Minilab 1d Worksheet (Optional)

Creating a Report with Live R Code

Scientists always have a lab notebook in which they write down what they are attempting and what they discover. Since every Data Scientist is also a Scientist, in this minilab, we will look at two ways of creating a notebook containing live R code: Jupyter Notebook and RMarkdown.

1. Create a Jupyter Notebook

You might have some experience using Jupyter Notebook to develop Python code. However, the Jupyter Notebook system supports over 100 programming languages including Python, R, Java, Julia, Matlab and many more.

(1) Try Jupyter with R from https://jupyter.org/try
Select the File | New Notebook | R
Please note that this website is a free service but it does timeout if you don't use it for several minutes.

Alternatively, you could install the *Anaconda Individual Edition* from https://www.anaconda.com/products/individual on your machine. Then use the following guide to set up Anaconda to be able to use R in Jupyter Notebook: https://docs.anaconda.com/anaconda/navigator/tutorials/r-lang/. Finally, start Jupyter Notebook from the Windows menu (on Windows).

(2) Here is a simple example using the *mpg* dataset. Type the R code into the cell and press the Run button.

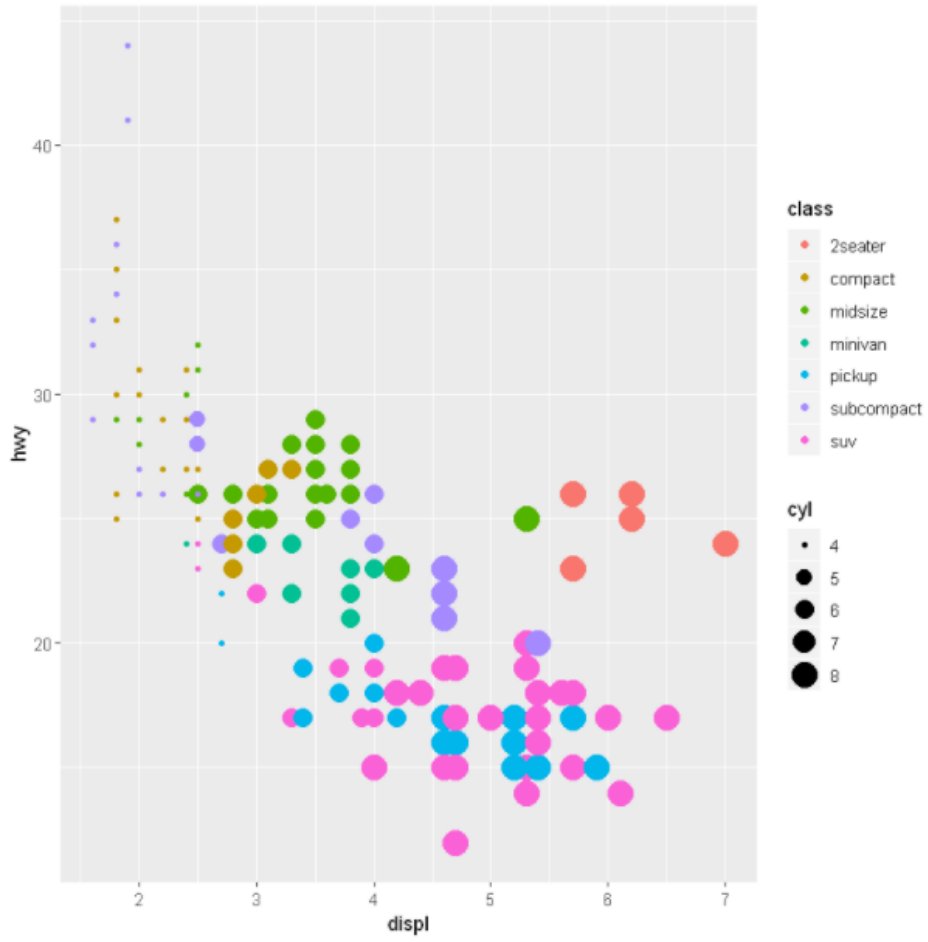
jupyter Untitled2 (unsaved changes)

Logout

File Edit View Insert Cell Kernel Help Trusted R

Run Code

In [4]:
```
library(tidyverse)
ggplot(data = mpg) +
  geom_point(mapping = aes(x=displ, y=hwy, colour=class, size=cyl))
```



In [ ]:

2. Create a notebook using RMarkdown

RMarkdown allows you to create documents that serve as a neat record of your analysis of a dataset. We want others to easily understand what we did in our analysis, otherwise nobody can be certain that you analysed your data properly.

RMarkdown uses *Markdown* syntax, a very simple "markup" language which provides methods for creating documents with headers, images, links, etc, from plain text files, while keeping the original plan text file easy to read.

(1) Within RStudio, install the R package *rmarkdown* using

```
install.packages("rmarkdown")
```

(2) Create a new RMarkdown (.Rmd) file from the RStudio File menu (File | New File | R Markdown...). A popup window will ask for a Title (call it "Lab Notebook Week 1) and Author (give your own name). Select HTML as the default output format.

(3) The newly created .Rmd file comes with basic instructions included. **Please delete all lines in the file following the "---" on Line 6.** Now save the .Rmd file to an appropriate folder, perhaps using the filename "labnotebook01.Rmd".

(4) The top of any RMarkdown script is a YAML header section enclosed by ---. This includes a title, author, date, and the file type you want to output to. Many other options are available. Your .Rmd file should look like this so far.

```
---
title: "Lab Notebook 01"
author: "Mark Johnston"
date: "20/01/2021"
output: html_document
---
```

(5) Add the following to the end of your .Rmd file and save. Note the ``` are backtick characters (usually under the esc key on a UK keyboard).

````
# Analysis of mpg dataset


```{r}
library(tidyverse)
ggplot(data = mpg) +
  geom_point(mapping = aes(x=displ, y=hwy))
```
````

(6) Click on "Knit" in the toolbar for the editor pane.

This will build and popup a webpage (HTML) which includes the R code and any output produce (both text in the console and any graphics). The snippet of R code (between the ```) needs everything necessary to execute, including any libraries used.

(7) You can add your own notes and comments to the .Rmd file. The following RMarkdown syntax can be used to change how text appears in your notebook.

```
*italic*
**bold**
This is `code` font in text.
# Header level 1
## Header level 2
* unordered list item
1. ordered list item
[Link](https://www.google.com)
$A=\pi r^2$ is an equation in latex
```

Summary

In this minilab, we have seen how to create a simple lab notebook using RMarkdown or Jupyter Notebook. Note that RMarkdown outputs to a non-interactive file format. It is also possible to create interactive R notebooks (created in a similar way).