

MATLAB on Lisa

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Overview

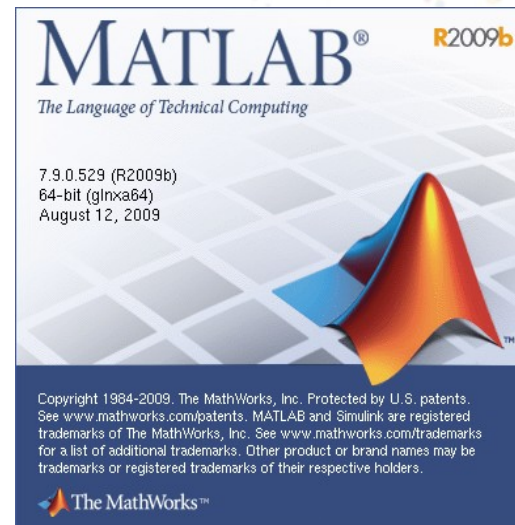
- ▀ **What is MATLAB?**
- ▀ **MATLAB at SARA on Lisa**
- ▀ **A Simple Example**
- ▀ **Multithreading**
- ▀ **When to use MATLAB?**
- ▀ **Questions & Answers**

What is MATLAB (1)?

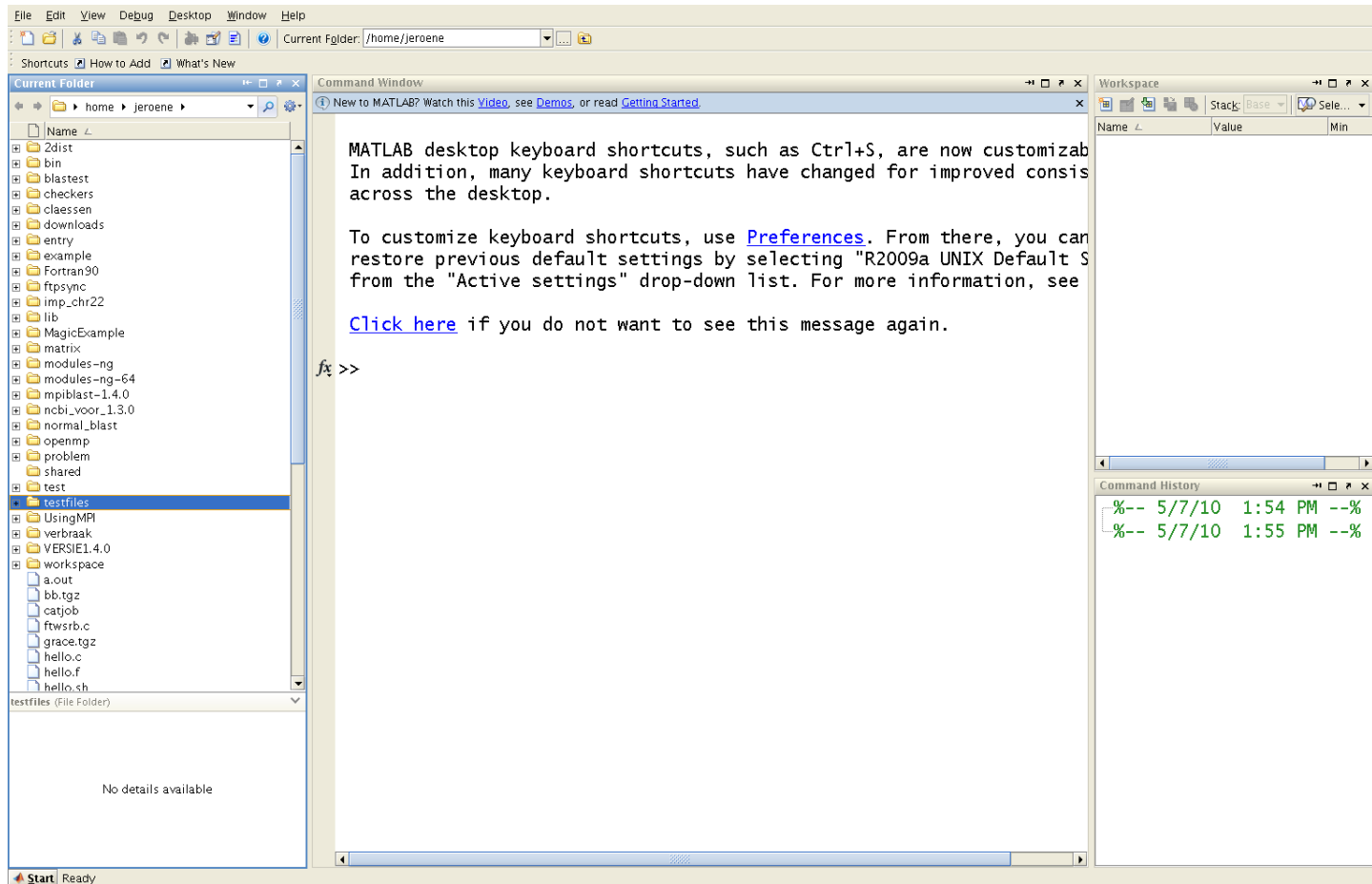
■ MATLAB

- ...stands for *MATrix LABORatory*
- ...is a numerical computing environment
- ... is a fourth-generation programming language
- ...allows matrix manipulations
- ...allows plotting of functions and data
- ...allows (easy) implementation of algorithms

Source: Wikipedia



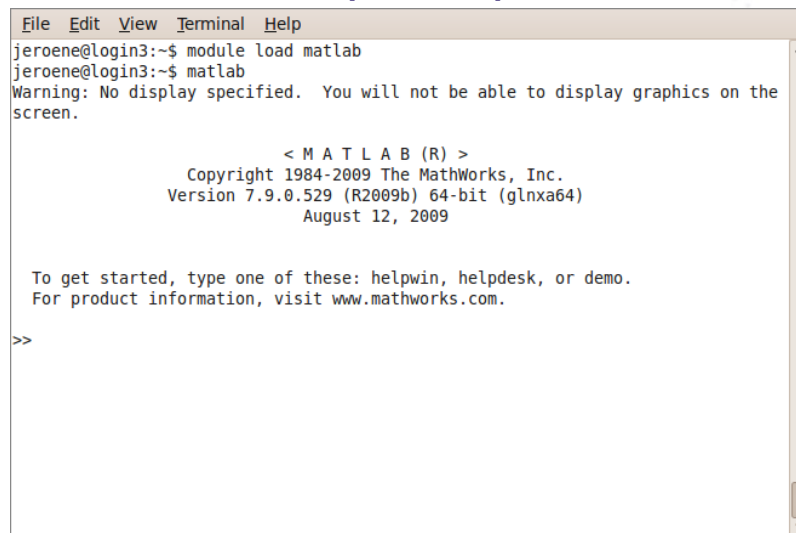
What is MATLAB (2)?

A screenshot of the MATLAB desktop environment. The interface is divided into several panes. On the left is the "Current Folder" browser showing a directory tree with folders like "bin", "blastest", "checkers", "claessen", "downloads", "entry", "example", "Fortran90", "ftpsync", "imp_chr22", "lib", "MagicExample", "matrix", "modules-ng", "modules-ng-64", "mpiblast-1.4.0", "ncbi_voor_1.3.0", "normal_blast", "openmp", "problem", "shared", "test", "testfiles", "UsingMPI", "verbraak", "VERSIE1.4.0", "workspace", and files like "a.out", "bb.tgz", "catjob", "ftwsrb.c", "grace.tgz", "hello.c", "hello.f", and "hello.sh". The "testfiles" folder is selected. In the center is the "Command Window" with a message: "New to MATLAB? Watch this [Video](#), see [Demos](#), or read [Getting Started](#)." Below this, it says: "MATLAB desktop keyboard shortcuts, such as Ctrl+S, are now customizable. In addition, many keyboard shortcuts have changed for improved consistency across the desktop. To customize keyboard shortcuts, use [Preferences](#). From there, you can restore previous default settings by selecting 'R2009a UNIX Default Settings' from the 'Active settings' drop-down list. For more information, see [Click here](#) if you do not want to see this message again." At the bottom of the Command Window, the prompt "fx >>" is visible. On the right is the "Workspace" pane, which is currently empty. Below the Workspace is the "Command History" pane, showing two entries: "%-- 5/7/10 1:54 PM --%" and "%-- 5/7/10 1:55 PM --%". The top menu bar includes "File", "Edit", "View", "Debug", "Desktop", "Window", and "Help". The status bar at the bottom left shows the "Start" button and "Ready".

