

The MATLAB logo is a stylized 'M' composed of six overlapping triangles in shades of blue and orange. It is positioned on the left side of the image, partially overlapping the hands.

MATLAB EXPO 2018

UNITED KINGDOM

3 October | Silverstone, Northamptonshire

Register at matlabexpo.co.uk

MATLAB EXPO 2018

App and Toolbox Development

Amy Koh & Sylvain Lacaze
MathWorks Consulting



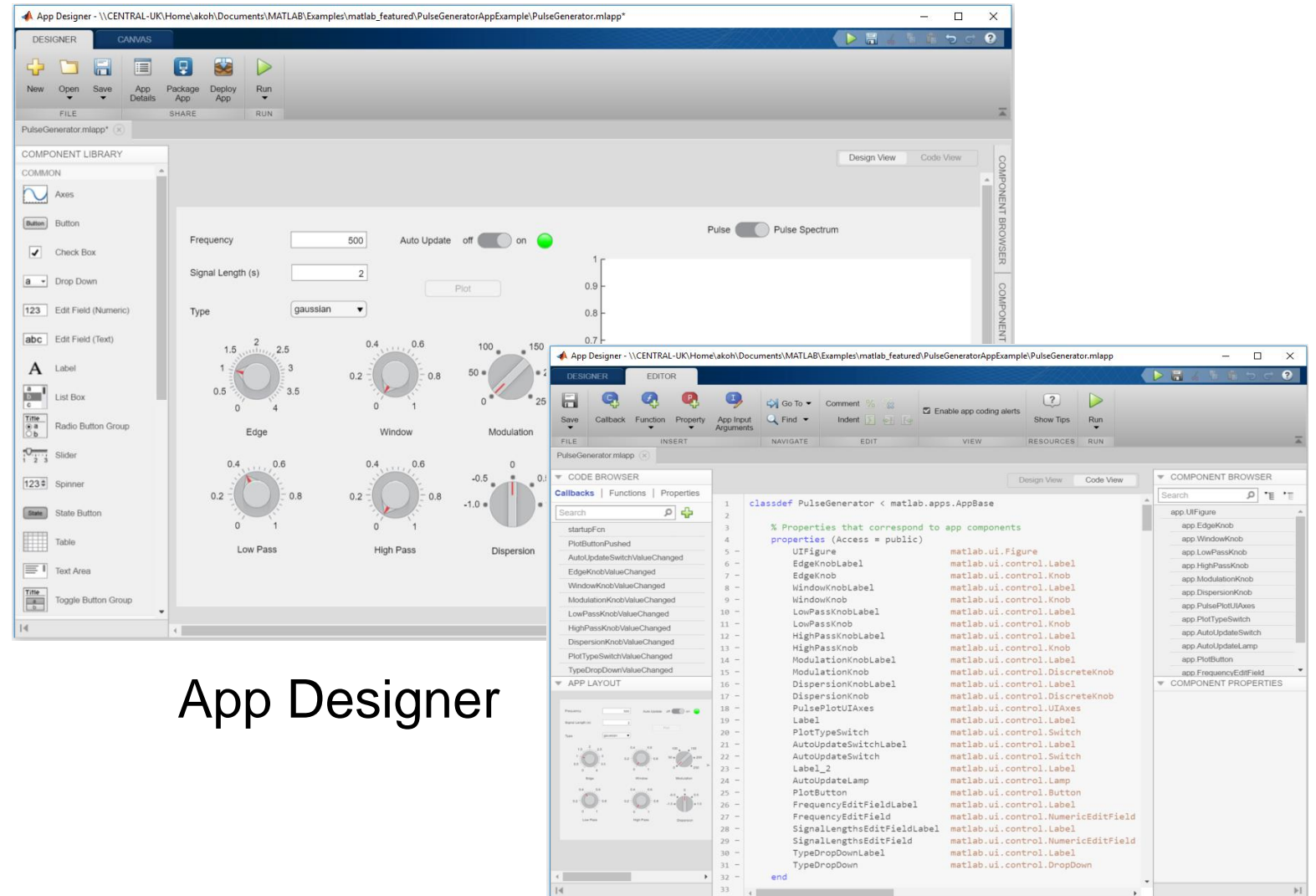
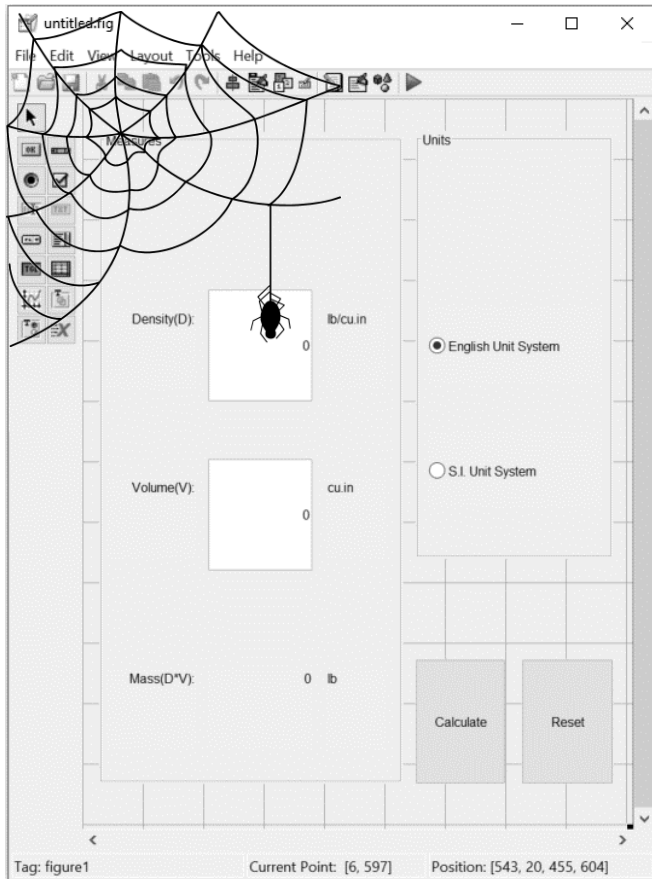
Software Development Best Practices

- Maintainability, extendibility, reuse
- Accuracy and robustness
- Effective testing
- Ease of collaboration
- Integration
- Sharing and Distribution





