Creating Box and Whisker plots in R

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Introduction

Box and Whisker plots

The box and whisker plot is a display that is used to summarise data via a graphical representation of a five number summary of a set of data. The summary statistics are the median of the data, lower and upper quartiles and the minimum and maximum values. The box and whisker plot is an effective way to study the distribution of a set of data and the shape to determine skewness and to compare distributions between groups without making any assumptions about the underlying distribution. Extreme values at either end of the scale, small or large, are sometimes included on the display.

To illustrate box and whisker plots we will consider meteorological data collected monthly at Southampton, UK between 1950 and 1999. This data is available from `http://www.metoffice.gov.uk/` and we will compare the range of temperatures recorded in each month of the year over this period by creating box and whisker plots. The data is assumed to have been imported into **R** and stored in a data frame called `soton.df`.

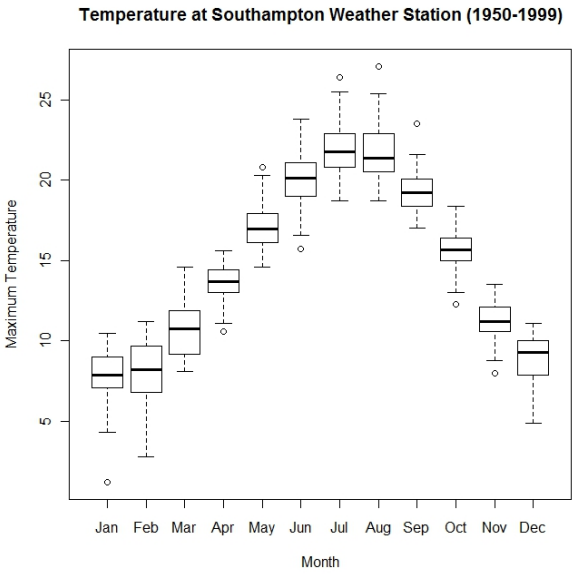
Base Graphics

The **base** graphics approach uses the function `boxplot` to create box and whisker plots. This function can be used with a formula rather than specifying two separate vectors of data and a data frame can be included in the function to point towards a source of data to be used. The horizontal and vertical axes labels are specified with the `xlab` and `ylab` arguments respectively

and the title of the plot is created using the `main` argument.

```
boxplot(Max.Temp ~ Month, data = soton.df,
ylab = "Maximum Temperature", xlab = "Month",
main = "Temperature at Southampton Weather
Station (1950-1999)")
```

The box and whisker plot is shown here:



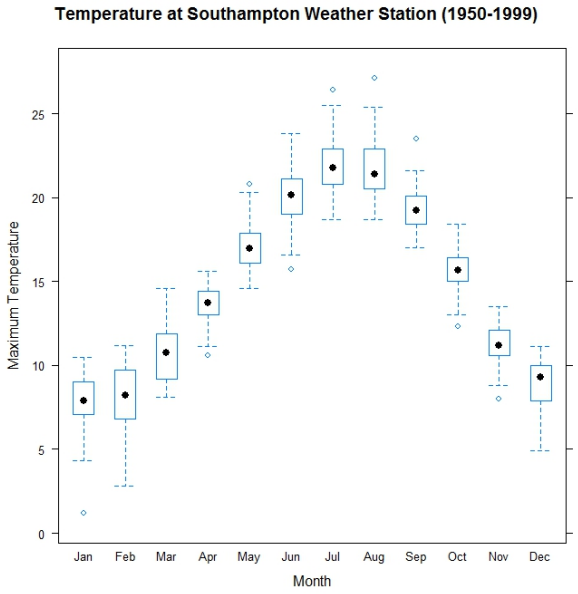
The function `boxplot` makes it easy to create a reasonable box and whisker plot.

Lattice Graphics

In the **lattice** graphics package there is a function `bwplot` to create box and whisker plots. The function call uses a formula to specify the `x` and `y` variables to use on the graph. The function call arguments are identical to the `boxplot` function in **base** graphics:

```
bwplot(Max.Temp ~ Month, data = soton.df,
ylab = "Maximum Temperature", xlab = "Month",
main = "Temperature at Southampton Weather
Station (1950-1999)")
```

The **lattice** version of the graph is shown here:



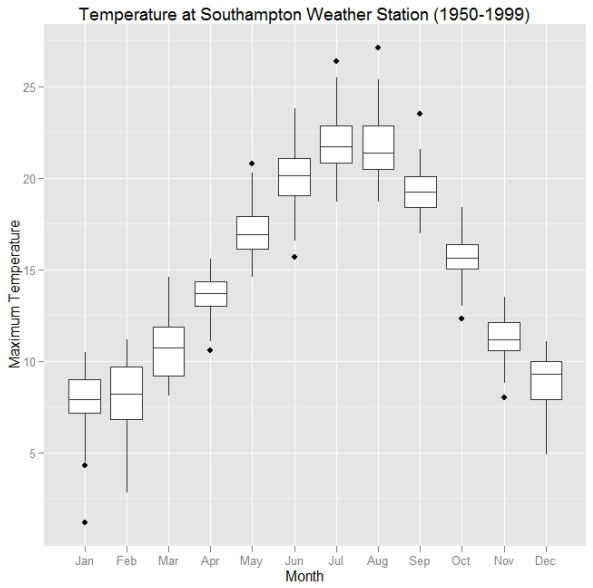
This is very similar to the box and whisker plot created by **base** graphics. The main difference is the use of a circle rather than a line to identify the location of the median of the data.

ggplot2 Graphics

In the **ggplot2** package there is a general function `ggplot` that is used to create graphs and we make use of the boxplot geom to create a box and whisker plot. The first step is to specify a data frame and then map the columns, via the `aes` argument, to the different axes or other aesthetics and the geom to specify the type of plot to create. We then add on the various axes labels and overall title to the graph.

```
ggplot(soton.df, aes(Month, Max.Temp)) +
geom_boxplot() + ylab("Maximum Temperature")
+ opts(title = "Temperature at Southampton
Weather Station (1950-1999)")
```

The **ggplot2** version of box and whisker plots is shown here:



The distinctive gray background differs from the default clear background used in the other two approaches. The boxes themselves have a cleaner look in this graph than the other two.

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