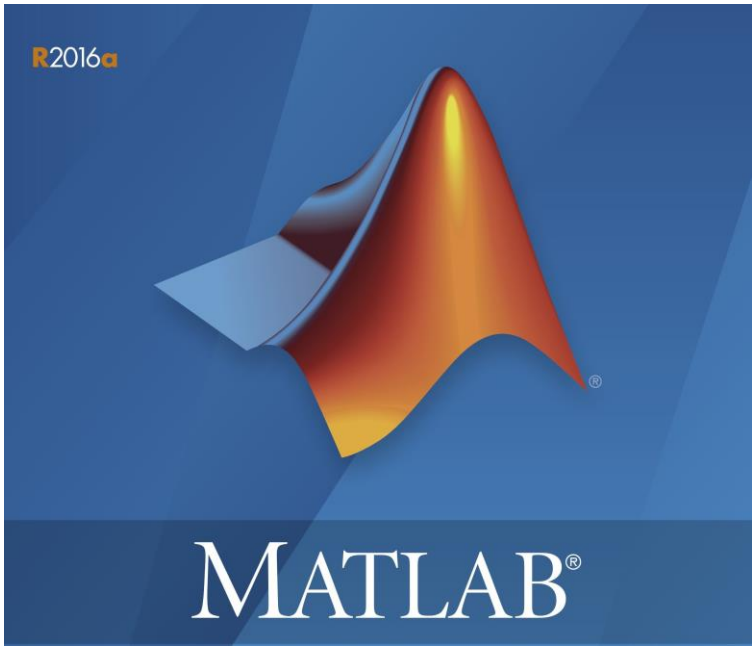
MATLAB

a short primer



Ovidiu Ivanov
'Gheorghe Asachi' Technical University,
Electrical Engineering Faculty
Iasi, Romania
www.tuiasi.ro

What is MATLAB?

- A programming language for numerical computation
- A very powerful tool for any engineer, scientist or economist
- It name stands for MATrix LABoratory

Why use MATLAB?

- Very intuitive and easy to learn syntax, compared to other programming languages
- Many useful functions, just like Excel
  - built-in
  - provided into supplementary packages called toolboxes
- Easy debugging

Why use MATLAB?

- Built-in capabilities:
  - Friendly user interface for beginners, packed with useful features for advanced users
  - Text editor for building algorithms, using its proprietary programming language
  - Easy to understand syntax
  - Easy data importing and exporting
  - Compatibility with Microsoft Excel, CSV and text files
  - Many useful functions for number, matrix and text processing
  - Easy graph plotting
  - GUI (Graphical User Interface) creation capabilities

Content

Part One: Get to know MATLAB

- The Main Window
- The Program Editor

Part Two: Warm up

- How to define, save and load data
- Some useful functions and statements of general purpose