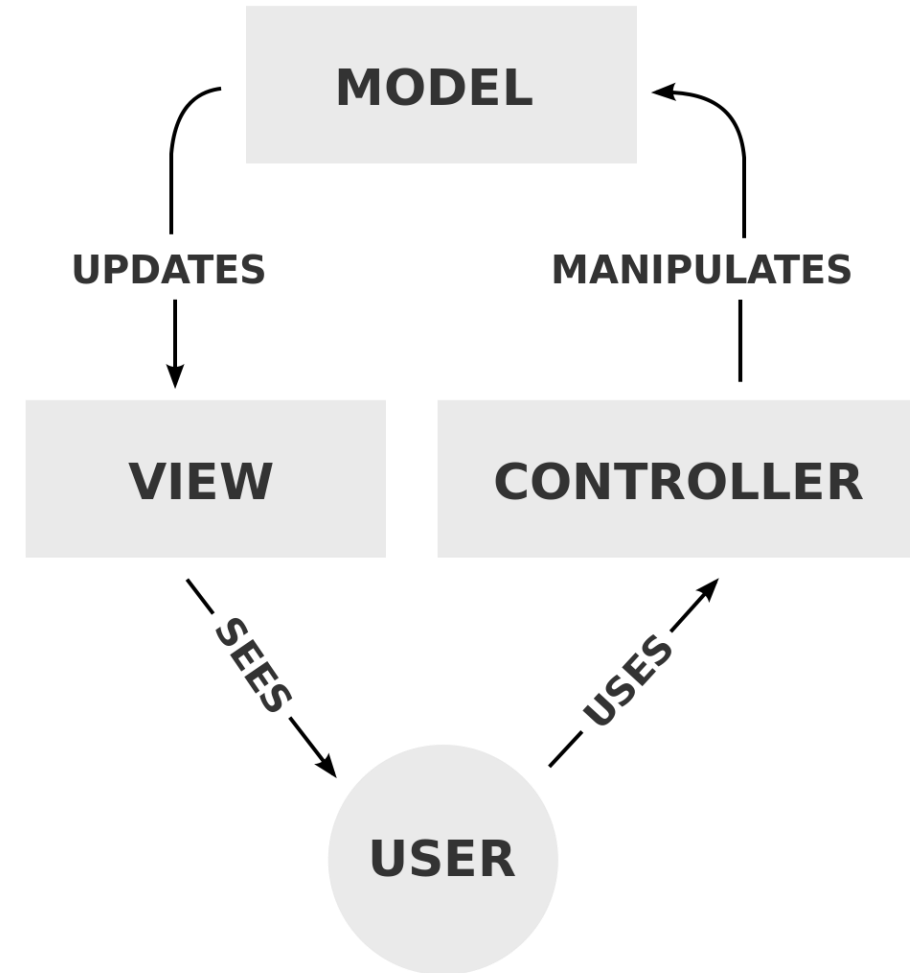
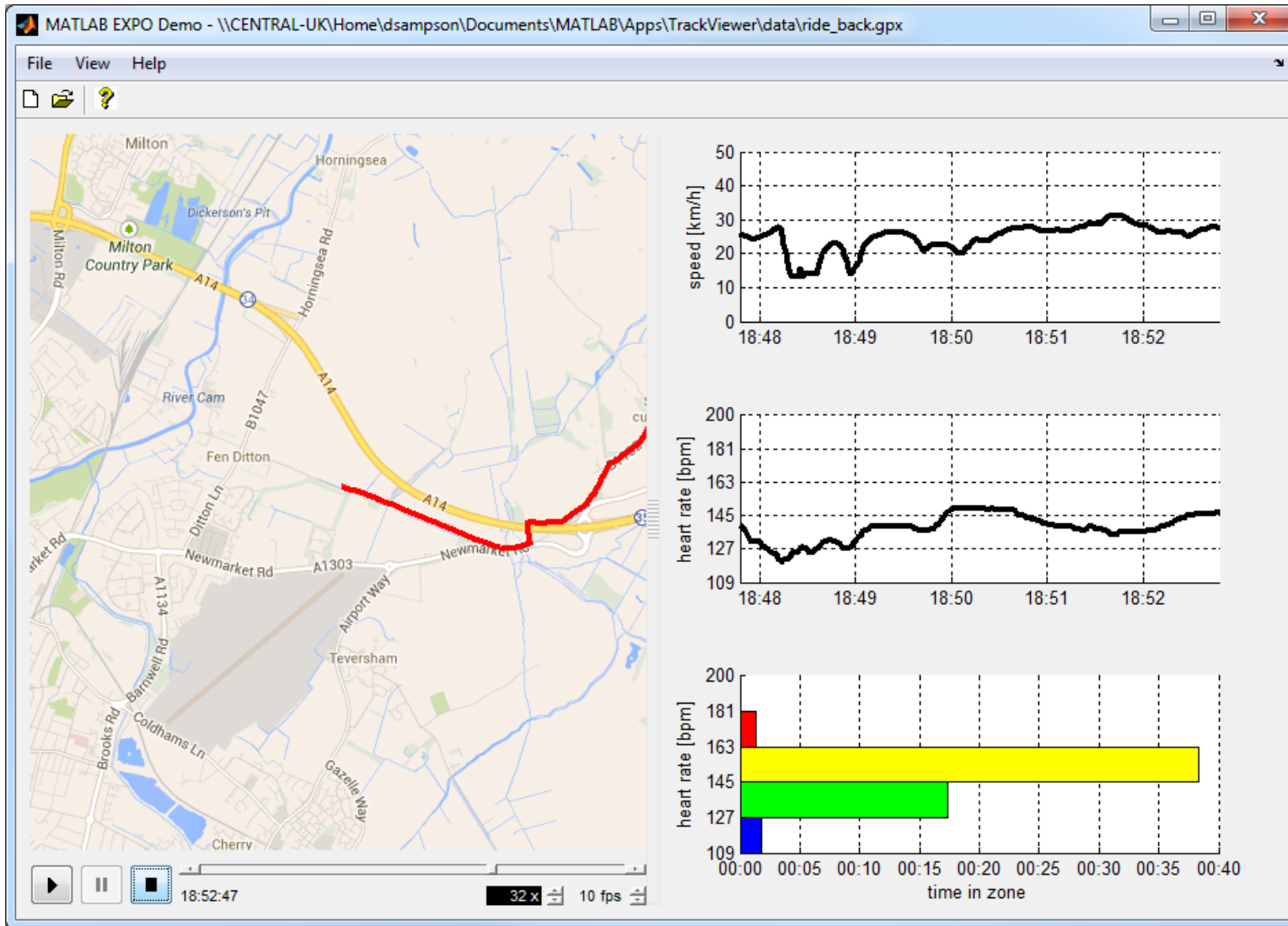
App Building Tools

