

Tidyverse

The **tidyverse** is a powerful collection of R packages that are actually data tools for transforming and visualizing data. All packages of the tidyverse share an underlying philosophy and common APIs.

The core packages are:

- ggplot2**, which implements the grammar of graphics. You can use it to visualize your data.
- dplyr** is a grammar of data manipulation. You can use it to solve the most common data manipulation challenges.
- tidyr** helps you to create tidy data or data where each variable is in a column, each observation is a row and each value is a cell.
- readr** is a fast and friendly way to read rectangular data.
- purrr** enhances R's functional programming (FP) toolkit by providing a complete and consistent set of tools for working with functions and vectors.
- tibble** is a modern re-imaging of the data frame.
- stringr** provides a cohesive set of functions designed to make working with strings as easy as possible.
- forcats** provide a suite of useful tools that solve common problems with factors.

You can install the complete tidyverse with:

```
> install.packages("tidyverse")
```

Then, load the core tidyverse and make it available in your current R session by running:

```
> library(tidyverse)
```

Note: there are many other tidyverse packages with more specialised usage. They are not loaded automatically with library(tidyverse), so you'll need to load each one with its own call to library().

> Useful Functions

```
> tidyverse_conflicts() #Conflicts between tidyverse and other packages
> tidyverse_deps() #List all tidyverse dependencies
> tidyverse_logo() #Get tidyverse logo, using ASCII or unicode characters
> tidyverse_packages() #List all tidyverse packages
> tidyverse_update() #Update tidyverse packages
```

> Loading in the data

```
> library(datasets) #Load the datasets package
> library(gapminder) #Load the gapminder package
> attach(iris) #Attach iris data to the R search path
```

> dplyr

Filter

```
filter() allows you to select a subset of rows in a data frame.
> iris %>% #Select iris data of species "virginica"
  filter(Species=="virginica")
> iris %>% #Select iris data of species "virginica" and sepal length greater than 6.
  filter(Species=="virginica",
        Sepal.Length > 6)
```

Arrange

```
arrange() sorts the observations in a dataset in ascending or descending order based on one of its variables.
> iris %>% #Sort in ascending order of sepal length
  arrange(Sepal.Length)
> iris %>% #Sort in descending order of sepal length
  arrange(desc(Sepal.Length))

Combine multiple dplyr verbs in a row with the pipe operator %>%:
> iris %>% #Filter for species "virginica" then arrange in descending order of sepal length
  filter(Species=="virginica") %>%
  arrange(desc(Sepal.Length))
```

Mutate

```
mutate() allows you to update or create new columns of a data frame.
> iris %>% #Change Sepal.Length to be in millimeters
  mutate(Sepal.Length=Sepal.Length*10)
> iris %>% #Create a new column called SLmm
  mutate(SLmm=Sepal.Length*10)

Combine the verbs filter(), arrange(), and mutate():
> iris %>%
  filter(Species=="virginica") %>%
  mutate(SLmm=Sepal.Length*10) %>%
  arrange(desc(SLmm))
```

Summarize

```
summarize() allows you to turn many observations into a single data point.
> iris %>% #Summarize to find the median sepal length
  summarize(medianSL=median(Sepal.Length))
> iris %>% #Filter for virginica then summarize the median sepal length
  filter(Species=="virginica") %>%
  summarize(medianSL=median(Sepal.Length))

You can also summarize multiple variables at once:
> iris %>%
  filter(Species=="virginica") %>%
  summarize(medianSL=median(Sepal.Length),
            maxSL=max(Sepal.Length))

group_by() allows you to summarize within groups instead of summarizing the entire dataset:
> iris %>% #Find median and max sepal length of each species
  group_by(Species) %>%
  summarize(medianSL=median(Sepal.Length),
            maxSL=max(Sepal.Length))
> iris %>% #Find median and max petal length of each species with sepal length > 6
  filter(Sepal.Length>6) %>%
  group_by(Species) %>%
  summarize(medianPL=median(Petal.Length),
            maxPL=max(Petal.Length))
```

> ggplot2

Scatter plot

```
Scatter plots allow you to compare two variables within your data. To do this with ggplot2, you use geom_point()
> iris_small <- iris %>%
  filter(Sepal.Length > 5)
> ggplot(iris_small, aes(x=Petal.Length, #Compare petal width and length
                        y=Petal.Width)) + geom_point()
```

Additional Aesthetics

```
Color
> ggplot(iris_small, aes(x=Petal.Length,
                        y=Petal.Width,
                        color=Species)) +
  geom_point()

Size
> ggplot(iris_small, aes(x=Petal.Length,
                        y=Petal.Width,
                        color=Species,
                        size=Sepal.Length)) +
  geom_point()

Faceting
> ggplot(iris_small, aes(x=Petal.Length,
                        y=Petal.Width)) +
  geom_point()+
  facet_wrap(~Species)
```

Line Plots

```
> by_year <- gapminder %>%
  group_by(year) %>%
  summarize(medianGdpPerCap=median(gdpPerCap))
> ggplot(by_year, aes(x=year,
                    y=medianGdpPerCap))+
  geom_line()+
  expand_limits(y=0)
```

Bar Plots

```
> by_species <- iris %>%
  filter(Sepal.Length>6) %>%
  group_by(Species) %>%
  summarize(medianPL=median(Petal.Length))
> ggplot(by_species, aes(x=Species,
                        y=medianPL)) +
  geom_col()
```

Histograms

```
> ggplot(iris_small, aes(x=Petal.Length))+
  geom_histogram()
```

Box Plots

```
> ggplot(iris_small, aes(x=Species,
                        y=Sepal.Width))+
  geom_boxplot()
```