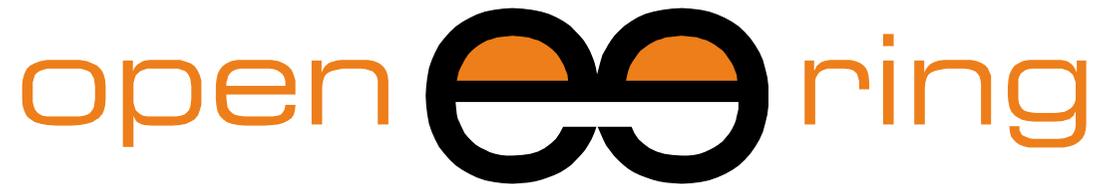


OPEN SOURCE ENGINEERING



A SCILAB PROFESSIONAL PARTNER



FIRST STEPS WITH SCILAB

The purpose of this tutorial is to get started using Scilab, by discovering the environment, the main features and some useful commands.

Level



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Step 1: The purpose of this tutorial

Are you new in Scilab and you want to learn it easily and quickly?

Are you looking for an open source MATLAB® alternative?

The purpose of this tutorial is to make the user comfortable with the Scilab software, introducing him/her the features and the potentialities of this program through the use of the main commands and windows.



Step 2: Roadmap

In this tutorial, after explaining how to install Scilab, we will give a description of the Scilab environment and start practicing with an example of data processing, using data stored in an Excel file, which is a typical format in industrial applications.

We will also learn how to get information through the use of the help and the demos.

Descriptions	Steps
How to install Scilab	3
Scilab environment	4-5
Importing data from Excel	6
Visualizing data	7-9
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Conclusions and remarks	17-18

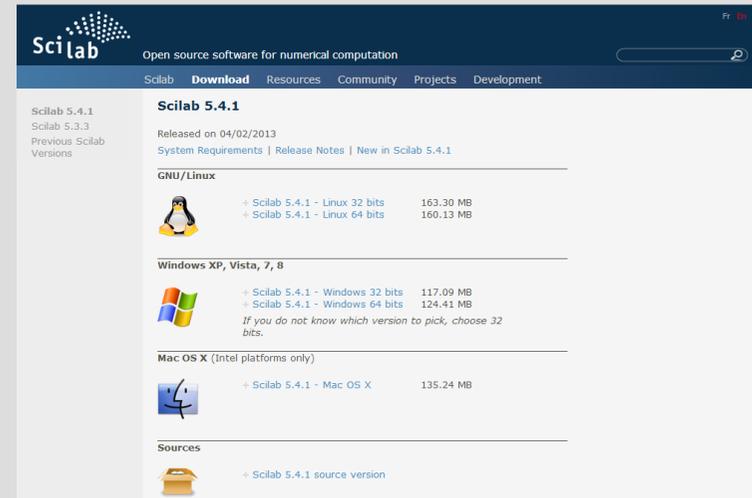
Step 3: How to install Scilab

You can download Scilab for Linux, Windows or MacOSX from the official page at <http://www.scilab.org/products/scilab/download>.

If you save the installation file on your Desktop, once the entire file is downloaded, you will find a file with extension .exe. Just double click on the icon and the installation will start. You have the option of selecting your language.

Be careful, you must have administrator privileges to install Scilab, then simply accept the license terms, select the installation folder and you're done.

When the installation ends, you will see the Scilab icon  on your desktop. Double click on the icon to start the software.



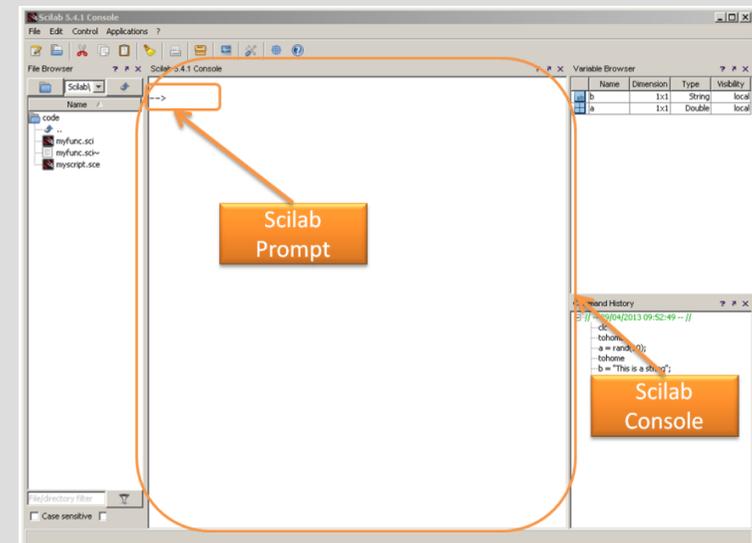
Step 4: The Scilab environment: Console and Prompt

Once the user has opened Scilab, the window shown on the right appears.

The main part is the **Scilab Console**, in which is contained the **Prompt of commands**, identified by the symbol

-->

Here the user types the commands and interacts with the environment.



