MatLab Intro

2011

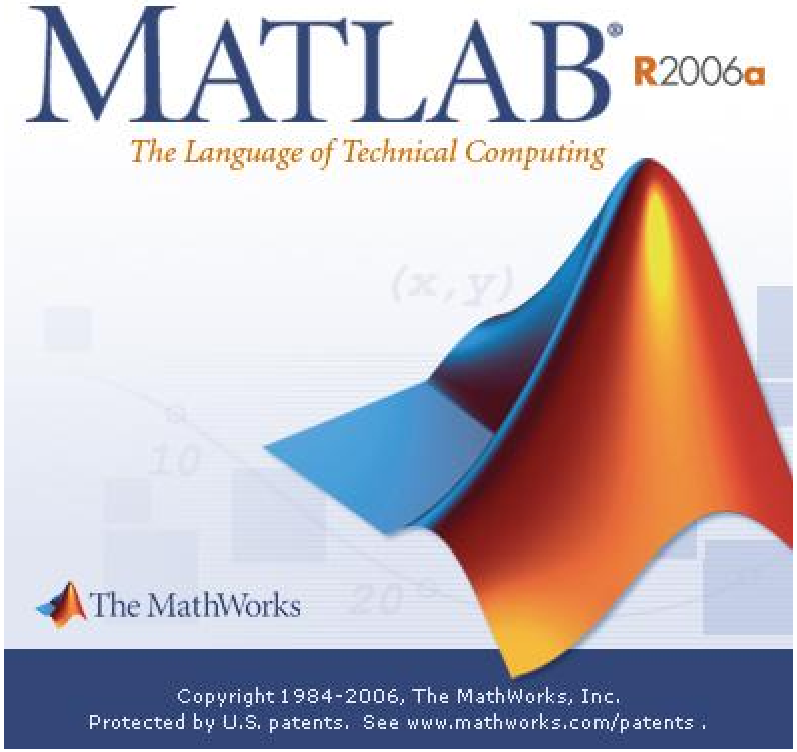
MIEET 1º ano

UAlg
UNIVERSIDADE DO ALGARVE

30 anos
1979 | 2009

Peter Stallinga UAlg 2011

MatLab



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MatLab = Matrix Laboratory

Functional programming language. Type of **declarative** programming: Tell computer **what** you want to know

Compare: **imperative** programming language: Tell computer **how** it should be calculated

MatLab example

Problem:

$$x + 2y + z = -1$$
$$2x - y - z = 3$$
$$3x - y + z = 4$$

x, y, z?

MatLab:

```
A = [
   1, 2, 1;
   2,-1,-1;
   3,-1, 1
];

B = [
   -1;
   3;
   4
];

A\B
```

```
Ans =

    1.0000e+00
   -1.0000e+00
   -1.0598e-16
```

$x = 1$, $y = -1$, $z = 0$

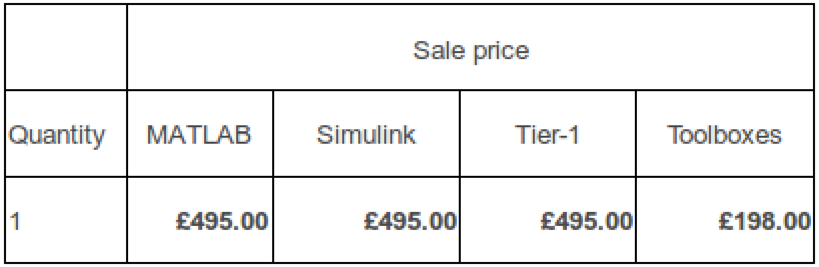
MatLab

Advantages:

Powerful
Engineering standard (MI**E**ET)

Disadvantages:

Interpreted (slow vs. compiled)
Non intuitive syntax
Expensive



	Sale price			
Quantity	MATLAB	Simulink	Tier-1	Toolboxes
1	**£495.00**	**£495.00**	**£495.00**	**£198.00**

Octave

GNU Octave. Gratis!