Part Three: Writing programs in MATLAB

- Scripts
- Functions
- The if, for, while, case statements

Content

Part Four: Out-of-the-box numerical processing

- Matrix manipulation

Part Five: Graphical Representations

- Line and scatter graphs

Part six: Hands-on programming

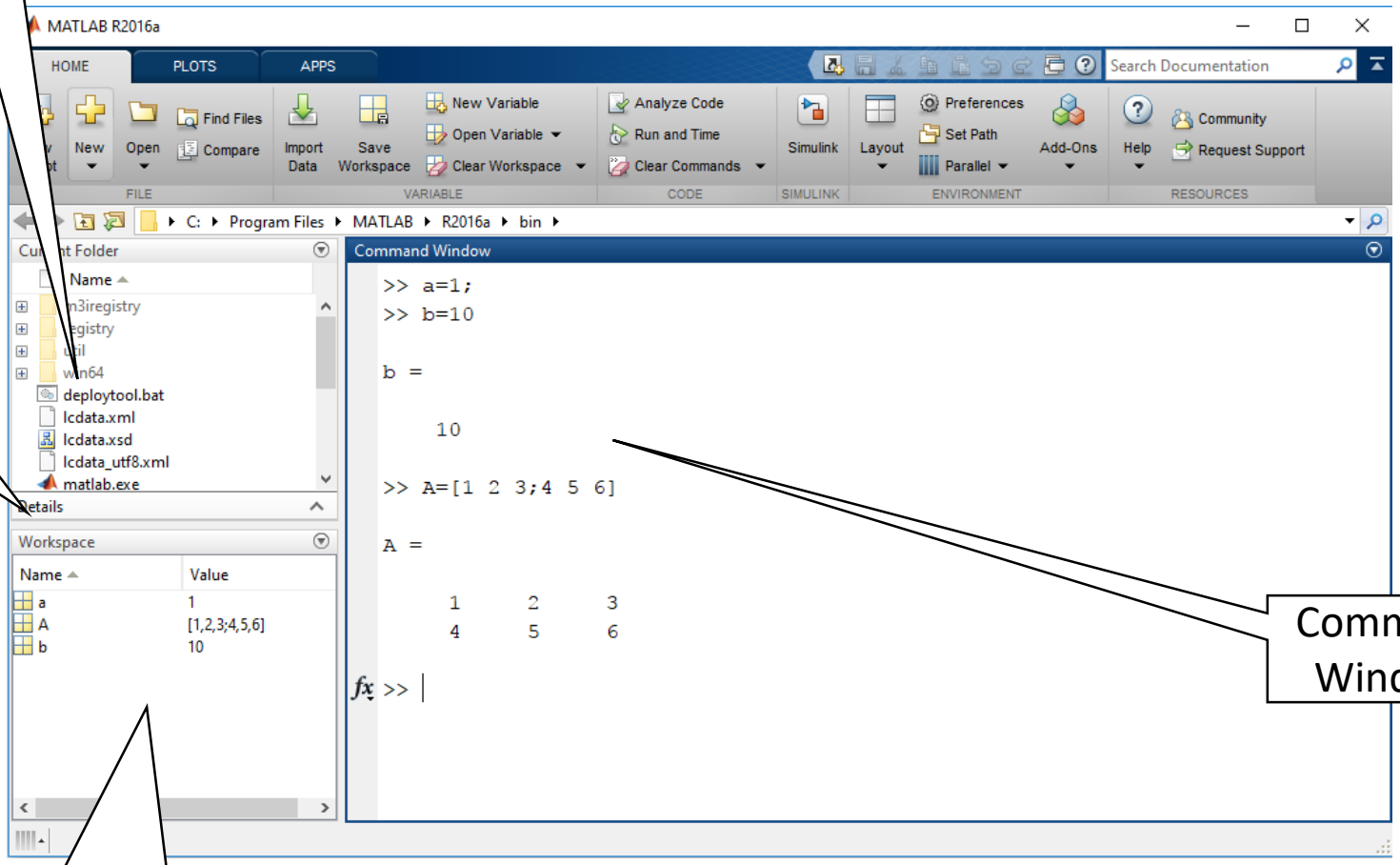
- We write together a small program which uses functions, loops, if and graphical representations
- Demo: a slot machines game written in MATLAB