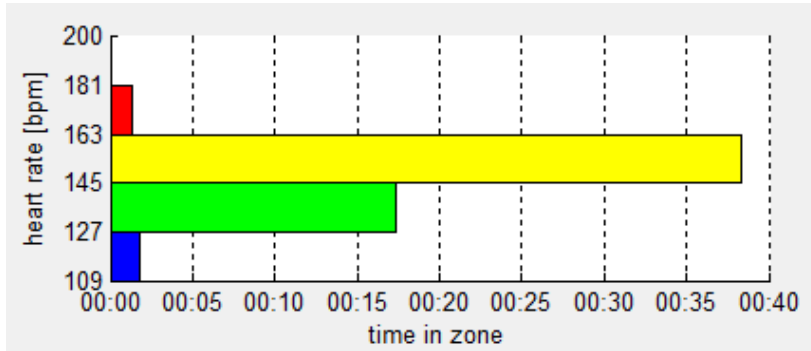


App Designer

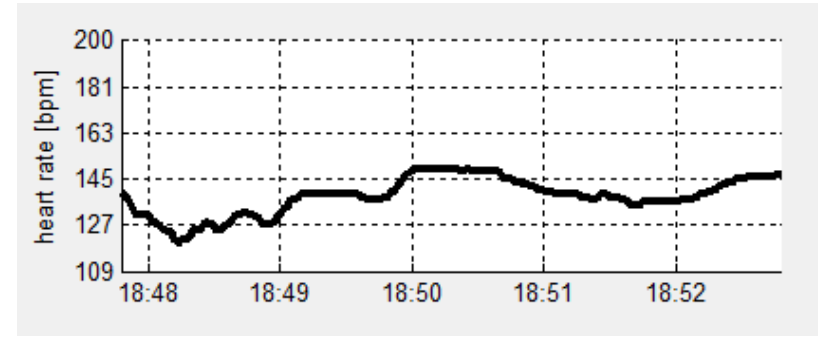
GUIDE

Model-View-Controller Pattern

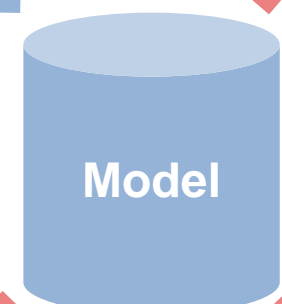




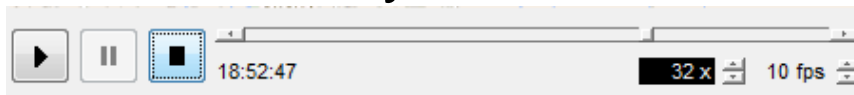
HeartZoneView



StripChartView



Player



MapView



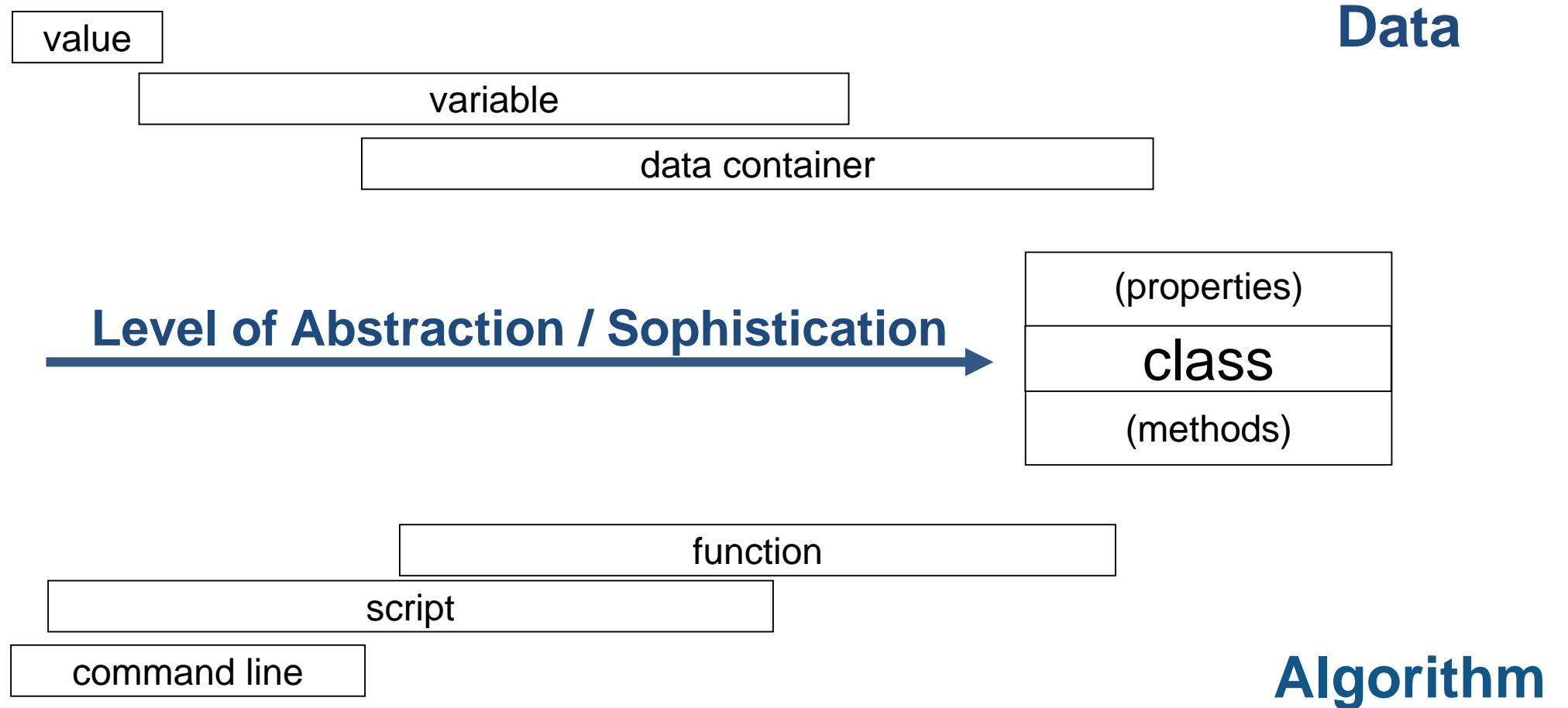
Layout Management

- Large, dynamic apps need layout management tools
- [GUI Layout Toolbox](#) is widely used
 - Rows, columns and grids
 - Mix fixed and variable sizes
 - Resize components interactively
 - Show and hide components





Progression of Programming Techniques



Validate inputs

- `assert`
- `validateattributes`
- `isempty`, `isnan`, `isfinite` ...
- `narginchk`
- `inputParser`

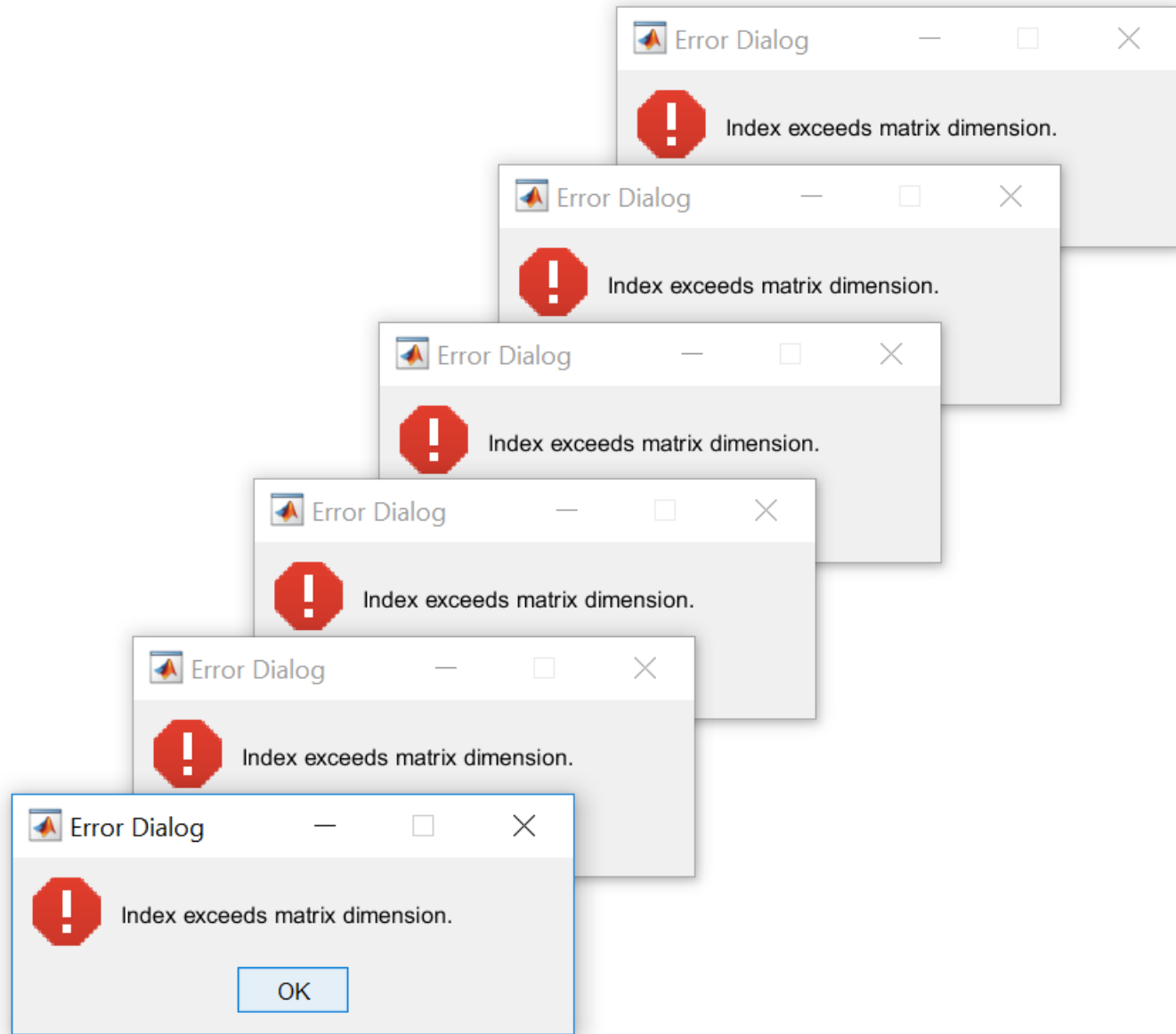
```
1 function y = timesTwo( x )
2
3     % Validate
4     validateattributes( x, {'double'}, {'size',[1 3], 'increasing'} );
5
6     y = x * 2;
7
8     end
```

```
>> timesTwo( [2 3 1] )
Error using timesTwo (line 4)
Expected input to be increasing valued.
```

