

What's New in MATLAB R2016a:

R2016a

Why This Is the Most Profound Release Ever for Academia.

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Engineer
MathWorks Australia



Let's do this by the numbers:

1600 Developers  MathWorks®

100 Products

2 Releases every year (**a** and **b**) **R2016a**

500+ Pages of release notes (“what’s new”) for **R2016a**

40 Minute presentation

Profundus ?

*far-reaching and thoroughgoing in effect
especially on the nature of something*

- **Today's R2016a highlighted features**
 - Everybody, everyday
 - Machine Learning
 - Vision, Sound, hardware

- **Do you ... teach ... learn**
 - Free auto grading of assignments
 - Free training courses
 - MATLAB in a web browser, and more

Everybody .

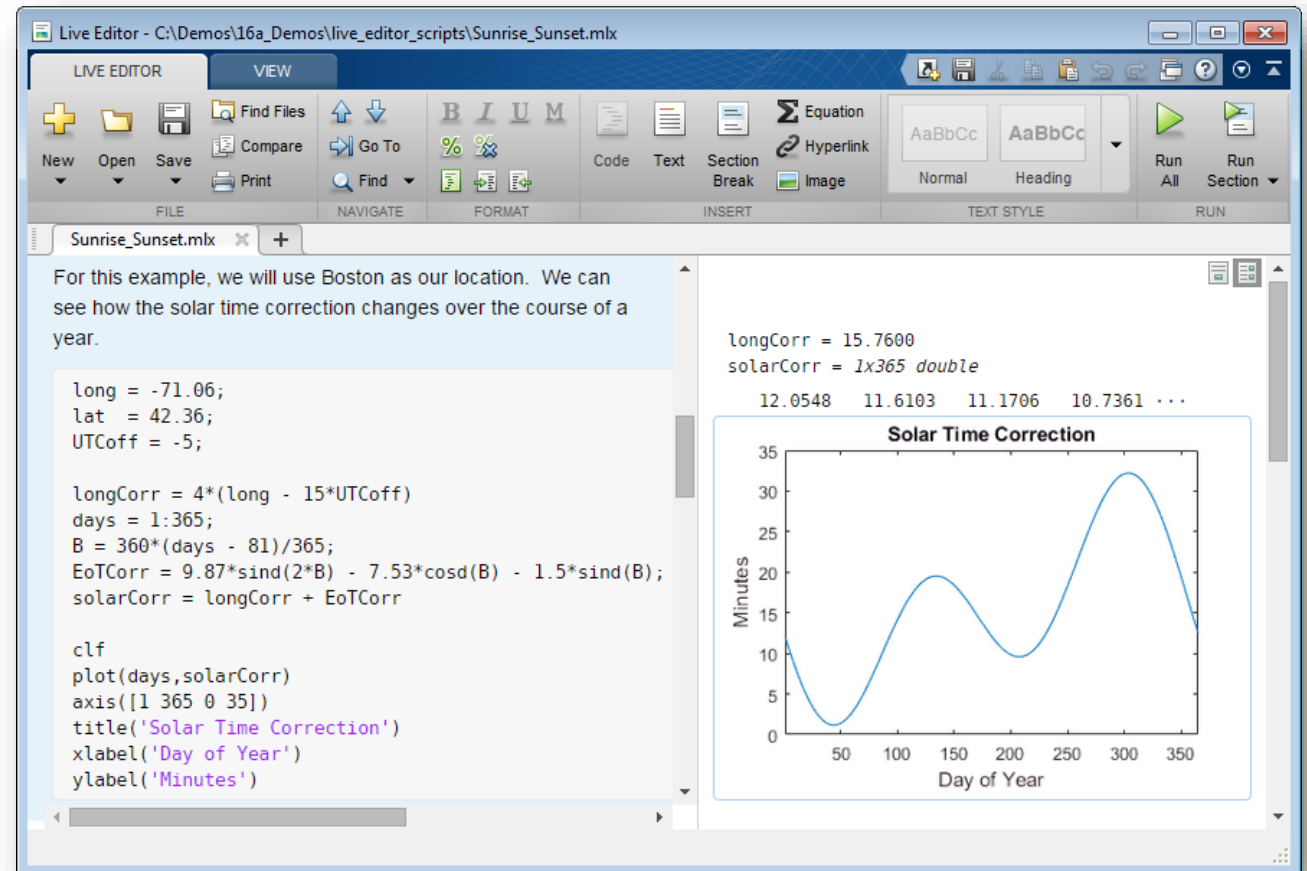
Everyday .

R2016a

Live Editor

Accelerate Exploratory Programming and Analysis

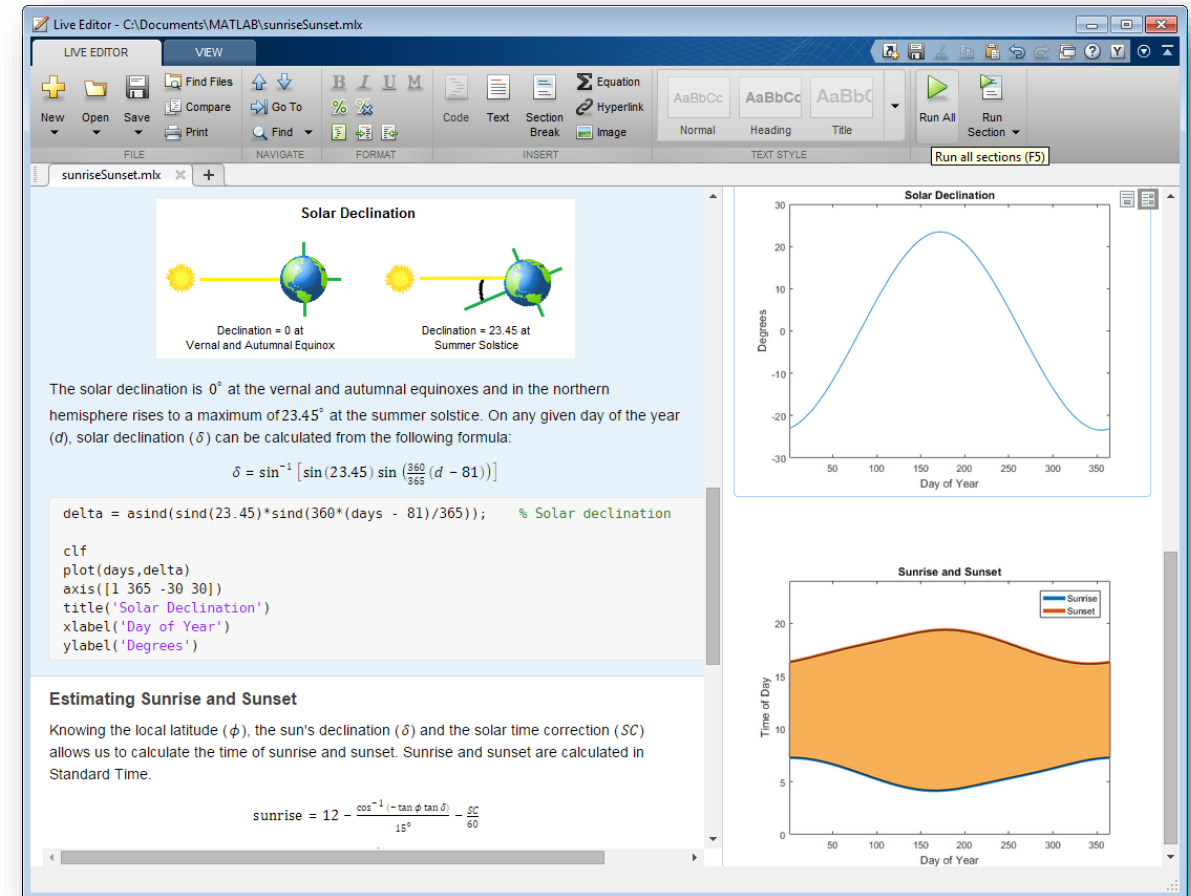
- An ***additional*** editor for scripts
- Work more efficiently
- Write, execute, and test code in a single interactive environment
- Generate results and graphics together with the code that produced them