MATLAB at SARA on Lisa (1)

- ▶ Access to MATLAB not accessible for every user
 - ▶ Permission may be granted via `hic@sara.nl`
- ▶ Access via “module”-mechanism

```
module load matlab
matlab
```
- ▶ Interactive environment with X11 (previous slide) or only textbased in Terminal (below):

A screenshot of a terminal window with a menu bar (File, Edit, View, Terminal, Help) and a scroll bar on the right. The terminal shows the following text:

```
jeroene@login3:~$ module load matlab
jeroene@login3:~$ matlab
Warning: No display specified. You will not be able to display graphics on the
screen.

      < M A T L A B (R) >
      Copyright 1984-2009 The MathWorks, Inc.
      Version 7.9.0.529 (R2009b) 64-bit (glnxa64)
      August 12, 2009

      To get started, type one of these: helpwin, helpdesk, or demo.
      For product information, visit www.mathworks.com.

>>
```

MATLAB at SARA on Lisa (2)

▶ Newest MATLAB with available toolboxes

▶ MATLAB	Version 7.12	(R2011a)
▶ Image Processing Toolbox	Version 7.2	(R2011a)
▶ MATLAB Compiler	Version 4.15	(R2011a)
▶ Optimization Toolbox	Version 6.0	(R2011a)
▶ Signal Processing Toolbox	Version 6.15	(R2011a)
▶ Statistics Toolbox	Version 7.5	(R2011a)

▶ Check available versions with: “module avail matlab”:

```
$module avail matlab
```

```
...
```

```
--- /sara/sw/modules-ng-64/modulefiles/tools ---
```

```
matlab/64(default)      matlab/64/2010b(default)
```

```
matlab/64/2009b        matlab/64/2011a
```

```
...
```


MATLAB at SARA on Lisa (2)

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▶ Statistics Toolbox	Version 7.5	(R2011a)

A Simple Example (1)

- Prerequisites for running MATLAB on Lisa
 - Make use of MATLAB-scripts
 - Compile your scripts to be able to run parallel

```
$echo "magic(3)" > matlabprogram.m
```

creates simple example

Interactively this results in:

```
>> magic(3)
```

```
ans =
```

```
8     1     6
3     5     7
4     9     2
```


A Simple Example (2)

■ Compile the example with:

```
$module load matlab  
$mcc -m matlabprogram.m  
$module unload matlab
```

■ Run the example with:

```
$module load mcr  
$export MCR_CACHE_ROOT=`mktemp -d /scratch/mcr.XXXX`  
$./matlabprogram  
$module unload mcr
```

→ **MATLAB and MCR versions have to match!**

A Simple Example (3)

■ A small PBS file for this example

```
#PBS -lnodes=1 -lwalltime=100
module load mcr
# create unique mcr cache directory on /scratch:
export MCR_CACHE_ROOT=`mktemp -d /scratch/mcr.XXXX`
# goto the directory where this job is submitted:
cd $PBS_O_WORKDIR
# run the program
./matlabprogram
```

Multithreading

■ Since MATLAB R2008b, more and more functions are parallelized by MathWorks

■ Advantages

- ▶ Automatically faster on multicore PC
- ▶ No need to parallelize code by user

■ Disadvantages

- ▶ Loss of control
- ▶ For parameter sweeps $nx8x1$ may be faster than $nx1x8$

■ Solution

■ User can set number of threads inside MATLAB program

- ▶ `maxNumCompThreads (1)`

When to use MATLAB?

- ▶ For rapid prototyping
- ▶ When performance is not very important
- ▶ When knowledge of Fortran/C is absent

- ▶ Drawbacks of MATLAB
 - ▶ Supported platforms limited (not on Huygens, for example)
 - ▶ Not an open standard like FORTRAN, but is proprietary – depends on MathWorks for updates and future support

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Questions and Answers

