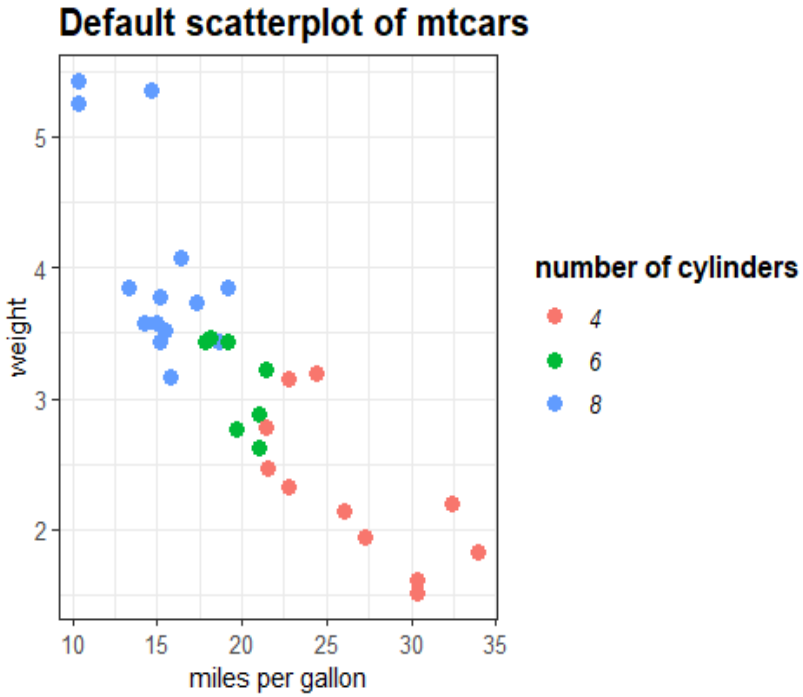
**Qualitative data color palette:**

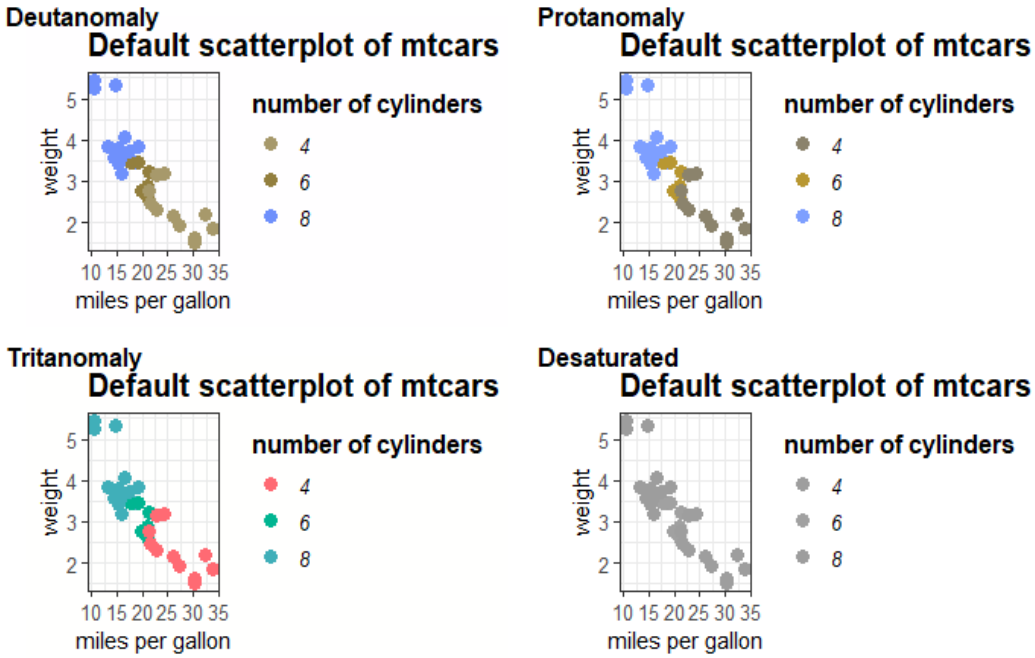
*Fig 4.0: Qualitative color palette*

**Hex: #0f38ed #b03be4 #5eceef #1b5740 #882140 #936822**

## 3.0 Part B

## 3.1 Default ggplot color assignment



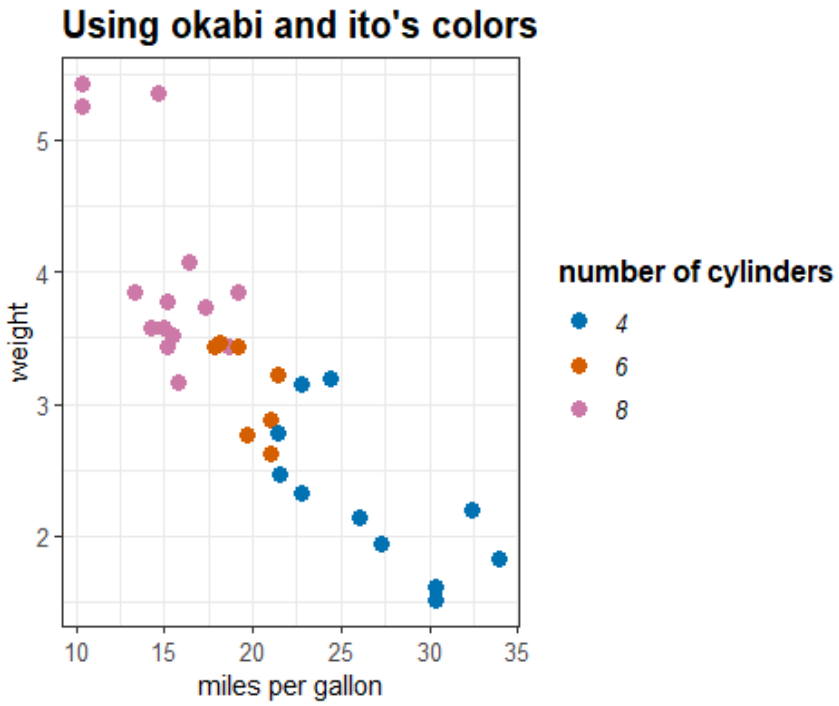

*Plot 1.0: Default ggplot color assignment*

*Plot 1.1: color blindness simulation*

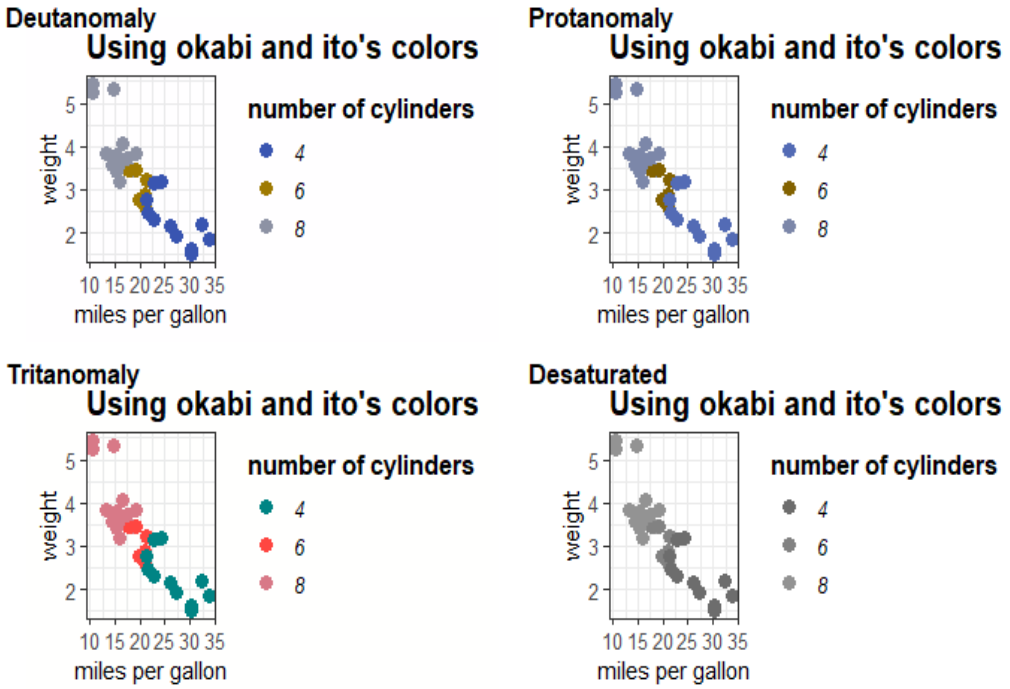
*Plot 1.0 represents a scatter plot of mtcars dataset using default ggplot colors and plot 1.1 represents color blindness simulation of default colors using colorblindr R package.*

If we use the default color of ggplot to plot a given data. To the readers with deuteranomaly and protanomaly, two categories of colors are almost similar which makes readers difficult to identify the different categories of the data and also, it's very hard to differentiate two categories of data by a reader with tritanomaly color blindness. It's better to avoid default colors in order to clearly communicate to the reader with color vision deficiency.

