MATLAB at King Saud University

Accelerating the Pace of Engineering and Science

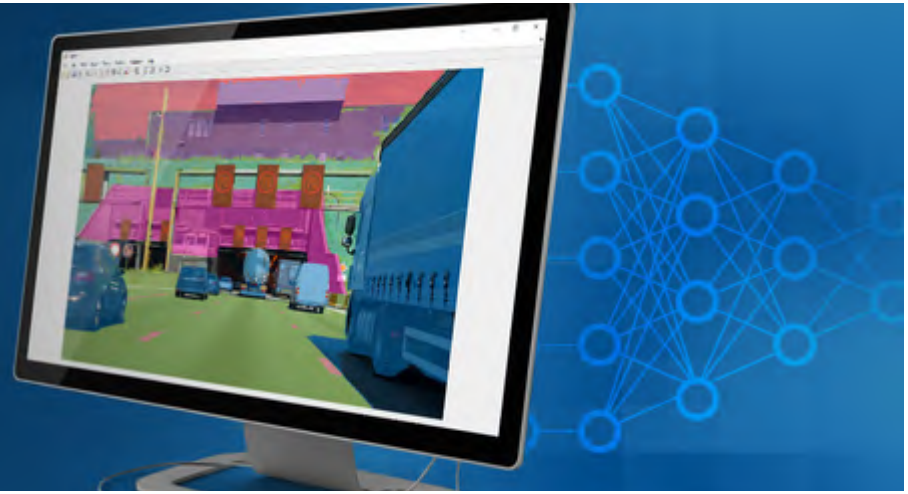
Dr. Joachim Levelt

Agenda Introduction

1. MATLAB, a short introduction

2. Resources and services for you

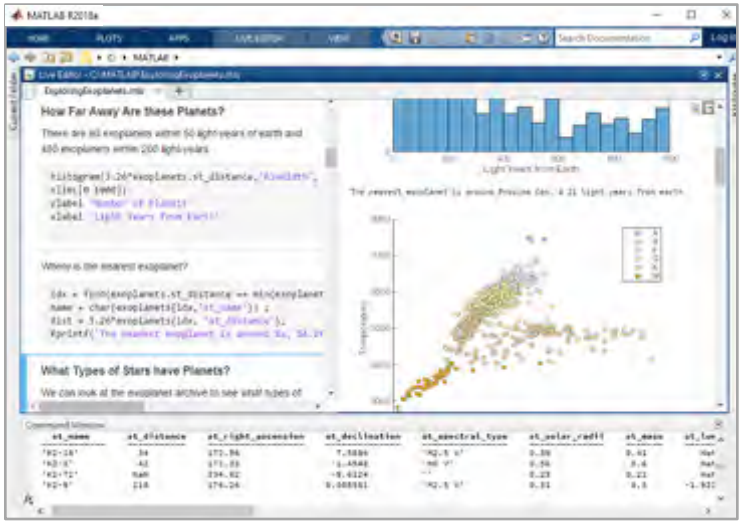
MATLAB®
&SIMULINK®



Our Products

- MATLAB is a programming environment for algorithm development, data analysis, visualization, and numeric computation.
- Simulink is a graphical environment for designing, simulating, and testing systems.
- Nearly 100 add-on products for specialized tasks.

MATLAB



Our Customers

Millions of engineers and scientists worldwide use MATLAB and Simulink.

90,000+ business, government, and university sites

All of the top 10 auto manufacturers[1]

All of the top 10 aerospace companies[2]

Three of the top five internet companies

[1]OICA: 2016 World Motor Vehicle Production

[2]PwC: Aerospace and Defense 2017 Year in Review

MATLAB & Simulink | Applications & Industries

Mathematical Modeling

Signals and Communications

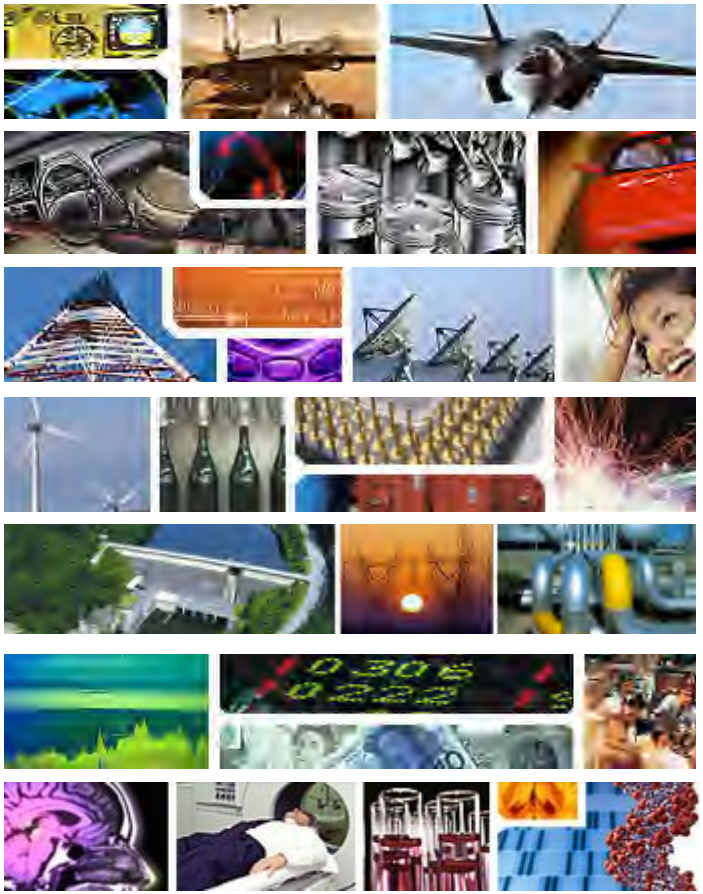
Control Systems

Data Analytics

Computer Vision and Image Processing

Physical Modeling

Internet of Things



Aerospace and Defense

Automotive

Communications, Electronics, Semiconductors

Industrial Automation and Machinery

Energy and Chemical Production

Financial Services

Biotech and Pharmaceuticals

How is industry using MATLAB?

Eurocopter: Helicopters
Eaton: Hybrid Delivery Truck
Caterpillar: Construction Machine

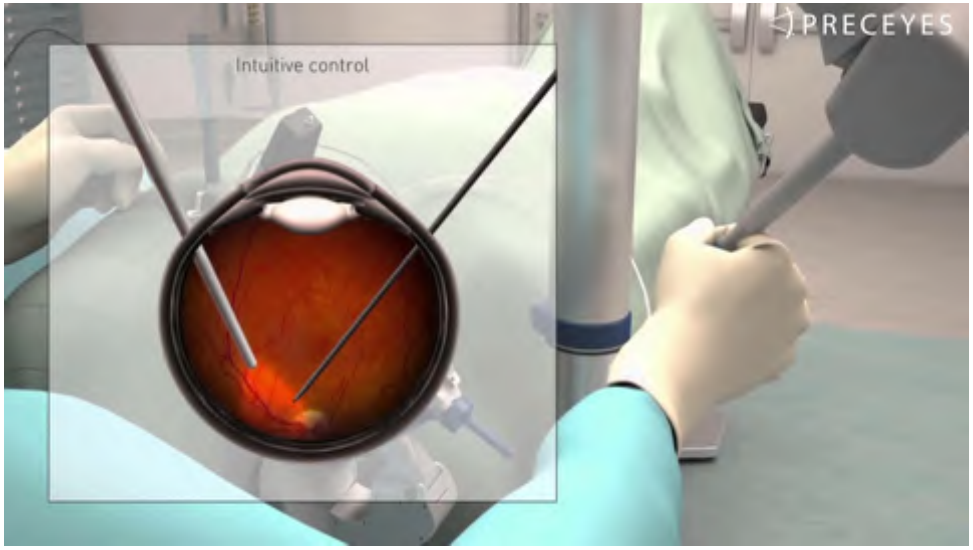
IAV: CNG/LPG EMS
GM: HVAC
Delphi: Common Rail Diesel

Dongfeng: BMS
Honeywell: Flight Controls
GM: Hybrid Powertrain

Daimler: Vehicle Controller
Lear: BCM
Vodafone: Telematics

How is industry using MATLAB?