Octave is very similar (but not equal) to MatLab. However

Open Source. Available for Linux (Ubuntu) and Windows. In lectures only support for Ubuntu and Octave will be given

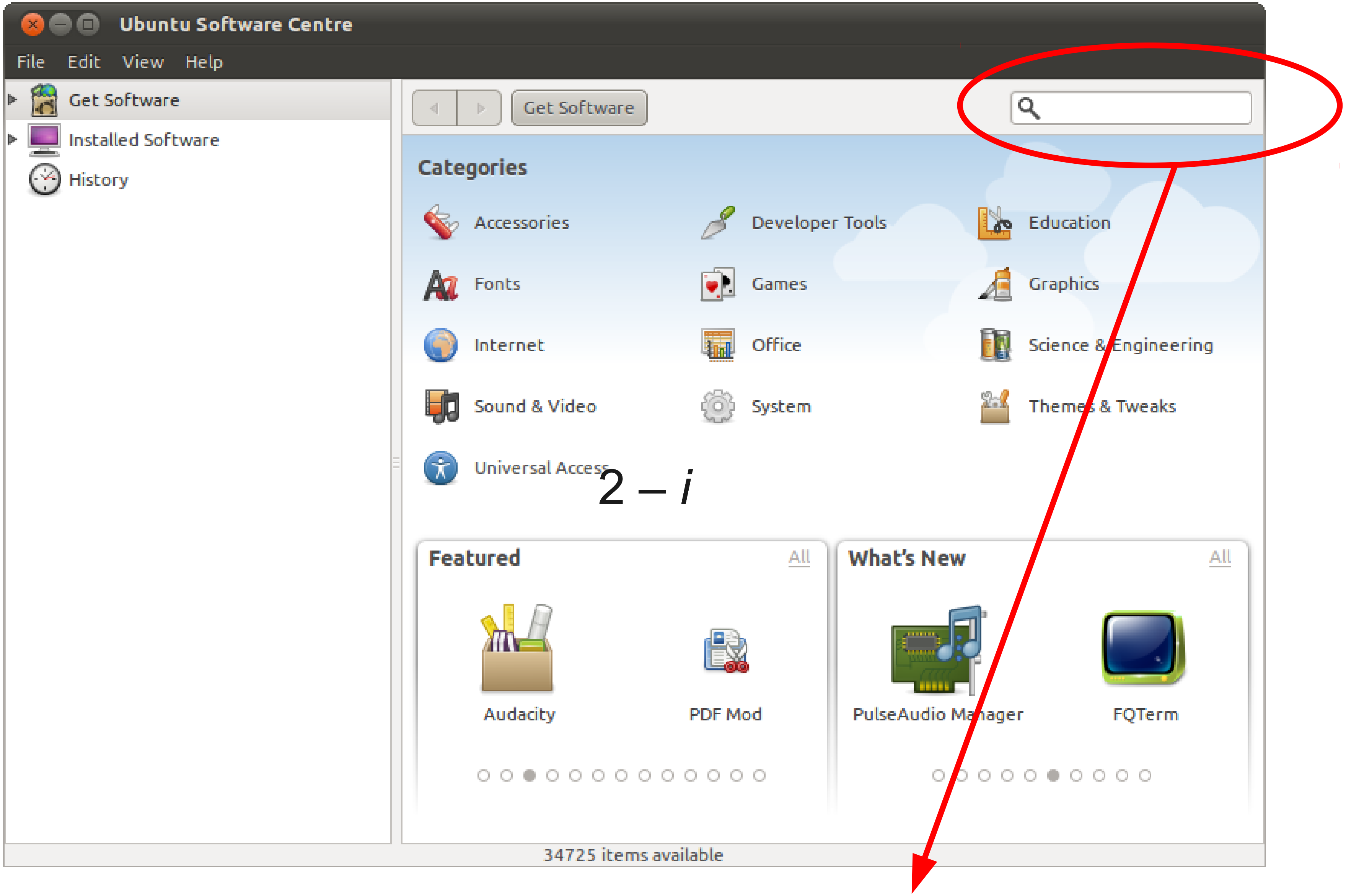
Gratis. **For free**. Zero cost. Including manuals updates and everything.