Part One

Meet MATLAB

The Main Window
The Program Editor

The Main Window



Current Folder

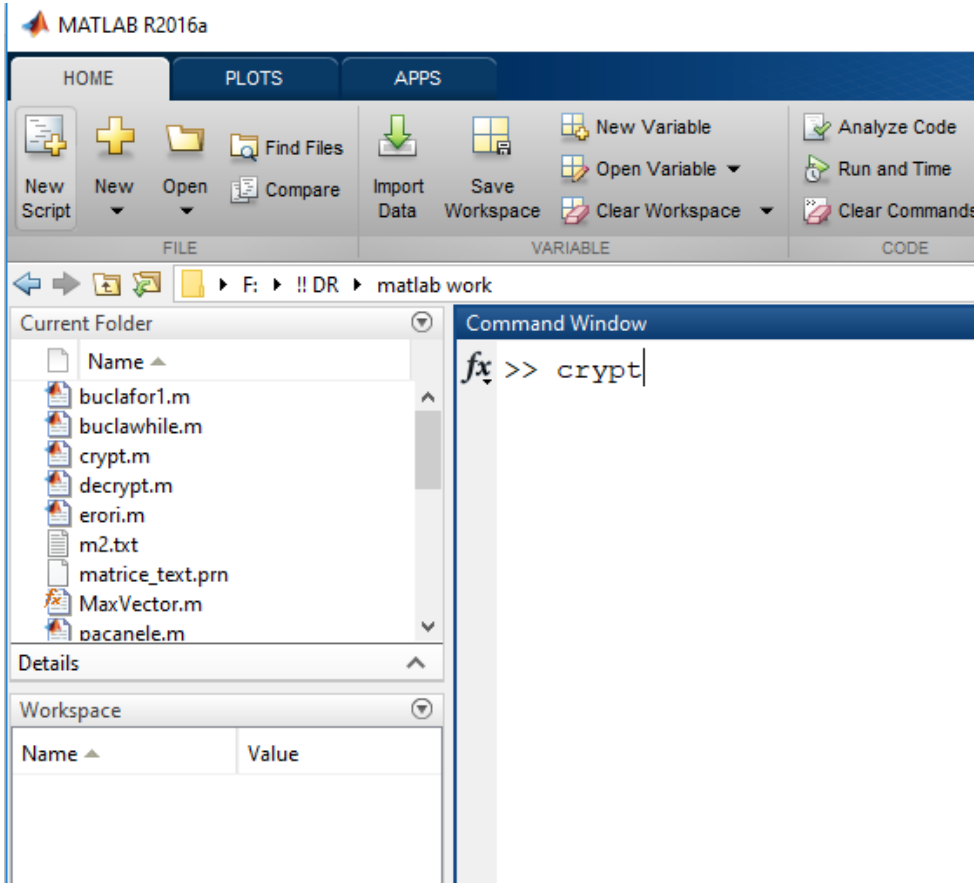
Details (hidden)

Workspace

Command Window

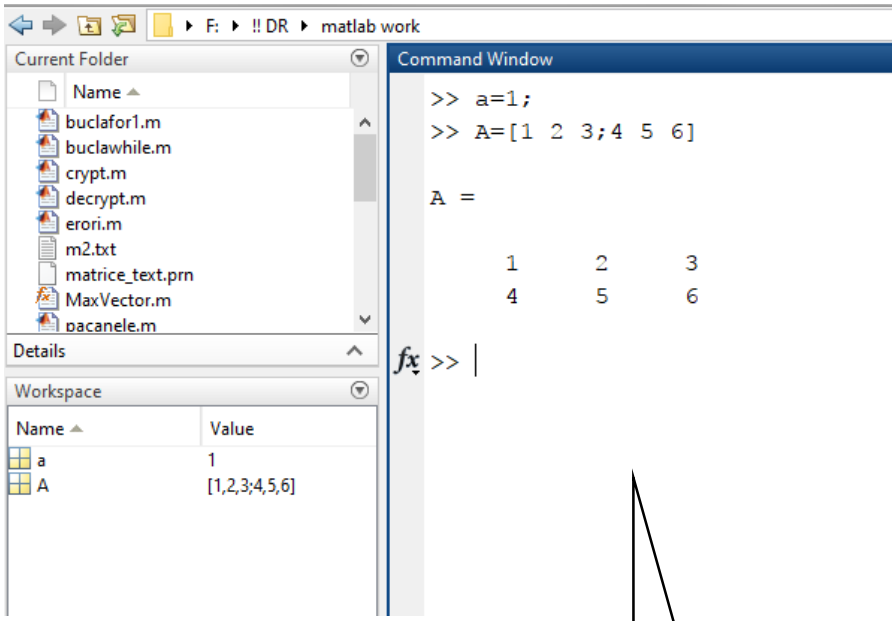
Current Folder

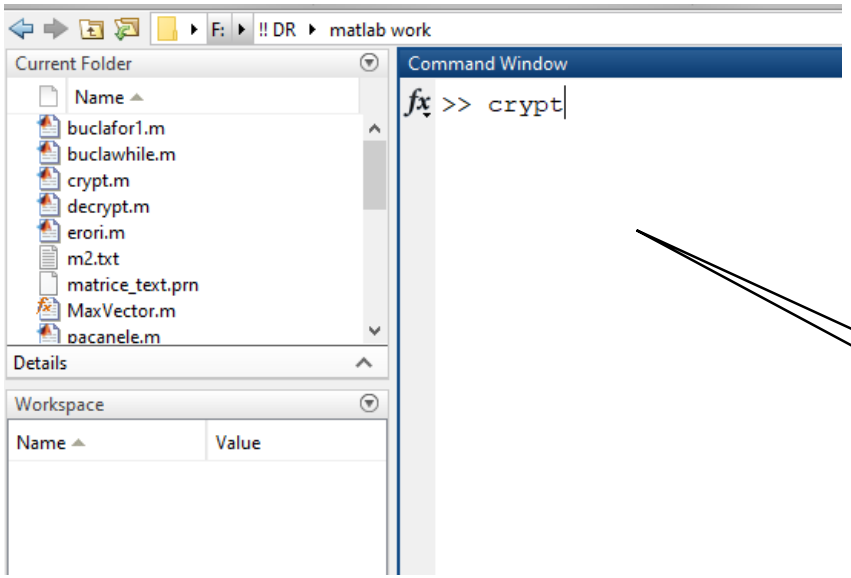
- Your user-defined programs will run only if MATLAB is in their folder
  - Or if the folder is in MATLAB's search path
- Data files will be saved in the current folder