(Scilab environment)

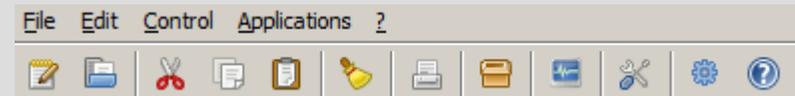
Step 5: The Scilab environment: Bars and Windows

On the top of the environment we find the **Main Menu** and, right below it, the **Toolbar**. The content of these two bars changes depending on the selected part of the environment.

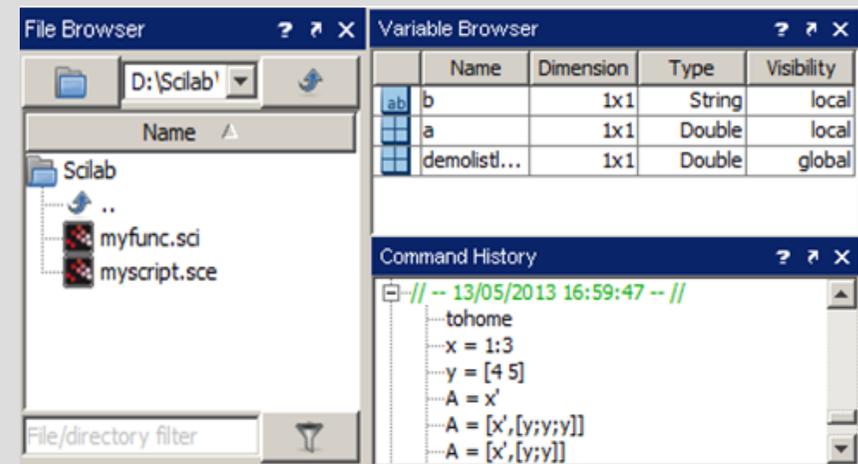
On the left we can see the **File Browser**, which specifies the current working directory and shows the files with extensions `.sci` and `.sce`, which are the Scilab files interpreted by the environment.

On the top right we have the **Variable Browser**, which allows to see all the variables in use. For example, in the figure on the right we have three variables stored: a global one and two local variables `a` and `b`, where `a` is a double and `b` a string.

Lastly, on the bottom right there is the **Command History**, which contains the commands typed so far. All commands entered in a given Scilab session get stored in this docked window, making them accessible for re-use or editing.



(Main Menu and Toolbar)

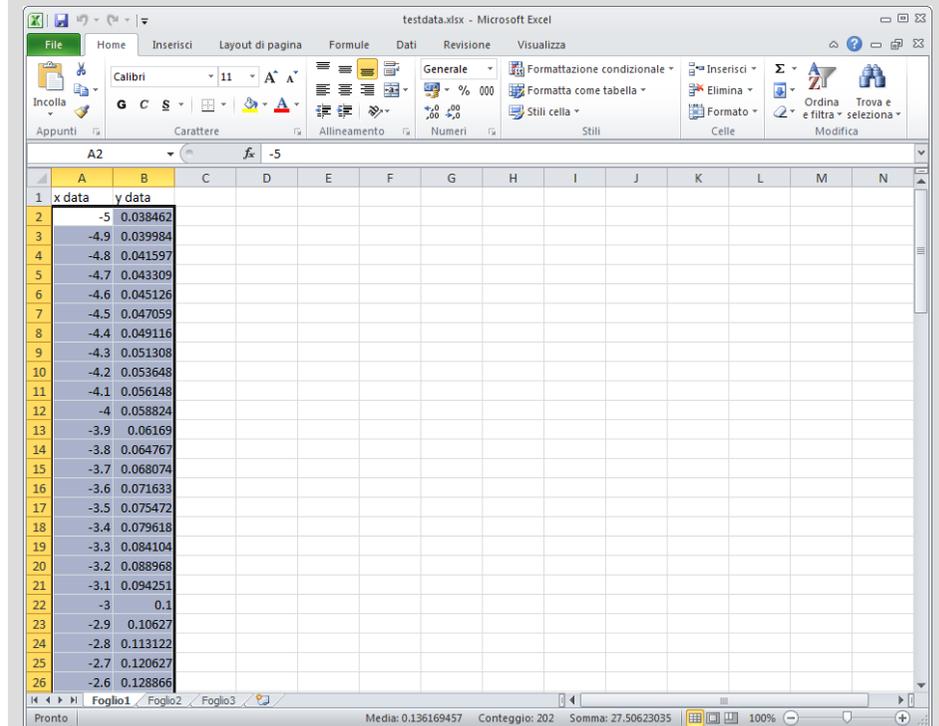


(Docked windows)

Step 6: Importing data from Excel

Our dataset is stored in the Excel file *testdata.xlsx* and it consists of two columns of data. This file is available in the Scilab Tutorial section of the Openeering website (http://www.openeering.com/scilab_tutorials), in the compressed folder *First Steps (Additional files)*.