Ubuntu

Get an installation CD (or USB disk) here:
http://www.ubuntu.com/

(It is advised to use 'classic desktop' to make it more Windows-like)

Octave in Ubuntu



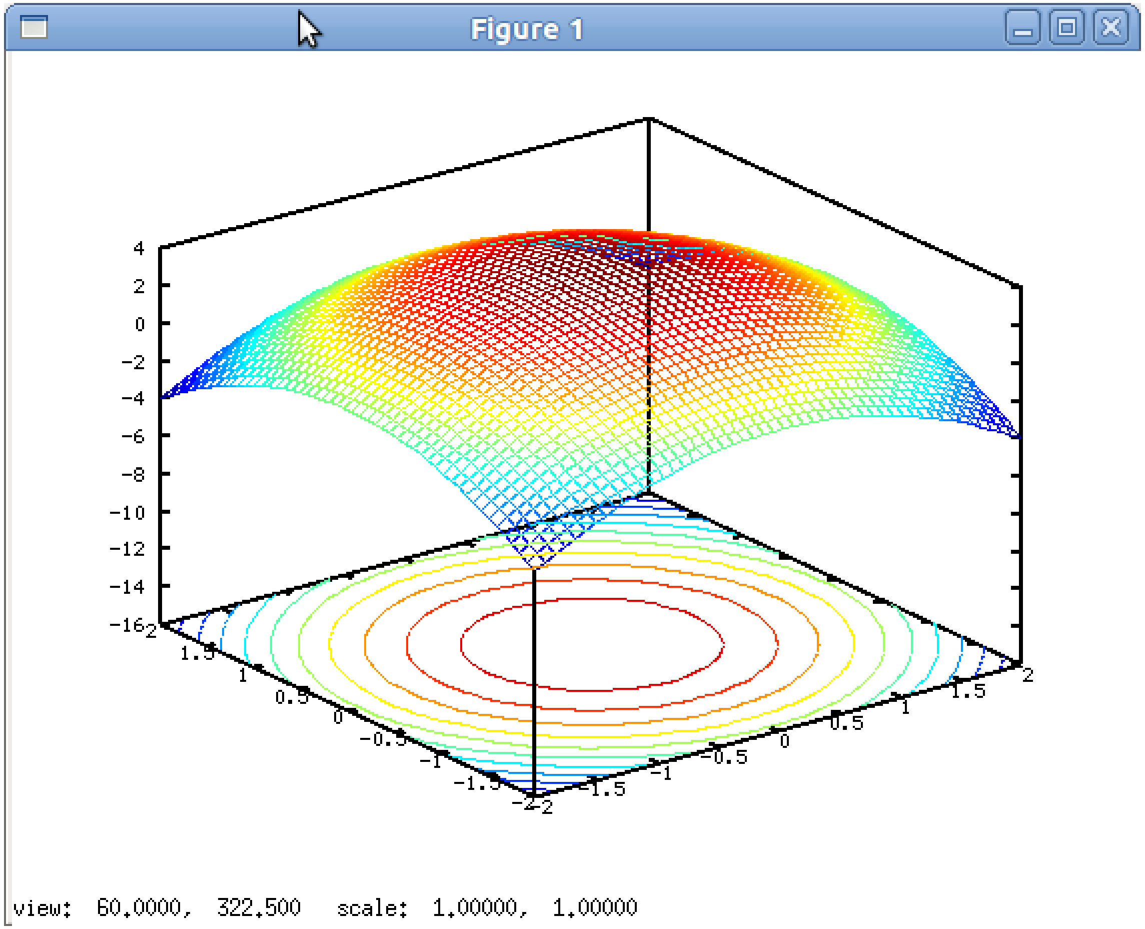
Go to Ubuntu Software Centre and type “QtOctave”

(Windows addicts can get GUI Octave at http://www.download.com)