The Command Window

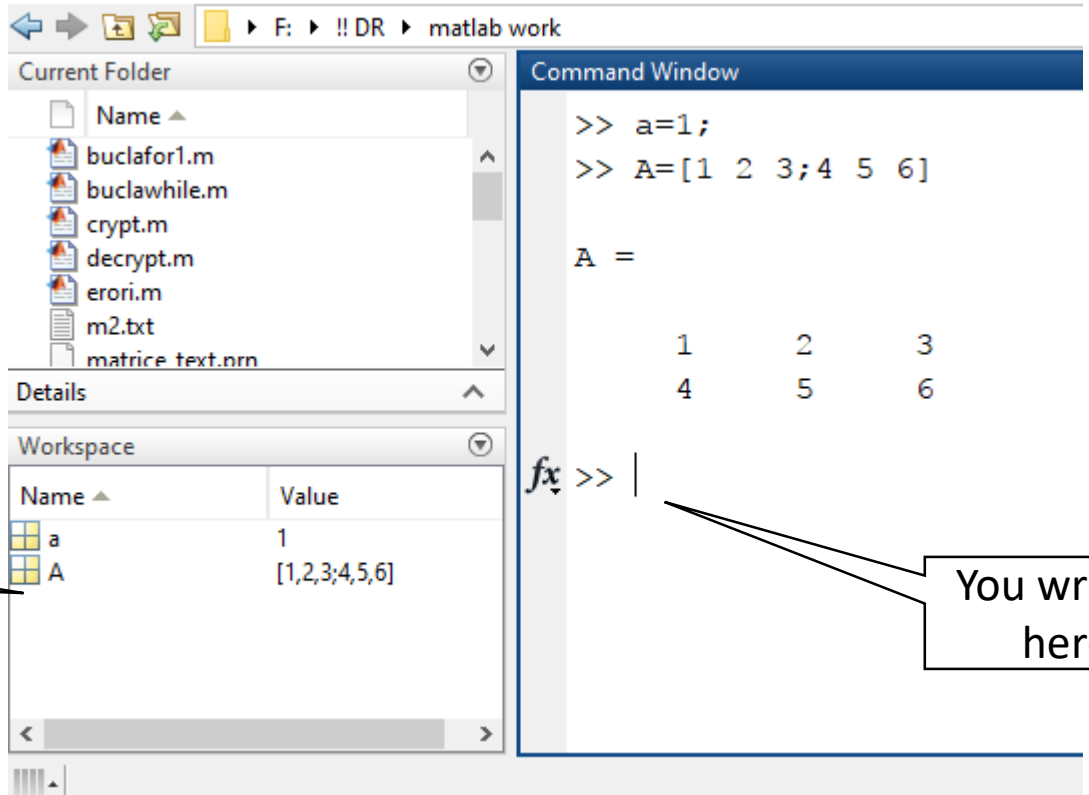
- Can be used for
  - Creating variables
  - Writing code
  - Running programs
  - Debugging