The first step to import data in Scilab is to open the Excel file, select the cells we wish to copy and copy them to the clipboard, as shown in the figure on the right.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	x data	y data												
2	-5	0.038462												
3	-4.9	0.039984												
4	-4.8	0.041597												
5	-4.7	0.043309												
6	-4.6	0.045126												
7	-4.5	0.047059												
8	-4.4	0.049116												
9	-4.3	0.051308												
10	-4.2	0.053648												
11	-4.1	0.056148												
12	-4	0.058824												
13	-3.9	0.06169												
14	-3.8	0.064767												
15	-3.7	0.068074												
16	-3.6	0.071633												
17	-3.5	0.075472												
18	-3.4	0.079618												
19	-3.3	0.084104												
20	-3.2	0.088968												
21	-3.1	0.094251												
22	-3	0.1												
23	-2.9	0.10627												
24	-2.8	0.113122												
25	-2.7	0.120627												
26	-2.6	0.128866												

(Excel file with data stored)

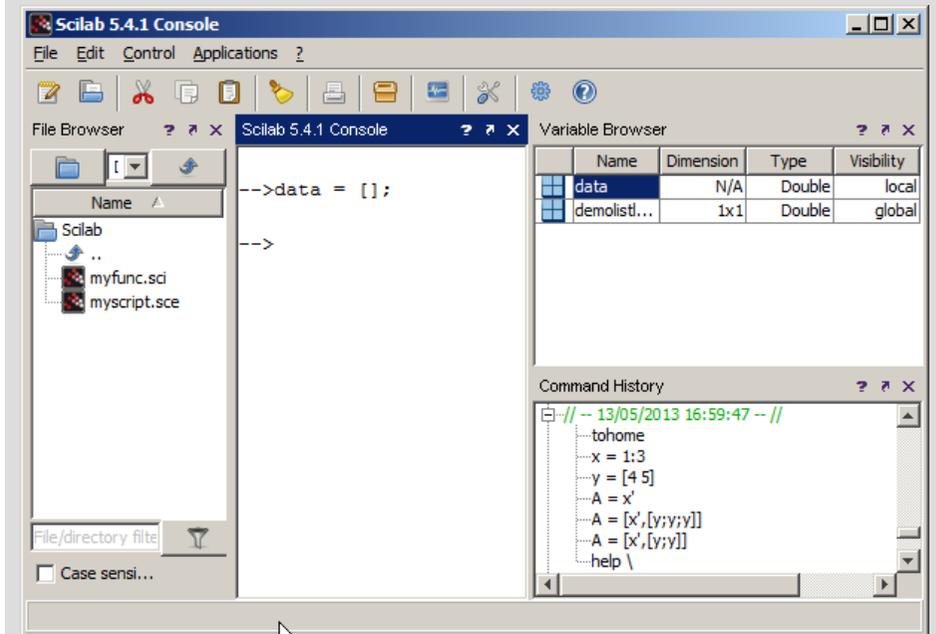
Then we create an empty variable in Scilab where to store the data, by typing in the Console the command

```
data = [];
```

Here `data` is the name of the variable we are creating. With the empty square brackets `[]` we are assigning to this new variable an empty content and the assignment is done through the symbol `=`.

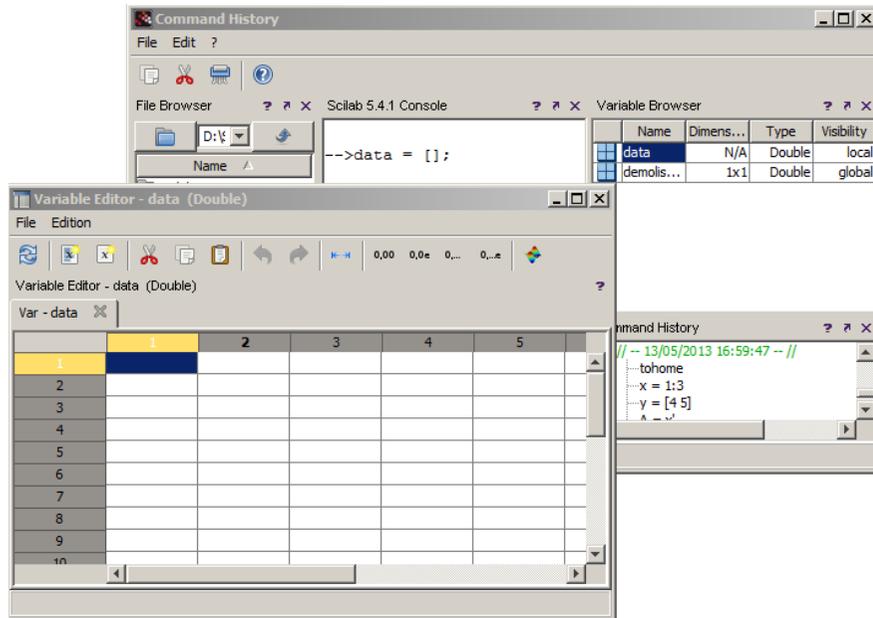
The semicolon operator suppresses the visualization of the output in the console.

After pressing Enter we will find in the Variable Browser the new variable "data" with no dimension, as shown in the figure on the right.

