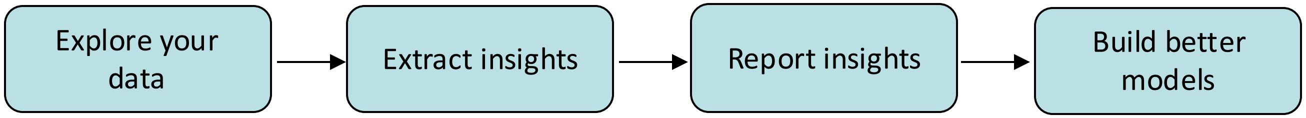
Creating plots with base R

Data visualization in R

- Data visualization is an essential part in the data analysis process:



Explore your data → Extract insights → Report insights → Build better models

- R's plotting packages enable customized graphs and more:

Packages	Description
Base R Graphics/grDevices	Built-in plotting functionalities in R base
Ggplot2	"Grammar of Graphics": build your plot from various layers
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https://wiki.python.org/moin/NumericAndScientific/Plotting

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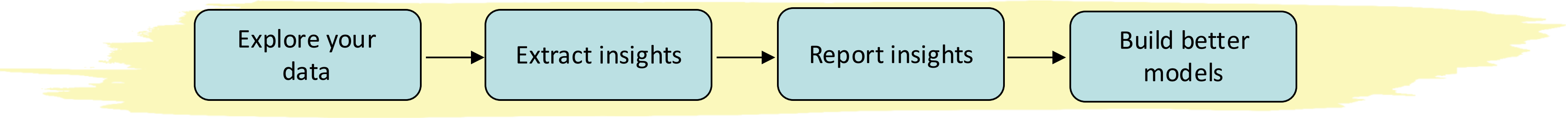

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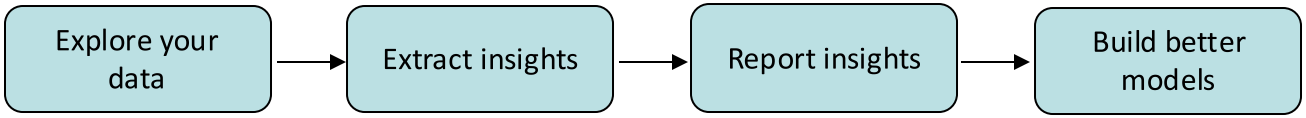

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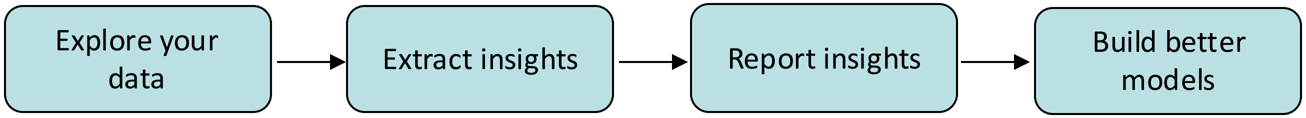

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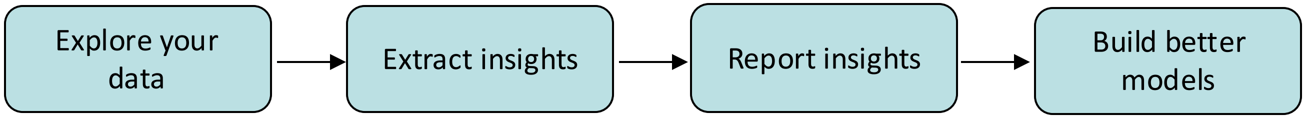

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Data visualization in R
Why use R base for plotting?

- Base graphics are usually constructed in a piecemeal manner, with each aspect of the plot handled separately through a series of function calls.
- The R base functionalities for plotting have several advantages:
  - No additional package installation necessary
  - Easy to learn and thus, quick for standard plots
- However, there are also disadvantages:
  - As it provides less flexibility than alternative plotting packages, it is difficult for advanced visualization.

