



MATLAB Programming

Introduction



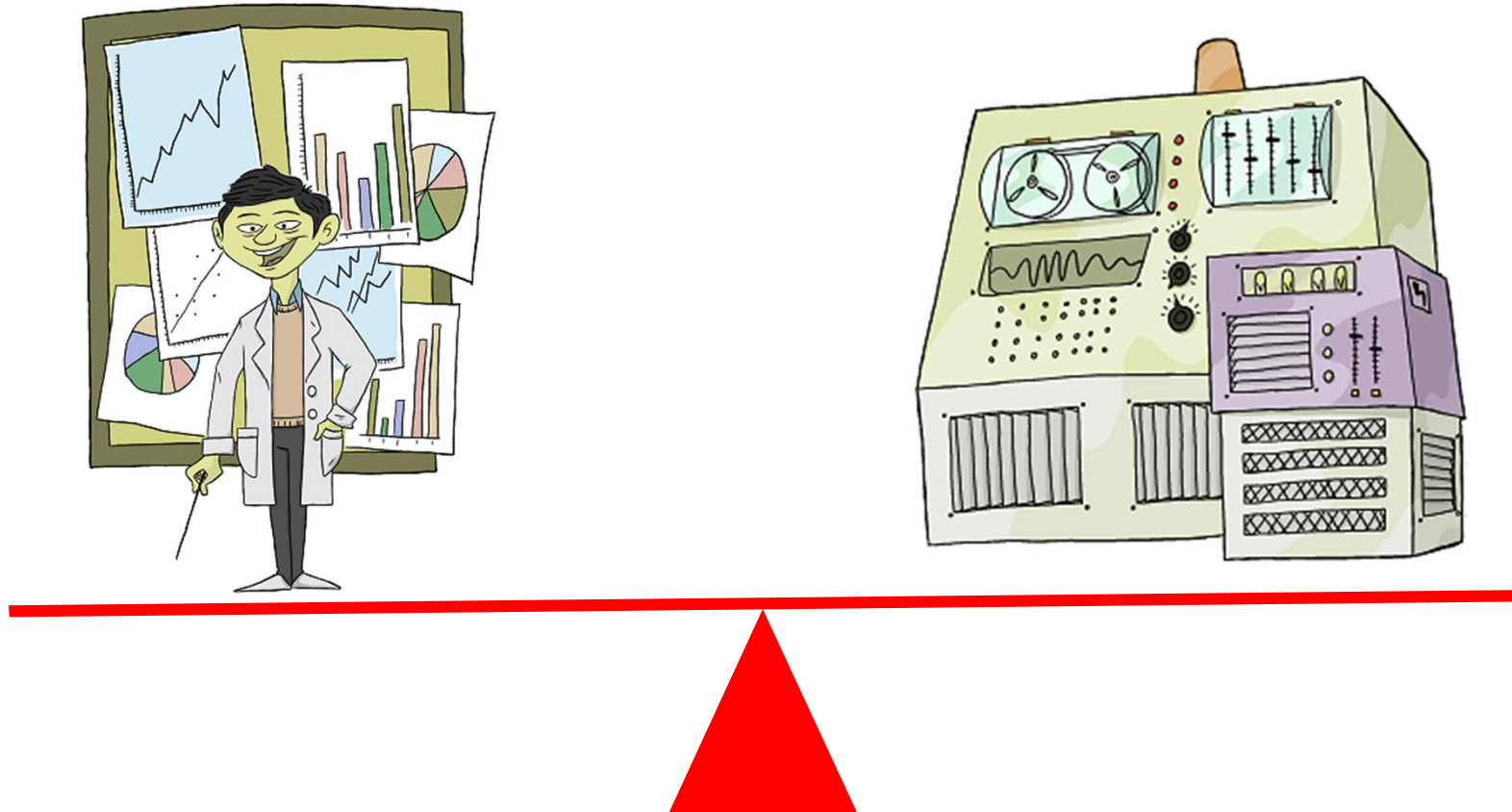
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