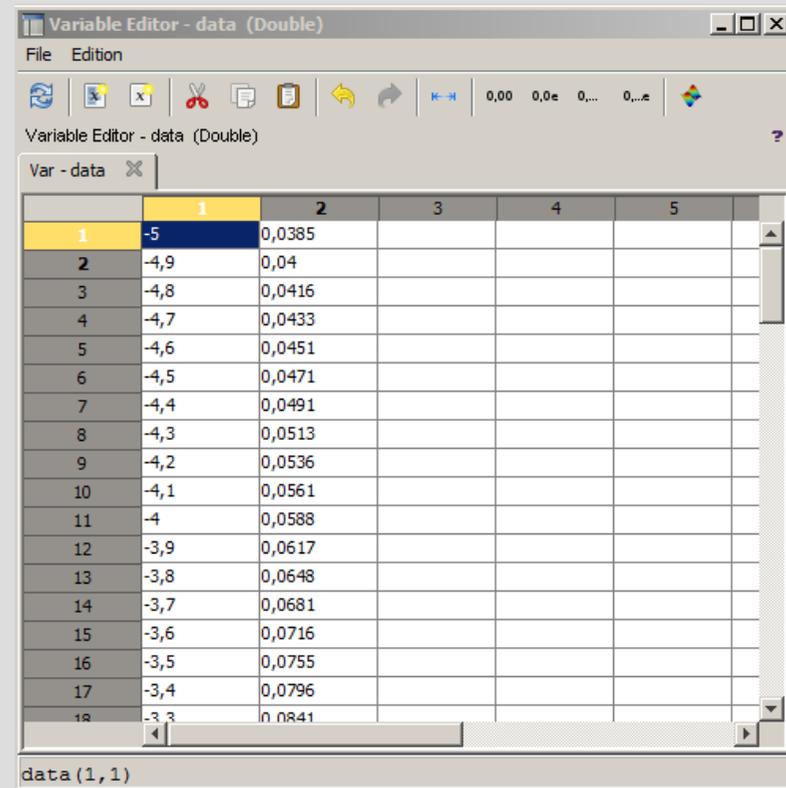


(Creating an empty variable)

Once our variable has been created, it is possible to select in the Variable Browser the cell “data” with a double click, which will open the **Variable Editor**, as shown in the figure below.



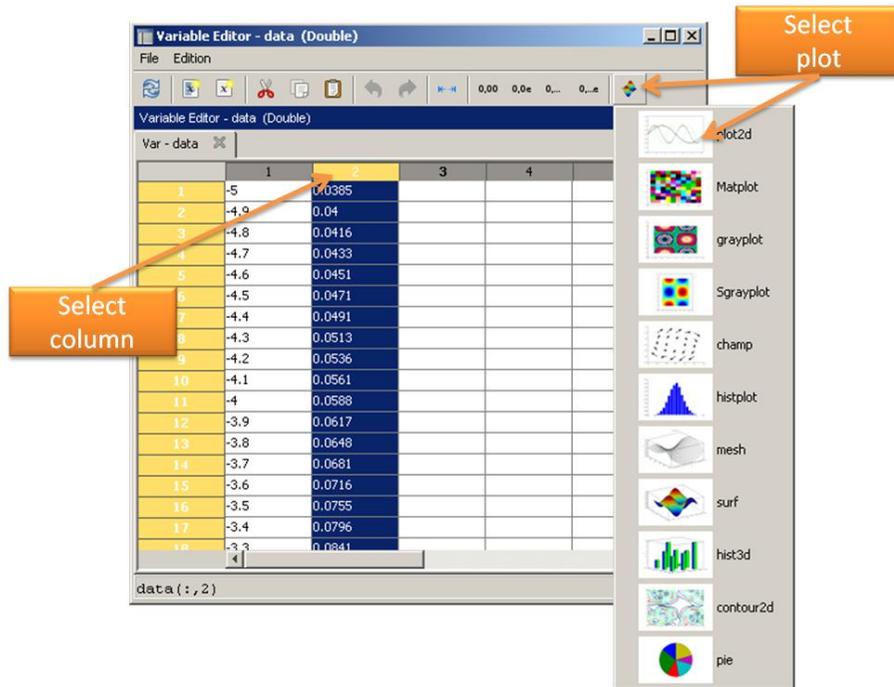
We now paste in the table given by the Variable Editor the data copied from Excel (figure on the right), making the variable “data” available in Scilab for data processing. We can paste the data from the clipboard.



(Variable Editor with data stored)