Live Editor

Create Interactive Narratives

- Create the story you want to share with others
 - Add titles, headings, and formatted text
 - Add equations, images, and hyperlinks
- Let them reproduce, validate, and extend your work
- Use live scripts to teach
 - Create lectures that combine explanatory text, mathematical equations, code and results



Live Editor

Integrate Symbolic Math in Live Scripts

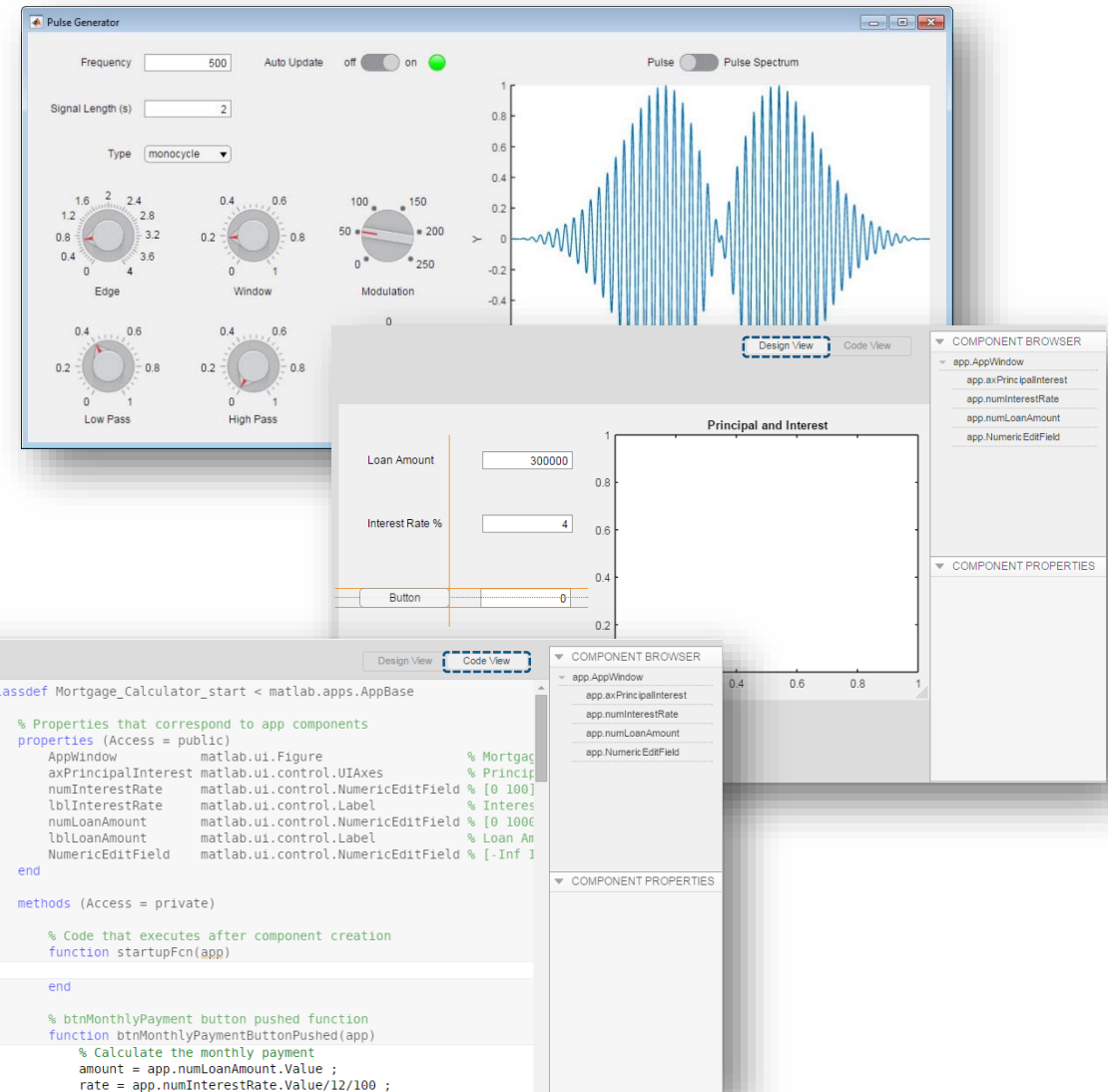
Symbolic Math Toolbox

- Combine analytic and numeric techniques to develop and validate mathematical models
- Improve accuracy and efficiency of algorithms by providing exact solutions
- Computational mathematics are displayed using math typesets
- New functions for plotting mathematical expressions and equations
- Simulink and Simscape integration

The screenshot shows the MATLAB Live Editor interface. The main window is titled 'Computational Mathematics in the Symbolic Toolbox' and displays a 3D surface plot and a contour plot. The 3D plot is labeled 'MATLAB speaks ...' and shows a surface with a peak and a valley. The contour plot shows concentric contours. Below the main window, there are two smaller windows. The left one is titled 'Differentiation' and shows a plot of a function with its first and second derivatives. The right one is titled 'Integration' and shows a plot of a function with a shaded area under the curve representing a definite integral.

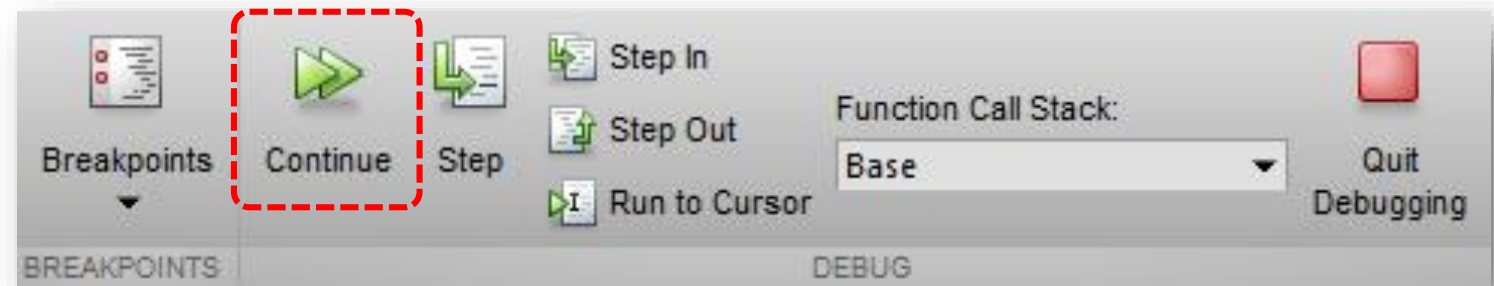
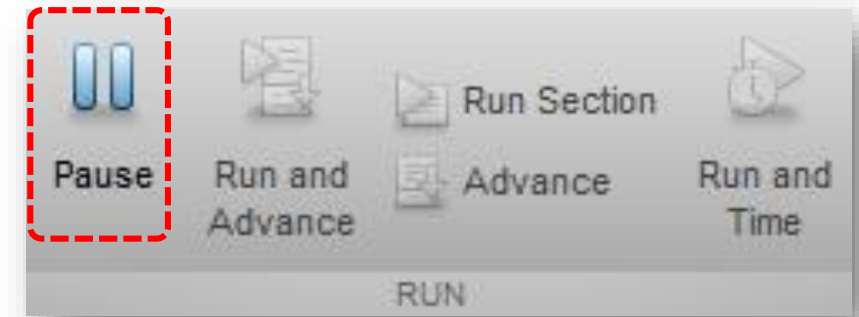
App Designer Integrates the Primary Tasks of App Building