Example

Open a terminal. Type 'octave' and then

```
x=linspace(-2,2,50);
y=linspace(-2,2,50);
[xx,yy]=meshgrid(x,y);
meshc(xx,yy,4-(xx.^2+yy.^2))
```



```
view:  60.0000,  322.500   scale:  1.00000,  1.00000
```

Example 2

To get next weeks Euromillions numbers and stars type*:

```
1+floor(49*rand(5,1))
1+floor(9*rand(2,1))
```

```
octave:17> 1+floor(49*rand(5,1))
ans =

   14
   39
    8
   33
   30

octave:18> 1+floor(9*rand(2,1))
ans =

   7
   1

octave:19>
```

*: Don't forget to give 50% of your winnings to the professor who taught you this :-)

Variables

We have changed the state of the computer. Stored **information** (values)

Note: computing consists of information processing (or better to say information **destruction**!, ex. 3+6 = 9; two pieces of information before, one after)

To see what variables (boxes with information we have)

```
octave:19> who
Variables in the current scope:

ans  x    xx   y    yy

octave:20> whos
Variables in the current scope:

  Attr Name        Size                     Bytes  Class
  ==== ====        ====                     =====  =====
       ans         2x1                         16  double
       x           1x50                       400  double
       xx         50x50                     20000  double
       y           1x50                       400  double
       yy         50x50                     20000  double

Total is 5102 elements using 40816 bytes
```

*: Don't forget to give 50% of your winnings to the professor who taught you this :-)

Variables

To reset the memory we can use 'clear'

```
octave:23> clear
octave:24> whos
octave:25> a = 1
a =  1
octave:26> b = 2
b =  2
octave:27> c = a+b
c =  3
octave:28> whos
Variables in the current scope:

  Attr Name        Size                     Bytes  Class
  ==== ====        ====                     =====  =====
       a           1x1                          8  double
       b           1x1                          8  double
       c           1x1                          8  double

Total is 3 elements using 24 bytes
```

This is **not** a mathematical equation!

Variables

Rules for names of variables (and filenames and functions!)

- Starts with a letter

- Letters, digits and underscore _

- No spaces!

- Use meaningful names (Write programs for your colleagues, not for yourself!)

What is '='?

```
octave:27> c = a+b
```

This is **not** a mathematical equation!

Don't say “c equals a plus b”

Instead say “c takes the value of a plus b”

```
octave:30> a = 2
a =  2
octave:31> b = a^3
b =  8
octave:32> a^2 = 1
error: invalid lvalue function called in expression
octave:32> a^2-1 = 0
error: invalid lvalue function called in expression
octave:32> b^2 = a^2
error: invalid lvalue function called in expression
```

variable_name = expression

“The variable takes the value of the result of the expression”

Output

The magic disappearing act of the semicolon

```
octave:32> a=2
a =  2
octave:33> a=3;
octave 34> 2*a
ans = 6
octave 35> 2*a;
octave 36>
```