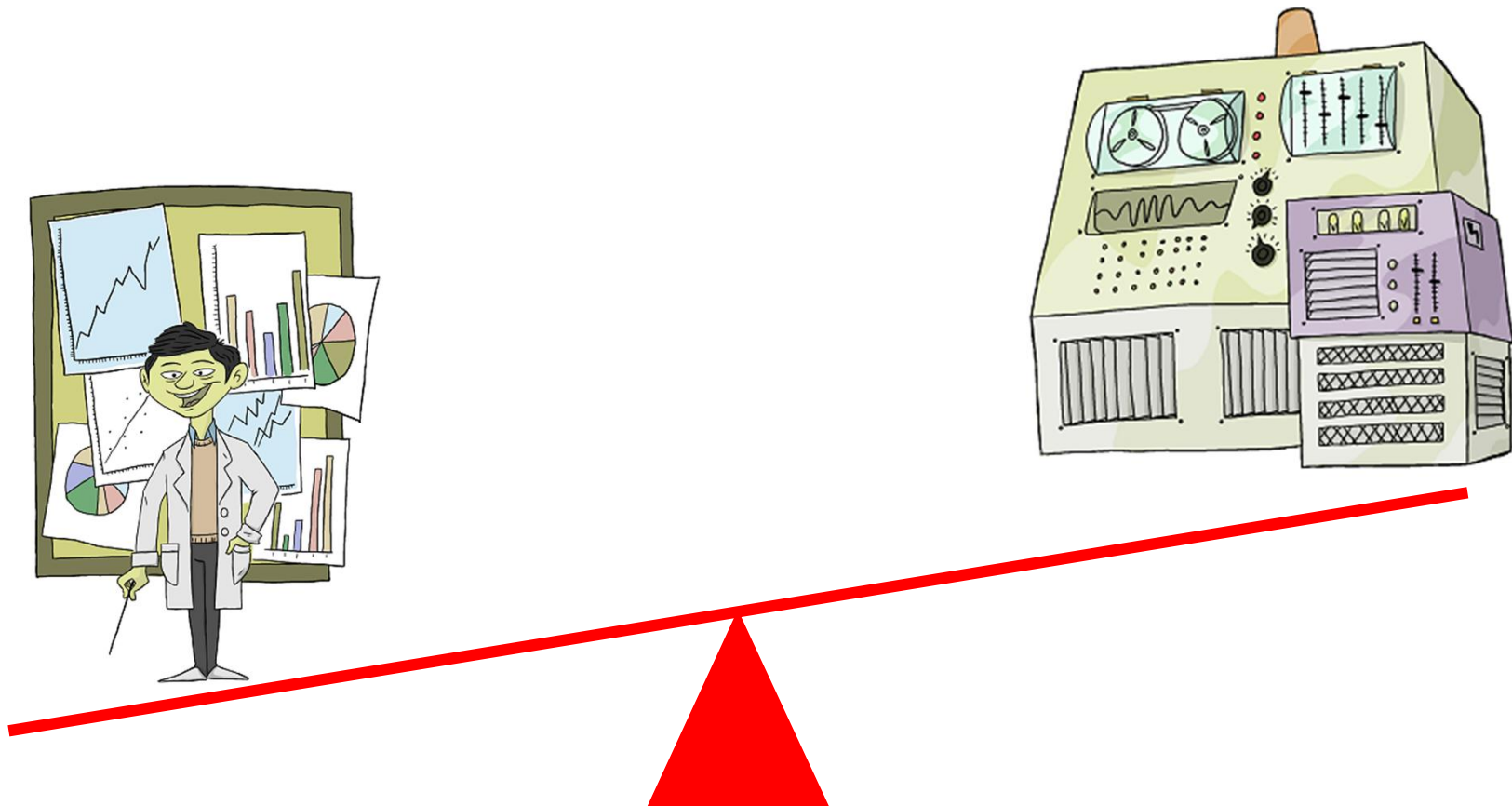
Good scientific software:

For whom is software written?