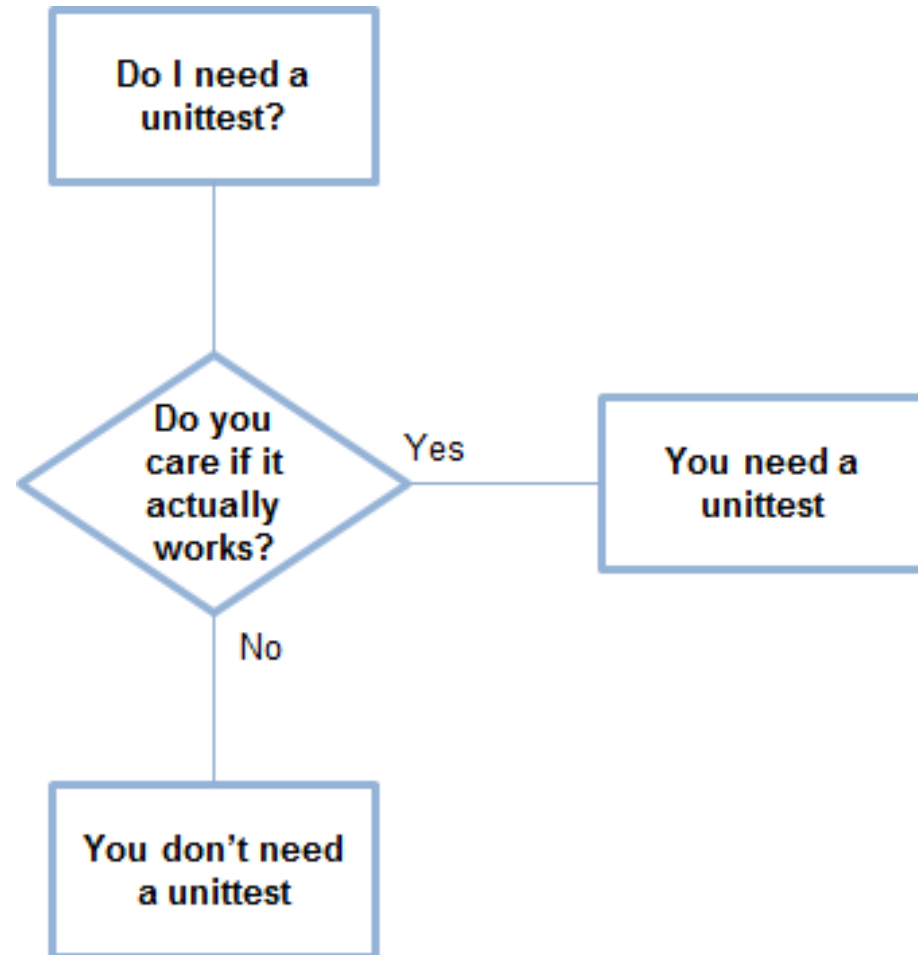
```
>> timesTwo( 1:5 )
Error using timesTwo (line 4)
Expected input to be of size 1x3, but it is of size 1x5.
```

Handling errors

- error **and** warning
- Use identifiers
- MException
- try/catch
- `errordlg` **and** `warndlg`



Why use Automated Testing?

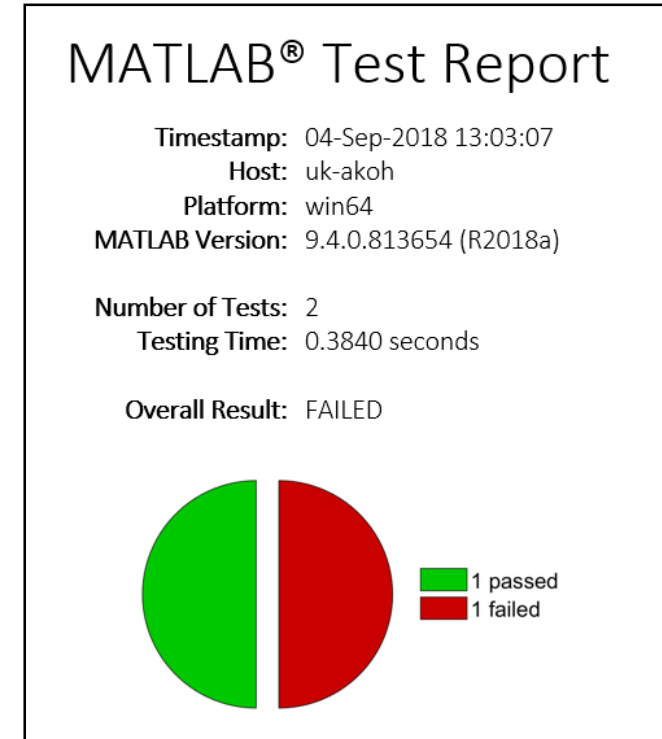




- Improve code quality
- Understand and document code
- Reduce and not introduce risk
- Catch bugs early and often

Test Frameworks

- MATLAB Unit Testing Framework
 - Test your code early and often
 - xUnit style framework
 - Script / function / class based testing
 - Automatic reporting
 - Code coverage
 - Run tests from the MATLAB Editor toolstrip

- Performance Testing Framework
 - Time MATLAB code automatically
 - Track performance over time