; → no output to screen

; is used to suppress output

Quit

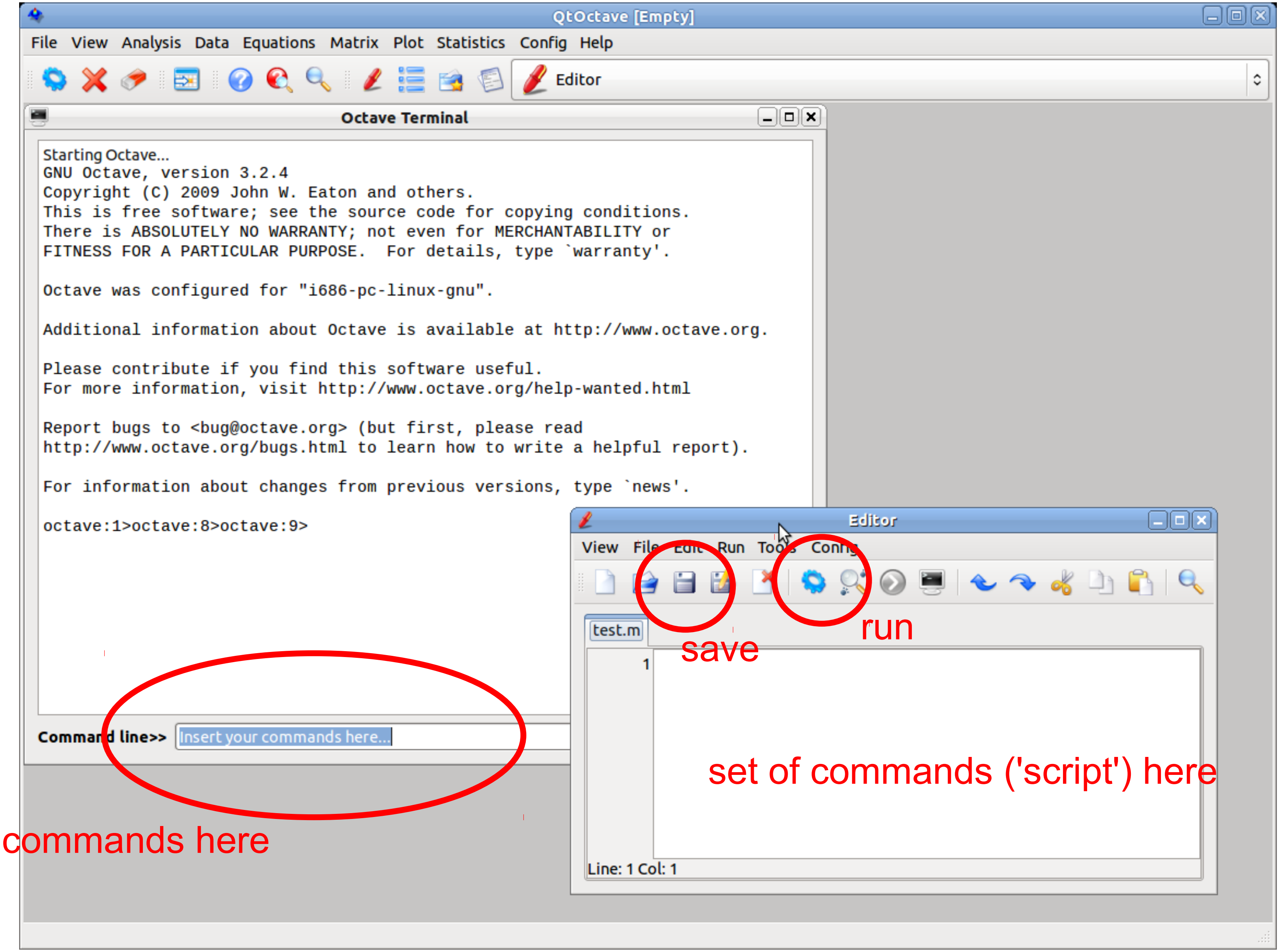
Say goodbye

```
octave:32> quit
```

quit

Command line?

Command line is sooooo 20th century!!!!
Applications: Science: QtOctave



QtOctave [Empty]
File View Analysis Data Equations Matrix Plot Statistics Config Help
Editor
Octave Terminal

```
Starting Octave...
GNU Octave, version 3.2.4
Copyright (C) 2009 John W. Eaton and others.
This is free software; see the source code for copying conditions.
There is ABSOLUTELY NO WARRANTY; not even for MERCHANTABILITY or
FITNESS FOR A PARTICULAR PURPOSE.  For details, type `warranty'.

Octave was configured for "i686-pc-linux-gnu".

Additional information about Octave is available at http://www.octave.org.

Please contribute if you find this software useful.
For more information, visit http://www.octave.org/help-wanted.html

Report bugs to <bug@octave.org> (but first, please read
http://www.octave.org/bugs.html to learn how to write a helpful report).

For information about changes from previous versions, type `news'.

octave:1>octave:8>octave:9>
```

Command line>>
Insert your commands here...
Editor
View File Edit Run Tools Config
test.m
1
Line: 1 Col: 1
save
run
set of commands ('script') here

Direct commands here