Step 7: Visualizing data

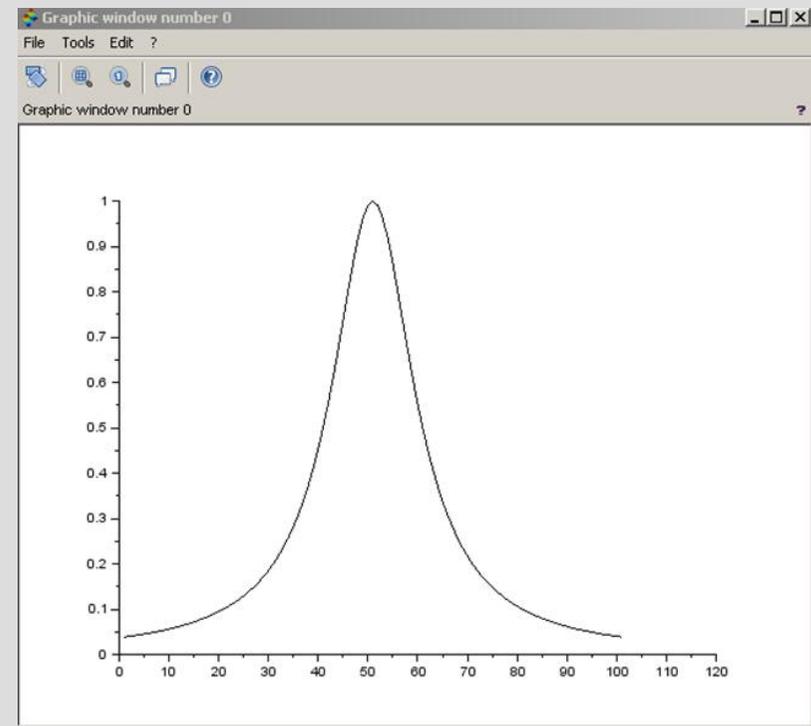
The simplest way to visualize data is to select one of the predefined charts available in the Variable Editor: the user has just to select the column of data he/she wants to plot by clicking on the column header and to choose the kind of plot from the list given by clicking on the icon .



The Variable Editor window displays a dataset with two columns. The second column is selected. The plot menu is open, showing various chart options. The 'plot2d' option is highlighted.

	1	2	3	4
1	-5	0.0385		
2	-4.9	0.04		
3	-4.8	0.0416		
4	-4.7	0.0433		
5	-4.6	0.0451		
6	-4.5	0.0471		
7	-4.4	0.0491		
8	-4.3	0.0513		
9	-4.2	0.0536		
10	-4.1	0.0561		
11	-4	0.0588		
12	-3.9	0.0617		
13	-3.8	0.0648		
14	-3.7	0.0681		
15	-3.6	0.0716		
16	-3.5	0.0755		
17	-3.4	0.0796		
18	-3.3	0.0841		

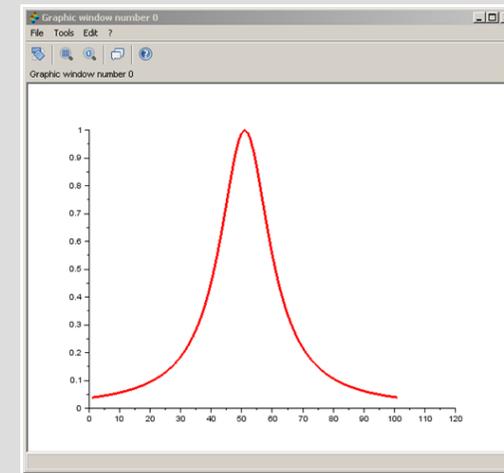
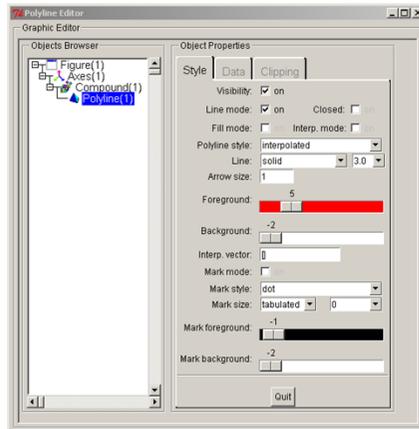
On the right we have plotted the second column of our dataset by choosing the *plot2d* chart among the options.



(Example of data plotting from the Variable Editor)

Step 8: Editing figure properties

It is possible to change properties of the figure by selecting *Figure Properties* from the *Edit* menu of the figure:



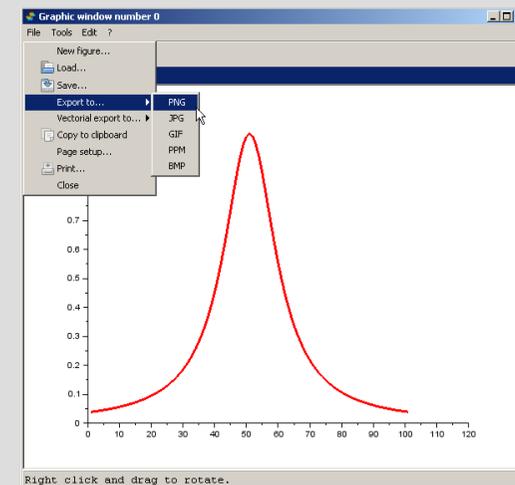
(Figure properties modified)

Step 9: Exporting data in png format

It is possible to export data in png format selecting from the menu:

File → *Export to...* → *png*

Many other exportation formats are available in the menu.