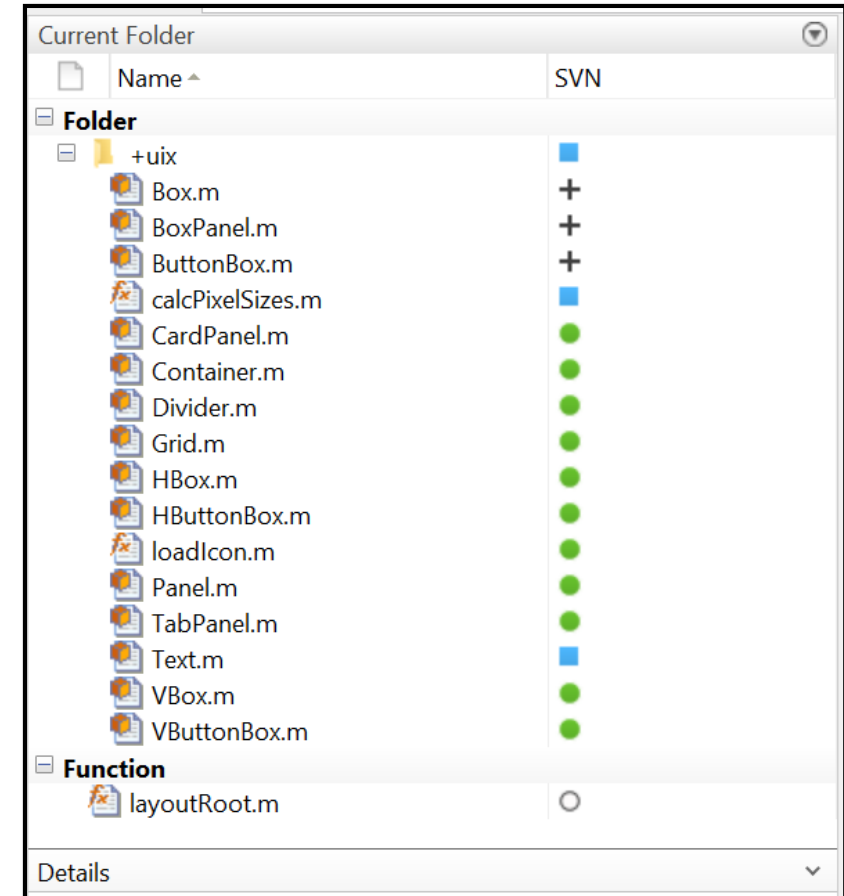


Failure Summary	
1 test failed.	
Name of Failing Test TestRectangle/testArea	Failure Reasons Failed by verification. (Details)
Overview	
C:\Work\Workshop\talks\Ford\testing\	
TestRectangle	0.3840 seconds
 	



Source Control Integration

- Manage your code from within the MATLAB Desktop
- Leverage source control capabilities
 - GIT and Subversion integration in Current Folder browser
- Software release and change management
 - Use Comparison Tool to view and merge changes between revisions

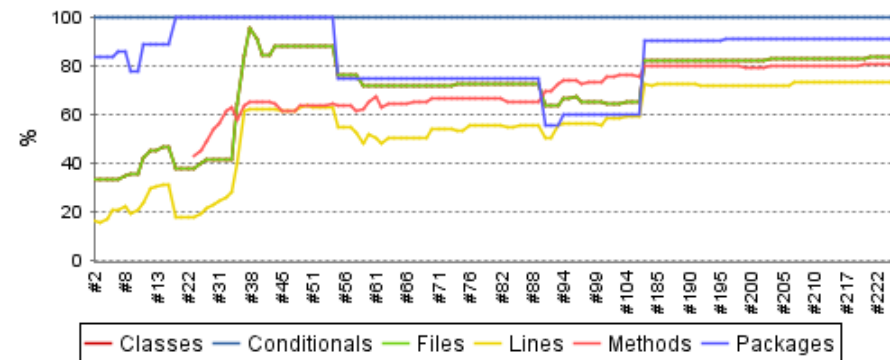


Continuous Integration

- Runs tests after code changes to track development progress
- Code coverage report
- Support for TAP, jUnit XML, ...



Trend



Project Coverage summary

Name	Packages	Files
Cobertura Coverage Report	91% 10/11	85% 62/73



Design

Implement

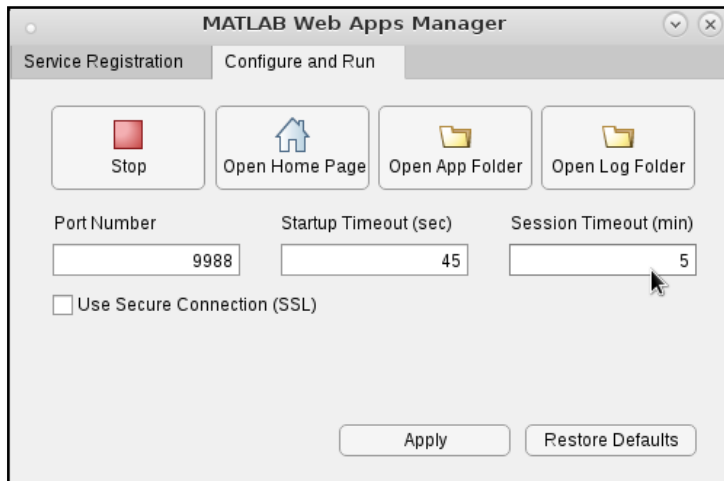
Integrate

Share

Web Apps

- Package and run MATLAB apps in a web browser

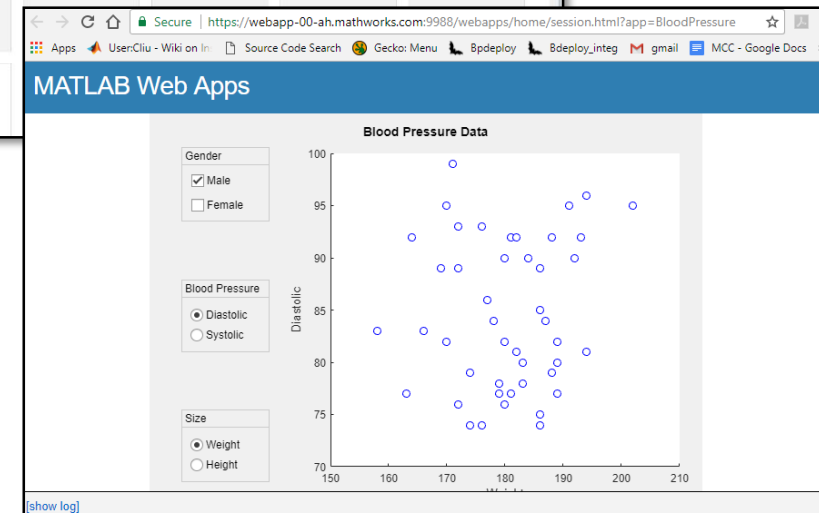
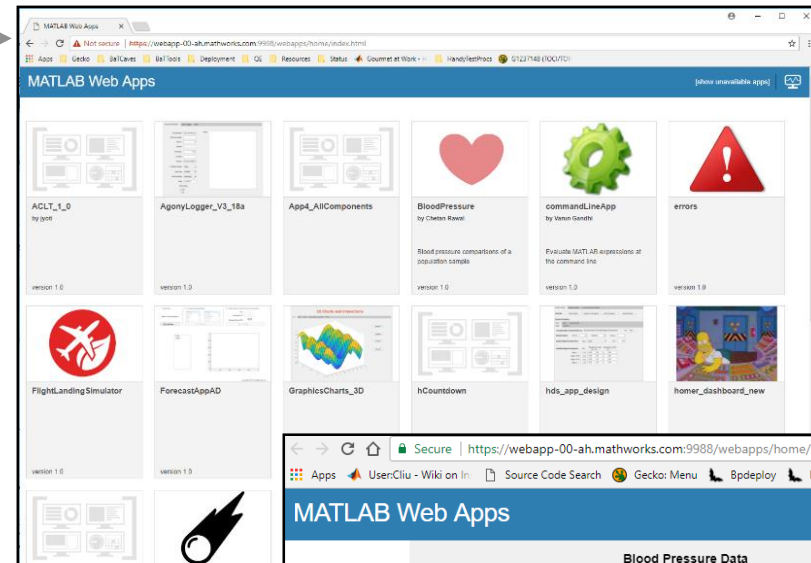
Admin



