R | Multiple-Group Linear Regression with Confidence Intervals and Marginal Distributions (KDE + Boxplots)

```
library(ggplot2)
library(ggExtra)
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 4.3.3
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(broom)
```

=== 1. Load the dataset ===

```
df <- read.csv("C:/Users/zheng/Downloads/data_three_groups.csv")
```

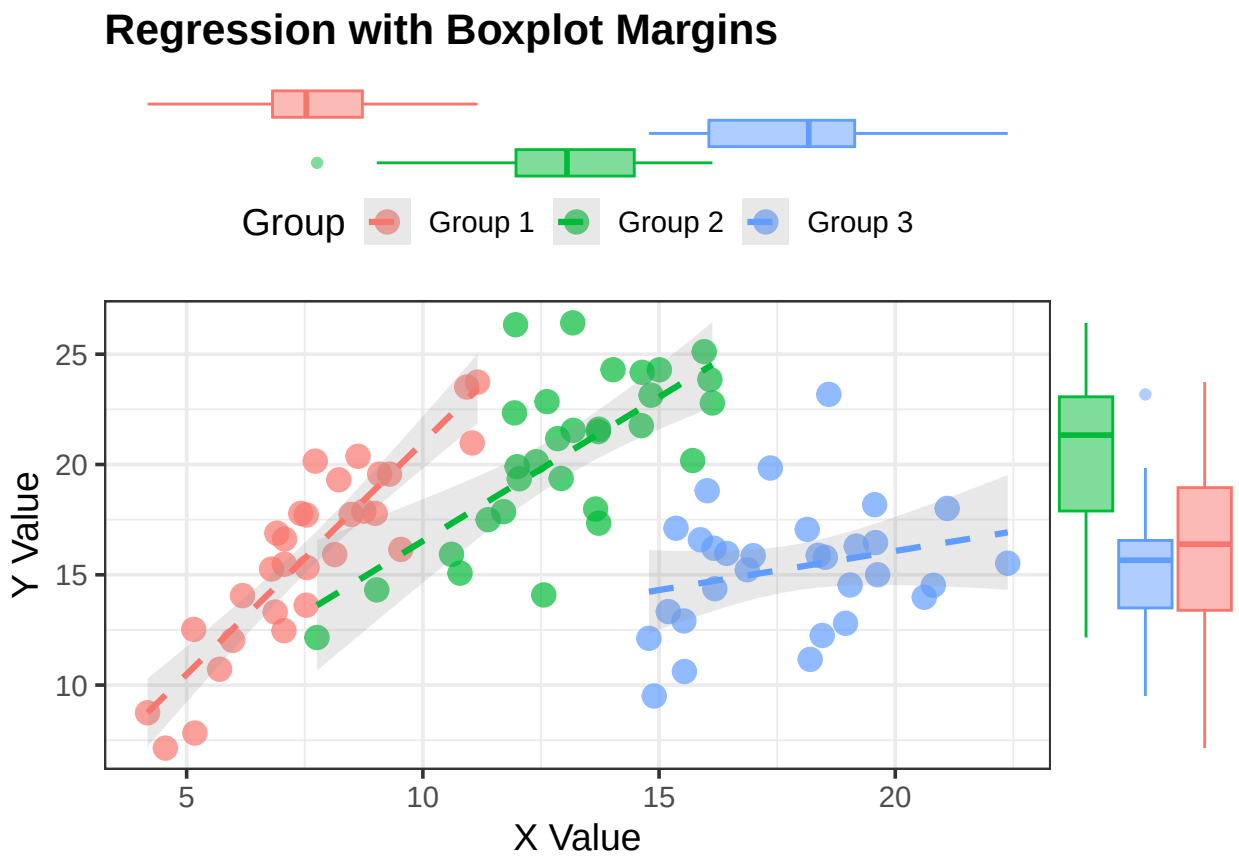
=== 2. Plot 1: Scatter plot with regression + boxplot margins ===

```
p1 <- ggplot(df, aes(X_value, Y_value, color = Group)) +
  geom_point(size = 3, alpha = 0.7, stroke = 1.1) +   # scatter points
  geom_smooth(method = "lm", se = TRUE, linetype = "dashed",
              linewidth = 1.1, alpha = 0.22) +        # regression line + CI
  labs(x = "X Value", y = "Y Value", title = "Regression with Boxplot Margins") +
  theme_bw(base_size = 14) +
  theme(
    legend.position = "top",
    plot.title = element_text(face = "bold", size = 16)
  )

# Add marginal boxplots (horizontal and vertical)
p1_box <- ggMarginal(p1, type = "boxplot", groupColour = TRUE, groupFill = TRUE)
```

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

```r
# Display the figure
p1_box
```



=== 3. Plot 2: Scatter plot with regression + density (KDE) margins ===

```r
p2 <- ggplot(df, aes(X_value, Y_value, color = Group)) +
  geom_point(size = 3, alpha = 0.7, stroke = 1.1) +   # scatter points
  geom_smooth(method = "lm", se = TRUE, linetype = "dashed",
              linewidth = 1.1, alpha = 0.22) +        # regression line + CI
  labs(x = "X Value", y = "Y Value", title = "Regression with Density Margins") +
  theme_bw(base_size = 14) +
  theme(
    legend.position = "top",
    plot.title = element_text(face = "bold", size = 16)
  )

# Add marginal density plots
p2_kde <- ggMarginal(p2, type = "density", groupColour = TRUE, groupFill = TRUE, alpha = 0.30)
```

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

```
# Display the figure
p2_kde
```