(Exporting the figure in png format)

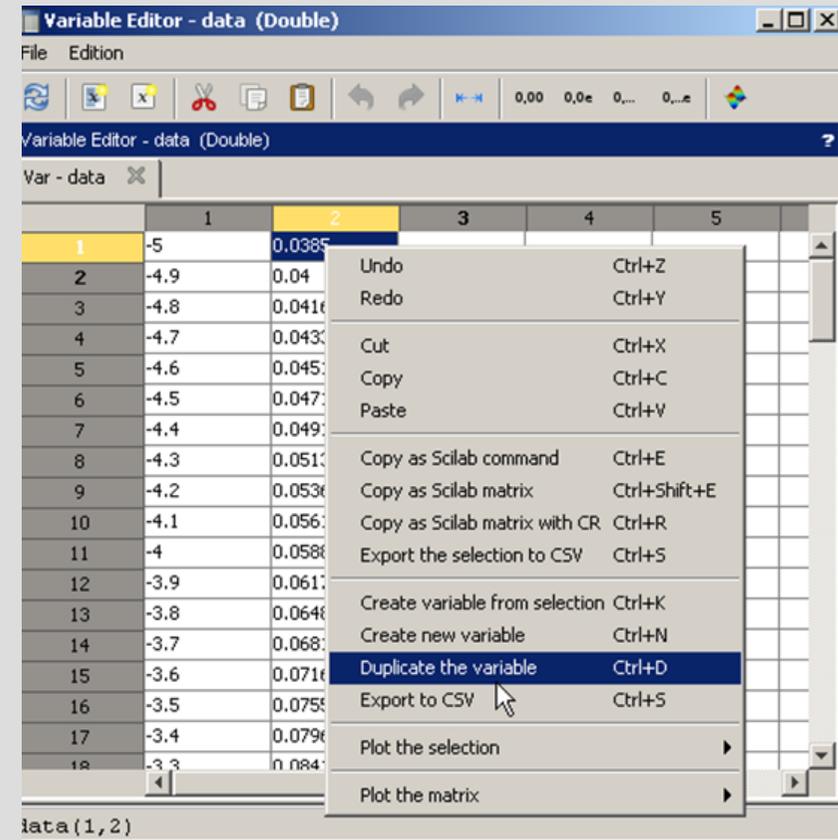
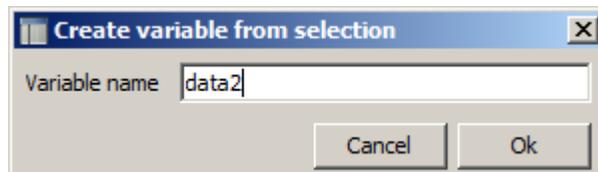
Step 10: How to duplicate a variable

We can now practice with a simple example of data processing on a single vector of data, in particular, on the second column of our dataset.

The first step is to duplicate the variable “data” to get a new variable that we can modify without losing the original dataset.

To duplicate the data from the Variable Editor we have to right click on a cell and then select *Duplicate the variable* (figure on the right).

Hence the window shown below pops up and we create a new variable with name `data2`.



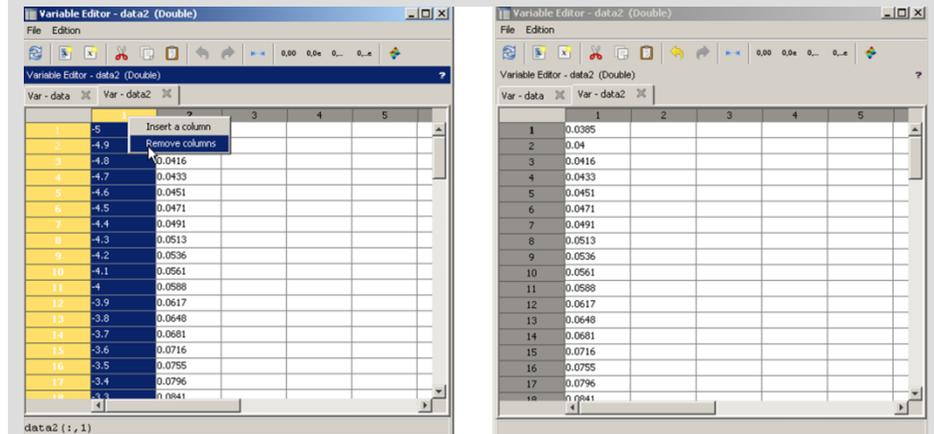
(Duplication of a variable)

Step 11: Removing a column

To remove an unused column, he/she just have to right click on the column header and select *Remove column*.

In the Variable Browser we have the possibility to check the dimensions of our two variables:

Variable Browser				
	Name	Dimension	Type	Visibility
	data2	10x1	Double	local
	data	10x2	Double	local



(Removing a column)

Step 12: Basic data analysis

We are now going to apply to the new dataset the two functions listed on the right to perform a simple data analysis.

We will compute the mean value and the standard deviation of the vector "data2".