Package and deploy MATLAB Apps with **Web App Compiler**

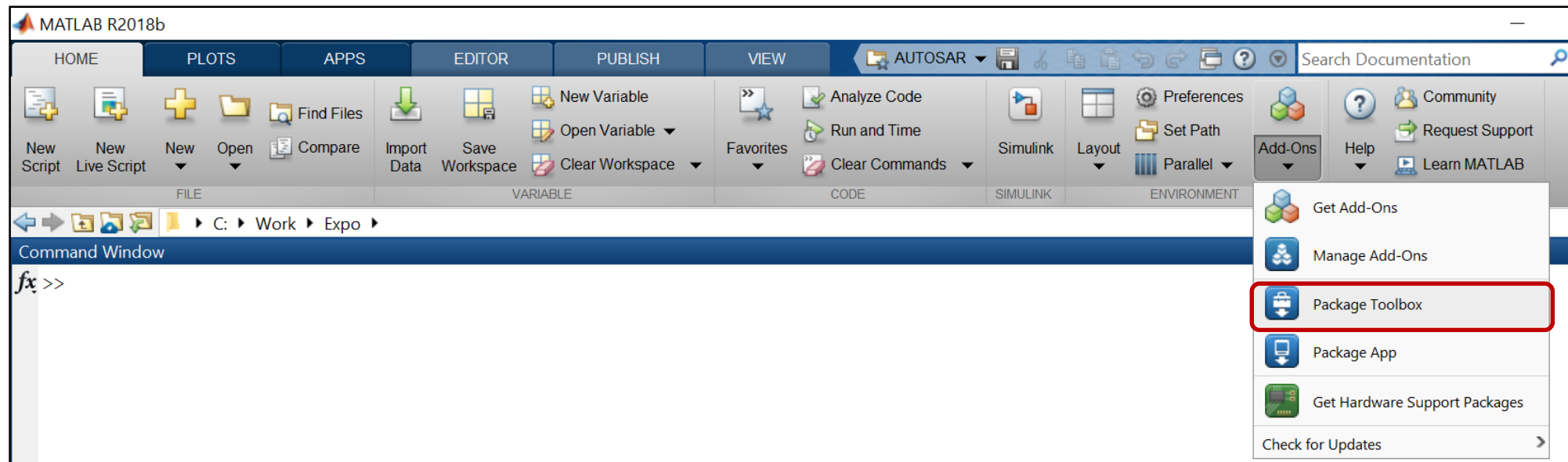
Share apps via an URL:
<http://webAppServer:PortNumber>

Users



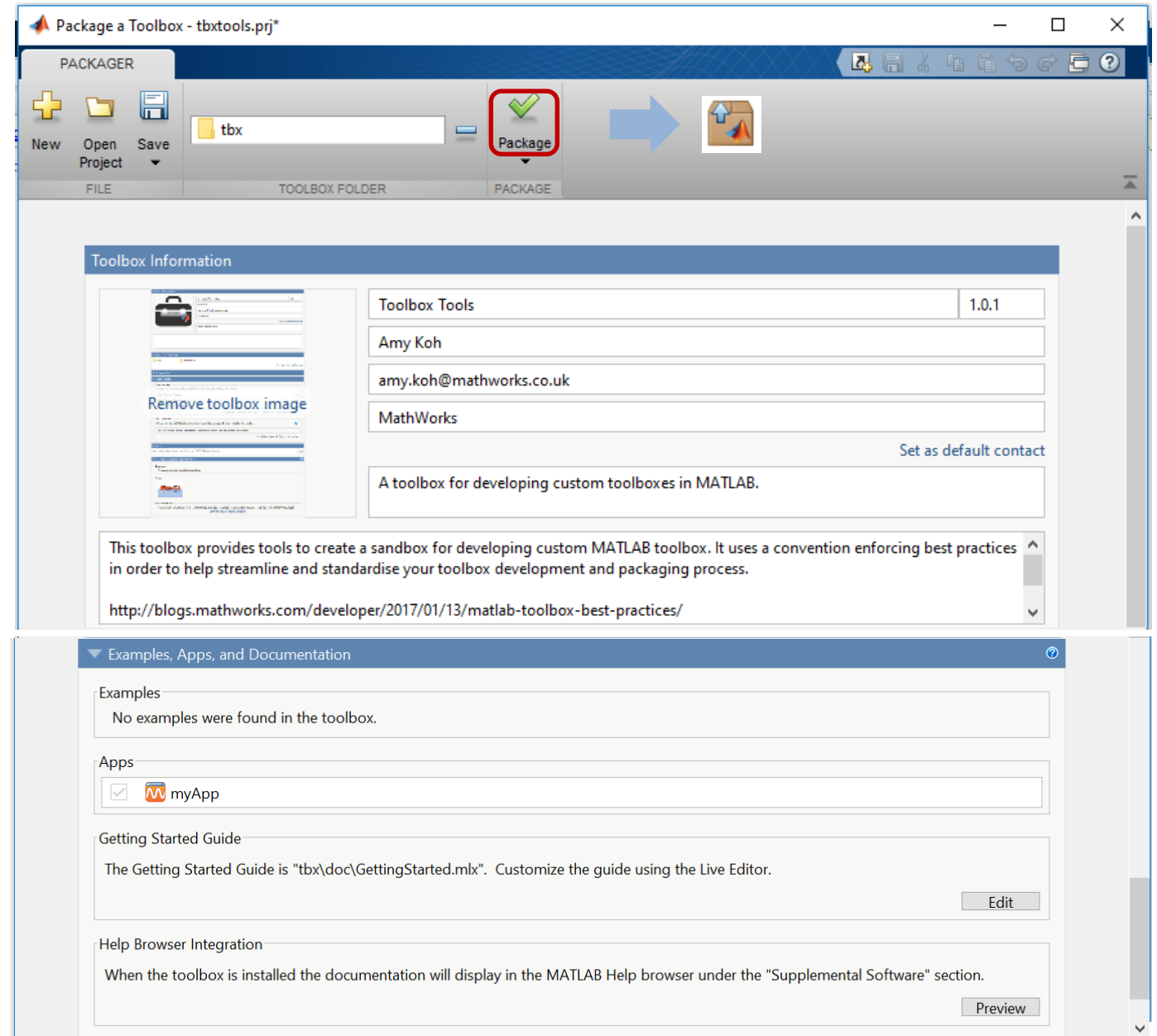
MATLAB Toolbox

- Single toolbox installer (.mltbx)
- Toolbox metadata
- External dependencies
- Examples, apps, custom doc
- MATLAB path management
- Toolbox upgrade management