## 3.2 Custom palette colors from okabi and ito's palette




*Plot 2.0: Using okabi and ito's colors*

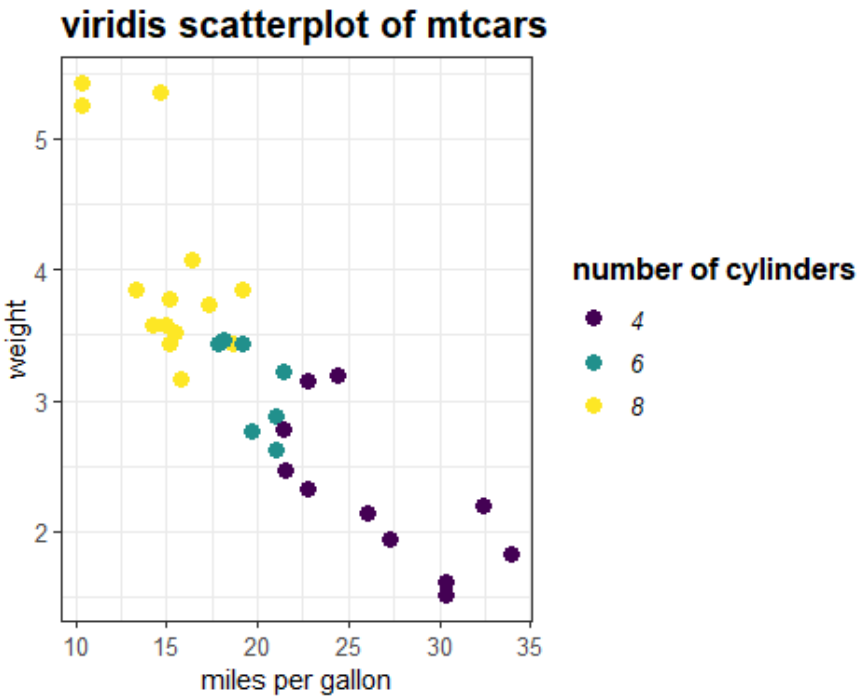



*Plot 2.1: color blindness simulation*

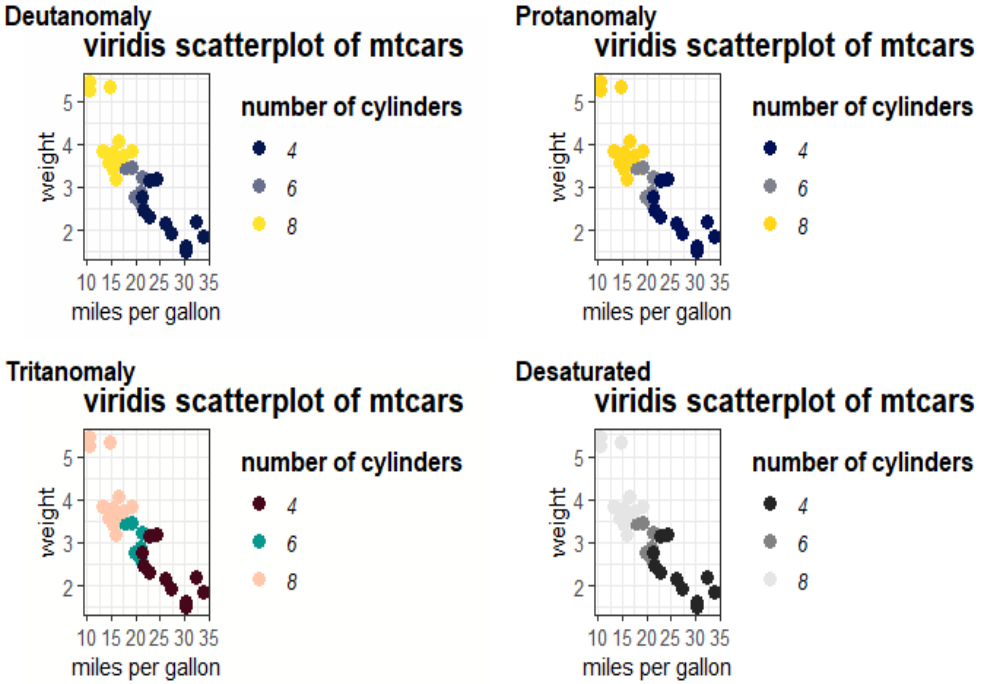
*Plot 2.0 represents a scatter plot of mtcars dataset using okabo and ito's color blind friendly palette colors and plot 2.1 represents color blindness simulation of okabo and ito's color blind friendly palette colors using colorblindr R package.*