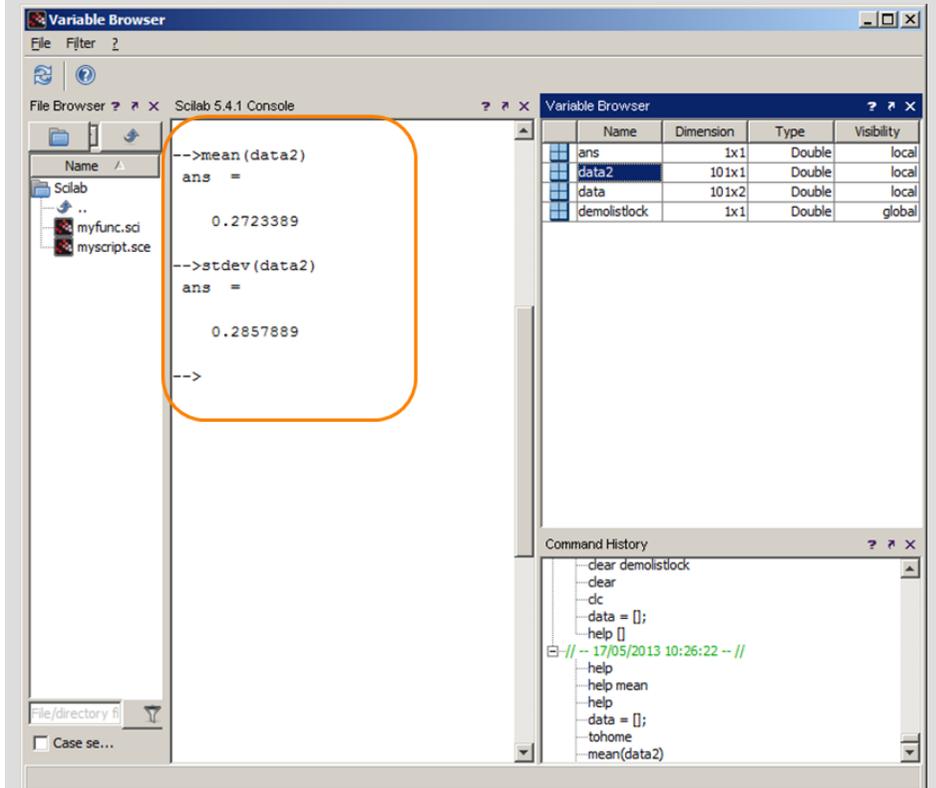
Command	Description
<code>mean</code>	Mean (row mean, column mean) of vector/matrix entries
<code>stdev</code> <code>st_deviation</code>	Standard deviation (row or column-wise) of vector/matrix entries

Step 13: Performing basic data analysis

In the figure on the right we can see the following commands typed in the console:

```
mean(data2)
stdev(data2)
```

The commands are not followed by semicolons, hence the outputs are displayed in the console and stored one by one in the variable `ans`. This variable contains the result of the last operation computed without assigning to it a variable name.



(Example of data processing)

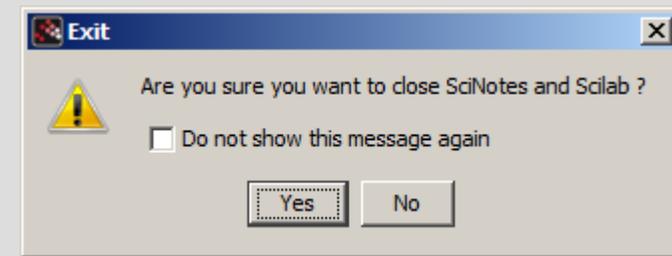
Step 14: Some useful commands

Here we present four useful commands:

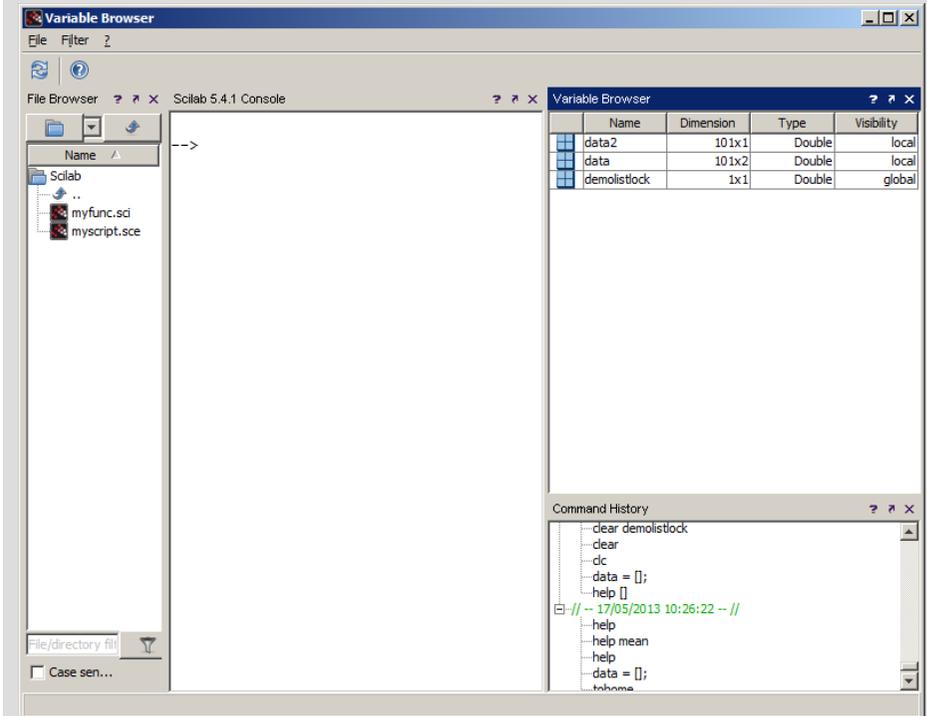
Command	Description
<code>exit</code>	Ends the current Scilab session
<code>clc</code>	Clears the Console
<code>tohome</code>	Moves the cursor to the upper-left corner of the Command Window and clears the screen
<code>help</code>	On-line help command