MATLAB Toolbox

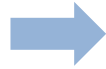
- Toolbox metadata
- External dependencies
- MATLAB path management
- Examples, apps, custom doc
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Add-On Manager

Add-Ons
 Help
 Community
 Request Support
 Learn MATLAB

Get Add-Ons
Manage Add-Ons
 Package Toolbox
 Package App
 Get Hardware Support Packages
 Check for Updates >



Add-On Manager

Installed (103)

Name	Type	Author	Install Date
Toolbox Tools version 1.1	Toolbox	Amy Koh	2 October 2017
GUI Layout Toolbox version 2.3.1	Toolbox	David Sampson	5 D
LoadForecaster version 1.0	Toolbox	MathWorks	28
Load Forecasting App version 1.0	Toolbox	MathWorks	28
Biking Tracks version 1.1.1	App	David Sampson	4 September 2018
Hiking Tracks version 1.1.1	App	David Sampson	4 September 2018
Rowing Tracks version 1.1.1	App	David Sampson	4 September 2018
MATLAB Tracks version 1.1.1	Toolbox	David Sampson	4 September 2018
Mapp version 1.1.1	App	David Sampson	4 September 2018
MATLAB Web Maps version 1.2	Toolbox	David Sampson	4 September 2018
MATLAB Minimart version 1.2.2	Toolbox	David Sampson	4 September 2018
5G Toolbox version 1.0	MathWorks Toolbox		13 September 2018

Get Add-Ons
 Open Documentation
 Open Folder
 View Details
 View in Add-On Explorer
 View Getting Started Guide
 Enabled
 Uninstall...

Help | MATLAB Documentation | All | Examples | Functions | Blocks | Apps | Search Documentation

CONTENTS | Close

Category

- MATLAB
- Simulink
- 5G Toolbox
- Aerospace Blockset
- Aerospace Toolbox
- Antenna Toolbox
- Audio System Toolbox
- Automated Driving System Toolbox
- Bioinformatics Toolbox
- Communications Toolbox
- Computer Vision System Toolbox
- Control System Toolbox
- Curve Fitting Toolbox
- Data Acquisition Toolbox
- Database Toolbox
- Datafeed Toolbox
- Deep Learning Toolbox
- DO Qualification Kit (for DO-178)
- DSP System Toolbox
- Econometrics Toolbox
- Embedded Coder
- Filter Design HDL Coder

R2018b
Release Notes

MATLAB® | **SIMULINK®** | | [View Installation Help](#)

Supplemental Software

[MATLAB Minimart](#)
[MATLAB Web Maps](#)

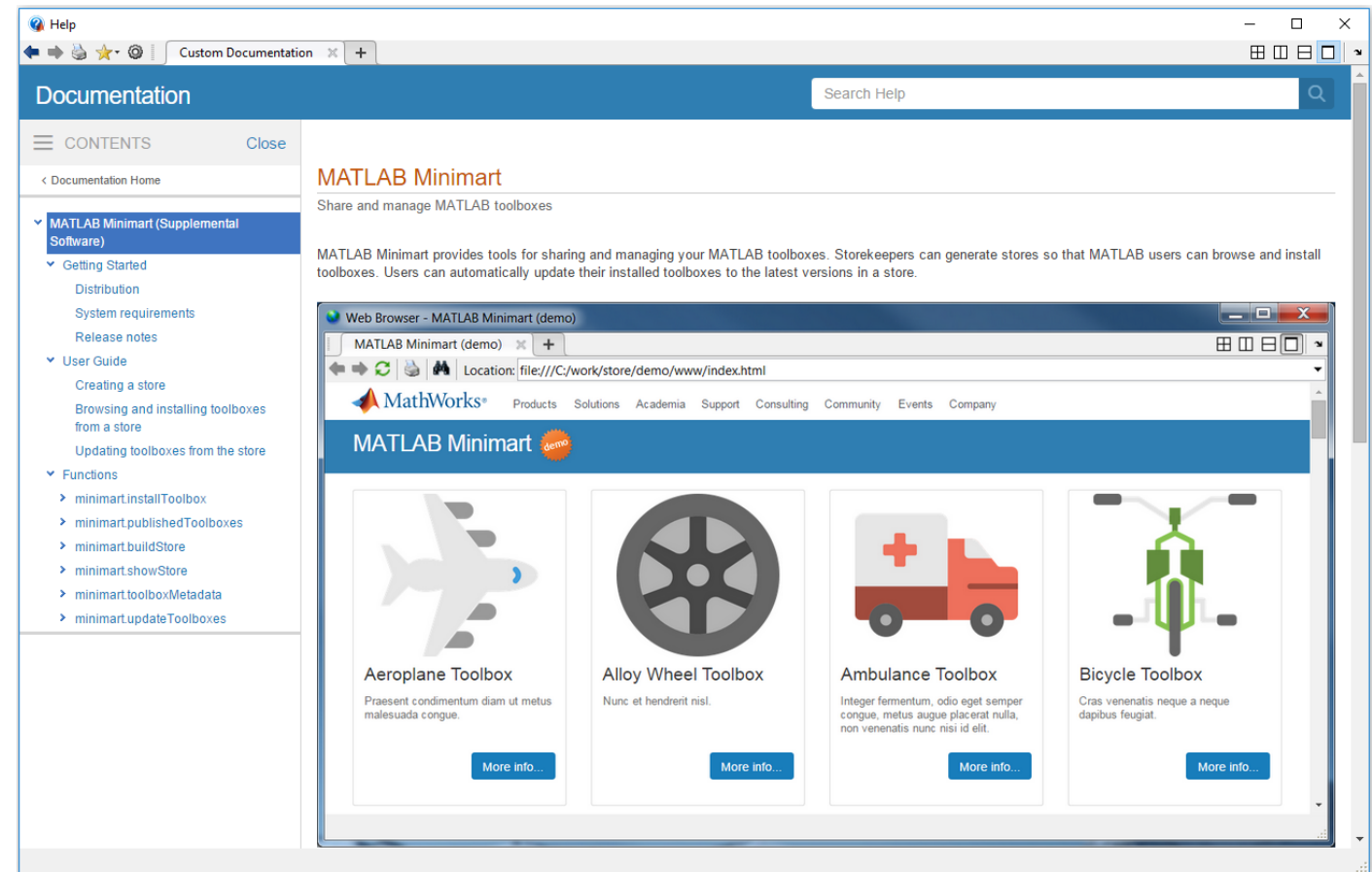
[Edit Preferences](#)

Applications

- > Math, Statistics and Machine Learning
- > Control Systems
- > Signal Processing and Wireless Communications
- > Image Processing and Computer Vision
- > Parallel Computing
- > Physical Modeling
- > Code Generation
- > Application Deployment
- > Real-Time Simulation and Testing

Where is the doc?

- `info.xml`
 - toolbox information and help location
- `helptoc.xml`
 - documentation files and structure
- `demos.xml`
 - custom examples






MATLAB Store



Upload Add-On

Control Panel: Administrator Recommender

Contact Administrator

Pages: 1 2 3 4 5 6 7 8 9 10 11

Clear filters - Sort by: Title

Add-ons per page: 10

Request Tag

X

Author X

- Abhishek Singhal
- Anni Piirainen
- Anthony Bobbie
- Arun Raveendran
- Azam Din
- Ben Tordoff
- David Sampson

Type X

- App
- Toolbox

Tag X



Vehicle Feedback XML Analyser Application

by Simulation Group

This application is intended to import Vehicle Diagnostic Data (DTCs/DIDs) from various XML file formats from around the business

Version 1.0

1 rating

0 comments - 4 tags

194 downloads



Engineering Data Toolbox

by Simulation Group


Toolbox providing importers for JLR engineering data files and a set of common data preparation methods. Type edtDoc to get started.