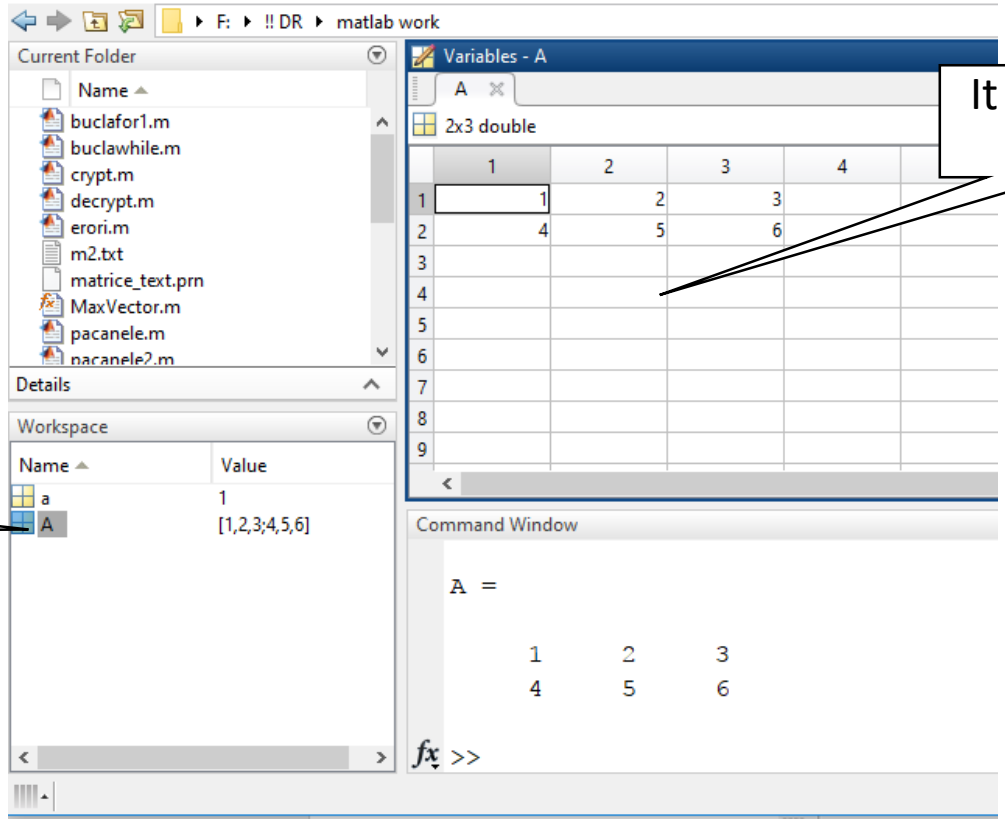
Workspace

- Any variable that you define in the Command Window or is created when running a program will show up in the Workspace
  - Different graphic symbols for different variable types