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- 3) Testable

Good scientific software:

For whom is software written?

- 1) Human readable
- 2) Emphasizes domain and problem specific computation.
- 3) Testable
- and then •
- 4) Efficient

Bad scientific software:

- 1) Emphasizes efficiency over readability
- 2) Emphasizes efficiency over testability
- 3) Reinvents the wheel
- 4) Couples domain specific knowledge with underlying mathematical routines.

Fast, wrong code gets you the wrong answer
faster.

MATLAB is a

- programming language
- and a programming environment.

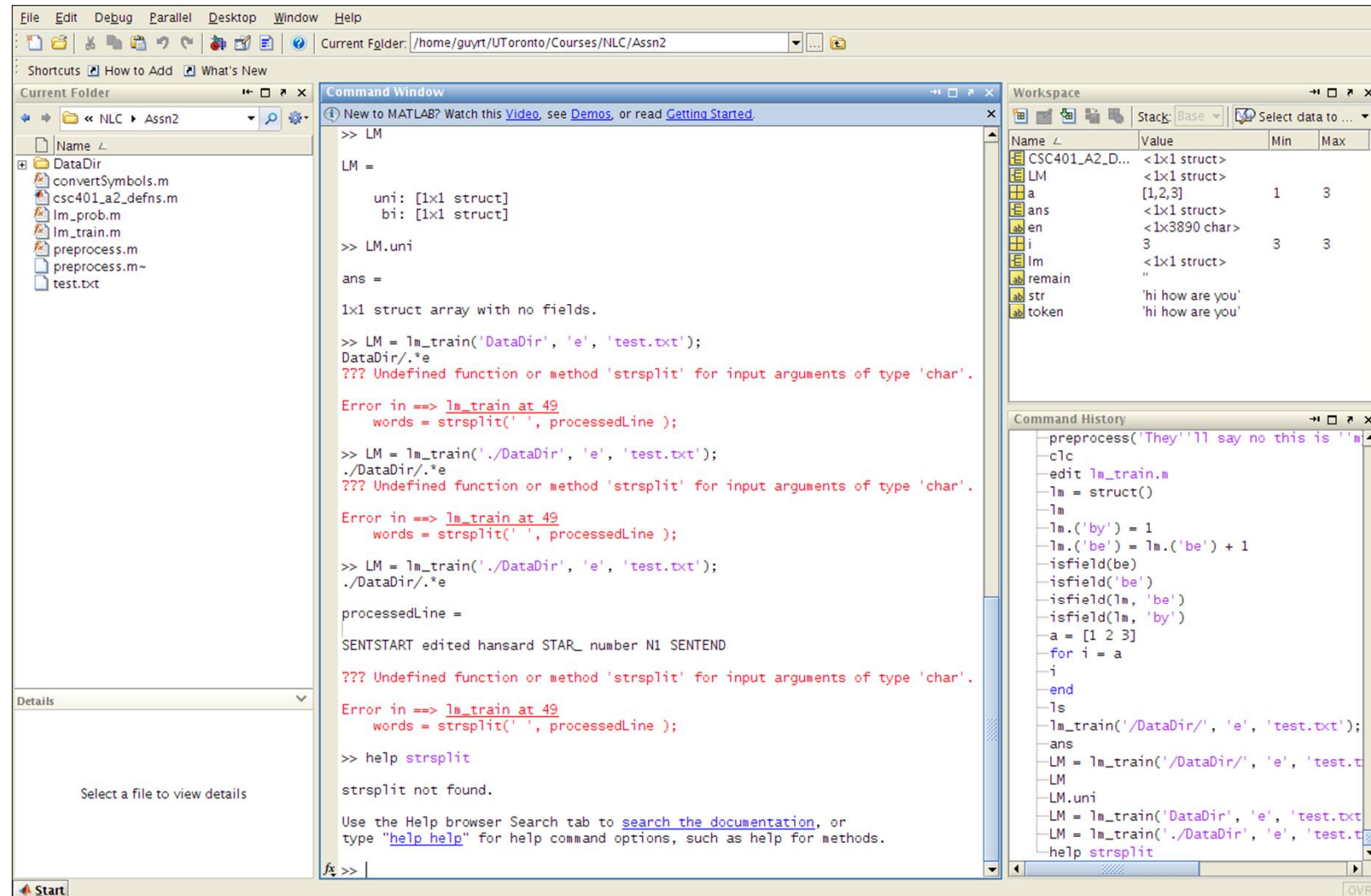
Encourages

Reuse of tested, efficient mathematical routines

High level representation of programs

Mathematical expression over details of algorithms.

MATLAB the environment



MATLAB the environment

The screenshot displays the MATLAB environment with three main panels:

- Current Folder:** Shows the directory structure for 'NLC \ Assn2', including files like 'convertSymbols.m', 'csc401_a2_defns.m', 'lm_prob.m', 'lm_train.m', 'preprocess.m', and 'test.txt'.
- Command Window:** Contains the following code and output:


```
>> LM
LM =
    uni: [1x1 struct]
    bi: [1x1 struct]

>> LM.uni
ans =
1x1 struct array with no fields.

>> LM = lm_train('DataDir', 'e', 'test.txt');
DataDir/.e
??? Undefined function or method 'strsplit' for input arguments of type 'char'.

Error in ==> lm_train at 49
    words = strsplit(' ', processedLine);

>> LM = lm_train('./DataDir', 'e', 'test.txt');
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    words = strsplit(' ', processedLine);

>> help strsplit
strsplit not found.

Use the Help browser Search tab to search the documentation, or
type "help help" for help command options, such as help for methods.
```
- Workspace:** A red box highlights the workspace contents, which include:

Name	Value	Min	Max
CSC401_A2_D...	<1x1 struct>		
LM	<1x1 struct>		
a	[1,2,3]	1	3
ans	<1x1 struct>		
en	<1x3890 char>		
i	3	3	3
lm	<1x1 struct>		
remain	"		
str	'hi how are you'		
token	'hi how are you'		