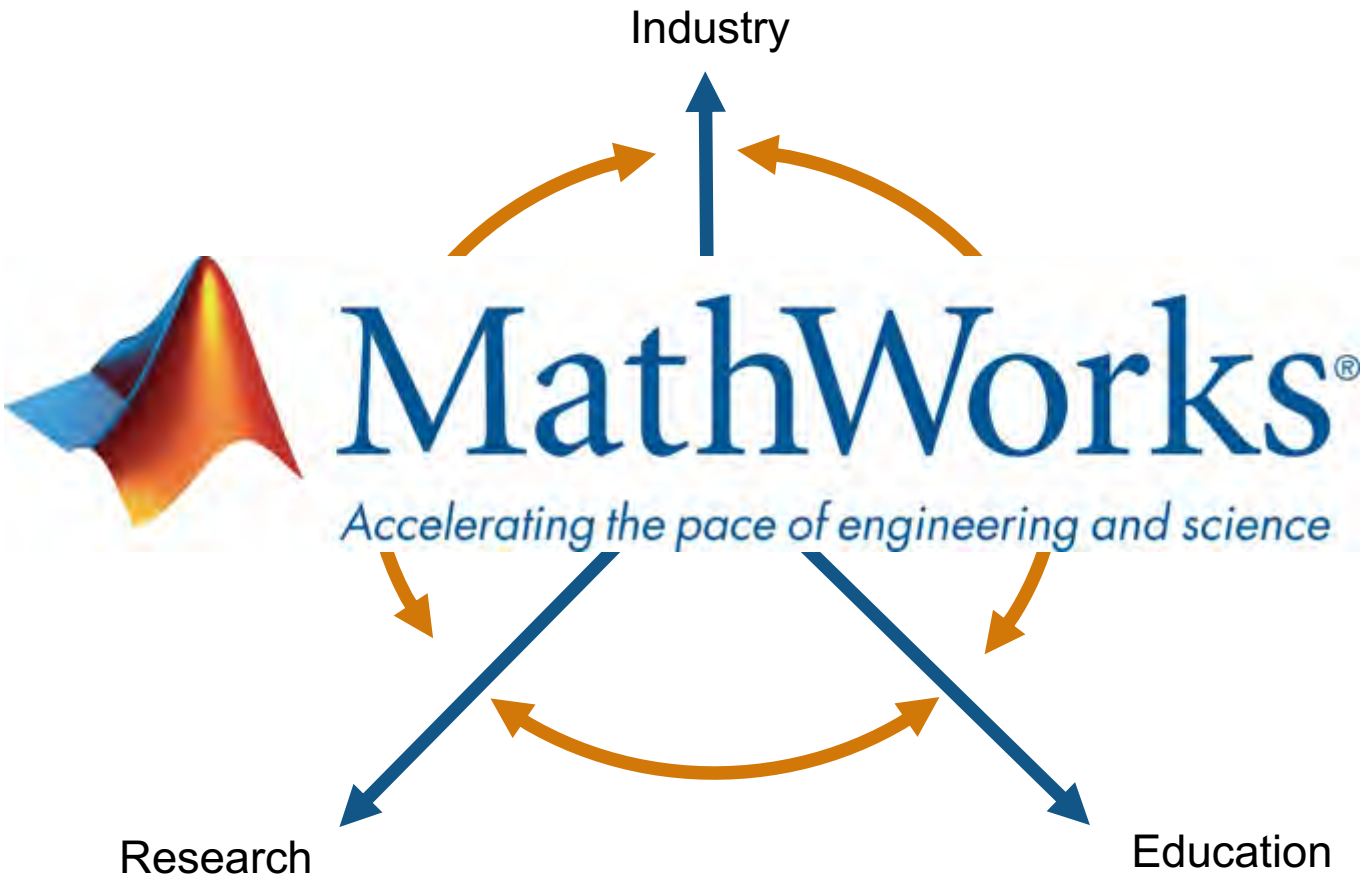
Search: **NASA 7 minutes of terror**



World's first robot-assisted surgery inside a human eye saves sight

removes a membrane one hundredth of a millimeter thick

Software helps everyone speak the same language



A Computational Thinking Infrastructure for...

Over 1100 universities have a

MATLAB TAH Campus License

Enabling over 4 million students

TAH Campus License offers an international ecosystem that is a fundamental component of the infrastructure for teaching, researching and collaborating with industry

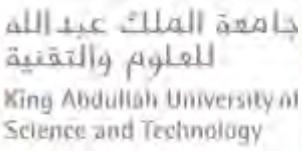
TAH at 16 out of top 20 of the Times Higher Education ranking

101 out of the top 168 ranked have a TAH

1	University of Oxford
2	University of Cambridge
3	Imperial College
4	ETH Zurich
5	University College London
6	London School of Economics
7	University of Edingburgh
8	Karolinska Institure
9	EPFL
10	LMU Munich
11	Kings College London
12	KU Leuven
13	Heidelberg University
14	Technical University of Munich
15	University of Manchester
16	Humboldt University of Berlin
17	Delft University of Technology
18	University of Amsterdam
19	Wagening University & Research
20	Ecole Normale Superiour