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Good plots have 3 characteristics

Plots should be:

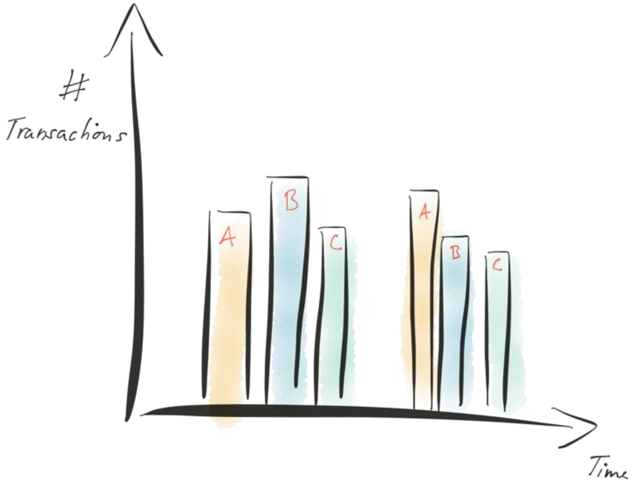
- Informative
- Easy to understand
- Visually appealing

How to plot:
Steps

1. Choose the plot type
2. Find the appropriate R function
3. Transform data
4. Create the plot
5. Improve aesthetic features of the plot
