Grammar of graphics

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1 The Grammar of Graphics

The grammar of graphics is a tool that helps us explicitly and concisely define a graphic. Analogous to the grammar in English, the grammar of graphics tells us which "words" should be used to make up a "sentence". It allows users to create a complex graphic by assembling multiple independent components together. The open-sourced R package **ggplot2** deals with this issue.

ggplot2 built a mapping from the data to geometric objects drawn on a coordinate system with parameters, such as scatters with multiple colors and shapes. As an example, the code to complete a line chart can potentially include:

- A base layer with raw data;
- A layer for drawing the lines;
- A layer for specifying x, y labels and the title;
- A layer for legend settings;
- A layer for choosing background theme;
- ……

Each of the above functionalities can be modularized into one or several functions. Modules are assembled together according to the "grammar" of **ggplot2** to eventually show the graphic we desire.

Compared to the plotting functions in vanilla R, **ggplot2** is more convenient to use, and has the advantage of higher flexibility and readability.

2 Why this package can be useful

In short, our package **ggpaintr** is a package for building shiny apps that plots **ggplot2** objects.

ggpaintr is a collection of highly modularized shiny app components. It offers the possibility to build a shiny app for ggplot2 data visualization with minimum effort. The resulting shiny app can achieve broader functionality

than the ggplot GUI, while the code to accomplish this is much more readable and logical.

ggpaintr is a user-friendly package. Anyone with some knowledge of **ggplot2** can get start with building a shiny app with basic ggplot output like the one shown below, after a self-teaching of **ggpaintr** for less than 10 minutes:

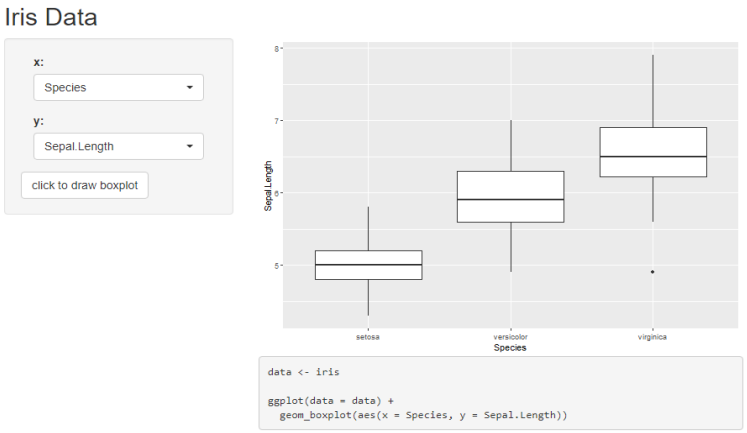

Figure 1: A simple shiny app to draw boxplots using the *iris* data

And more complex options and functionalities can be added and achieved using similar logic within a few lines of code.

Currently **ggpaintr** has implemented most of the commonly used ggplot functions and their parameter options. We expect this package to be useful in the following scenarios:

- Statistical education of graphics

  Our package offers a easier and more flexible way of building graphical shiny apps. Statistics instructors can develop interactive graphical UIs on their own with their specific demands. By transforming R's programming language into a point-and-click style, these UIs can be used to introduce different statistical graphics to fresh students in this field.

- Statistical education of R / ggplot2

  Along with the plot, shiny apps built from our package also interactively show the complete R code for generating such plot. This can be extremely useful for beginners in R or ggplot2.

- Graphical demos in presentation

  The most important characteristic of **ggpaintr** is that users can customize their app based on their demand and preference. We have implemented modules for most of the commonly used functionalities in **ggplot2**, and the grammar used in **ggpaintr** is also similar. As long as you are familiar

with ggplot2, you should not find it hard to build your own shiny app. With some extra knowledge of shiny, you also have the ability to convert it into a fancier style as a formal presentation demo.