- Apps are interactive applications for performing common tasks
- App Designer makes app building more efficient by letting you quickly move between visual design and code development
- App Designer includes:
 - Enhanced design environment
 - Expanded UI component set
 - Code integration
 - Tight synchronization of design and code views with embedded editing
 - New object-based code format that makes it easier to share data between parts of the app



Pause Long Running Programs

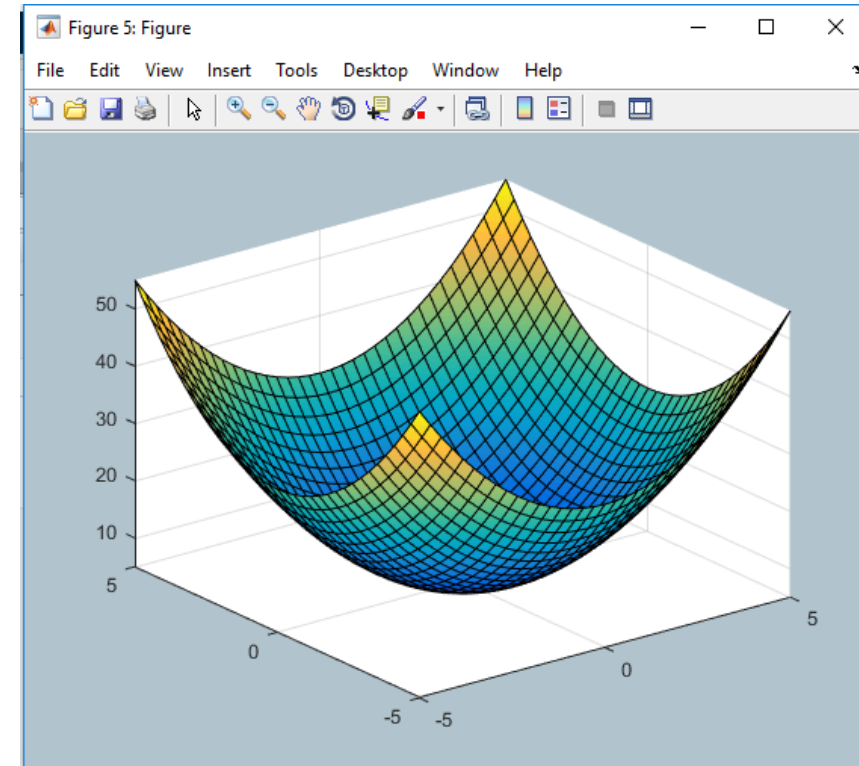
- New feature allows you to troubleshoot problems without specifying breakpoints in advance
 - Pause execution of a program from the Editor
 - Enter debug mode
 - Resume program execution



More Graphics Features

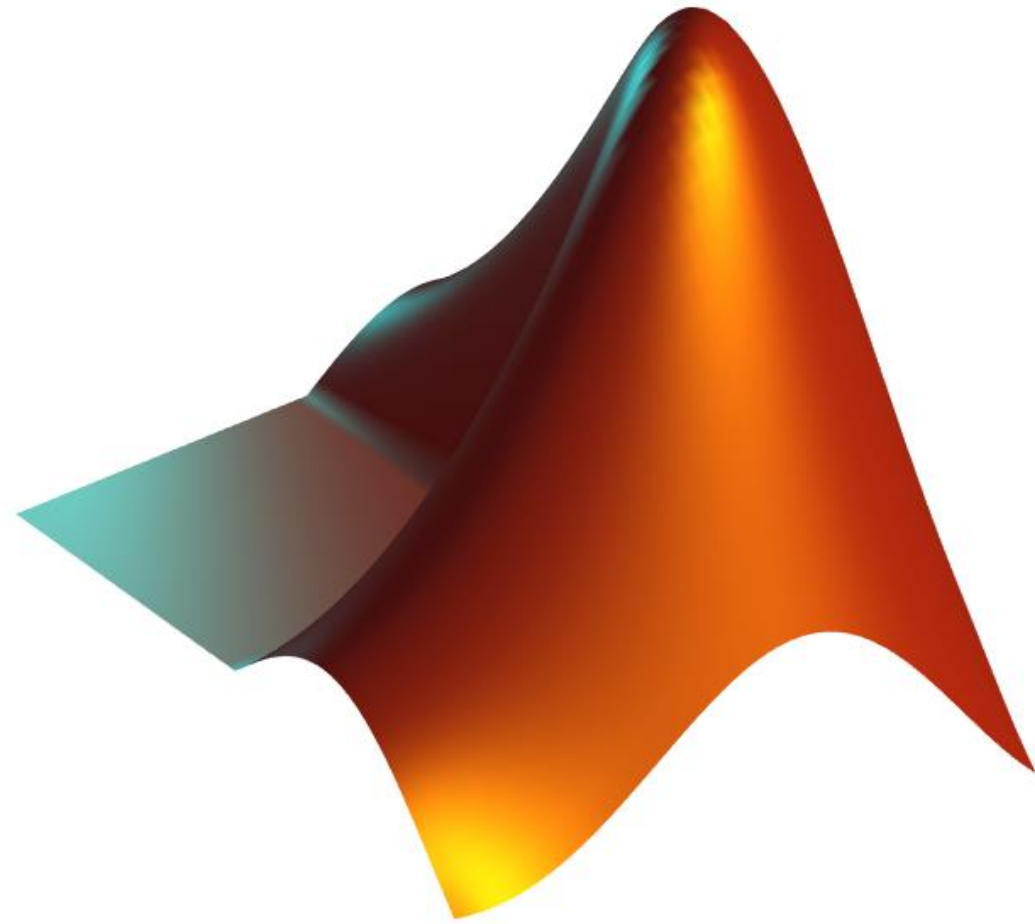
- `polarplot`
 - Including negative radial axis limits
 - Access polar plot properties

- Family of parametric plotting functions
 - `fplot`
 - `fplot3`
 - `fcontour`
 - `fsurf`
 - `fmesh`



Before .. AND still in R2016a	New to R2016a
<code>fh_3d = @(x,y) 5 + x.^2 + y.^2 ;</code>	<code>fh_3d = @(x,y) 5 + x.^2 + y.^2 ;</code>
<code>[X,Y] = meshgrid(-5:0.2:5, -5:0.2:5);</code> <code> Z = fh_3d(X,Y) ;</code>	
<code>surf(X,Y,Z) ;</code>	<code>fsurf(fh_3d) ;</code>