6. Save plot

Step 1: Choose the plot type
Decide the best way to convey the information

- What do you want to show?
  - A single variable?
  - The relationship between multiple variables?
- Is your data continuous or discrete?



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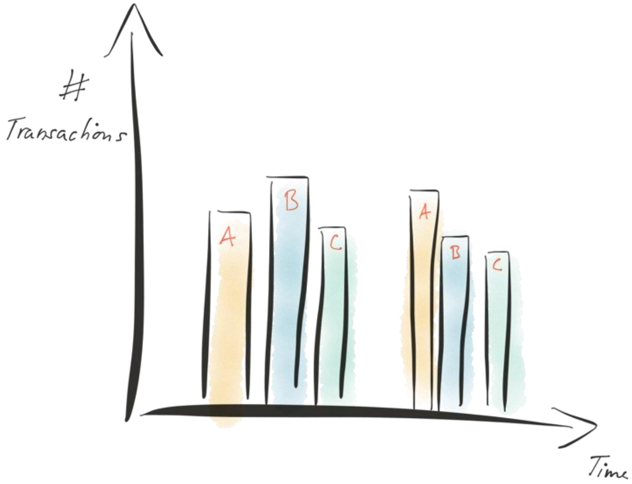
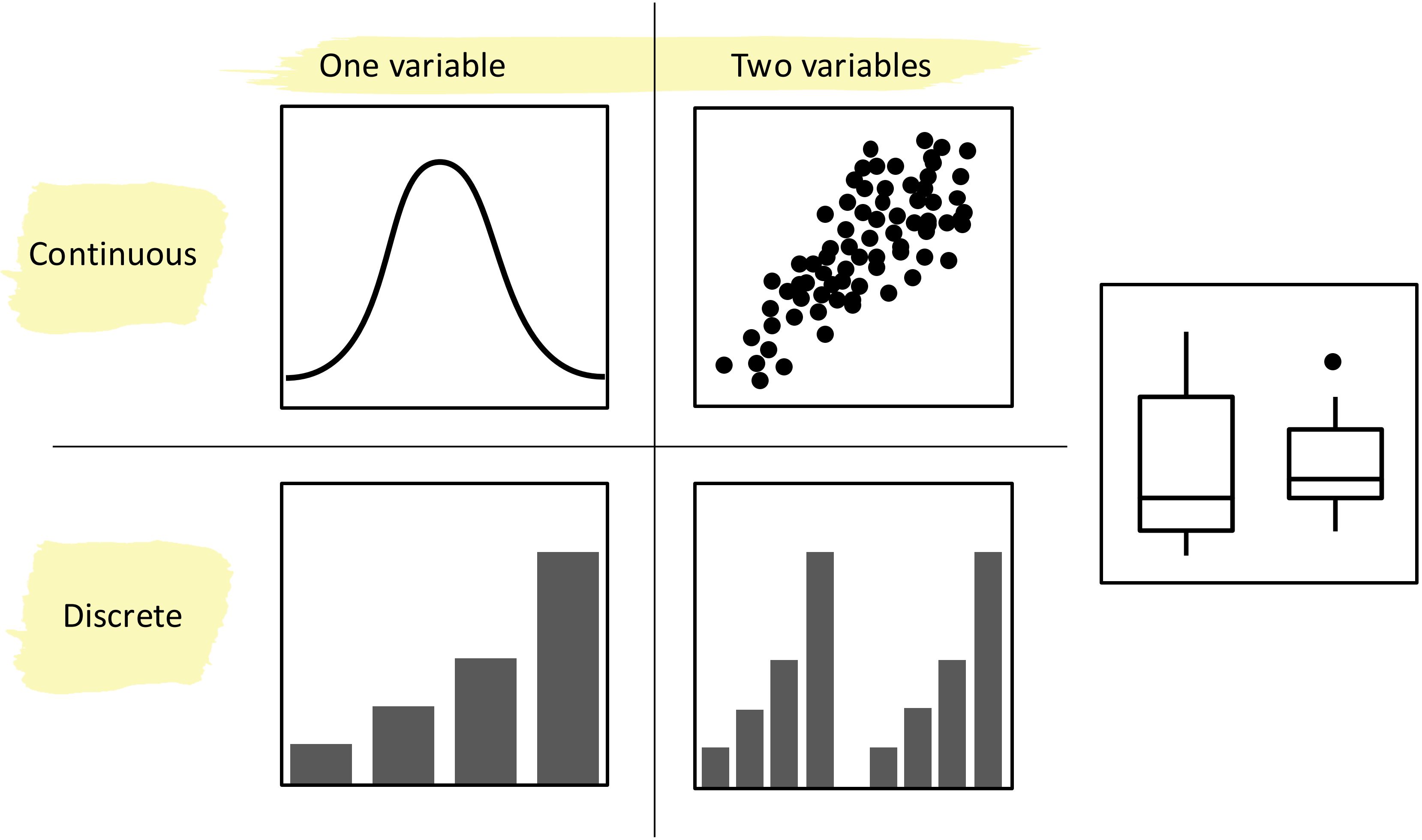