Version 1.3.0 1.2.0 more ...

3 ratings

5 comments - 4 tags

144 downloads



App Manager

by Mathworks

Tool for managing installed apps and toolboxes

Version 3.4 3.3 more ...

3 ratings

1 comment - 1 tag

162 downloads

The App Manager allows you to:

- Connect to a MATLAB Store, either local or in a SharePoint site
- Check for new versions of installed apps and toolboxes
- Check for app and toolbox recommendations
- Update and downgrade apps and toolboxes to a specified version

The App Manager uses MATLAB release compatibility information when suggesting and

Download

Share




Aeroplane Toolbox 1.2
MATLAB Toolbox
14.8 KB




Aeroplane Toolbox 2.1
MATLAB Toolbox
14.8 KB




Aeroplane Toolbox 3.2
MATLAB Toolbox
15.0 KB




Alloy Wheel Toolbox 1.2
MATLAB Toolbox
16.3 KB




Alloy Wheel Toolbox 3.1
MATLAB Toolbox
16.6 KB




Ambulance Toolbox 1.0
MATLAB Toolbox
11.6 KB




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MATLAB Toolbox
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Bicycle Toolbox 1.3
MATLAB Toolbox
10.7 KB




Cable Car Toolbox 1.0
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MATLAB Toolbox
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MATLAB Toolbox
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Alloy Wheel Toolbox 2.0
MATLAB Toolbox
16.1 KB




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MATLAB Toolbox
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MATLAB Toolbox
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MATLAB Toolbox
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MATLAB Toolbox
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MATLAB Toolbox
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10.0 KB



Bus Toolbox 1.1
MATLAB Toolbox
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Cable Car Toolbox 2.0
MATLAB Toolbox
12.5 KB




Aeroplane Toolbox 2.0
MATLAB Toolbox
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Aeroplane Toolbox 3.1
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Alloy Wheel Toolbox 1.1
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Alloy Wheel Toolbox 3.0
MATLAB Toolbox
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Alloy Wheel Toolbox 3.4
MATLAB Toolbox
16.6 KB




Ambulance Toolbox 1.3
MATLAB Toolbox
11.3 KB



Bicycle Toolbox 1.2
MATLAB Toolbox
10.1 KB



Bus Toolbox 1.2
MATLAB Toolbox
15.1 KB



Cable Car Toolbox 2.1
MATLAB Toolbox
13.0 KB

MATLAB Store (demo)



MATLAB Minimart



Forklift Toolbox

Quisque eget erat tempor, sodales enim efficitur, malesuada ligula.

[More info...](#)



Aeroplane Toolbox

Ut sodales augue nec imperdiet fermentum.

[More info...](#)



Ship Toolbox

Integer auctor ultricies maximus.

[More info...](#)



Helicopter Toolbox

Maecenas euismod placerat euismod.

[More info...](#)



Wheel Toolbox

Suspendisse aliquam velit at urna consequat dapibus.

[More info...](#)



Drone Toolbox

Mauris commodo sapien tortor, id faucibus dolor pharetra nec.

[More info...](#)



Concrete Mixer Toolbox

Maecenas euismod placerat euismod.

[More info...](#)

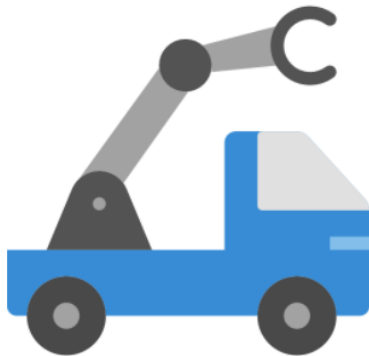


Dump Truck Toolbox

Fusce fermentum sem tellus, eget convallis tellus rhoncus eu.

[More info...](#)

MATLAB Minimart demo



Crane Toolbox

Etiam ut nisi eget sem vehicula hendrerit nec viverra sapien.

Nullam venenatis libero lectus, at ultricies erat dictum nec. Quisque sit amet ullamcorper tellus. Fusce molestie elit massa, sagittis congue metus rutrum et. Praesent consectetur in arcu id, dictum sagittis dolor. Duis velit odio, convallis eu nulla et, elementum porta lectus. Phasellus vitae auctor eros. Integer non eros metus. Sed nulla laoreet ullamcorper. Nullam feugiat sem lacinia, dignissim ex sed, bibendum justo. Sed at iaculis justo.

Nam gravida iaculis mauris, eu molestie purus finibus a. Duis rutrum arcu arcu. Sed fringilla est nisi, a convallis velit tempor id. Ut efficitur leo in consequat morbi tincidunt nunc id velit venenatis, at ultrices mi porta. Duis blandit gravida mauris, malesuada elementum leo finibus vitae. Donec efficitur ex fermentum, elementum interdum mi. Cras ornare lorem orci, ac dictum leo molestie eu. Etiam pretium risus non arcu posuere interdum nec ut neque. Vivamus molestie sodales blandit ac vehicula ante, eget rutrum ante. In venenatis euismod justo, a eleifend nisi pulvinar vel. Curabitur ut condimentum felis. Praesent purus dolor, viverra vel sagittis pretium vehicula nunc. Duis porta aliquam tortor, ut lobortis velit sollicitudin sed. Vivamus lorem nibh, tincidunt ut bibendum sed, sodales ut tellus.

Vivamus non lacinia ante, non aliquet tellus. Morbi in ex sed diam placerat venenatis at a nibh. Sed luctus dui vitae lacus ullamcorper maximus. In ac cursus nunc

- 2.2
- 3.4
- 3.3
- 3.2
- 3.1
- 3.0
- 2.3
- 2.2
- 2.1
- 2.0
- 1.3
- 1.2
- 1.1
- 1.0







Updating toolboxes

```
>> minimart.updateToolboxes( 'stores\huge' )
```

```
Upgrade 'Badminton Toolbox' from version 2.0 to version 2.4? (y/n) y
```

```
Upgrade 'Archery Toolbox' from version 1.1 to version 2.1? (y/n) y
```

```
Upgrade 'Bottle Toolbox' from version 1.4 to version 3.2? (y/n) y
```

	Name	Type	Author	Install D..
	Bottle Toolbox version 3.2	Toolbox	Darth Vader	23 Septem
	Archery Toolbox version 2.1	Toolbox	Richard Kimble	23 Septem
	Badminton Toolbox version 2.4	Toolbox	Wile E. Coyote	23 Septem
	MATLAB Minimart version 1.2.2	Toolbox	David Sampson	23 Septem
	Vehicle Network Toolbox version 3.4	 MathWorks		21 Septem

Resources

- [GUI Layout Toolbox](#) on File Exchange
- [Toolbox development blog posts](#) on Developer Zone

- [MATLAB Minimart](#) on File Exchange
- [“Jaguar Land Rover Standardizes on MATLAB for Developing, Packaging, and Sharing Engineering Tools”](#) on User Stories

Thank you!

Questions?