Demo



R2016a

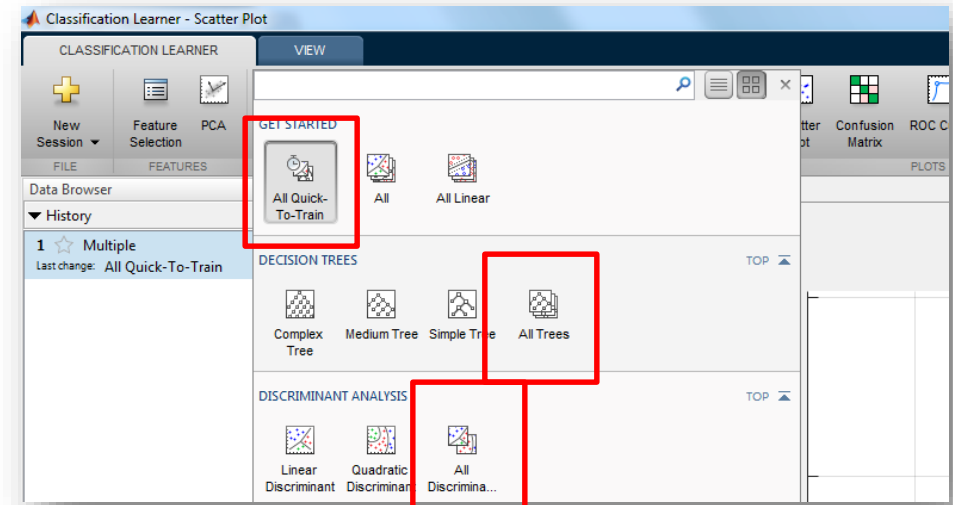
Machine Learning

R2016a

Apps for Machine Learning

Statistics and Machine Learning Toolbox
Computer Vision System Toolbox

- **Classification Learner app**
 - Get started by automatically training a selection of models
 - visualizes results by class labels,
 - logistic regression classification now part of the model options (for binary response cases)



Apps for Machine Learning

Statistics and Machine Learning Toolbox Computer Vision System Toolbox

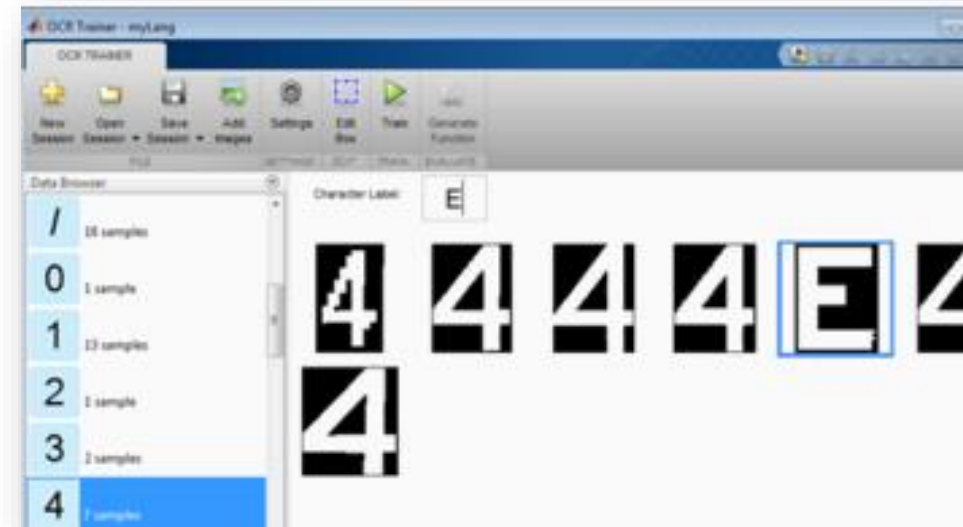
if you refuse to eat your

vegetables you will grow

horns and a goatee beard

and nobody will like you

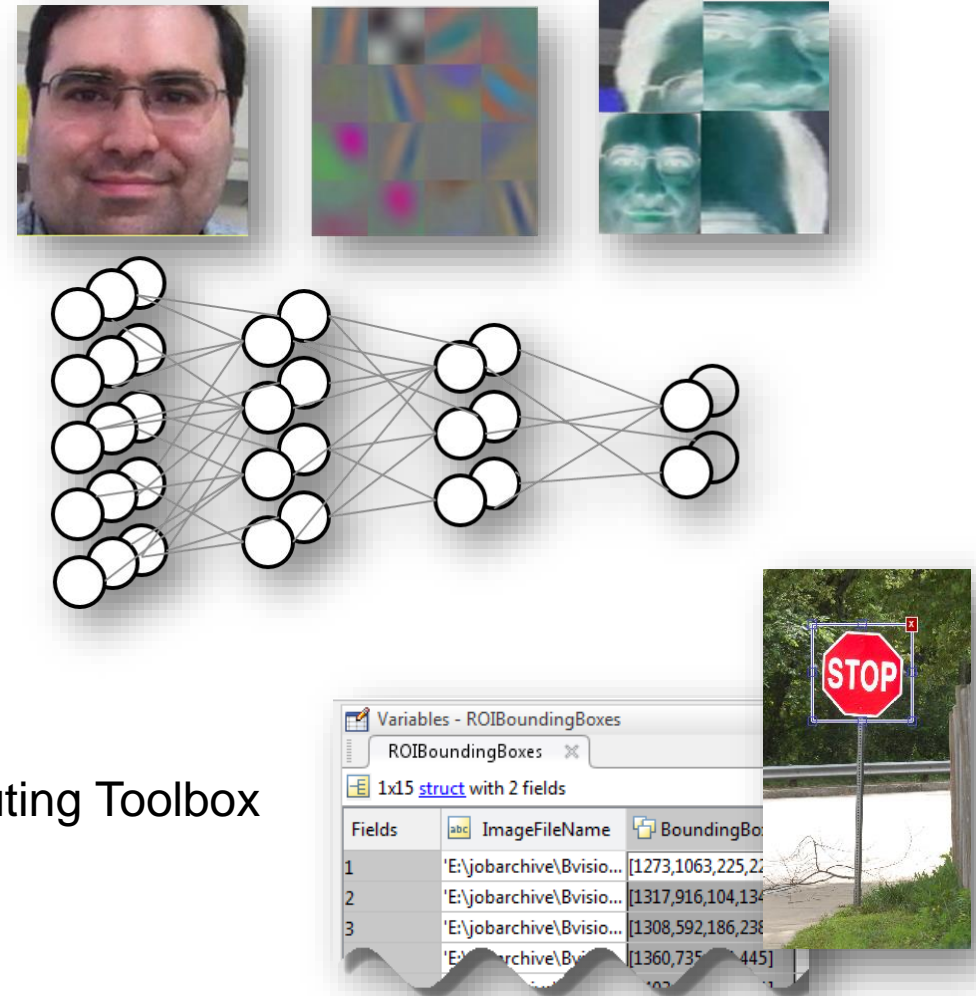
- Optical Character Recognition (OCR) app
 - Train an optical character recognition model to recognize a specific set of characters