Different combinations of variables can be portrayed with different plot types



One variable

Two variables

Continuous

Discrete

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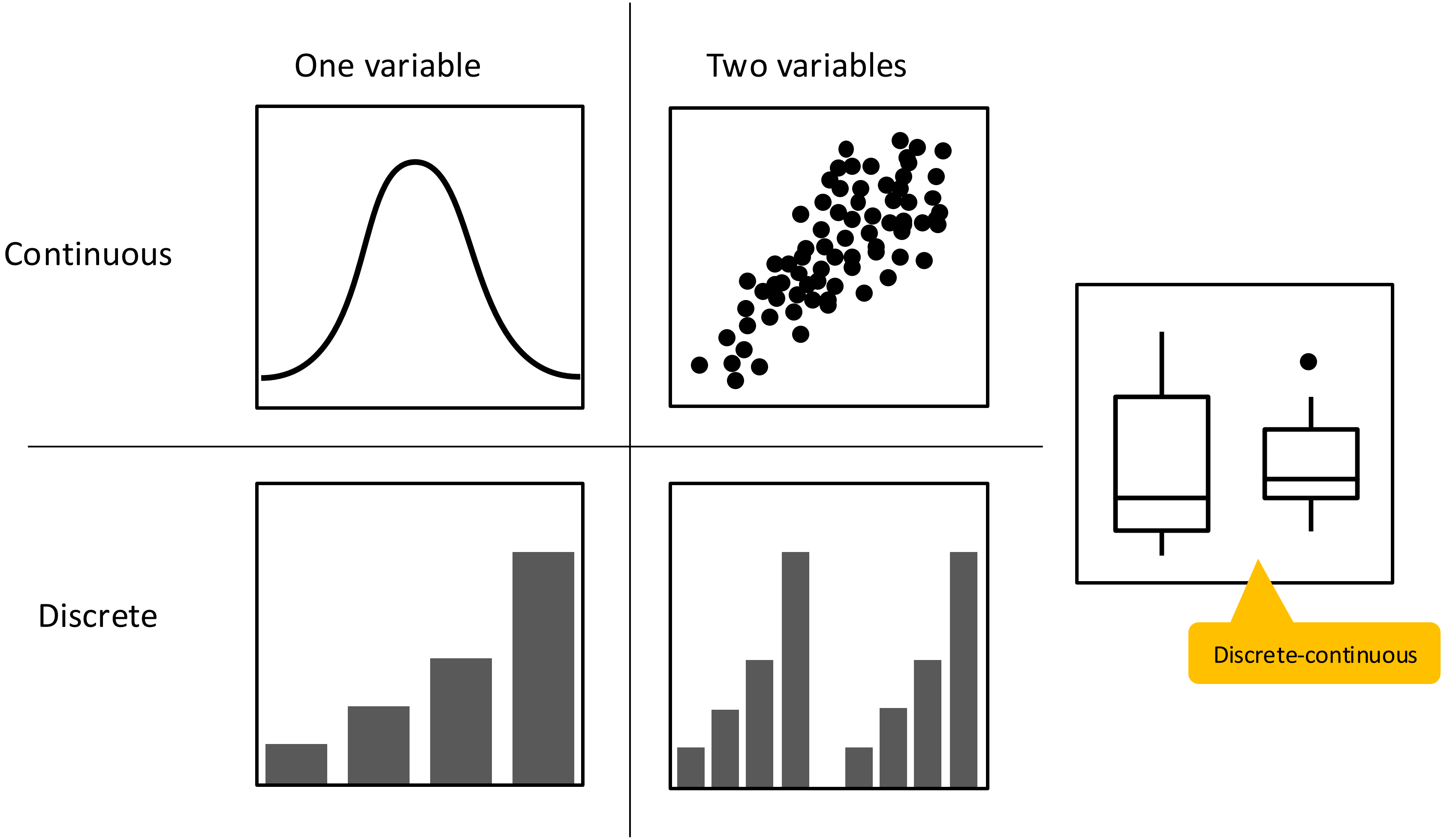


