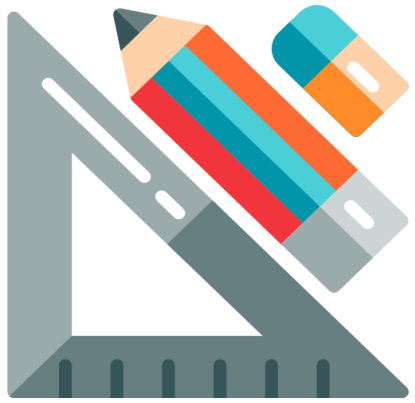


MATLAB EXPO 2018

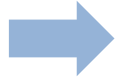
Toolbox Development

Olivier DUFOUR





Design



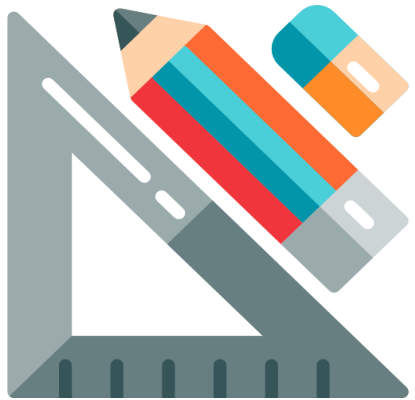
Implement



Package



Distribute



Design



Implement



Package



Distribute

Good names

Functions

- `*read, *write`
- `fft / delete / split`

Properties

- `Visible`
- `Connection`

Naming class properties

- MixedCase full names
- Noun, noun phrase
 - ✓ Connection
 - ✓ CornerThreshold
- Verb, verb phrase.
 - ✓ ShowLineNumber
 - ✓ Visible
- Avoid appending
 - ✗ ConnectionObject

MATLAB EXPO 2016

Naming classes

- lowercase short or camelCase full or MixedCase full names
- Noun, noun phrase (for things)
 - ✓ tf, ss, sym
 - ✓ griddedInterpolant
 - ✓ matlab.ui.eventdata.MouseData
- Adjective, adjective
 - ✓ Selectable
- Avoid prepending
- Avoid appending

MATLAB EXPO 2016

Naming functions and methods

- lowercase short or camelCase full names
- Verb, verb phrase (for actions)
 - ✓ delete, split
 - ✓ traverseGraph
- Noun, noun phrase (where the noun is the thing being returned)
 - ✓ eig, chebwin
- Avoid empty verbs: compute, get, display, perform, detect, retrieve, extract, return, do, does
 - ✗ computeFFT
- Conversion functions take the form foo2bar or fooToBar
- Readers and writers take the form fooread, barwrite

MATLAB EXPO 2016

Bad names

- `Model`
- `foo_new`
- `calc`
- `ModelClass`
- `IModel`
- Indecipherable abbreviations
- Unconventional capitalisation

Too many files

code

resources

doc

demos

- Border
- demoBrowser4
- EnableExample1
- GridFlex
- help_ex
- leftarrow
- why_layout_anno2
- colorbarexample
- gridflexpositioning
- minimizeexample
- bigicon_VBox
- DefaultsSystem2
- pagesicon
- ChildObserver
- Panel
- setPosition
- calcPixelSizes
- tab_NotSelected_NoEdge
- Box
- SelectionData
- HButtonBox
- TabPanel

- BoxInBox
- demoicon
- EnableExample2
- guide1
- help_fx
- pageicon
- info
- demoBrowser
- guideApp
- paneltabexample
- bigicon_VBoxFlex
- demoBrowser1
- reficon
- Empty
- FigureData
- tracking
- tab_NoEdge_Selected
- tab_NotSelected_NotSelected
- ButtonBox
- Empty
- VBox
- layoutRoot