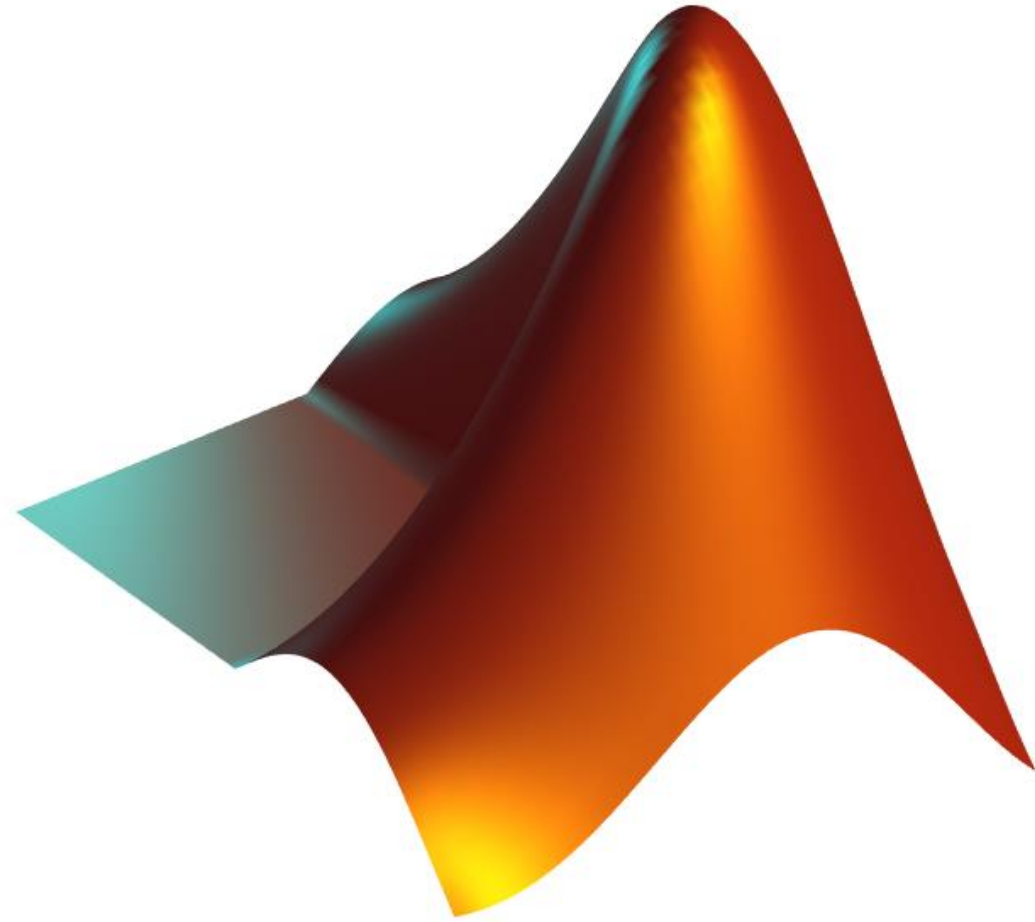
Deep Learning for Object Classification

Neural Network Toolbox
Parallel Computing Toolbox

- Deep learning enables face detection, autonomous robotics, and ADAS
- **Convolutional neural network** (CNN) algorithm added to Neural Network Toolbox
- Uses cuDNN (a GPU-accelerated library from NVIDIA) (*requires Parallel Computing Toolbox*)
- The MATLAB platform enables engineers to build complete applications using deep learning
 - Data labeling
 - Training large data sets with GPUs using Parallel Computing Toolbox
 - Use object classifier as part of broader application



Demo



R2016a

Vision
Hardware
Sound

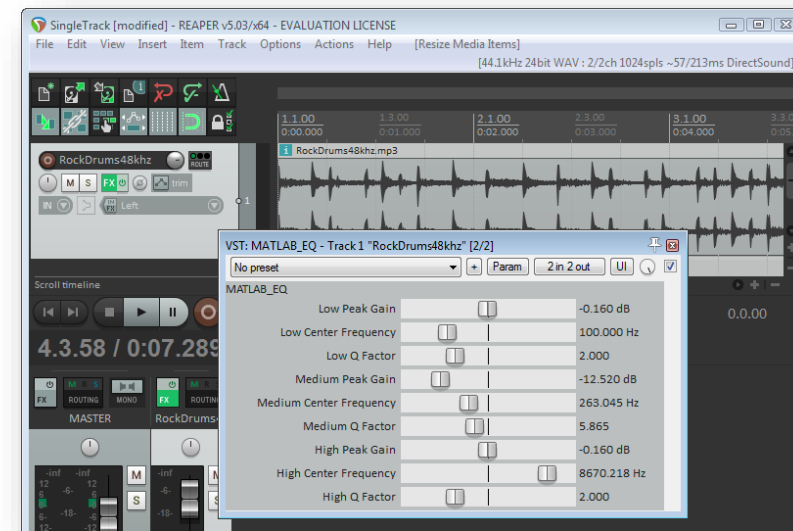
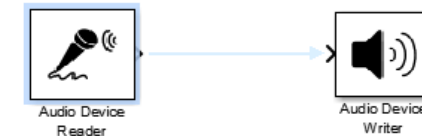
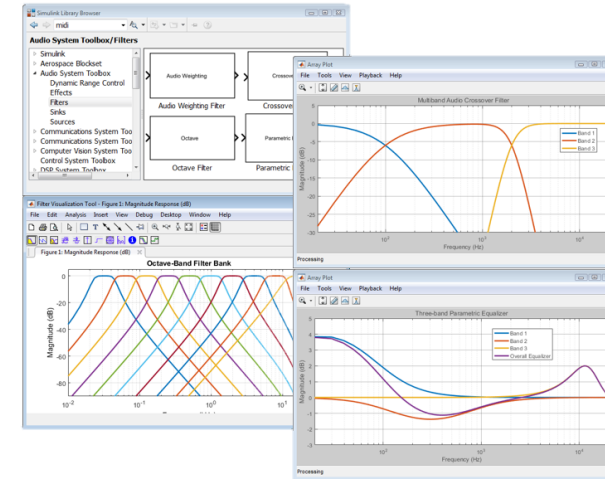
R2016a

Audio System Toolbox

Design and test audio processing systems



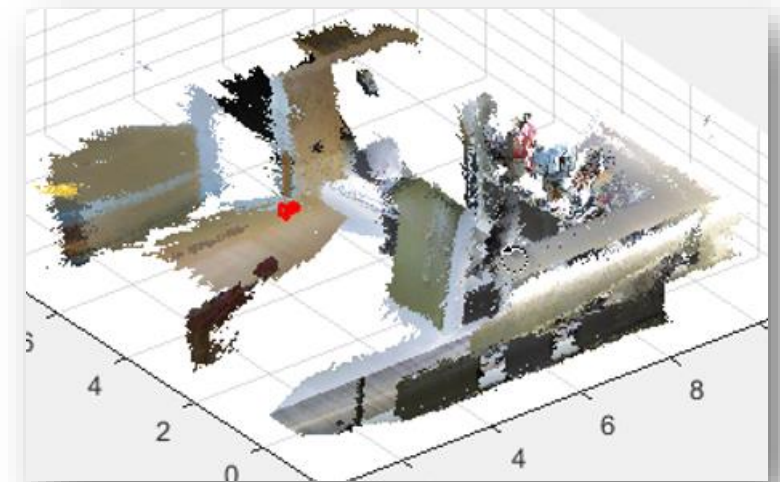
- Libraries of audio processing algorithms and examples
- Low-latency audio streaming from and to standard audio interfaces (e.g. ASIO, CoreAudio, ALSA)
- Live-tuning of MATLAB and Simulink via UI and MIDI controls
- VST plugin generation to run on Digital Audio Workstations