One variable

Two variables

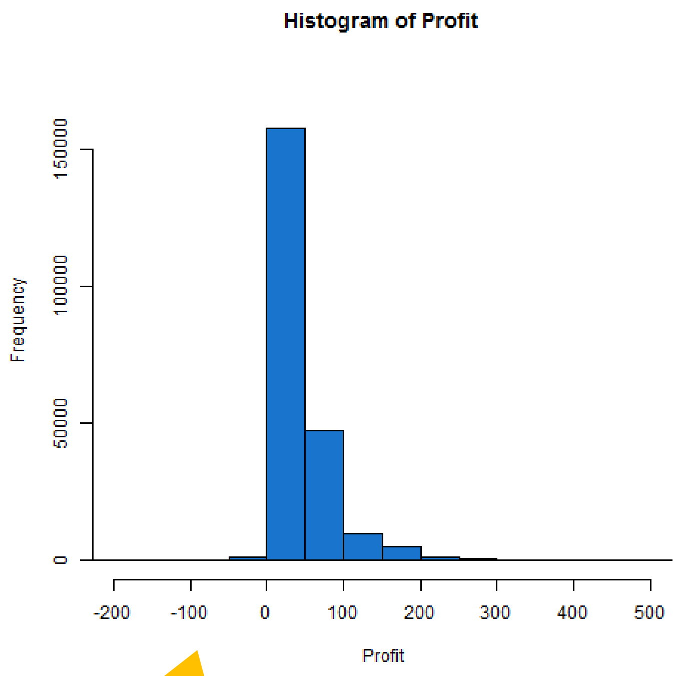
Continuous

Discrete

Discrete-continuous

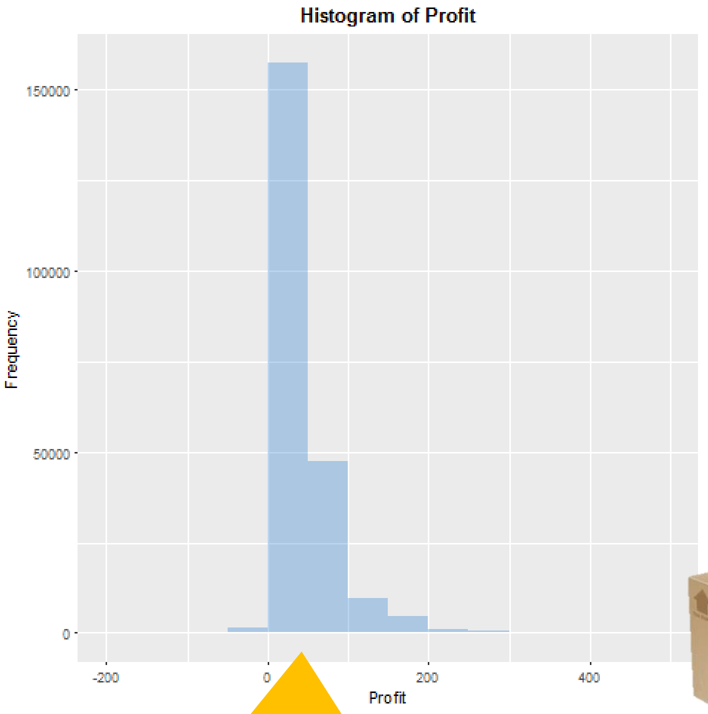
Step 2: Find the function – Base graphics and ggplot2 are the most used plotting tools

Base graphics



1 Base graphics is the built-in graphics toolbox

ggplot2 package

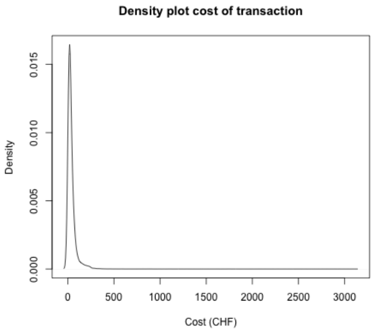


2 `ggplot2` is a very popular package that facilitates making plots by deconstructing them into layers

Step 2: Find the function – Base plots available in R

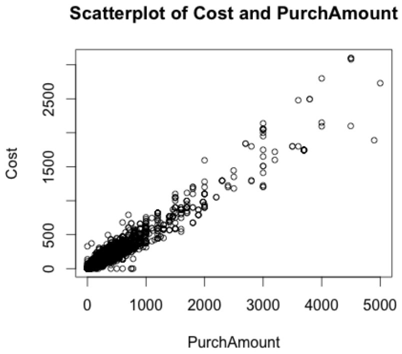
Regular plots (lines, density)

```
plot(density(x),
          ...)
```



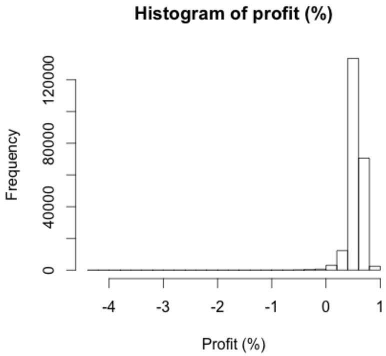
Scatterplot

```
plot(x,y,...)
```



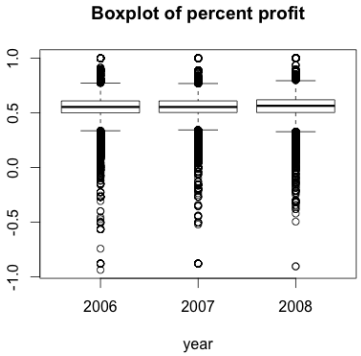
Histogram

```
hist(x,...)
```



Boxplot

```
boxplot(x,y,...)
```



… there's more!

Step 3: Transform data
Some graphs might require transformed data input

- It is quite rare that you can plot your data right away, i.e. certain **plots have requirements** on how the data should look like.
- In most cases it is **necessary to transform** your data before plotting it.
- Examples:

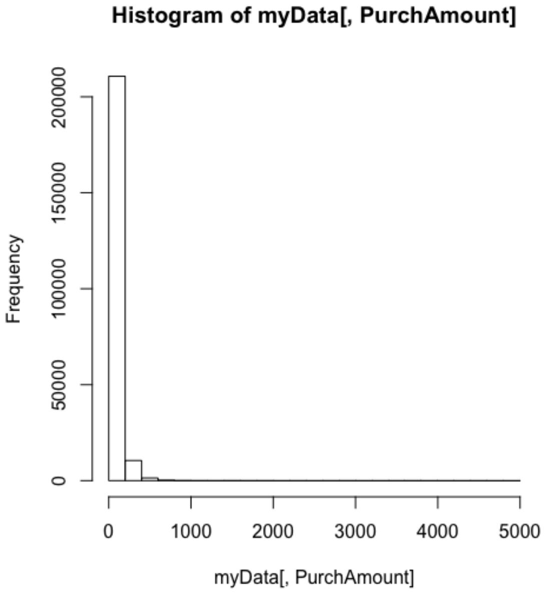
  Lecture: Basic techniques for investigating data objects

  Lecture: Advanced techniques for aggregating observations

  - Transform times and dates for aggregation of month or years
  - Group data for better overview
  - Logarithmic transformations for nicer distributions

Step 4: Create the plot (1/2)

Customer	TransDate	Quantity	PurchAmount	Cost
149332	15.11.2005	1	199.95	107.00
172951	29.08.2008	1	199.95	108.00
120621	19.10.2007	1	99.95	49.00
149236	14.11.2005	1	39.95	18.95
149236	12.06.2007	1	79.95	35.00
...	...	...	...	...



Multilayer principle:

Object to plot

```
hist(myData[, PurchAmount])
```

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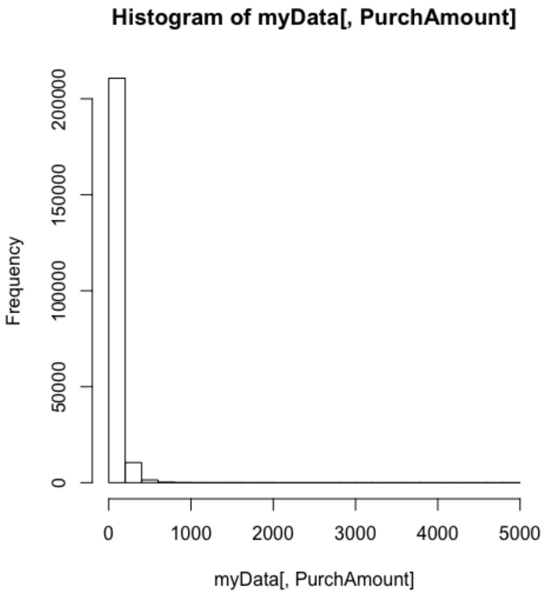

Multilayer principle:

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Step 4: Create the plot (2/2)

Customer	TransDate	Quantity	PurchAmount	Cost
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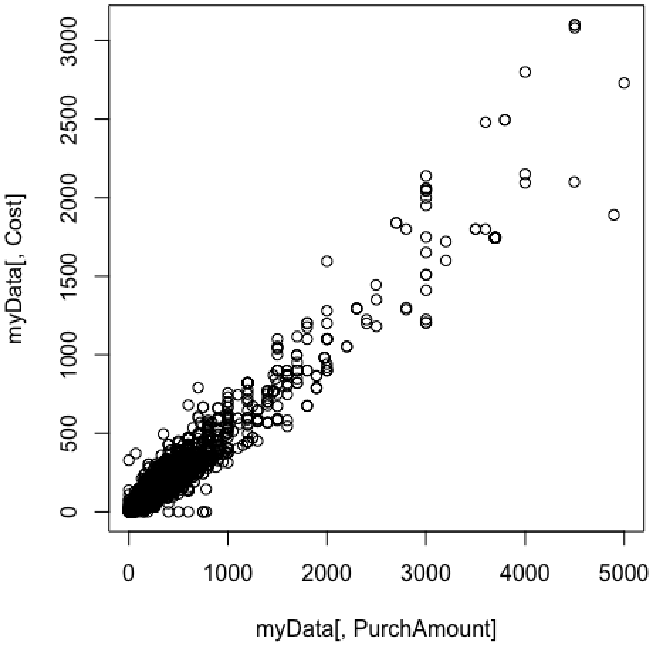

x variable 1

y variable 2

```
plot(x=myData[, PurchAmount], y=myData[, Cost])
```

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