How to Make a Histogram with Basic R

Making histogram with basic R commands will be the topic of this post; You will cover the following topics in this tutorial:

What Is A Histogram?

A histogram is a visual representation of the distribution of a dataset. As such, the shape of a histogram is its most evident and informative characteristic: it allows you to easily see where a relatively large amount of the data is situated and where there is very little data to be found (Verzani 2004). In other words, you can see where the middle is in your data distribution, how close the data lie around this middle and where possible outliers are to be found. Because of all this, histograms are a great way to get to know your data!

But what does that specific shape of a histogram exactly look like?

In short, the histogram consists of an x-axis, a y-axis and various bars of different heights. The y-axis shows how frequently the values on the x-axis occur in the data, while the bars group ranges of values or continuous categories on the x-axis. The latter explains why histograms don’t have gaps between the bars.

Note that the bars of histograms are often called “bins” ; This tutorial will also use that name.

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1. Show Me The Data

Since histograms require some data to be plotted in the first place, you do well importing a dataset or using one that is built into R.

This tutorial makes use of two datasets: the built-in R dataset `AirPassengers` and a dataset named `chol`, stored into a .txt file and [available for download](http://assets.datacamp.com/blog_assets/chol.txt).

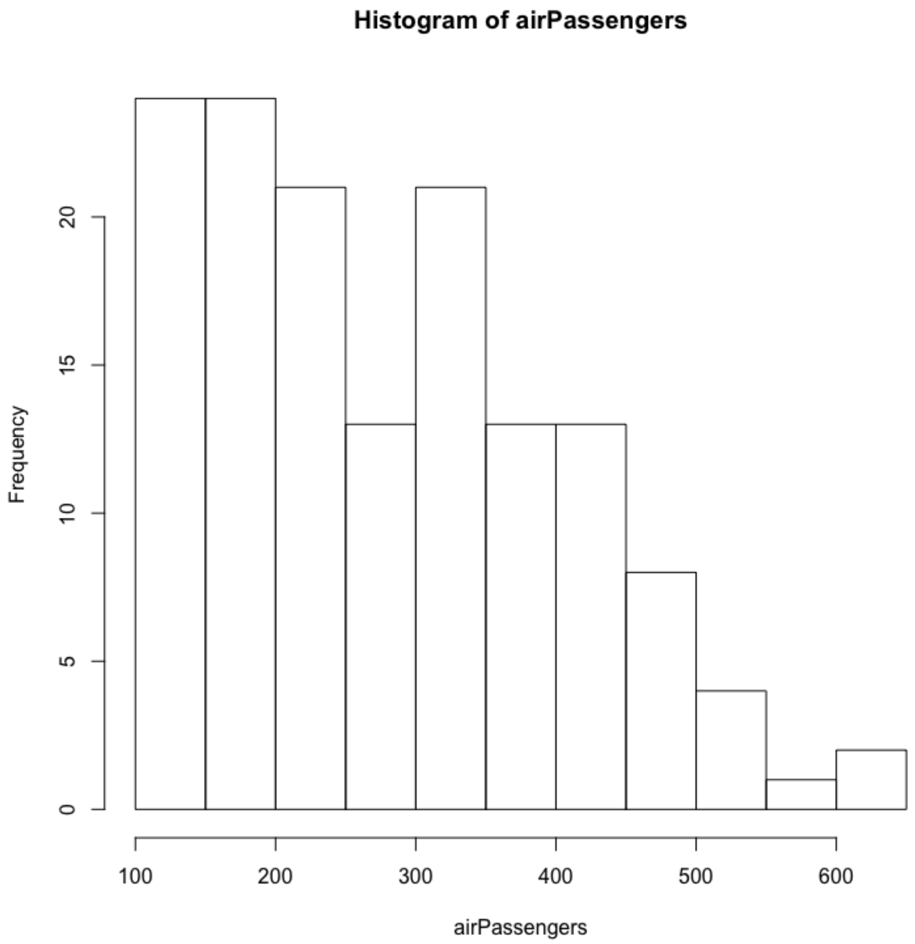
Before you can start using `chol` in your histograms, you can best read in the text file with the help of the `read.table()` function:

```
chol <- read.table(url("http://assets.datacamp.com/blog_assets/chol.txt"), header = TRUE)
```

2. Familiarize Yourself With The `Hist()` Function

You can simply make a histogram by using the `hist()` function, which computes a histogram of the given data values. You put the name of your dataset in between the parentheses of this function, like this:

Which results in the following histogram:

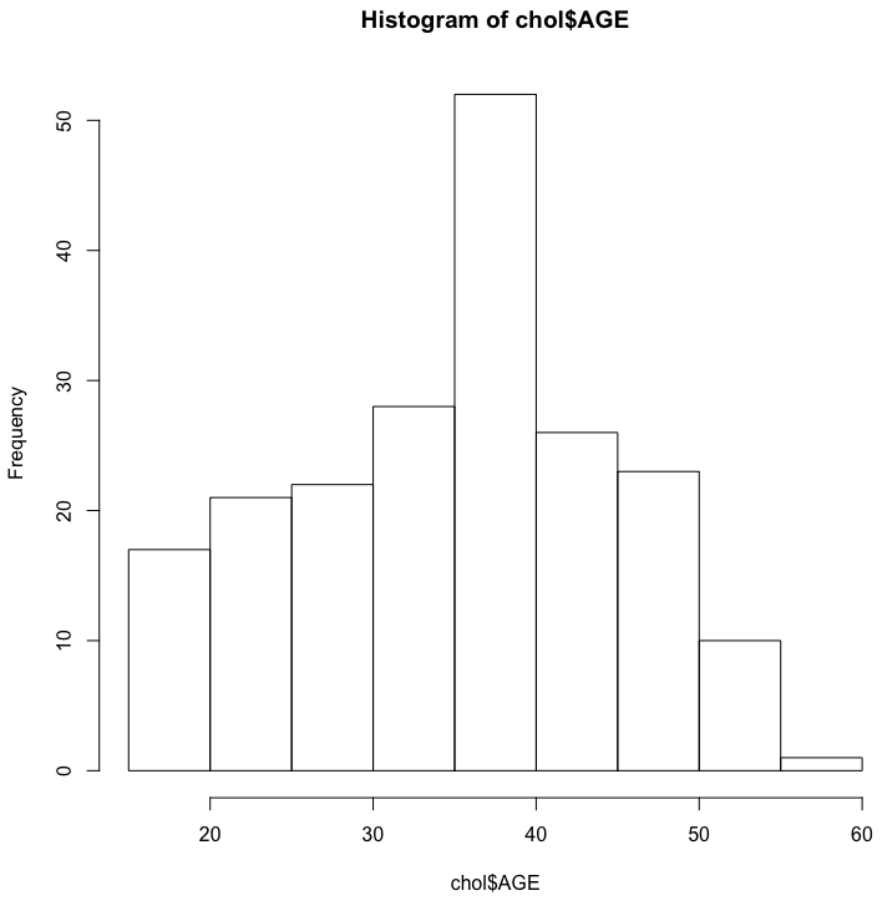


However, if you want to select only a specific column of a data frame, `chol` for example, to make a histogram, you will have to use the `hist()` function with the dataset name in combination with the `$` sign, followed by the column name:

```
hist(chol$AGE)
```

Note that the `chol` data has already been loaded in for you!

In this piece of code, you compute a histogram of the data values in the column `AGE` of the dataframe named `chol`. When you execute this line of code, you'll get the following histogram:



3. Take The `hist()` Function Up A Notch

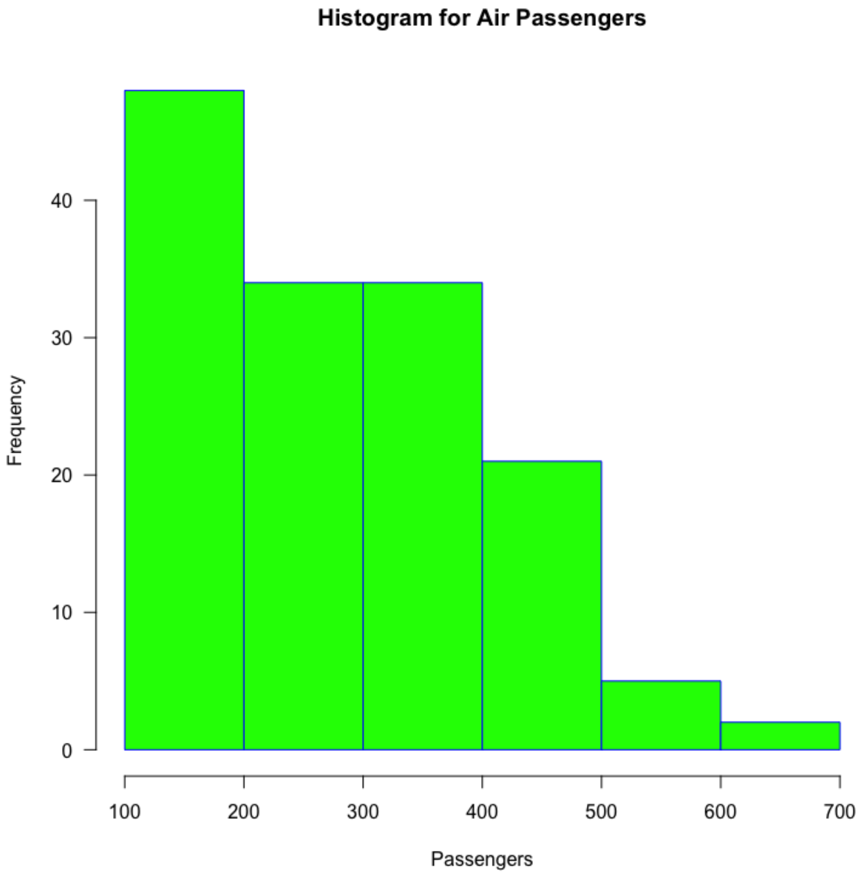
The histograms of the previous section look a bit dull, don’t they?

The default visualizations usually do not contribute much to the understanding of your histograms. You, therefore, need to take one more step to reach a better and easier understanding of your histograms. Luckily, this is not too hard: R allows for several easy and fast ways to optimize the visualization of diagrams, while still using the `hist()` function.

In order to adapt your histogram, you merely need to add more arguments to the `hist()`function, just like this:

```
hist(AirPassengers,
     main="Histogram for Air Passengers",
     xlab="Passengers",
     border="blue",
     col="green",
     xlim=c(100,700),
     las=1,
     breaks=5)
```

This code computes a histogram of the data values from the dataset `AirPassengers`, gives it “Histogram for Air Passengers” as title, labels the x-axis as “Passengers”, gives a blue border and a green color to the bins, while limiting the x-axis from `100` to `700`, rotating the values printed on the y-axis by `1` and changing the bin-width to `5`.



Do you feel slightly overwhelmed by this large string of code? No worries!

The following sections will break down the above code chunk into smaller pieces to see what each argument, such as `main`, `col`, …, does.

Names/colors

You can change the title of the histogram by adding `main` as an argument to `hist()` function. In this case, you make a histogram of the AirPassengers data set with the title “Histogram for Air Passengers”:

```
hist(AirPassengers, main="Histogram for Air Passengers")
```

If you want to adjust the label of the x-axis, add `xlab`. Similarly, you can also use `ylab` to label the y-axis:

```
hist(AirPassengers, xlab="Passengers", ylab="Frequency of
Passengers")
```

In the above, you have made a histogram of the AirPassengers data set with changed labels on the x-and y-axes.

If you want to change the colors of the default histogram, you merely add the arguments `border`or `col`. You can adjust, as the names itself kind of give away, the borders or the colors of your histogram. In the following code chunk, your histogram will have blue-bordered bins with green filling:

```
hist(AirPassengers, border="blue", col="green")
```

Tip: do not forget to put the colors and names in between `""`.

X and Y Axes

Change the range of the `x` and `y` values on the axes by adding `xlim` and `ylim` as arguments to the `hist()` function:

```
hist(AirPassengers, xlim=c(100,700), ylim=c(0,30))
```

In the code chunk above, your histogram has an x-axis that is limited to values `100` to `700`, and the y-axis is limited to values `0` to `30`.

Note that the `c()` function is used to delimit the values on the axes when you are using `xlim` and `ylim`. It takes two values: the first one is the begin value; the second is the end value.

You can rotate the labels on the y-axis by adding `las = 1` as an argument. `las` can take the following values: `0`, `1`, `2` or `3`.

According to whichever option you choose, the placement of the label will differ: if you choose 0, the label will always be parallel to the axis (which is the default); If you choose 1, the label will be put horizontally. Pick 2 if you want it to be perpendicular to the axis and 3 if you want it to be placed vertically.

```
hist(AirPassengers, las=1)
```

In this case, your histogram has the y-values projected horizontally, because you pass value `1` to the `las` argument. Try changing the amount that you pass to the `las` argument and see the effect!