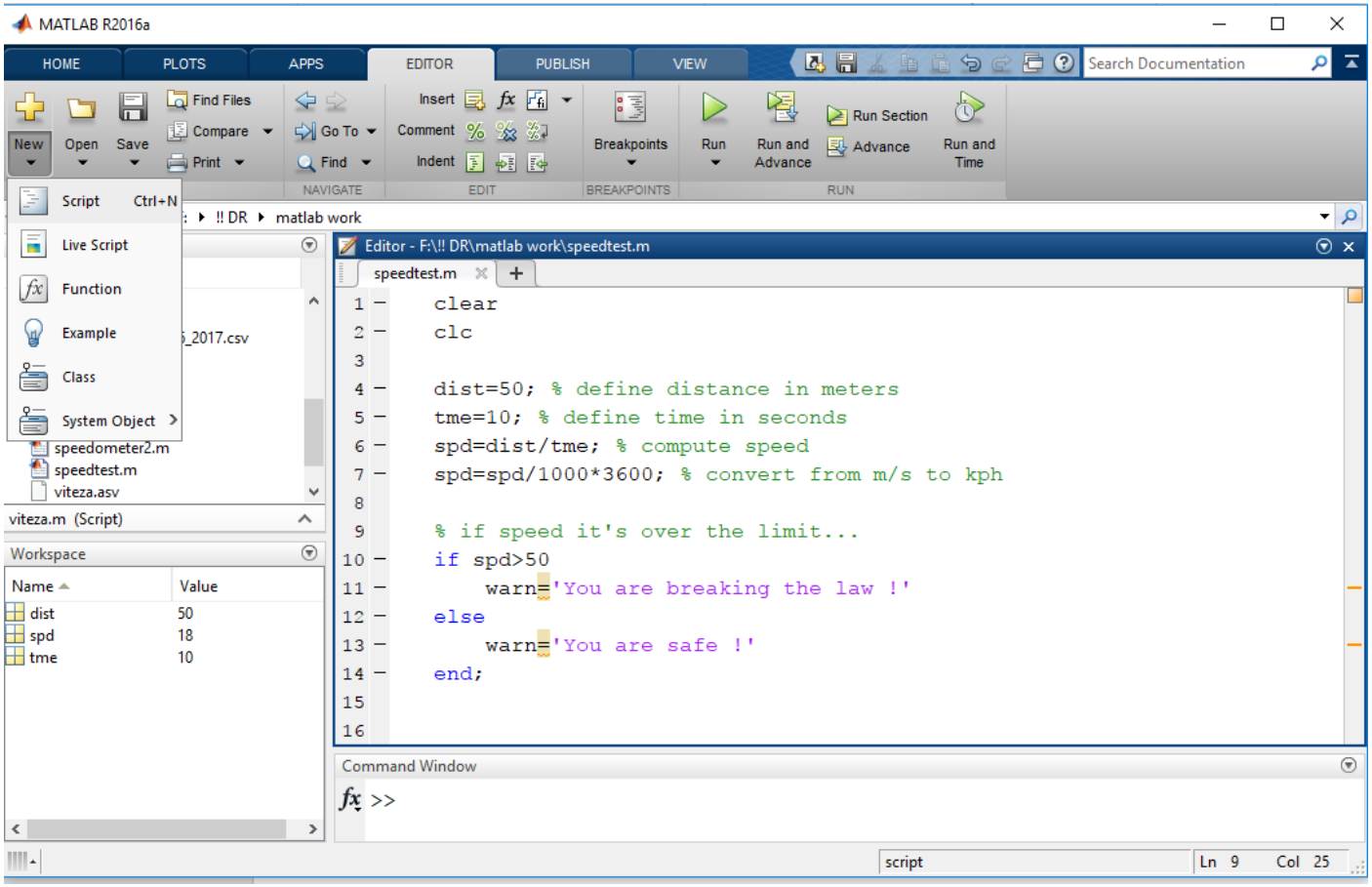
Workspace

- You can view and edit variables
  - Copy-Paste from and to Excel works from the Variables window !



The Program Editor

- Writing code in the Command Window is cumbersome
- A better tool is the Program Editor



The Program Editor

- syntax highlighting

Black is normal code

Green is a comment, defined with %

Blue is a reserved word

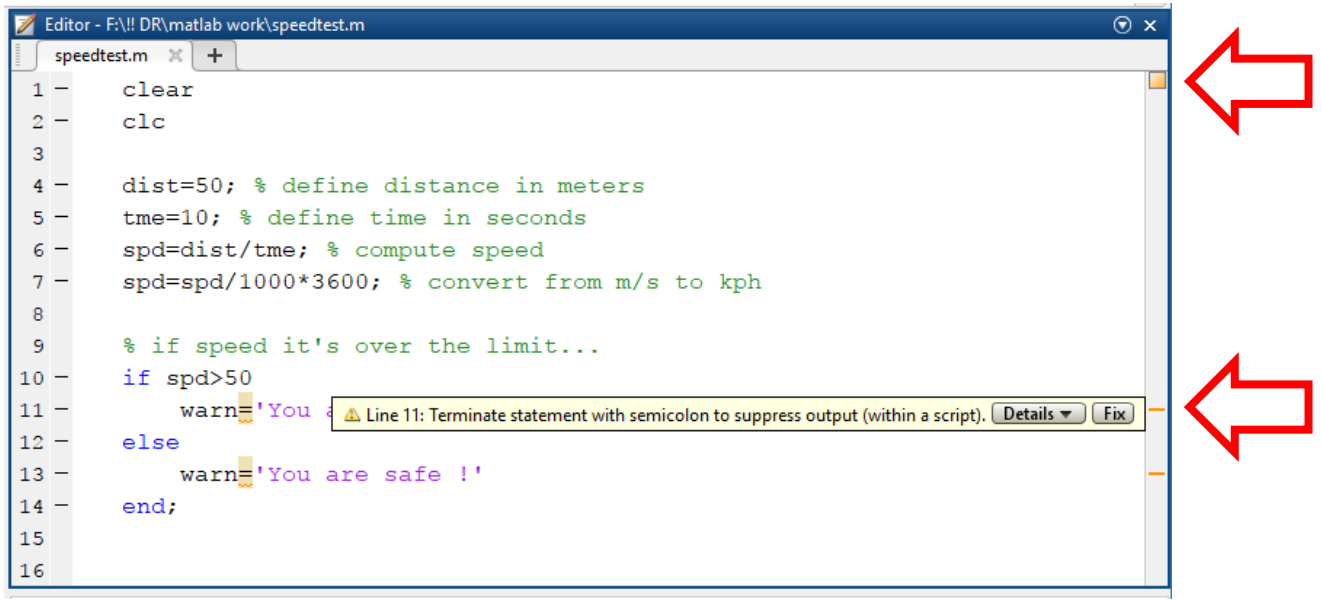
Pink is text, placed between prime symbols

```
clear
clc

dist=50; % define distance in meters
tme=10; % define time in seconds
spd=dist/tme; % compute speed
spd=spd/1000*3600; % convert from m/s to kph

% if speed it's over the limit...
if spd>50
    warn='You are breaking the law !'
else
    warn='You are safe !'
end;
```