- demoBrowser2
- deploy
- EnableExample3
- guide2
- help_gs
- uparrow
- axesexample
- displayEndOfDemoMessage
- guideApp
- visibleexample
- DefaultsFigure
- greenarrowicon
- rightarrow
- loadIcon
- FigureObserver
- Contents
- tab_Selected_NoEdge
- tab_NotSelected_Selected
- ChildEvent
- Grid
- VButtonBox
- BoxPanel

fresh

stale

public

internal

Organising your files

`/layout`

`/+uix`

`/+internal`

`/+uiextras`

`/resources`

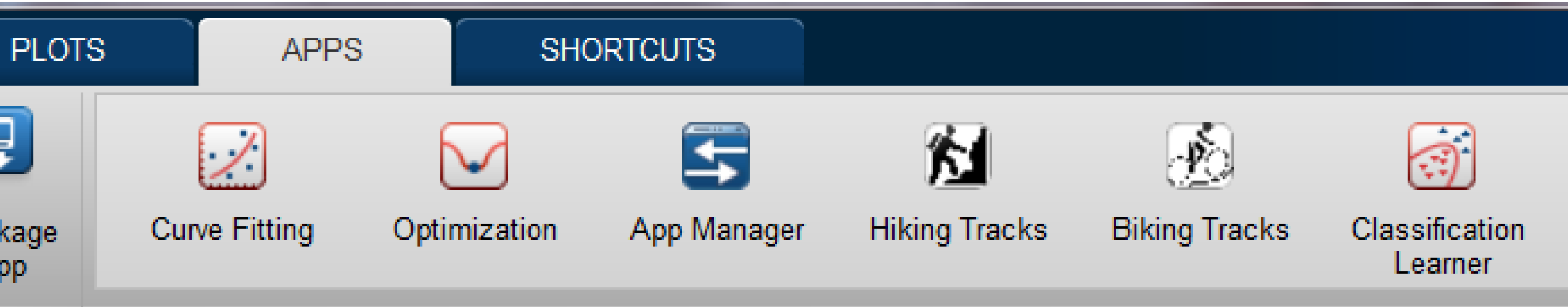
`/layoutdoc`

`/examples`

`/images`



MATLAB Apps



Classification Learner - Scatter Plot

CLASSIFICATION LEARNER VIEW

Import Data Feature Selection

DECISION TREES

Complex Tree Medium Tree Simple Tree

SUPPORT VECTOR MACHINES

Linear SVM Quadratic SVM Cubic SVM Fine Gaussian ... Medium Gaussian ... Coarse Gaussian ...

NEAREST NEIGHBOR CLASSIFIERS

Fine KNN Medium KNN Coarse KNN Cosine KNN Cubic KNN Weighted KNN

ENSEMBLE CLASSIFIERS

Boosted Trees Bagged Trees Subspace Discriminant Subspace KNN RUSBoost...

Current model

Type: Support Vector Machine
Preset: < Custom >
Data Transformation: 1 of 7 predictors excluded
Status: Trained

Show Classifier Results

Classifier Results

Color of misclassified points represents:

True class

Scatter Plot of CreditRating for: Sup

WC_TA

Binning Explorer - Overview

Selected Predictor: CustID Predictor Type: Numeric

Apply Monotone Algorithm Options Manual Binning

Overview

CustID

CustAge

TmAtAddress

ResStatus

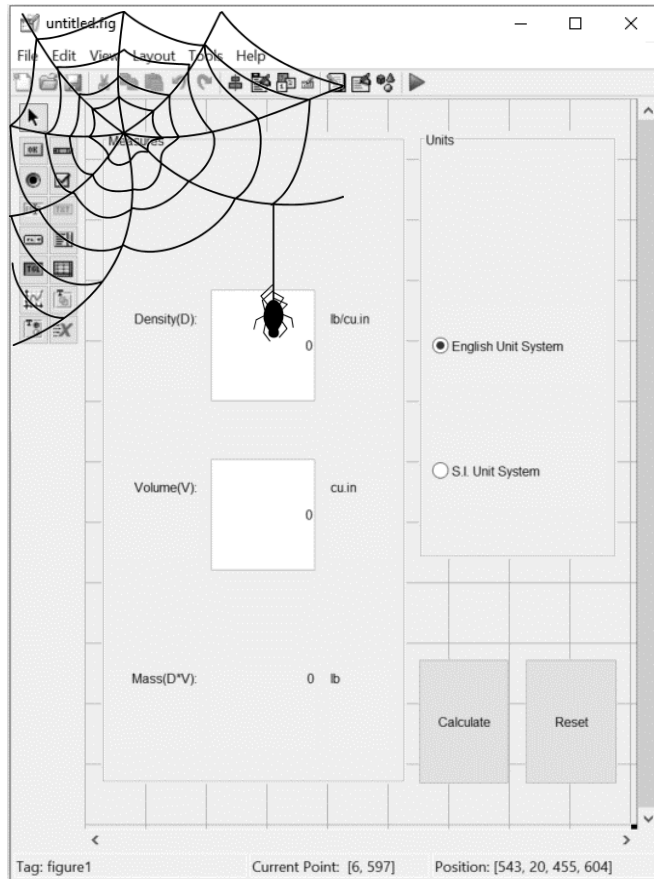
Bin Information: CustID

	Good	Bad	Odds	WOE	InfoValue
[-Inf,121)	84	36	2.3333	0.1429	0.0020
[121,241)	82	38	2.1579	0.0647	4.1412e-04
[241,1081)	559	281	1.9893	-0.0166	1.9398e-04
[1081,Inf]	78	42	1.8571	-0.0854	7.3919e-04
Totals	803	397	2.0227		0.0033