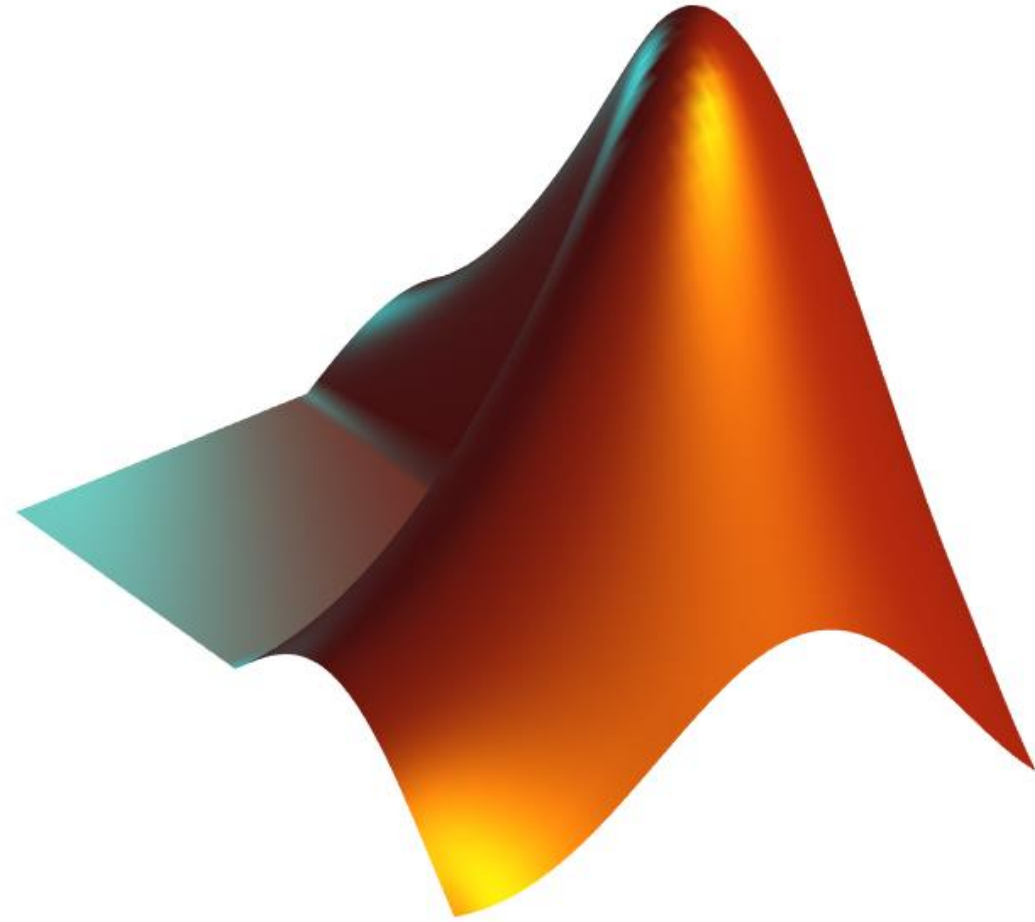
3D Vision

Computer Vision System Toolbox Image Acquisition Toolbox

- New advanced algorithms added to Computer Vision System Toolbox
 - Structure from motion
 - Bundle adjustment
- Support for Kinect for Windows v2 added to Image Acquisition Toolbox
 - Allows you to acquire images, depth maps, skeleton data, and metadata from Kinect for Windows v2



Demo



R2016a

Did you know ?

- NOT new ... but new'ish

MATLAB Online Access MATLAB From Your Web Browser

<http://au.mathworks.com/products/matlab-online/>

Access MATLAB® from your web browser.

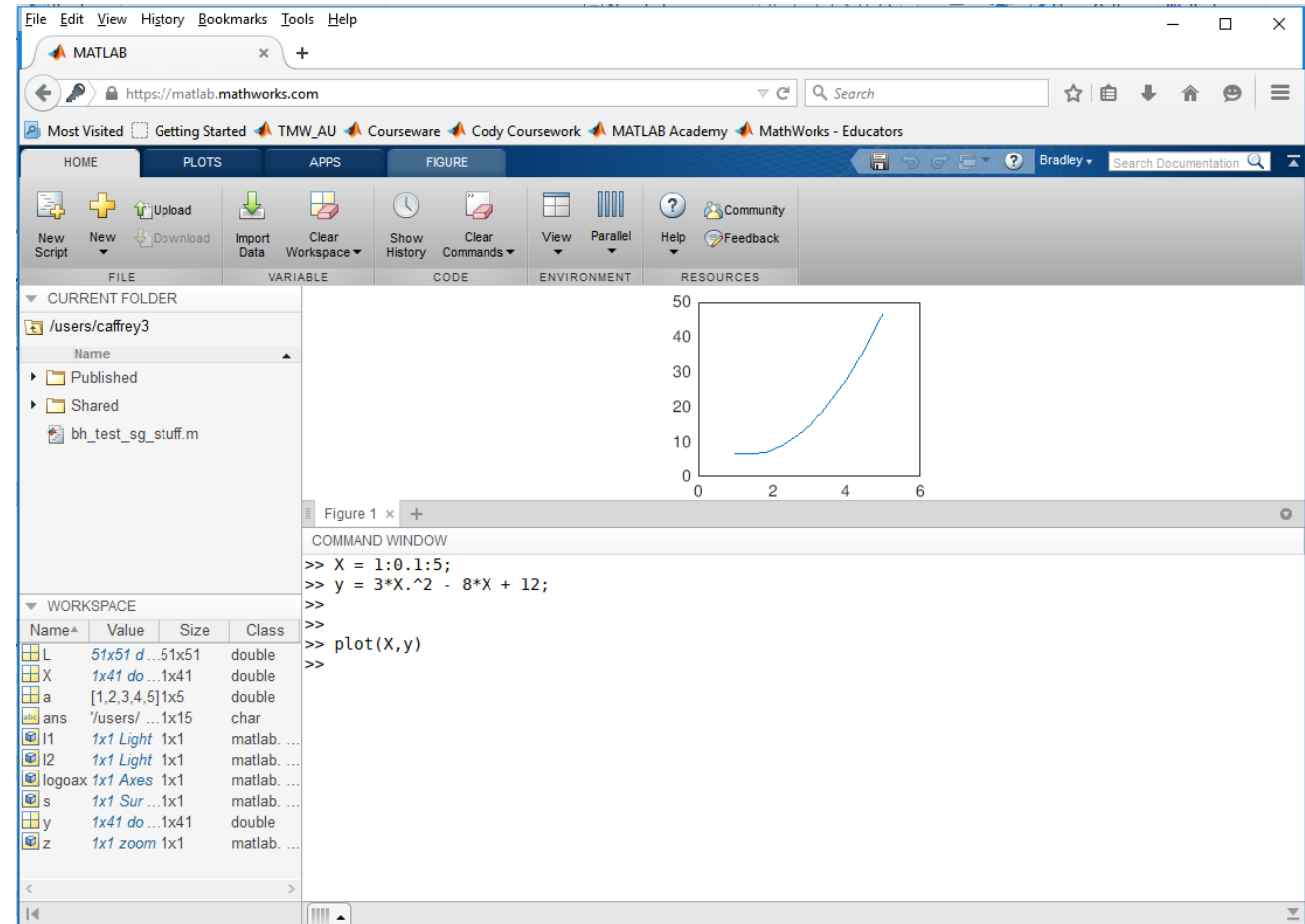
- Just [log in](#) to use MATLAB.