The Program Editor

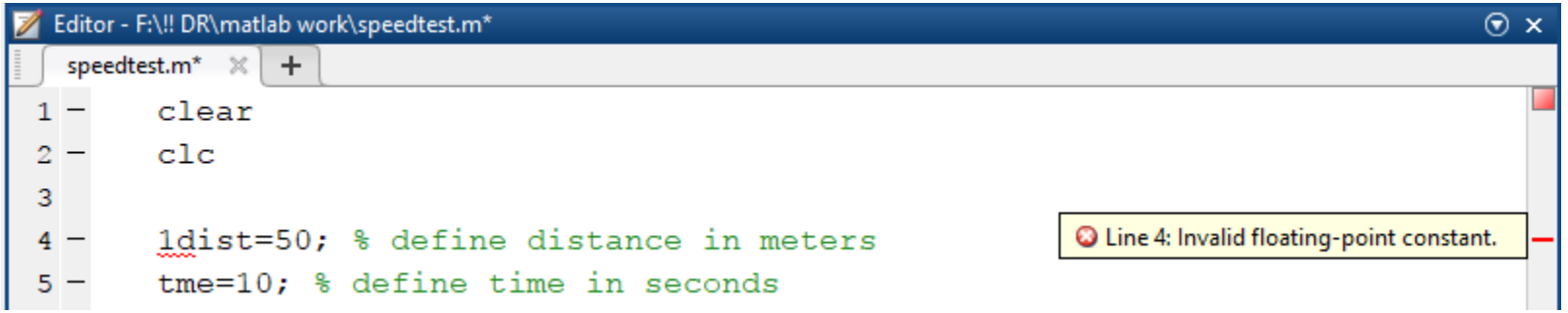
Warning colors for errors:

- Green: code with no errors or warnings, all OK
- Orange: Warning, better performance can be achieved if the code is changed
  - The program can run properly
- Red: fatal error, wrong syntax in code
  - The program cannot run at all

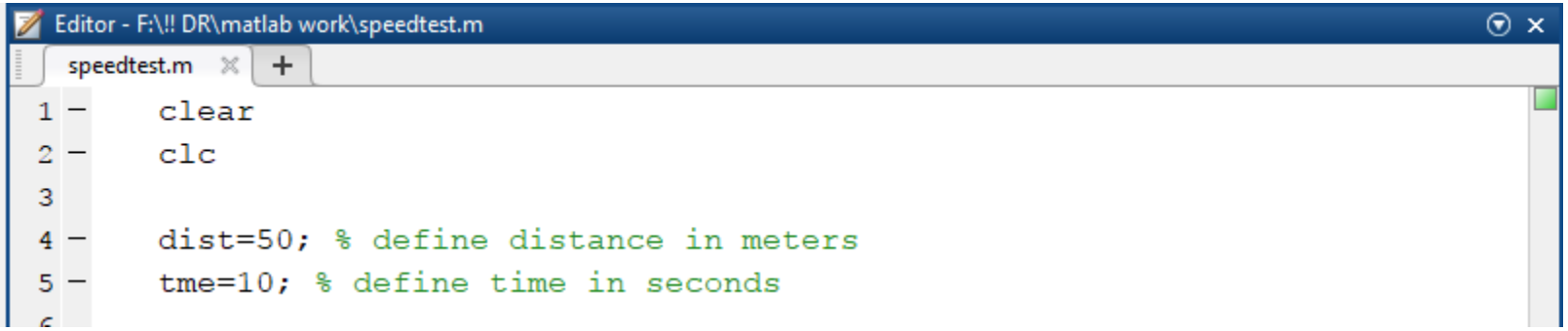


The Program Editor

- A fatal error in the code:
  - Hover the mouse on the red line to see the error