MATLAB the environment

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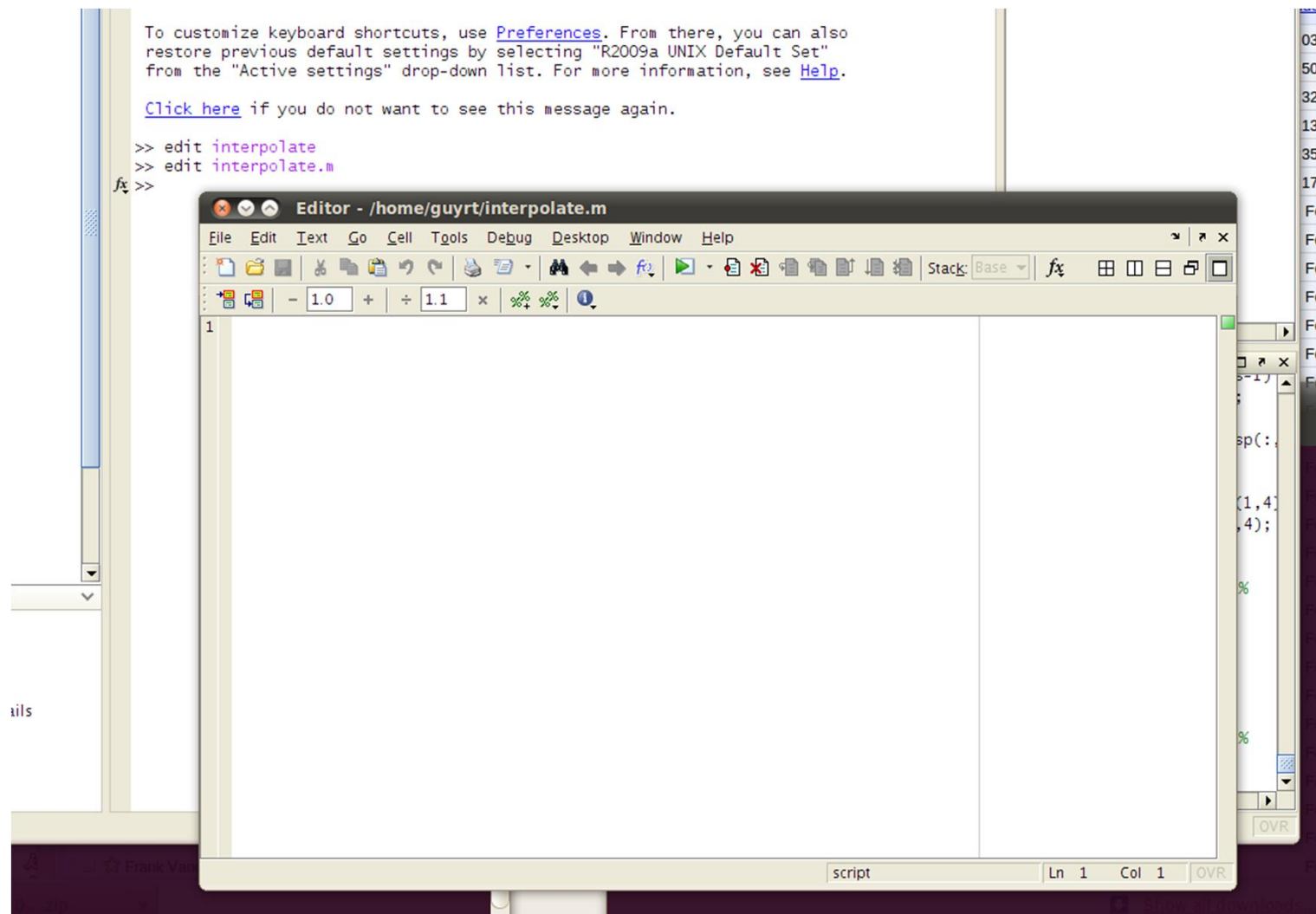
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```
- Workspace:** Shows variables in the workspace, including `CSC401_A2_D...`, `LM`, `ans`, `remain`, `str`, and `token`.
- Command History:** Shows the sequence of commands entered, including `preprocess('They'll say no this is 'm`, `clc`, `edit lm_train.m`, `lm = struct()`, `lm`, `lm('by') = 1`, `lm('be') = lm('be') + 1`, `isfield(ba)`, `isfield('be')`, `isfield(lm, 'be')`, `isfield(lm, 'by')`, `a = [1 2 3]`, `for i = a`, `i`, `end`, `lm_train('./DataDir', 'e', 'test.txt')`, `ans`, `LM = lm_train('./DataDir', 'e', 'test.t`, `LM`, `LM.uni`, `LM = lm_train('DataDir', 'e', 'test.txt`, `LM = lm_train('./DataDir', 'e', 'test.t`, and `help strsplit`.

MATLAB the environment



MATLAB as a programming language:

Arrays

```
>> nums = [1,2,3]
```

```
>> nums = nums + 4;
```

For loops

```
>> for i = nums:
```

```
>>     isprime(i);
```

Key idea: Data parallel programming

The programmer works at level of mathematical ideas

• not loops and indices.

Most operators work on arrays directly.

Common theme: you probably* don't want to use a loop

* (exceptions apply)

Example:

```
>> for i = 1:length(arr)
>>     arr(i) = arr(i) * 100;
>> end
```

Orõ

```
>> arr = arr * 100;
```


Why learn MATLAB?

Rapid prototyping

Scales well to large, production problems.

Thousands of mathematical routines

Tested

Efficient

Common language in many fields



created by

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