University in blue has TAH

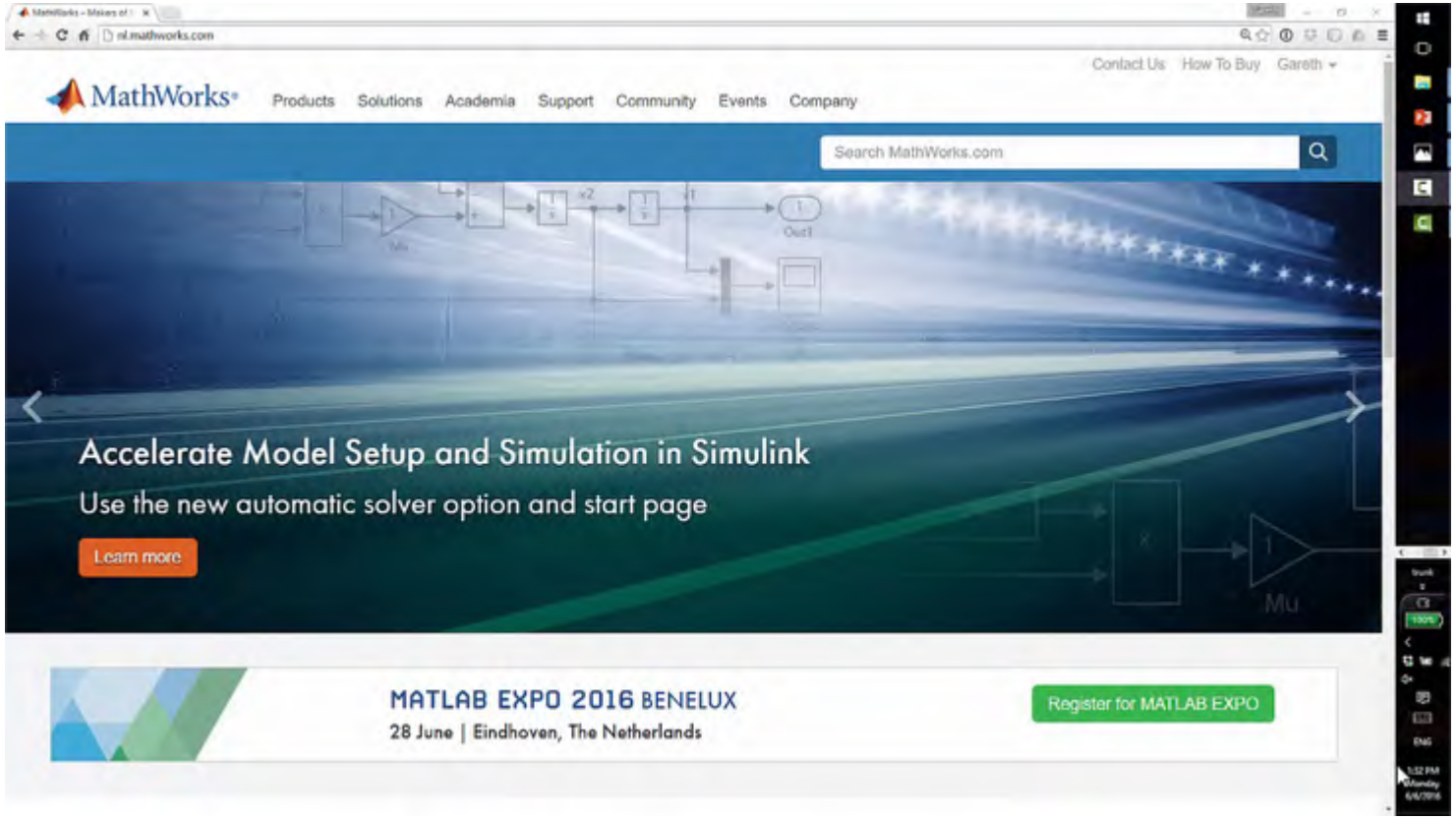
TAH Universities in the Middle East



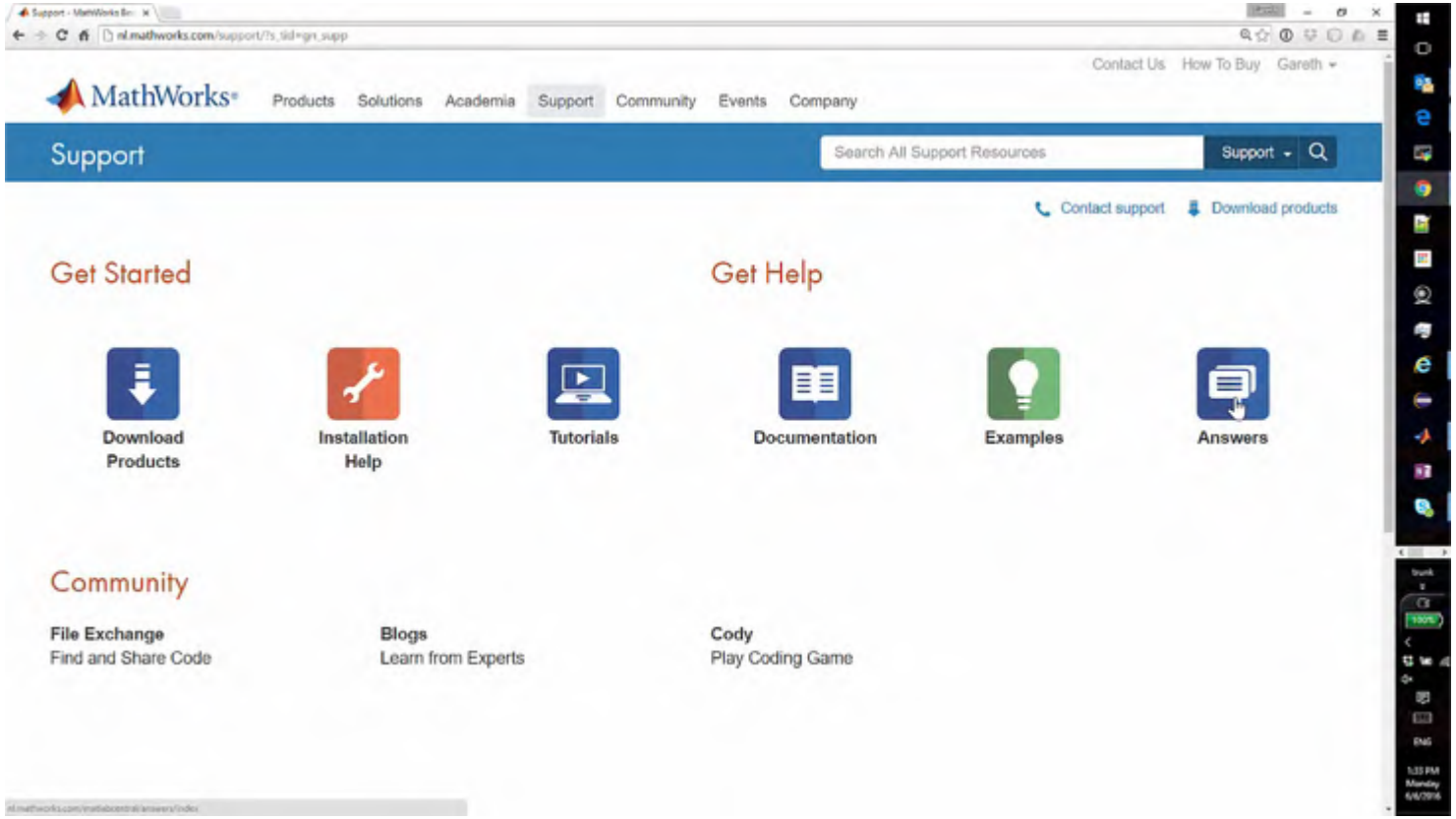
Resources and services for you

#1 MATLAB Examples

Garanteed to be reproduceable produced by MathWorks and community



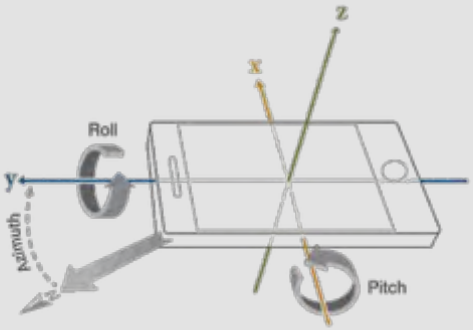
#2 MATLAB Answers



#3 Support for low-cost hardware and mobile sensors

MATLAB based 3D Scanner using
Raspberry Pi

Self-balancing robots using
LEGO and Arduino



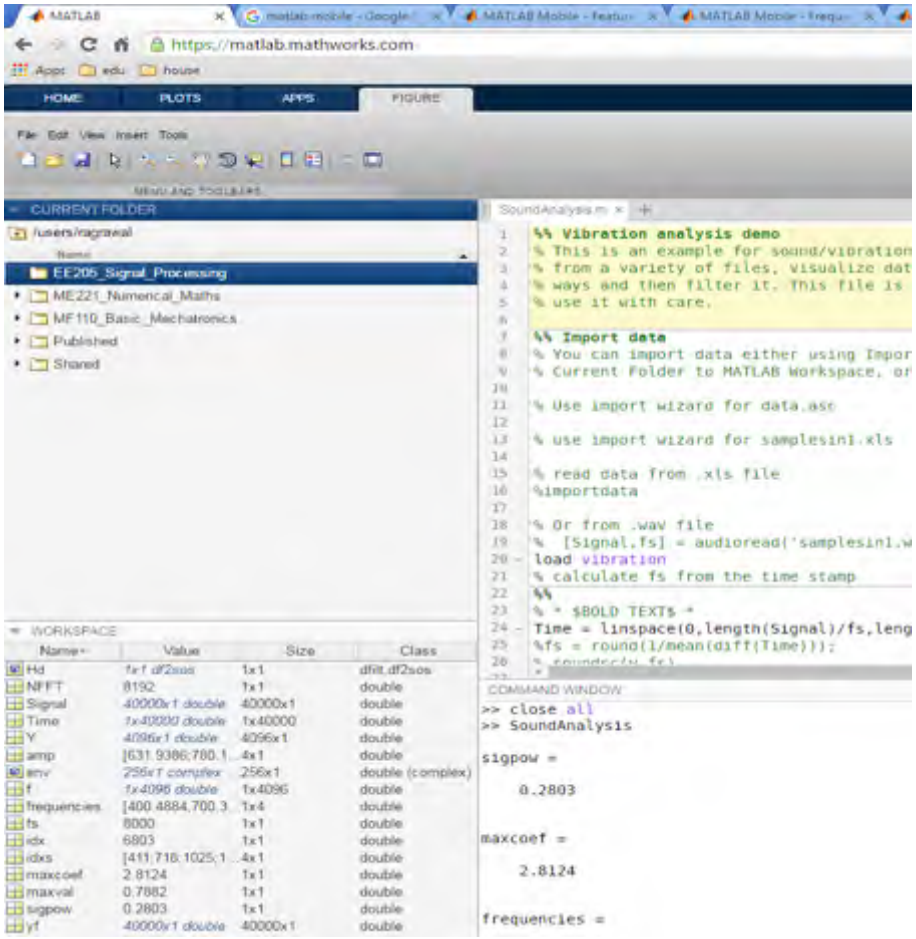
Sensor support for
Android and iOS devices

Search: **MATLAB Hardware Catalog**

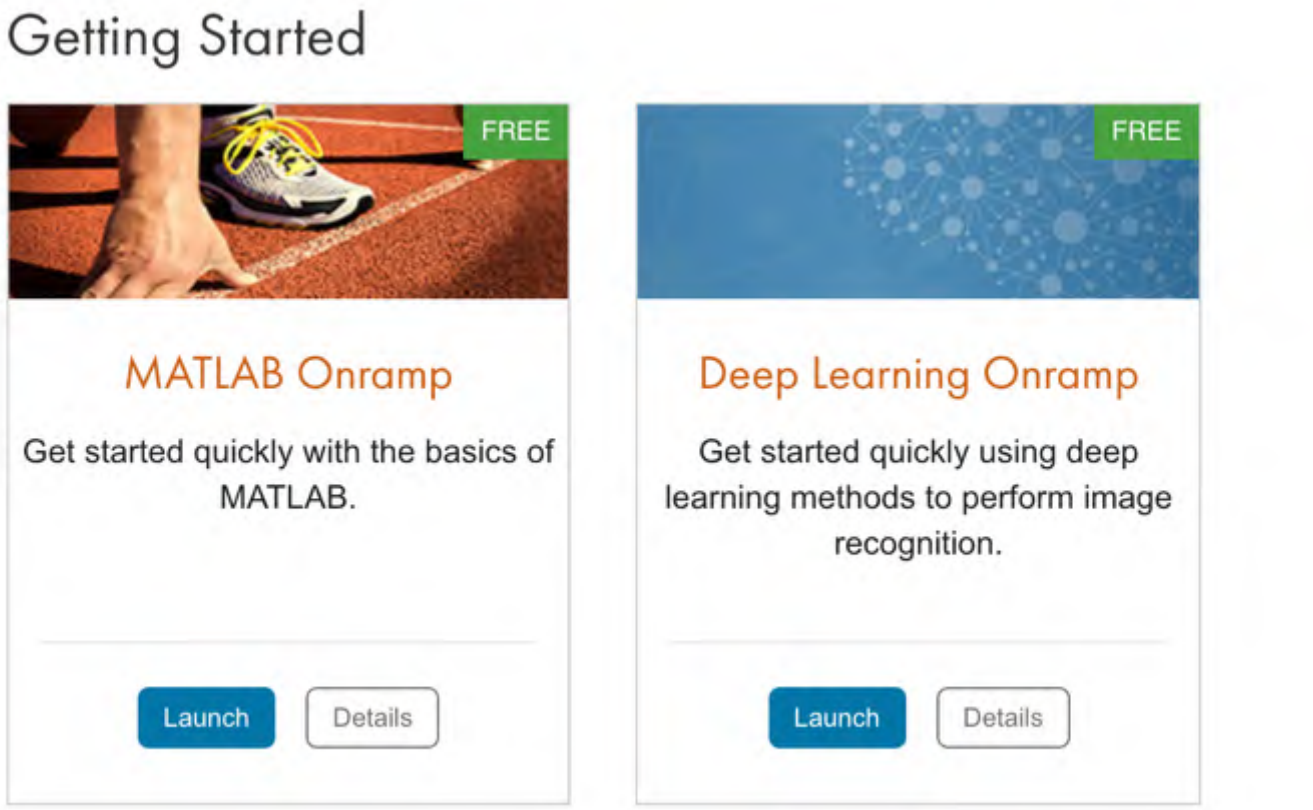
#4 Software Access: MATLAB Online

Use MATLAB from a web browser

- No Download/Installation
- Version Consistency
- Everywhere Access



#5 MATLAB Academy



4 hours of FREE content – available today for everyone in the world

Secure | https://matlabacademy.mathworks.com/R2017b/portal.html?course=odes#chapter=2&lesson=1&section=1

< My Courses | Solving Ordinary Differential Equations with MATLAB 100% complete | Gareth Thomas

2.1 Course Example - The Shuttle Launch: (1/3) Estimating the Space Shuttle's velocity | < previous | next >

Task 1

Background

Info: You can calculate the shuttle's velocity by finding the total change in height, Δh, and dividing by the total change in time, Δt.

$$v = \frac{\Delta h}{\Delta t}$$

The vector `h` contains the shuttle's altitude data. Find the total change in height by subtracting the first element of `h` from the last element of `h`. Assign the result to the variable `deltaH`.