Please notice that clearing the console (`clc`) does not mean clearing the data, so after we can still find in the Variable Browser all the variables created so far.

The command `tohome` is really similar, but scrolling the mouse in the Console we can see the previous typed commands.



(Warning when exiting Scilab)



(Environment after using the `clc` command)

Step 15: How to obtain online help

There are several ways to get the online help:

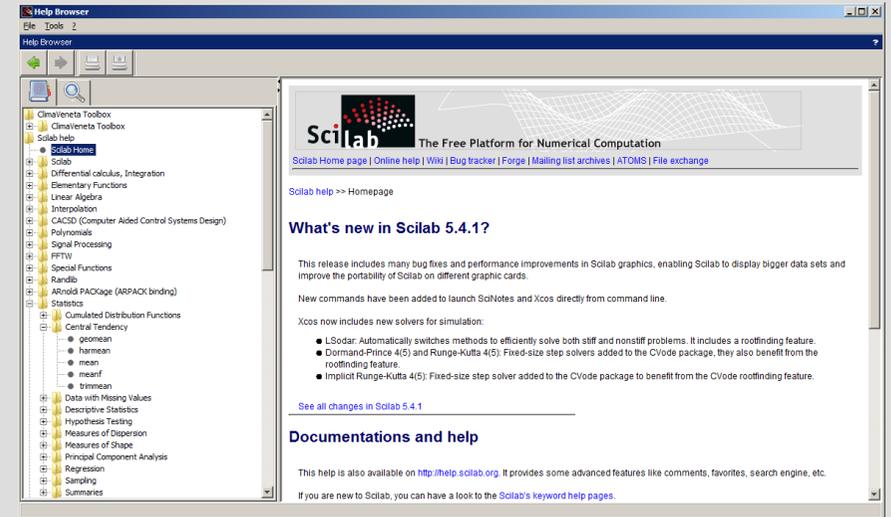
- Typing the command `help` in the Console
- Selecting from the Menu: `? → Scilab help`
- Pressing `F1` on the keyboard

We might want to get directly the specialized help of a given function:

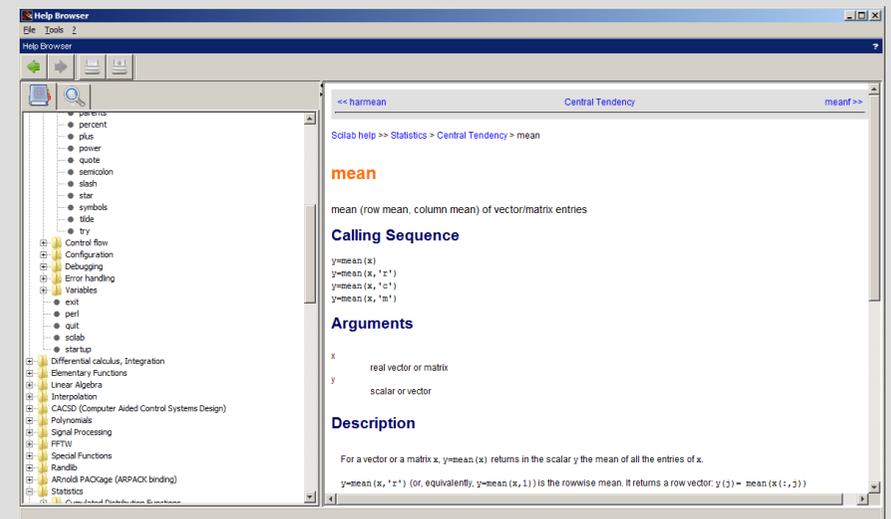
- We have to type in the Console the command `help` followed by the name of the function

For example, to get the specialized help of the mean function we type

```
help mean
```



(Scilab Help)



(Contextual help)

Step 17: Concluding remarks and References

In this tutorial we have introduced to the user the features and the potentialities of the Scilab software through the use of the main commands and windows.

On the right-hand column you may find a list of references for further studies.

1. Scilab Web Page: www.scilab.org.
2. Openeering: www.openeering.com.
3. Scilab download page:
<http://www.scilab.org/products/scilab/download>.

Step 18: Software content

To report a bug or suggest some improvement please contact Openeering team at the web site www.openeering.com.

Thank you for your attention,

Anna Bassi, Manolo Venturin

```
-----  
FIRST STEPS WITH SCILAB  
-----  
  
-----  
Main directory  
-----  
testdata.xlsx           : Excel file with the test dataset
```