Bins

You can change the bin width by adding `breaks` as an argument, together with the number of breakpoints that you want to have:

```
hist(AirPassengers, breaks=5)
```

The histogram that is the result of the line of code in the chunk above has 5 breakpoints.

If you want to have more control over the breakpoints between bins, you can enrich the breaks argument by giving it a vector of breakpoints. You can do this by using the `c()` function:

```
hist(AirPassengers, breaks=c(100, 300, 500, 700))
```

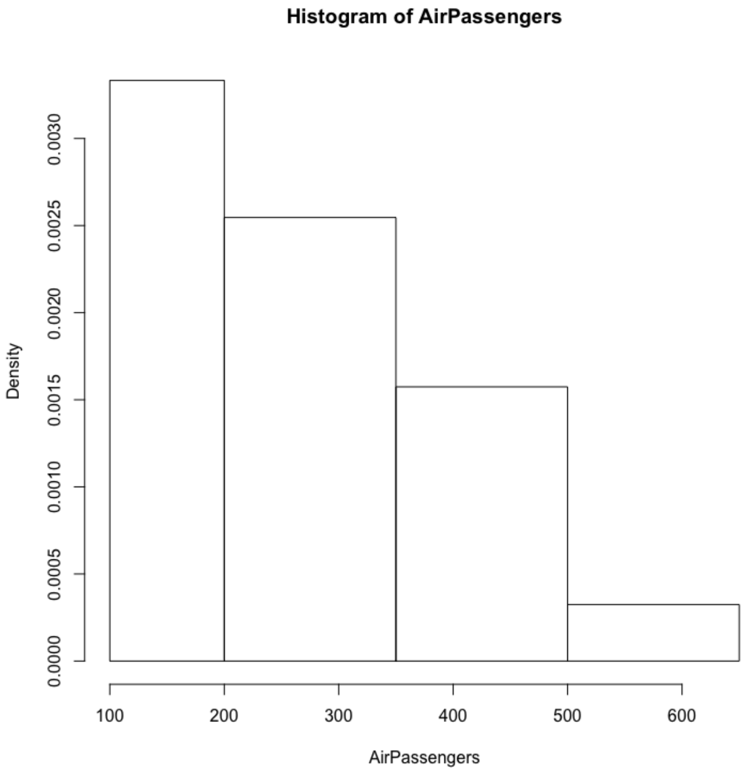
In other words, the histogram that is the result of the code above has bins such that they run from `100` to `300`, `300` to `500` and `500` to `700`.

However, the `c()` function can make your code very messy sometimes. That is why you can instead add `seq(x, y, z)`. The values of x, y, and z are determined by yourself and represent, in order of appearance, the beginning number of the x-axis, the end number of the x-axis and the interval in which these numbers appear.

Note that you can also combine the two functions:

```
hist(AirPassengers, breaks=c(100, seq(200,700, 150)))
```

This histogram starts at `100` on the x-axis and at values `200` to `700`, the bins are `150` wide. Take a look at the result of this piece of code by looking at the following image or by executing the Light chunk!



Tip: study the changes in the y-axis thoroughly when you experiment with the numbers used in the `seq` argument!

Note that the different width of the bars or bins might confuse people, and the most interesting parts of your data may find themselves to be not highlighted or even hidden when you apply this technique to your original histogram. So, just experiment with this and see what suits your purposes best!

Extra: Probability Density

The `hist()` function shows you by default the frequency of a certain bin on the y-axis. However, if you want to see how likely it is that an interval of values of the x-axis occurs, you will need a probability density rather than frequency. You thus want to ask for a histogram of proportions. You can change this by setting the `freq` argument to false or set the `prob` argument to `TRUE`:

```
hist(AirPassengers,
     main="Histogram for Air Passengers",
     xlab="Passengers",
     border="blue",
     col="green",
     xlim=c(100,700),
     las=1,
     breaks=5,
     prob = TRUE)
```

After you've called the `hist()` function to create the above probability density plot, you can subsequently add a density curve to your dataset by using the `lines()` function:

```
hist(AirPassengers,
     main="Histogram for Air Passengers",
     xlab="Passengers",
     border="blue",
     col="green",
     xlim=c(100,700),
     las=1,
     breaks=5,
     prob = TRUE)
lines(density(AirPassengers))
```

Note that this function requires you to set the `prob` argument of the histogram to `TRUE` first!