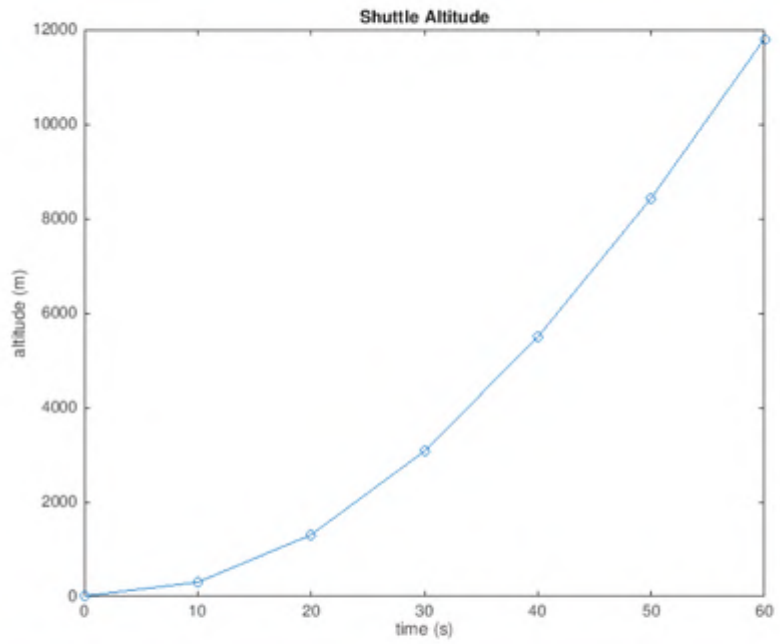
Hint | See Solution

Course Quick Reference

Task 2
Task 3
Task 4
Task 5
Task 6
Further Practice

HOME | FIGURE

Figure 1

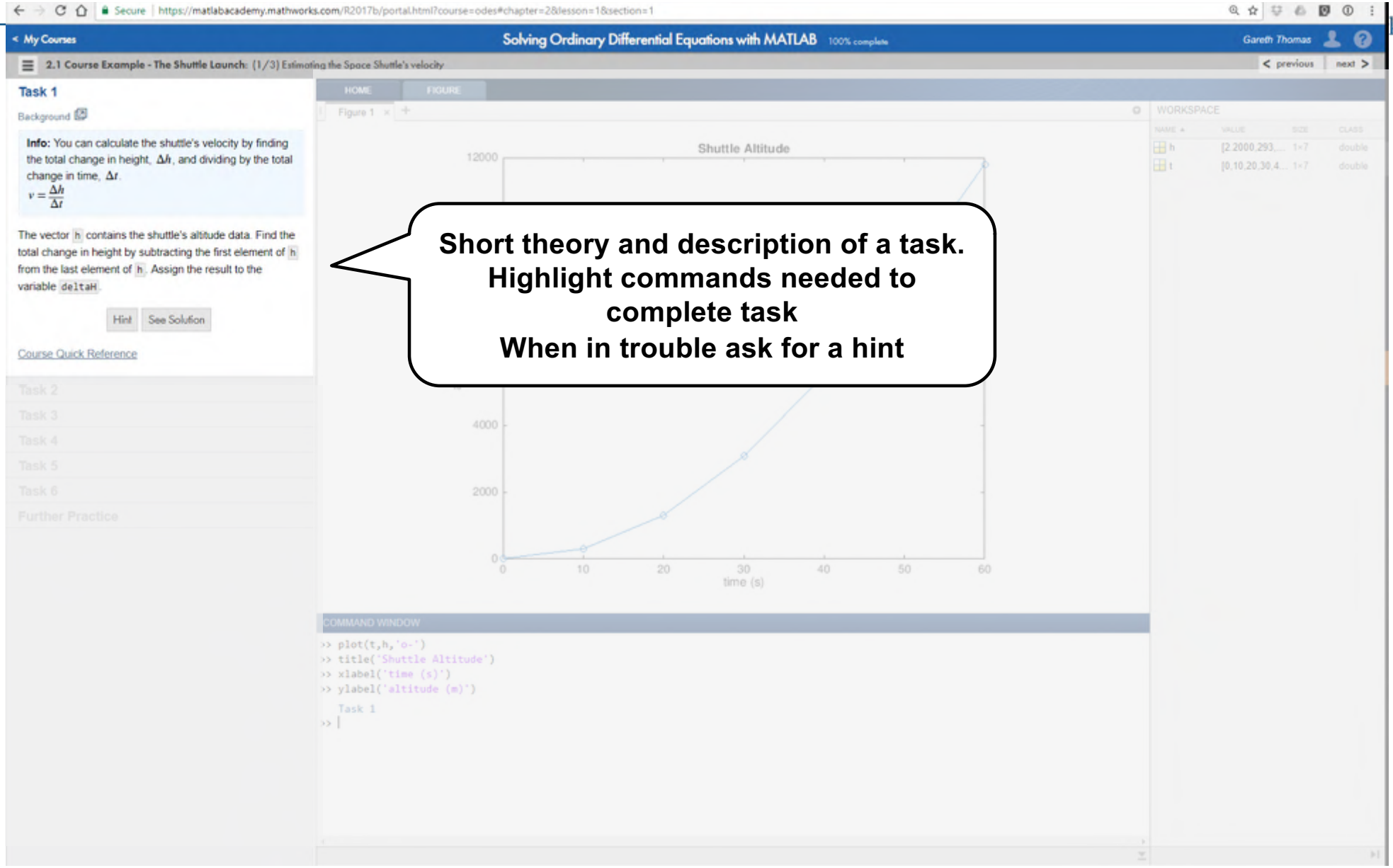


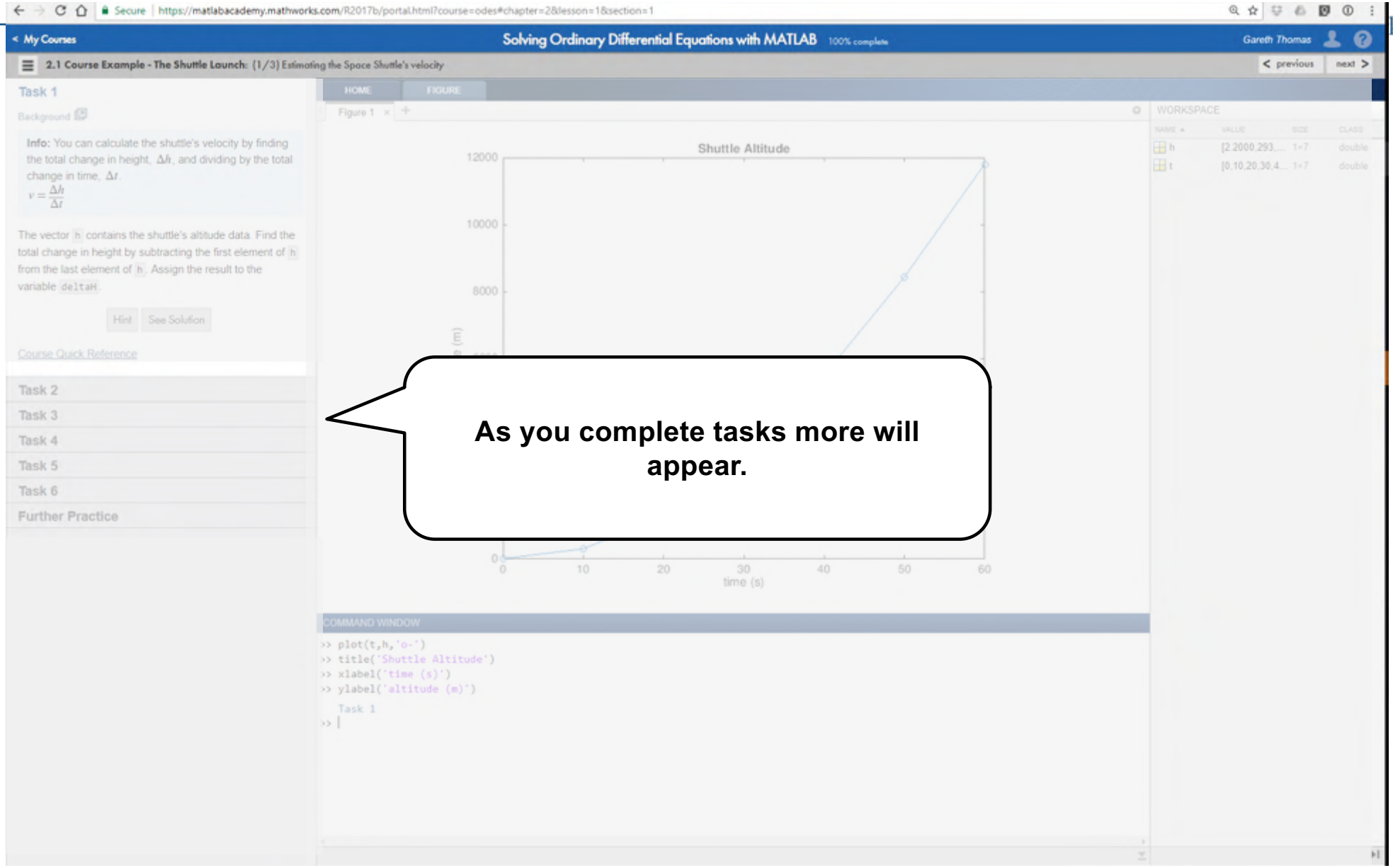
WORKSPACE

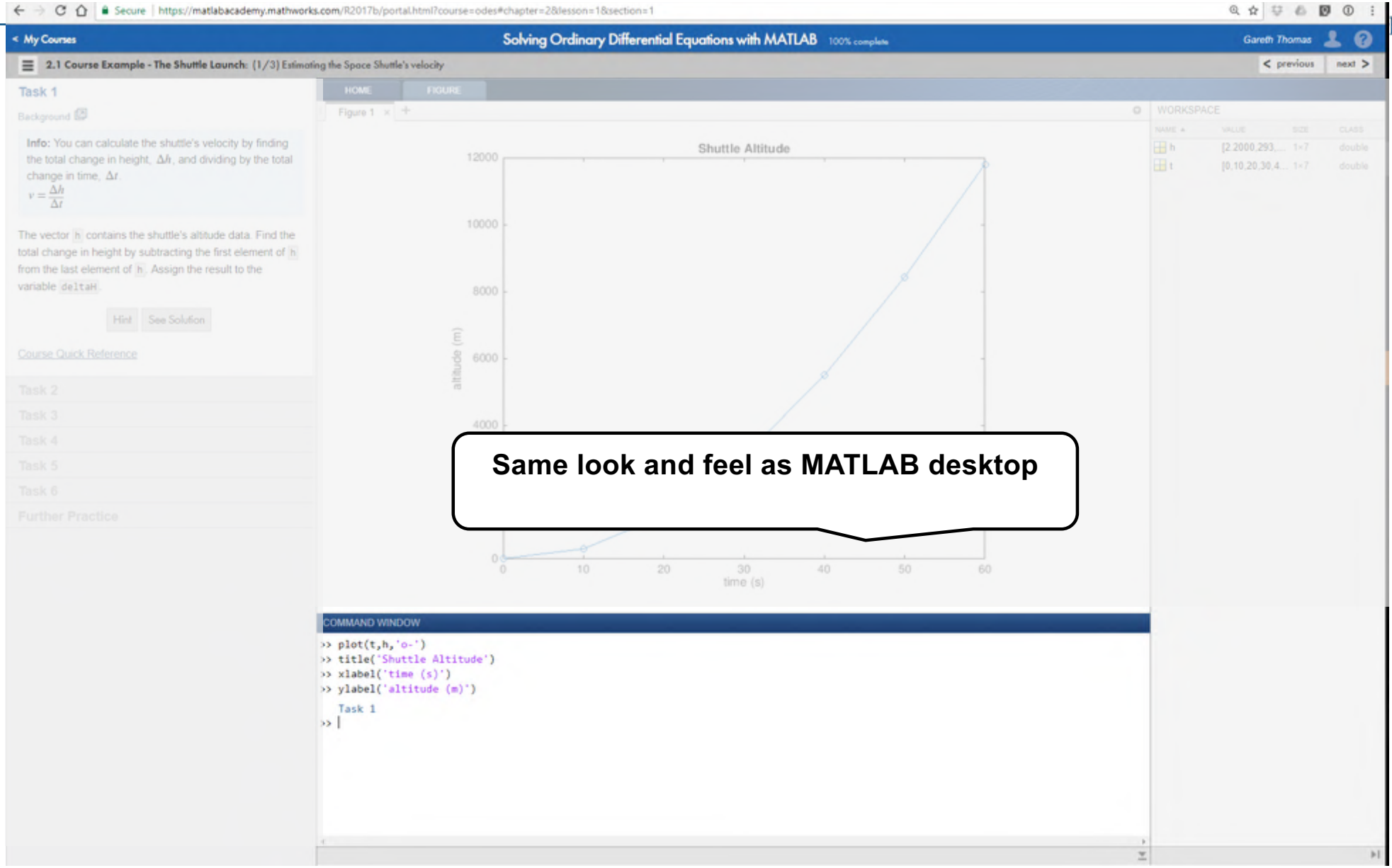
NAME	VALUE	SIZE	CLASS
h	[2,2000,293,...	1×7	double
t	[0,10,20,30,4...	1×7	double