In this plot, I used okabi and ito's color palette HEX ("#0072B2", "#D55E00", "#CC79A7") to plot the given data. By using these colors, different categories of data are distinct and colors are not overwhelming the other color. These colors are suitable for both standard and color vision deficiency people.

## 3.3 Custom palette colors using Viridis R package




*Plot 3.0: viridis scatterplot of mtcars*




*Plot 3.1: color blindness simulation*

*Plot 3.0 represents a scatter plot of mtcars dataset using viridis package which uses colour-blind friendly colors and plot 3.1 represents color blindness simulation of viridis color blind friendly colors using colorblindr R package.*

Using Viridis package to plot the given data values. The colors used by Viridis package are quite separable for color blind people and also for the standard vision people. Using this package has one more advantage that it is clearly separable on greyscale. This package is the best choice of colors for visual communication using the plot.

## 4.0 Conclusion:

Both plot 2.0 and plot 3.0 are preferable from a standard and color vision deficiency friendly vision perspective. Plot 2.0 uses okabi and ito's color palette and plot 3.0 uses the Viridis package. Both these plots use color-blind friendly color which makes color separable and not overwhelming to other colors.

## 5.0 Code appendix

```
require(ggplot2)
require(viridis)
library(colorblindr)


# get data set into mp_df
mtcars_df <- mtcars

# convert cyl column value to factor
mtcars_df$cyl <- as.factor(mtcars_df$cyl)

# plot default ggplot colors on mtcars dataset
default_mtcars_plt <- ggplot(data = mtcars_df, aes(x = mtcars_df$mpg, y = mtcars_df$wt, colour = mtcars_df$cyl)) +
  geom_point(size=3.0)  +
  labs(title = "Default scatterplot of mtcars", x="miles per gallon", y="weight", color="number of cylinders") +
  theme_bw()+
  theme(axis.text = element_text(size=10),
        legend.title = element_text(face="bold", size = 12),
        legend.text = element_text(face="italic", size = 10),
        plot.title = element_text(face="bold", size=15))
# plots using default color
default_mtcars_plt

# plots color blind simulation
cvd_grid(default_mtcars_plt)

# okabi and ito's color palette
okabi_ito_colors <- c("#000000", "#E69F00", "#56B4E9", "#009E73", "#F0E442", "#0072B2", "#D55E00", "#CC79A7")


# plot okabi and ito's color blind friendly colors on mtcars dataset
okabi_ito_plt <- ggplot(data = mtcars_df, aes(x = mtcars_df$mpg, y = mtcars_df$wt, colour = mtcars_df$cyl)) +
  geom_point(size=3.0)  +
  labs(title = "Using okabi and ito's colors", x="miles per gallon", y="weight", color="number of cylinders") +
  scale_colour_manual(values = okabi_ito_colors[6:8]) +
  theme_bw()+
  theme(axis.text = element_text(size=10),
        legend.title = element_text(face="bold", size = 12),
        legend.text = element_text(face="italic", size = 10),
        plot.title = element_text(face="bold", size=15))
```

```r
okabi_ito_plt # plots using okabi and ito's color blind friendly colors


# plots color blind simulation using okabi and ito's color

cvd_grid(okabi_ito_plt)

# plot using viridis package on mtcars dataset
viridis_plt <- ggplot(data = mtcars_df, aes(x = mtcars_df$mpg, y = mtcars_df$wt, colour = mtcars_df$cyl)) +
  geom_point(size=3.0)  +
  labs(title = "viridis scatterplot of mtcars", x="miles per gallon", y="weight", color="number of cylinders") +
  scale_colour_viridis_d() +
  theme_bw()+
  theme(axis.text = element_text(size=10),
        legend.title = element_text(face="bold", size = 12),
        legend.text = element_text(face="italic", size = 10),
        plot.title = element_text(face="bold", size=15))


# plots using viridis package
viridis_plt

# plots color blind simulation
cvd_grid(viridis_plt)
```