You get [MATLAB Drive™](#) :

- 500Mb of storage
- available wherever you go.

Share files:

- Collaborate with colleagues
- publish as HTML or PDF documents.



Currently available with: [Total Academic Headcount](#) licenses, MATLAB and Simulink [Student Suite*](#), and [MATLAB Student*](#).

*Requires [SMS](#) to access MATLAB Online.

MATLAB Mobile Connect to MATLAB from your iPhone, iPad, or Android device

<http://au.mathworks.com/products/matlab-mobile/>

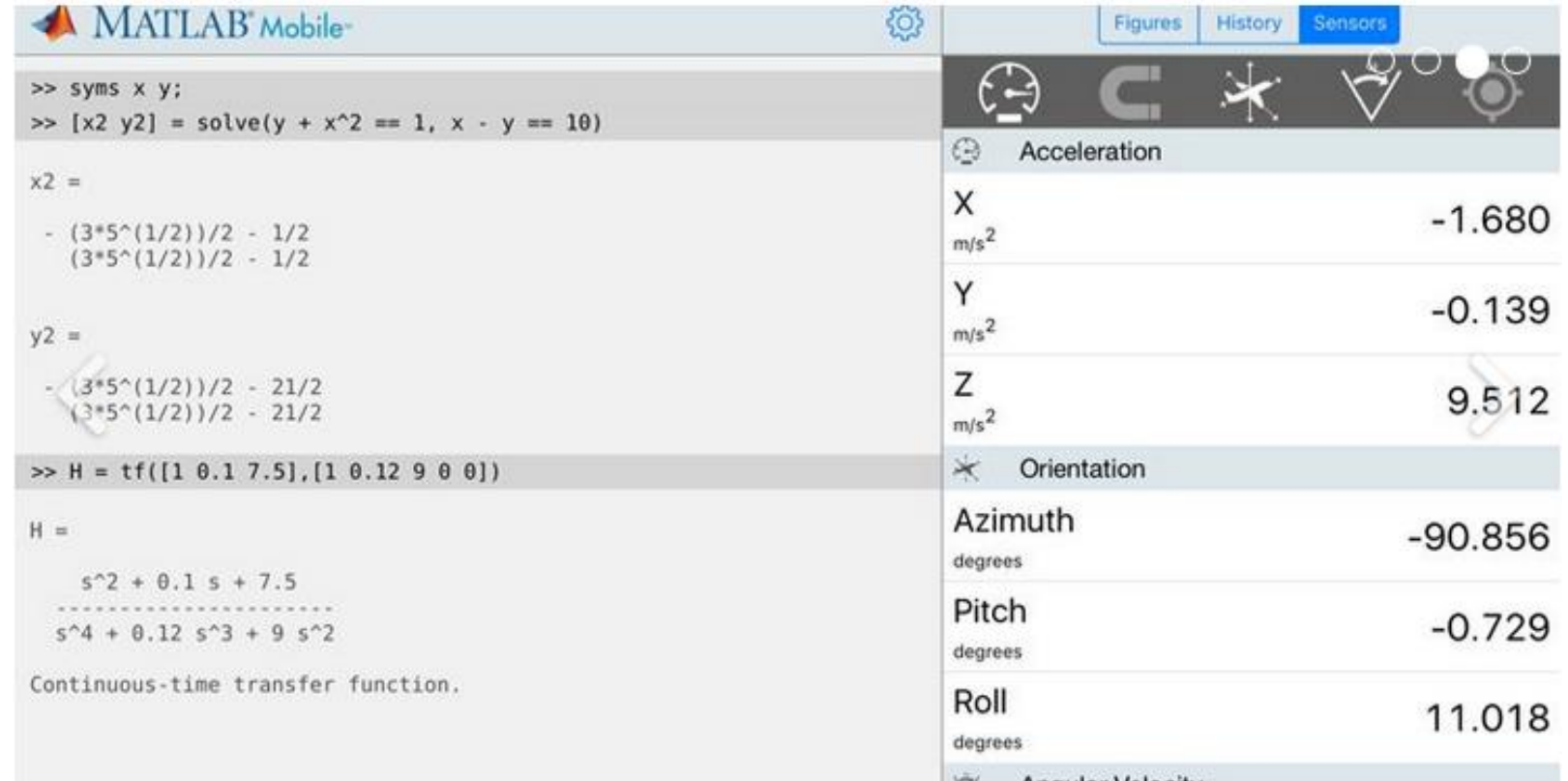
MATLAB Mobile for your iPhone, iPad, or Android:

- connects to MathWorks Cloud
- connects to your computer.

Evaluate MATLAB commands,

- run scripts,
- create plots and figures,

Access Sensors on your phone and stream to your desktop



The screenshot shows the MATLAB Mobile interface. On the left is a command window with the following text:

```
>> syms x y;
>> [x2 y2] = solve(y + x^2 == 1, x - y == 10)

x2 =
- (3*5^(1/2))/2 - 1/2
 (3*5^(1/2))/2 - 1/2

y2 =
- (3*5^(1/2))/2 - 21/2
 (3*5^(1/2))/2 - 21/2

>> H = tf([1 0.1 7.5],[1 0.12 9 0 0])

H =
      s^2 + 0.1 s + 7.5
-----
      s^4 + 0.12 s^3 + 9 s^2
Continuous-time transfer function.
```

On the right is a sensors panel with the following data:

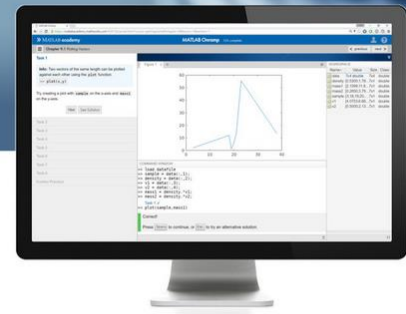
Acceleration	
X m/s ²	-1.680
Y m/s ²	-0.139
Z m/s ²	9.512
Orientation	
Azimuth degrees	-90.856
Pitch degrees	-0.729
Roll degrees	11.018
Angular Velocity	