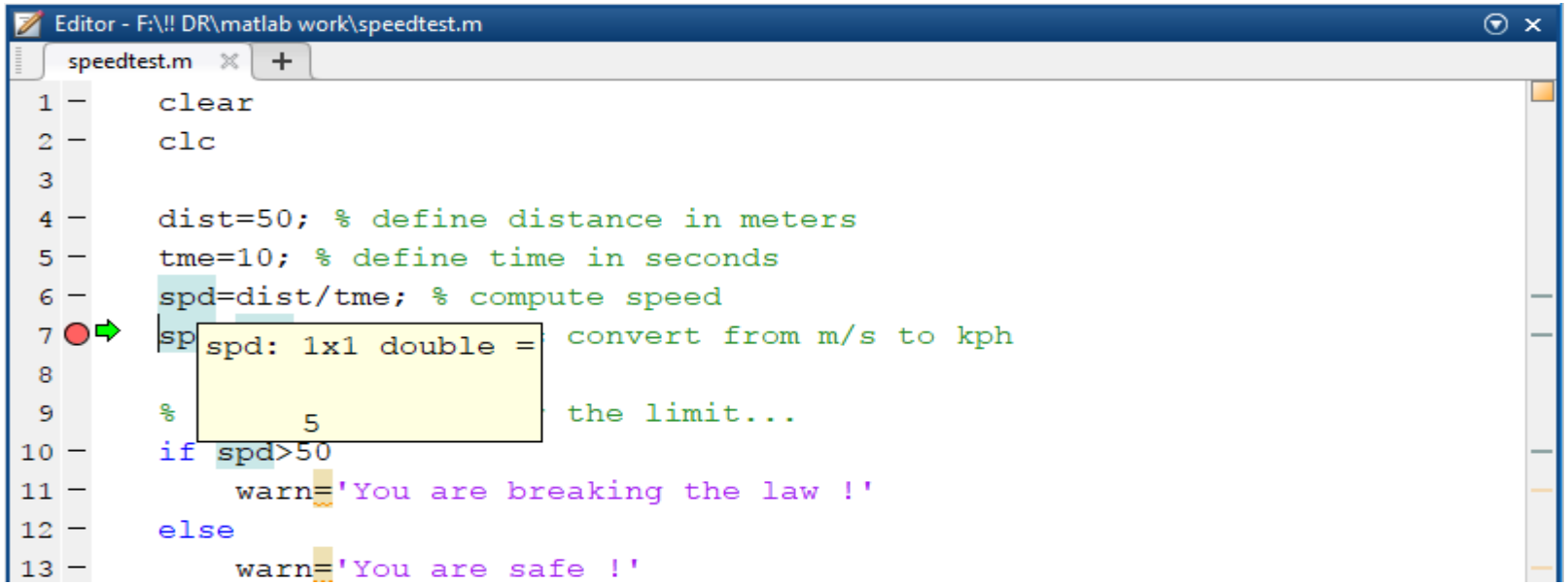


- A perfect sequence of code:
  - Syntax-wise, not program-wise



The Program Editor

- You can use the Program Editor to enable breakpoints and debug your code
  - Click on the horizontal black lines to enable red breakpoints
  - Use F5 to run the program until breakpoint line
  - Use F10 to run the program step by step
  - Hover on the variable names to see their values
  - Exit debugging with Shift+F5



- The Main Window
  - Current Directory
  - The Command Window
  - The Workspace
- The Program Editor
  - Syntax highlighting
  - Debugging
- A small piece of code

End of Part One - Review

- **Feel free to contact me with questions !**

Ovidiu Ivanov

Lecturer, PhD

The ‘Gheorghe Asachi’ Technical University

The Electrical Engineering Faculty

www.tuiasi.ro

ovidiuivanov@tuiasi.ro

THANK YOU !