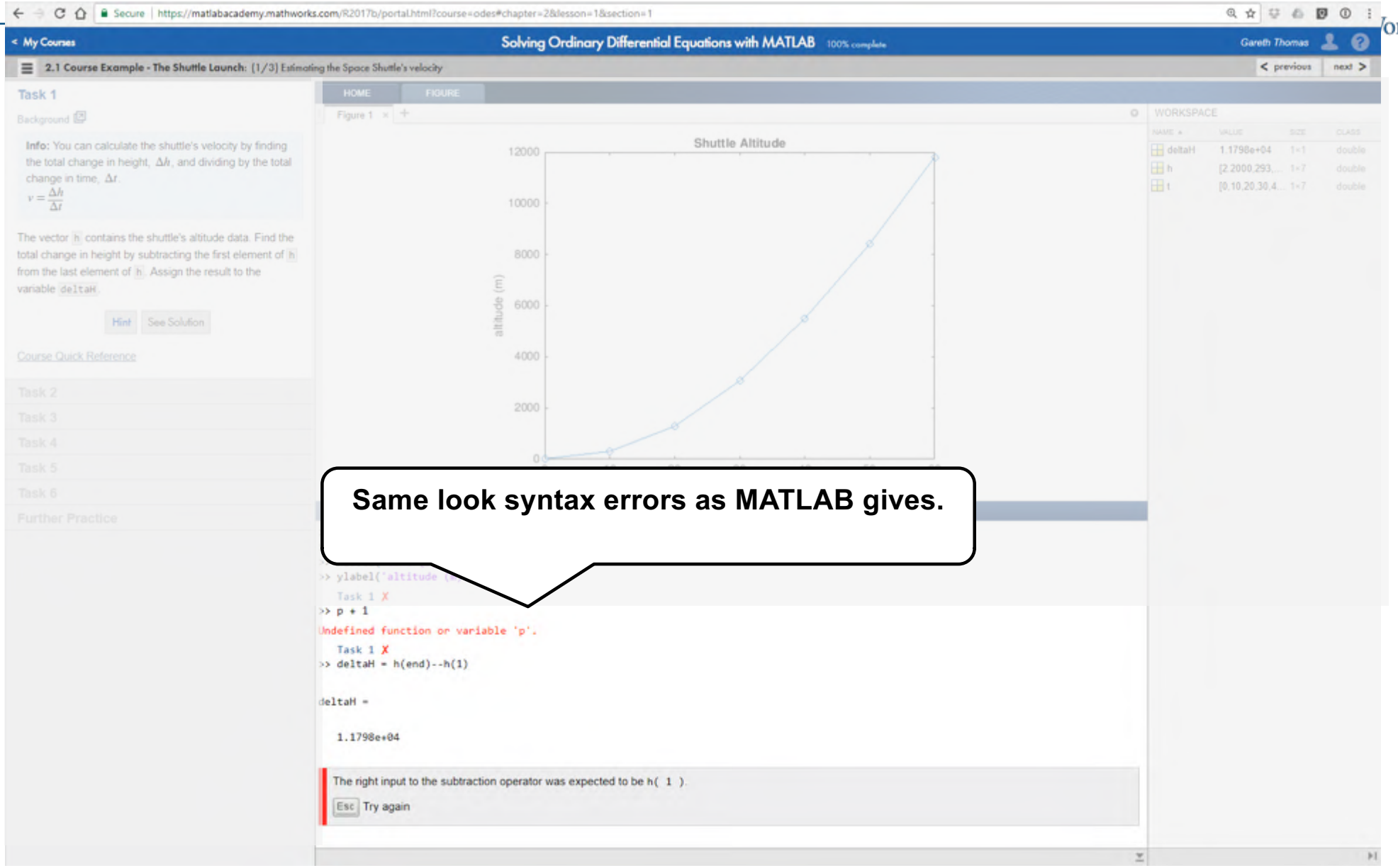
COMMAND WINDOW

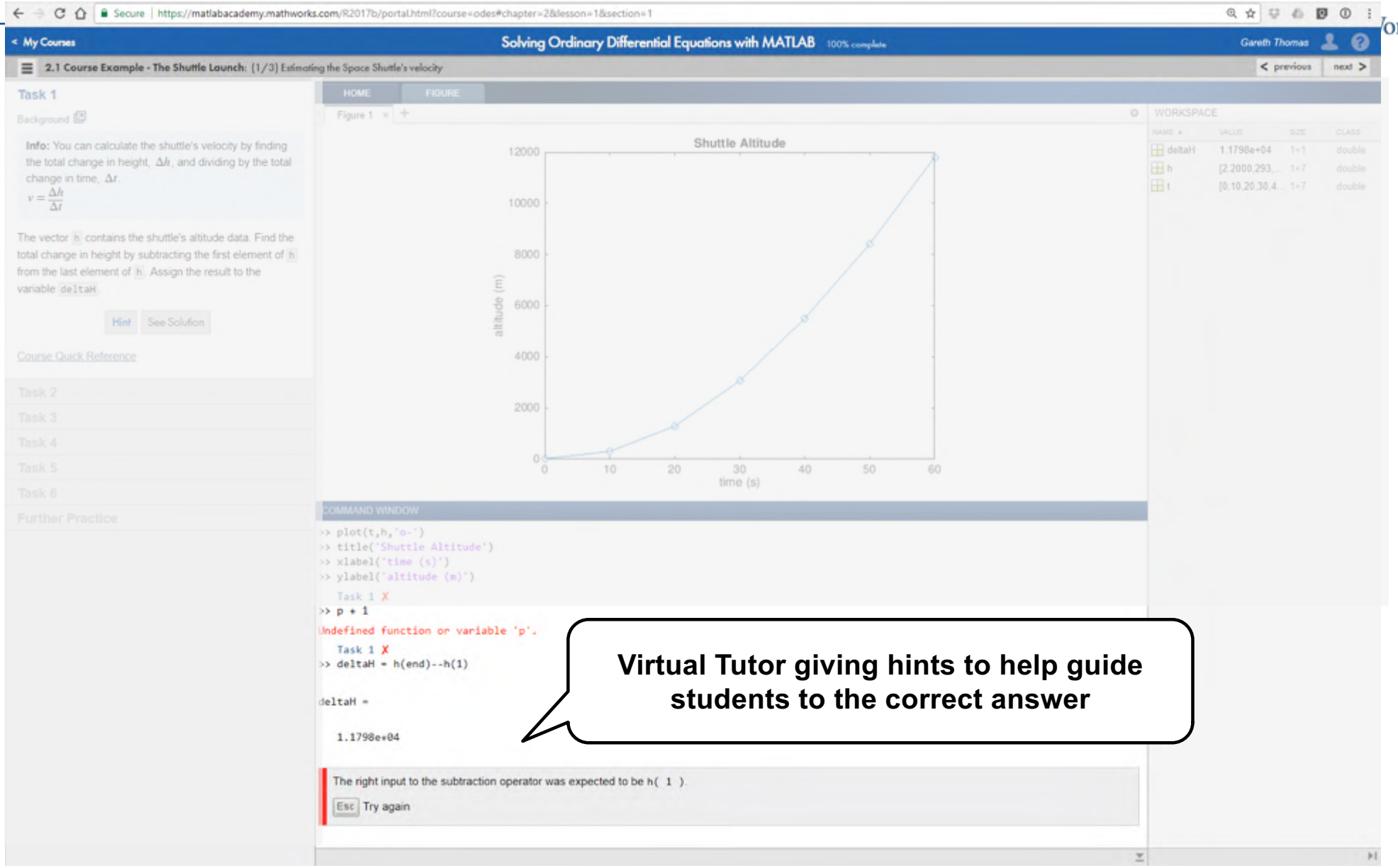
```
>> plot(t,h,'o-')
>> title('Shuttle Altitude')
>> xlabel('time (s)')
>> ylabel('altitude (m)')
   Task 1
>>
```

