

Subject: Introduction to Computing
Topic: Matlab @ Introduction
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What is MATLAB??

- It is a software package/ language developed to ease the complicated numerical computation
- The Matlab language was created by Prof. Cleve B. Moler, Professor of Computer Science (a specialist in numerical analysis) at the University of New Mexico.
- It has since spawned several commercial and open-source derivatives of the original matlab language.
- Today, the premier commercial version is MATLAB (R) by The Mathworks, Inc., and the best free, open-source version appears to be Octave.
- <https://in.mathworks.com/>

What is MATLAB??

- MATLAB stands for MAT + LAB
MAT = MATRIX
LAB = LABORATORY
Matlab stands for matrix laboratory
- All the calculations done in MATLAB is in form of matrices.
- It creates ease in calculations of Matrix operation in comparison of others existing software and programming languages

Features of MATLAB

- **Inbuilt functions**
 - inv, eig, roots, quad, triplequad, besselj, fzero
- **User defined function**
 - You can define your own program similar to inbuilt function
- **Ease in computation work**
 - Linear algebra
 - Solving differential equations
 - Data analysis
 - Interpolation and curve fitting

Features of MATLAB

- **Toolbox**
 - Simulink
 - Image processing
 - Neural Networks
 - Bioinformatics
- **Possibility of external interfacing** with other programming languages (C, C++ and Fortran etc)
- **Efficient Graphical User Interface (GUI)**
 - Create ease in analysing the results

Features of MATLAB

- **Data Handling**

- Data handling is much easier in MATLAB
- Matrix Operation and Array Operation both can be handled with ease just by using different operators.
- No need to define type of variable (REAL, INTEGER OR COMPLEX)
- No need to define dimension of array
- No need to define single precision or double precision for calculation

- **Limitation**

- Symbolic calculation: It also support symbolic calculation but with certain limitation.
- Mathematica Software is Software used for strong and efficient symbolic calculation

MATLAB LAYOUT

The image displays the MATLAB R2020a software interface. The top ribbon includes tabs for HOME, PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The EDITOR tab is active, showing a file explorer on the left with a 'Current Folder' pane containing files like blur.m, cell_practise.m, q_diode.m, q_ideal diode.asv, q_ideal diode.m, q_leibniz_series.m, q_leibniz_series.m, q_root.asv, q_root.m, and saddle.m. The main editor window, titled 'Editor - Untitled*', contains a script with the following code:

```
1 % MATLAB PROGRAM
2
```

The Command Window at the bottom shows the execution of the script, displaying the results of the commands:

```
>> x=3
x =
    3

>> y=[1 2 3; 4 5 6]
y =
     1     2     3
     4     5     6

fx >>
```

The Workspace pane on the right shows the current workspace variables:

| Name | Value | Min | Max |
|------|---------------|-----|-----|
| x | 3 | 3 | 3 |
| y | [1,2,3;4,5,6] | 1 | 6 |

The Command History pane on the right shows the sequence of commands entered in the Command Window:

```
q_root
clc
clear all
x
x=2
x=3
q_root
clc
x=[1 2 3 4 5]
x=[1 2 3 4 5];
x=[1 2 3 4 5];y=[1 4 9 16 25];plot(x,y)
%-- 12-08-2020 21:28 --%
EXIT
%-- 12-08-2020 21:49 --%
help besseli
clc\
clc
x=3
y=[1 2 3; 4 5 6]
```

The status bar at the bottom indicates the current file is 'script' and the cursor is at line 2, column 1.

Default Layout of MATLAB

- Address bar
- Current folder
 - Show all folders and files
- Command Window
 - Starts with “>>”, all commands execute here !!
- Command History
 - Show all previous commands with date
- Workspace
 - Display all of the variable
- Layout can be changes as per user’s choice using “Layout” option

File Type


- There are mainly three types of file in MATLAB
 - M-files
 - MAT-files
 - MEX-files

File Type

- **M-files**
 - M-files are standard ASCII text files.
 - File name of M-files are with extension (.m).
 - Any program written in a MATLAB editor is saved as M-files.
 - These files are further classified as
 - Script file
 - Function file

File Type

- **Script file**

- It is a file written in matlab editor to solve the given problem and saved with extension .m
 - » File can be executed by two ways
 - Typing file name in command window (Be careful about folder location)
 - Using the icon RUN () provided in MATLAB

File Type

- **Function file**
 - It is a file written in matlab editor using special syntax
 - Function file can be used called in other script/function file
 - Saved with extension .m
 - Function file can be executed by writing file name and required input parameters
 - Details of function file will be discussed in coming session

File Type

- **MAT-files**

- MAT-file is binary file used to save the data.
- Thus it is recognized as Data File
- MAT-file can be read by MATLAB environment
- Save with extension “.mat”
- MAT-files are double-precision MATLAB format files.
- They can be created on one machine and later read by MATLAB on another machine with a different floating-point format, retaining as much accuracy and range as the different formats allow.
- They can also be manipulated by other programs external to MATLAB.
- Working of MAT-files will be discussed in coming lectures

File Type

- **MEX-files**
 - A **MEX file** is a function, created in **MATLAB**, that calls a C/C++ program or a Fortran subroutine. A **MEX** function behaves just like a **MATLAB** script or function.
 - Students are advised to read about this as per their own interest.

OUTPUT DISPLAY

- format
 - format long: Display 15 places after decimal
 - format short: Display 4 places after decimal
 - format long e: Display 15 places after decimal followed by exponential
 - format short e: Display 4 places after decimal followed by exponential
 - format long g: Total 15 digits
 - format short g: Total 5 digits