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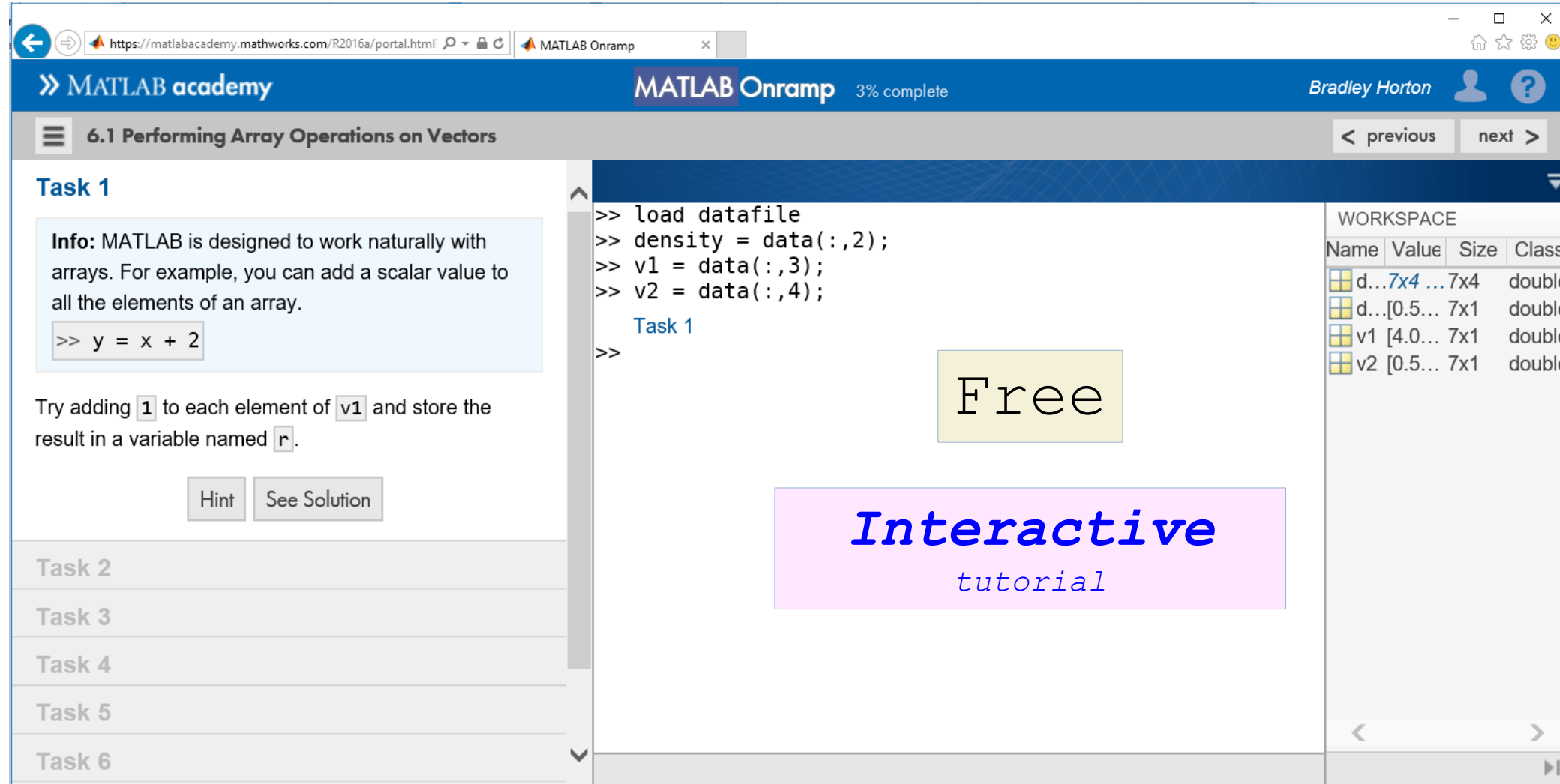
MATLAB Academy ---- MATLAB Onramp

<https://matlabacademy.mathworks.com/>



Learn MATLAB for Free

Launch MATLAB Onramp now



Task 1

Info: MATLAB is designed to work naturally with arrays. For example, you can add a scalar value to all the elements of an array.

```
>> y = x + 2
```

Try adding `1` to each element of `v1` and store the result in a variable named `r`.

Hint See Solution

```
>> load datafile
>> density = data(:,2);
>> v1 = data(:,3);
>> v2 = data(:,4);

Task 1
>>
```

Free

Interactive tutorial

Name	Value	Size	Class
d...	7x4 ...	7x4	double
d...	[0.5...	7x1	double
v1	[4.0...	7x1	double
v2	[0.5...	7x1	double

Cody Coursework™

Online automated grading system for MATLAB assignments

- Create online private courses and assignments
- Students **execute MATLAB code on the web**
- Control the visibility of the test suites from students.
- Visualize solution results using MATLAB graphics
- Download all student attempts and **report on grading data**

<http://coursework.mathworks.com>

Instructor Demo - ASEE Workshop T... COURSE PEOPLE Help ?

Course Details

Data Types

Create Numeric Array

Create Cell Array

PROBLEM

Programming Flow

if-else-elseif

PROBLEM

Elementary Math

Length of the hypotenuse

Fibonacci Sequence

PROBLEM

Engineering Problems

Projectile Motion

PROBLEM

Today's Exercises

Ex1 - Numeric Array

Ex2 - Projectile Motion

PROBLEM

Create Cell Array

Create a cell array where the first 10 elements are numbers from 1 to 10, and the 11th element is the character from the function input x.

For example, if input x is 'a', then the 11th element of the output cell array y should be 'a'.

Relevant Documentations:

- Cell Array
- Array to Cell Array

Solution

The following text area contains a copy of Solution 112067 [MATLAB Document](#)

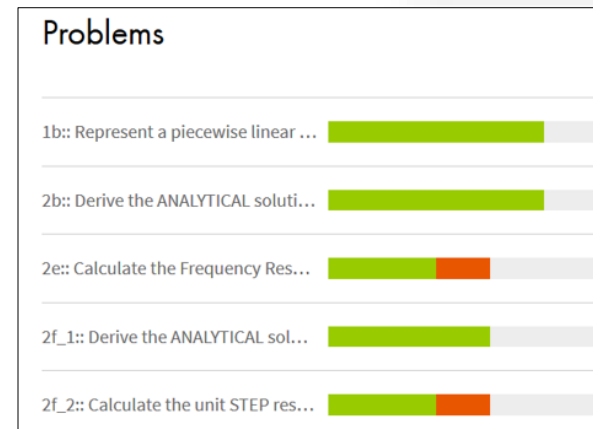
```
function y = cellArray(x)
% Do not modify the line above

%% Please place your answer between this line

y = |

%% and this line.
end
```

Submit



Create Report : Assignment 1

Assignment 1

Last best solutions submitted by due date(05 Jun 2015 2:00 PM UTC)

Last best solution as of today

All solutions

Report Format: CSV Excel

Cancel Create

R2016a

Profundus ?

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Enjoy the conference

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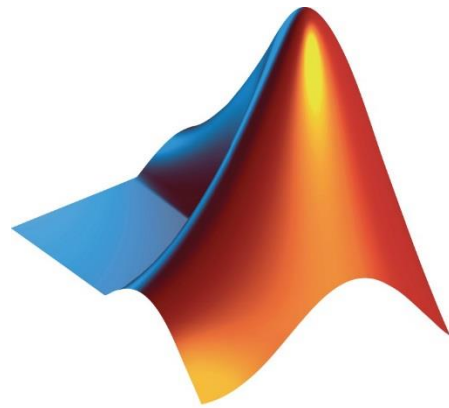
CODY Coursework

Live Editor

Classification Learner APP

3D vision Deep Learning

Morning tea	
Data Analytics and Machine Learning with MATLAB R2016a	
Lunch	
Teaching and Assessment Resources for MATLAB and Simulink	Computer Vision System Design: Deep Learning and 3D Vision R2016a
Modelling Simulation and Control of a Quadcopter R2016a	Distributed Computing with MATLAB
Afternoon tea	
Developing Robotics Applications in MATLAB: Introducing Robotics System Toolbox	Wireless Design in MATLAB



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