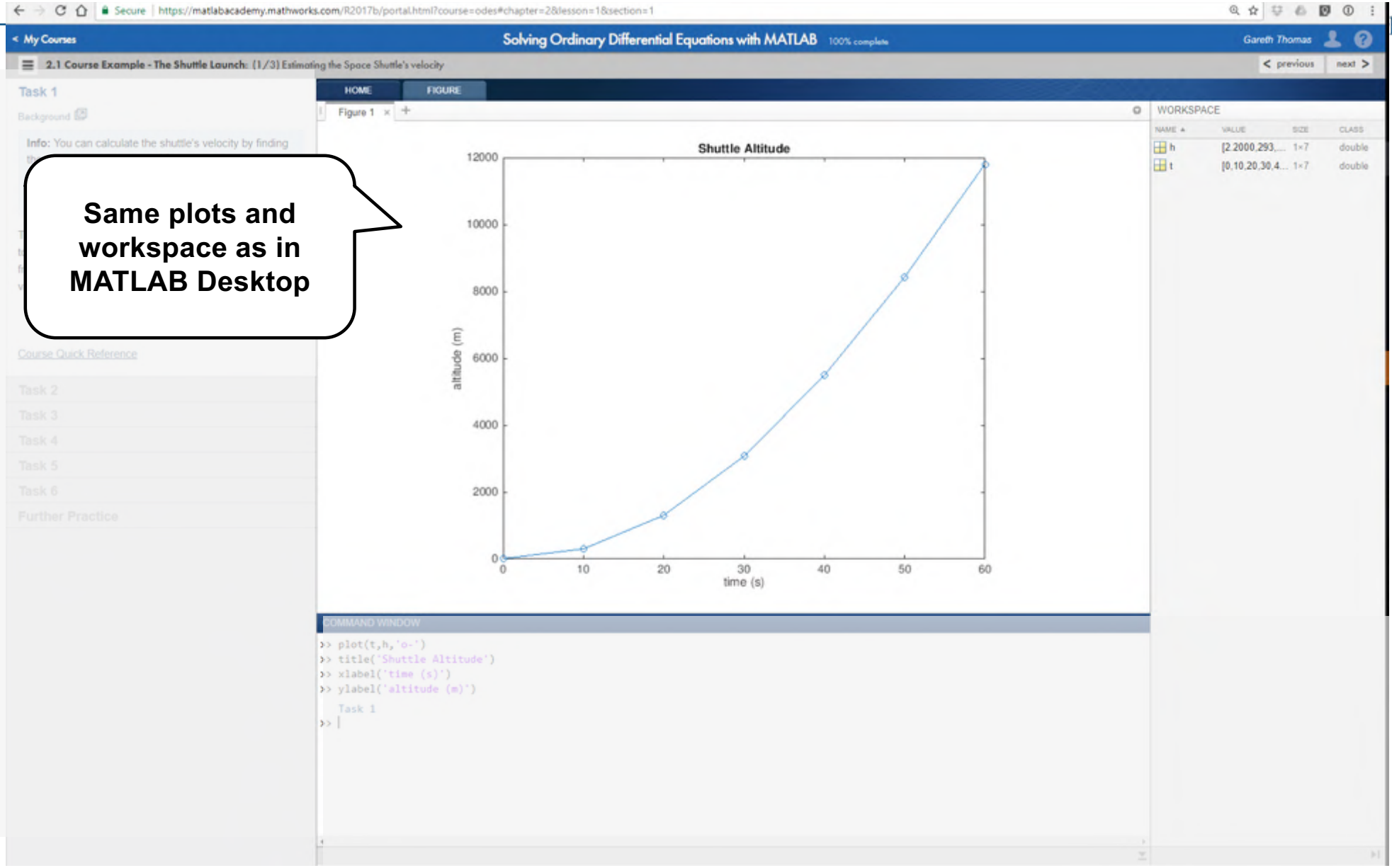

Secure https://matlabacademy.mathworks.com/R2017b/portal.html?course=odes#chapter=2&lesson=1&section=1
My Courses
Solving Ordinary Differential Equations with MATLAB 100% complete
Gareth Thomas
2.1 Course Example - The Shuttle Launch: (1/3) Estimating the Space Shuttle's velocity
previous
next
Task 1
Background
Info: You can calculate the shuttle's velocity by finding the total change in height, Δh, and dividing by the total change in time, Δt.
$v = \frac{\Delta h}{\Delta t}$
The vector h contains the shuttle's altitude data. Find the total change in height by subtracting the first element of h from the last element of h. Assign the result to the variable deltaH.
Hint
See Solution
Course Quick Reference
Task 2
Task 3
Task 4
Task 5
Task 6
Further Practice
HOME
FIGURE
Figure 1
Shuttle Altitude
12000
4000
2000
0
0
10
20
30
40
50
60
time (s)
WORKSPACE
NAME
VALUE
SIZE
CLASS
h
[2.2000,293,...
1×7
double
t
[0,10,20,30,4...
1×7
double
Short theory and description of a task.
Highlight commands needed to complete task
When in trouble ask for a hint
COMMAND WINDOW
>> plot(t,h,'o-')
>> title('Shuttle Altitude')
>> xlabel('time (s)')
>> ylabel('altitude (m)')
Task 1
>>


Secure | https://matlabacademy.mathworks.com/R2017b/portal.html?course=odes#chapter=2&lesson=1&section=1
My Courses
Solving Ordinary Differential Equations with MATLAB 100% complete
Gareth Thomas
2.1 Course Example - The Shuttle Launch: (1/3) Estimating the Space Shuttle's velocity
previous
next
Task 1
Background
Info: You can calculate the shuttle's velocity by finding the total change in height, Δh, and dividing by the total change in time, Δt.
$v = \frac{\Delta h}{\Delta t}$
The vector h contains the shuttle's altitude data. Find the total change in height by subtracting the first element of h from the last element of h. Assign the result to the variable deltaH.
Hint
See Solution
Course Quick Reference
Task 2
Task 3
Task 4
Task 5
Task 6
Further Practice
HOME
FIGURE
Figure 1
Shuttle Altitude
12000
10000
8000
(m)
0
10
20
30
40
50
60
time (s)
WORKSPACE
NAME
VALUE
SIZE
CLASS
h
[2,2000,293,...
1×7
double
t
[0,10,20,30,4...
1×7
double
As you complete tasks more will appear.
COMMAND WINDOW
>> plot(t,h,'o-')
>> title('Shuttle Altitude')
>> xlabel('time (s)')
>> ylabel('altitude (m)')
Task 1
>>

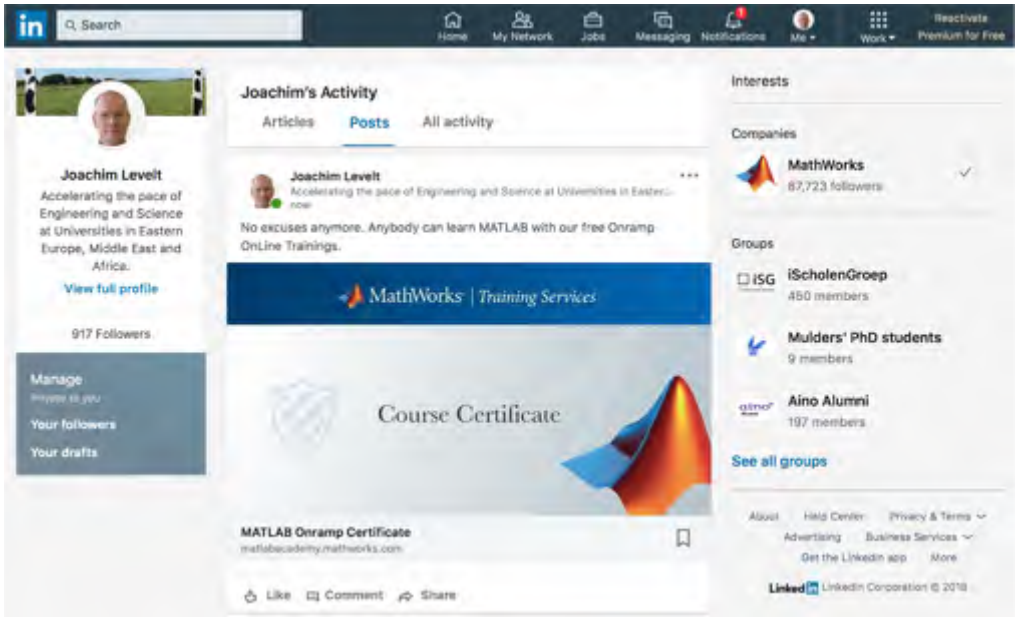

Secure | https://matlabacademy.mathworks.com/R2017b/portal.html?course=odes#chapter=2&lesson=1&section=1
My Courses
Solving Ordinary Differential Equations with MATLAB 100% complete
Gareth Thomas
2.1 Course Example - The Shuttle Launch: (1/3) Estimating the Space Shuttle's velocity
previous
next
Task 1
Background
Info: You can calculate the shuttle's velocity by finding the total change in height, Δh, and dividing by the total change in time, Δt.
$v = \frac{\Delta h}{\Delta t}$
The vector h contains the shuttle's altitude data. Find the total change in height by subtracting the first element of h from the last element of h. Assign the result to the variable deltaH.
Hint
See Solution
Course Quick Reference
Task 2
Task 3
Task 4
Task 5
Task 6
Further Practice
HOME
FIGURE
Figure 1
Shuttle Altitude
altitude (m)
time (s)
0
4000
6000
8000
10000
12000
0
10
20
30
40
50
60
WORKSPACE
NAME
VALUE
SIZE
CLASS
h
t
double
COMMAND WINDOW
>> plot(t,h,'o-')
>> title('Shuttle Altitude')
>> xlabel('time (s)')
>> ylabel('altitude (m)')
Task 1
>>
Same look and feel as MATLAB desktop


Solving Ordinary Differential Equations with MATLAB
Shuttle Altitude
altitude (m)
Same look syntax errors as MATLAB gives.
>> p + 1
Undefined function or variable 'p'.
>> deltaH = h(end)--h(1)
deltaH =
1.1798e+04
The right input to the subtraction operator was expected to be h(1).
Try again


Secure | https://matlabacademy.mathworks.com/R2017b/portal.html?course=odes#chapter=2&lesson=1&section=1
My Courses
Solving Ordinary Differential Equations with MATLAB 100% complete
Gareth Thomas
2.1 Course Example - The Shuttle Launch: (1/3) Estimating the Space Shuttle's velocity
< previous
next >
Task 1
Background
Info: You can calculate the shuttle's velocity by finding the total change in height, Δh, and dividing by the total change in time, Δt.
$v = \frac{\Delta h}{\Delta t}$
The vector h contains the shuttle's altitude data. Find the total change in height by subtracting the first element of h from the last element of h. Assign the result to the variable deltaH.
Hint
See Solution
Course Quick Reference
Task 2
Task 3
Task 4
Task 5
Task 6
Further Practice
HOME
FIGURE
Figure 1
Shuttle Altitude
altitude (m)
time (s)
WORKSPACE
deltaH 1.1798e+04 1×1 double
h [2,2000,293,... 1×7 double
t [0,10,20,30,4... 1×7 double
COMMAND WINDOW
>> plot(t,h,'o-')
>> title('Shuttle Altitude')
>> xlabel('time (s)')
>> ylabel('altitude (m)')
Task 1 ✗
>> p + 1
Undefined function or variable 'p'.
Task 1 ✗
>> deltaH = h(end)-h(1)
deltaH =
1.1798e+04
The right input to the subtraction operator was expected to be h(1).
Esc Try again
Virtual Tutor giving hints to help guide students to the correct answer


Secure https://matlabacademy.mathworks.com/R2017b/portal.html?course=odes#chapter=2&lesson=1&section=1
My Courses
Solving Ordinary Differential Equations with MATLAB 100% complete
Gareth Thomas
2.1 Course Example - The Shuttle Launch: (1/3) Estimating the Space Shuttle's velocity
previous
next
Task 1
Background
Info: You can calculate the shuttle's velocity by finding
Course Quick Reference
Task 2
Task 3
Task 4
Task 5
Task 6
Further Practice
HOME
FIGURE
Figure 1
Shuttle Altitude
altitude (m)
time (s)
0
2000
4000
6000
8000
10000
12000
0
10
20
30
40
50
60
WORKSPACE
NAME
VALUE
SIZE
CLASS
h
[2.2000,293,...
1×7
double
t
[0,10,20,30,4...
1×7
double
COMMAND WINDOW
>> plot(t,h,'o-')
>> title('Shuttle Altitude')
>> xlabel('time (s)')
>> ylabel('altitude (m)')
Task 1
>>
Same plots and workspace as in MATLAB Desktop

Share your learning with professors and community



#5 MATLAB Academy

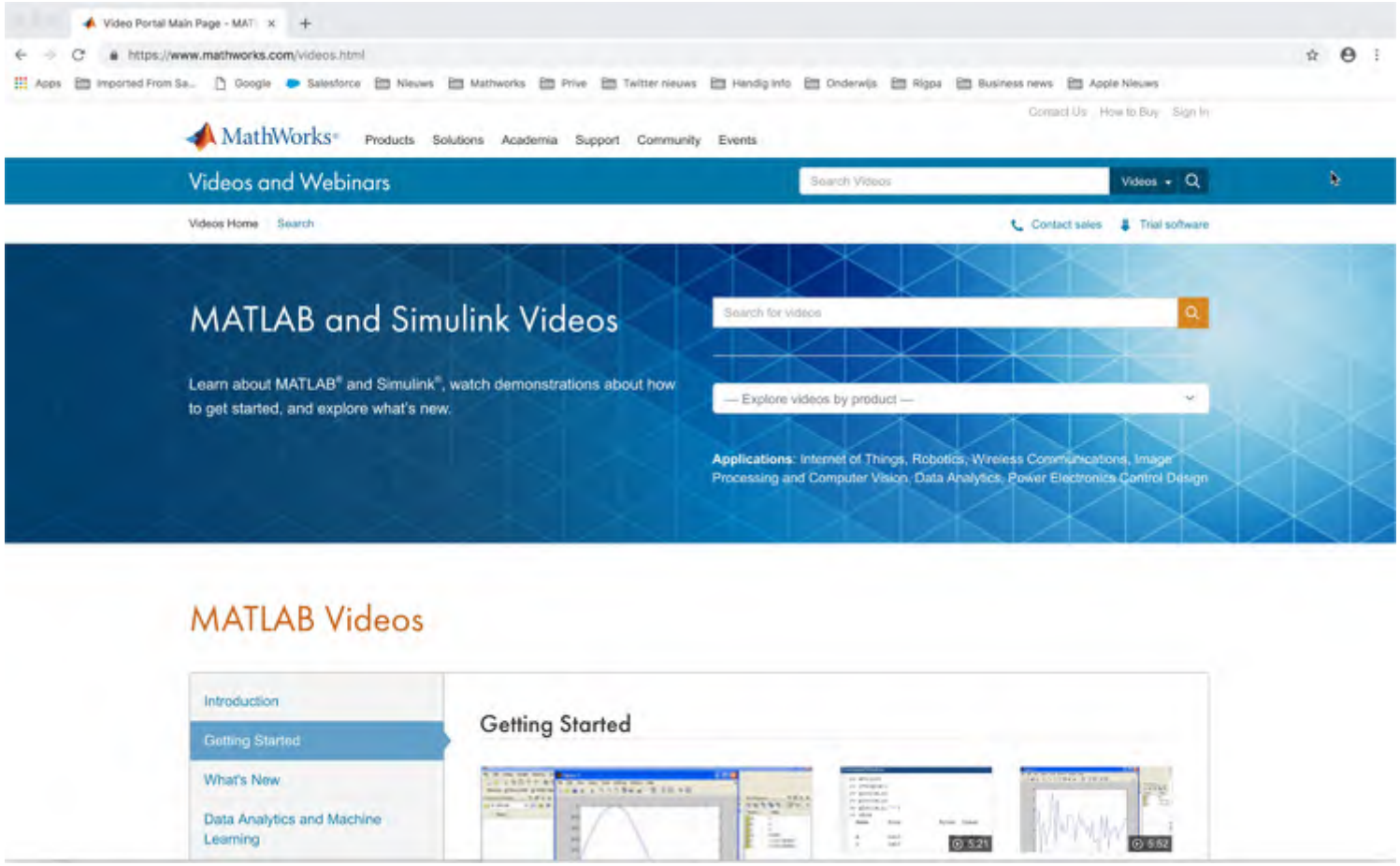
4 hours getting started from zero knowledge

>7 hours of solving Computational Mathematics with MATLAB available with Campus License

>80 hours of learning how to improve MATLAB skills available with Campus License

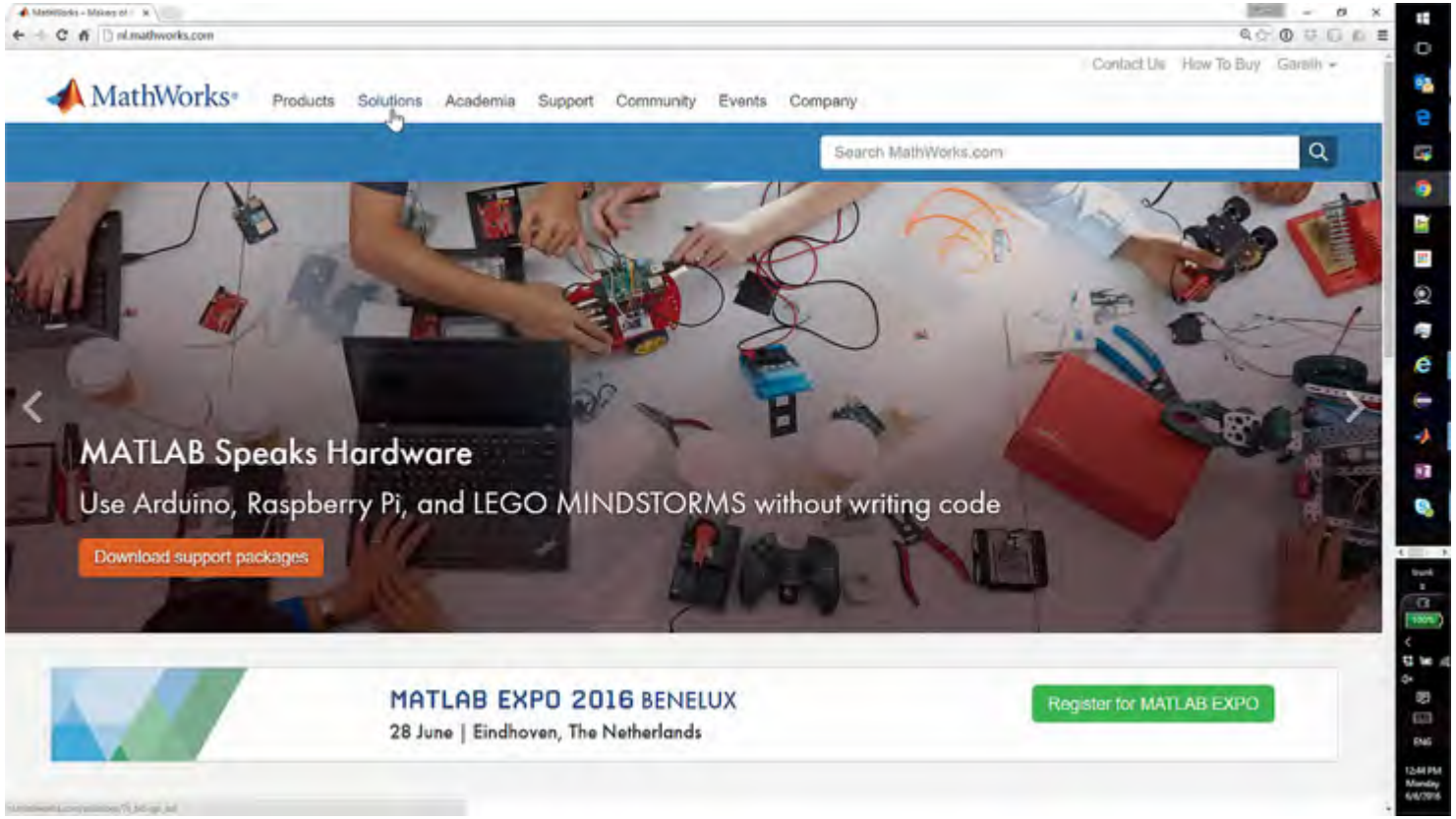
#6 MathWorks Videos

Every day we launch a new video



#7 Cody

Join the community, earn badges by solving MATLAB challenges



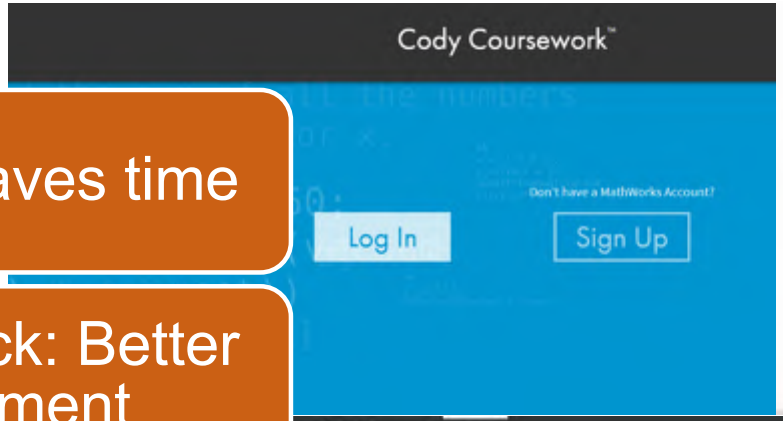
#8 MATLAB Grader supports Teaching

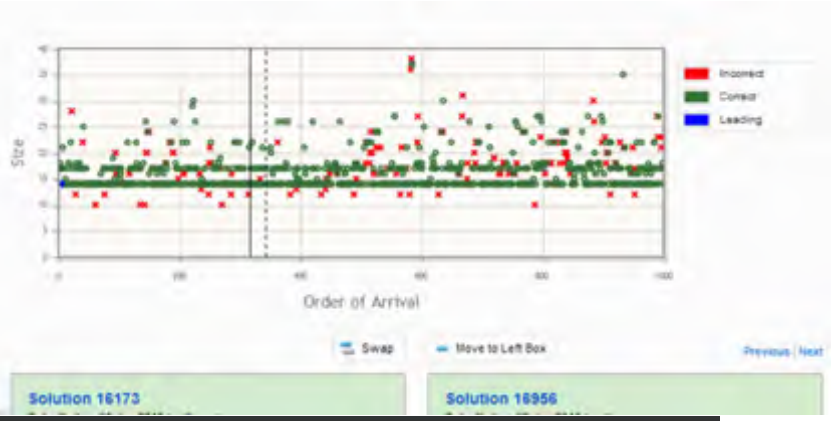
Online Autograding of MATLAB Code

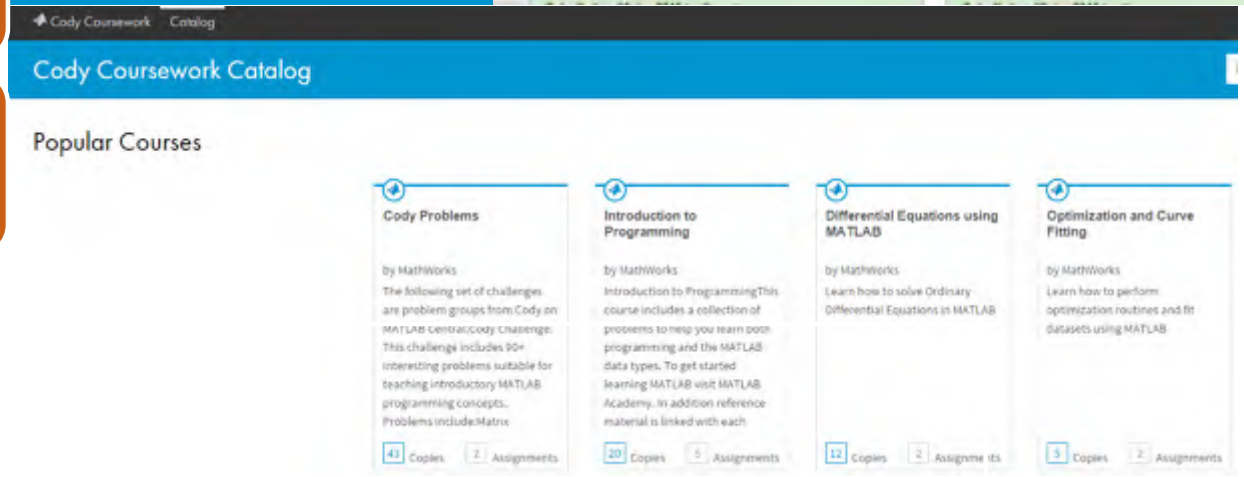
Autograding: Saves time

Instant Feedback: Better student engagement

Student Analytics: Teacher gets a report

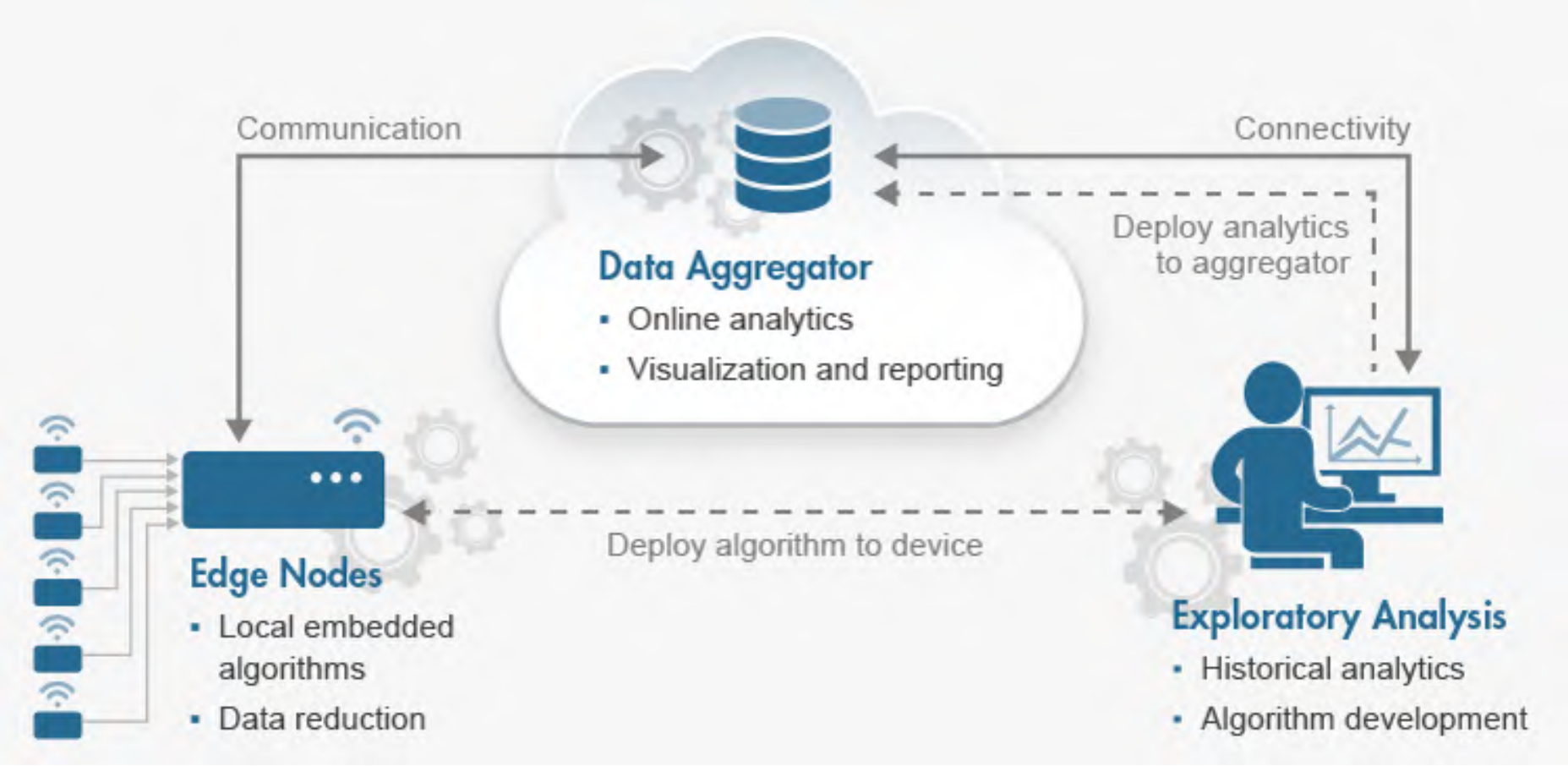






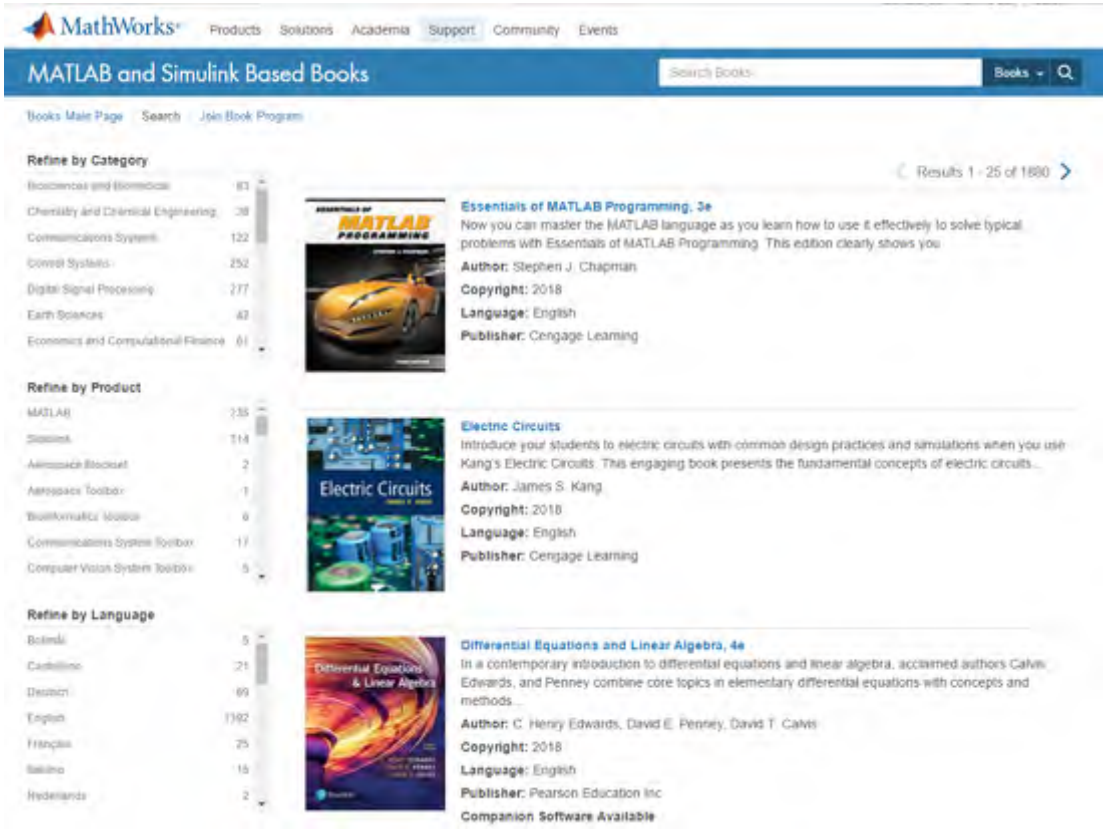
#9 ThingSpeak

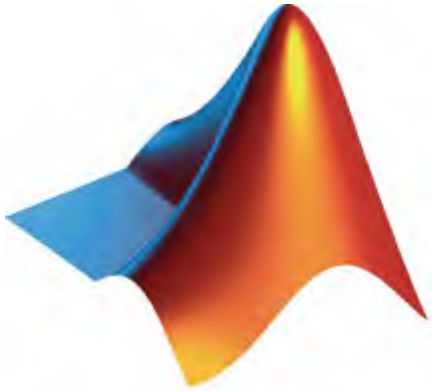
MathWorks IoT platform



#10 MathWorks Book Program

There are over 1800 different books written with MATLAB examples.





MathWorks®

Accelerating the pace of engineering and science