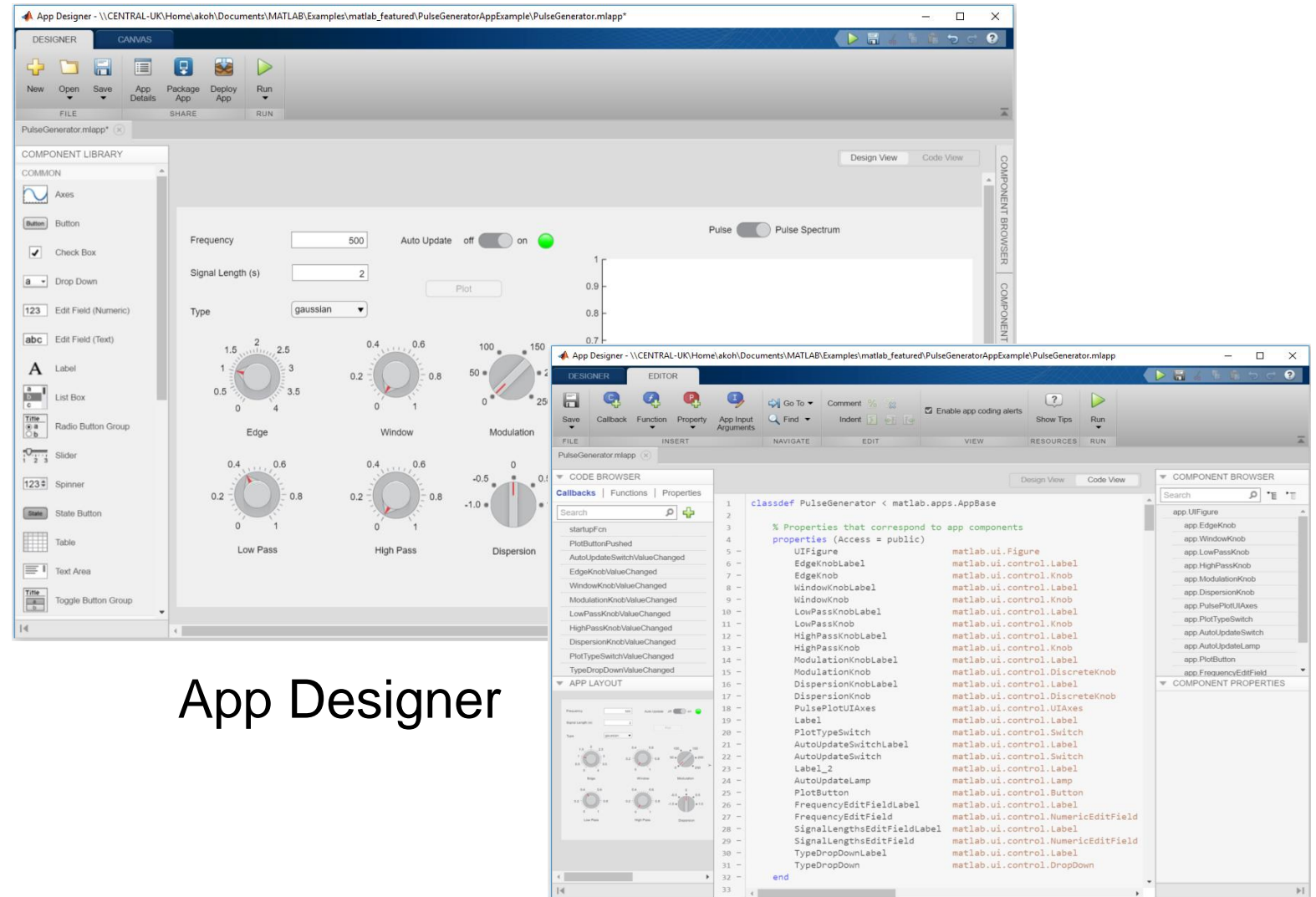
Predictor Information: CustID

Value	
Min	1
Max	1200
Mean	600.5000
Std	346.5545

App building tools

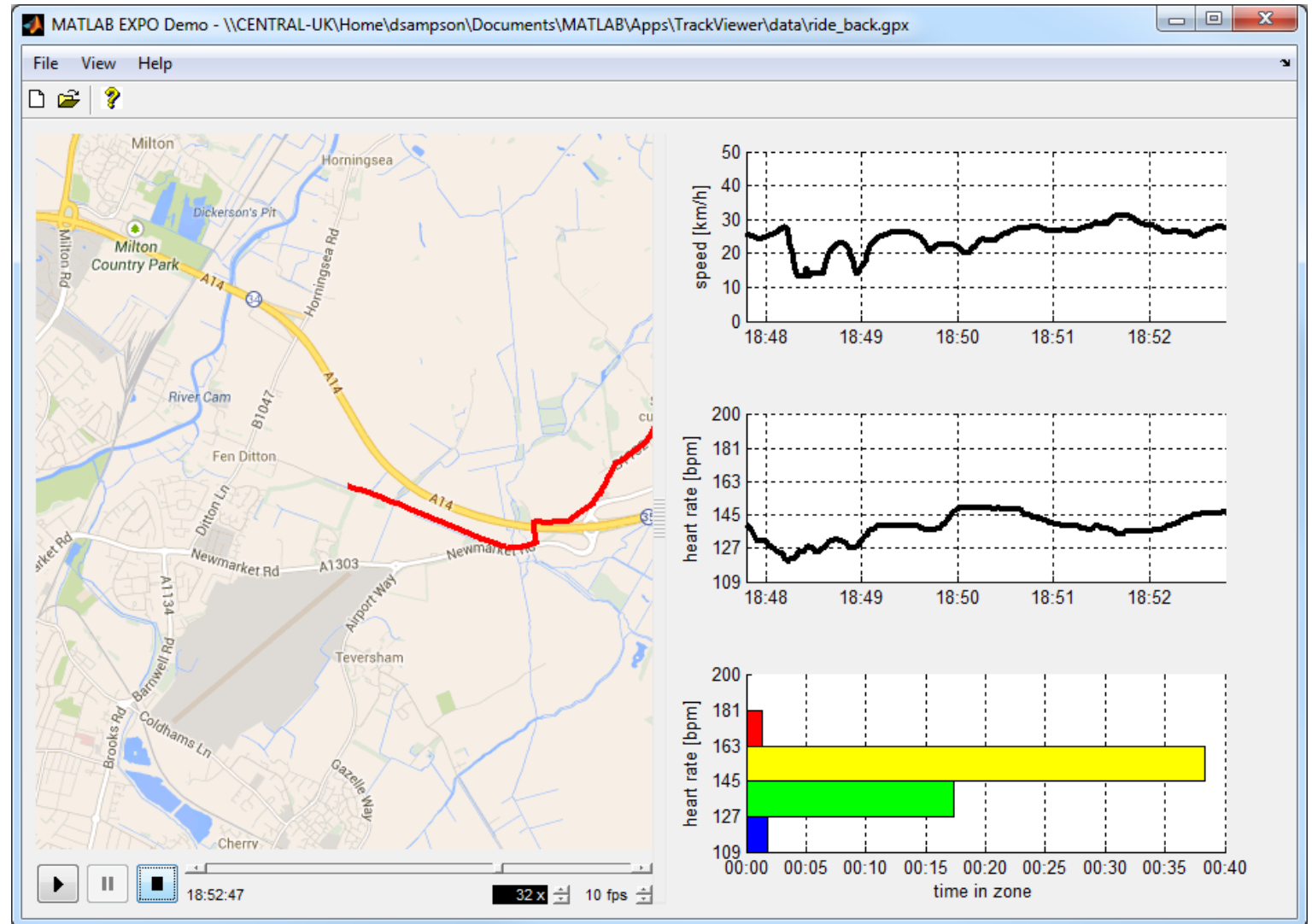
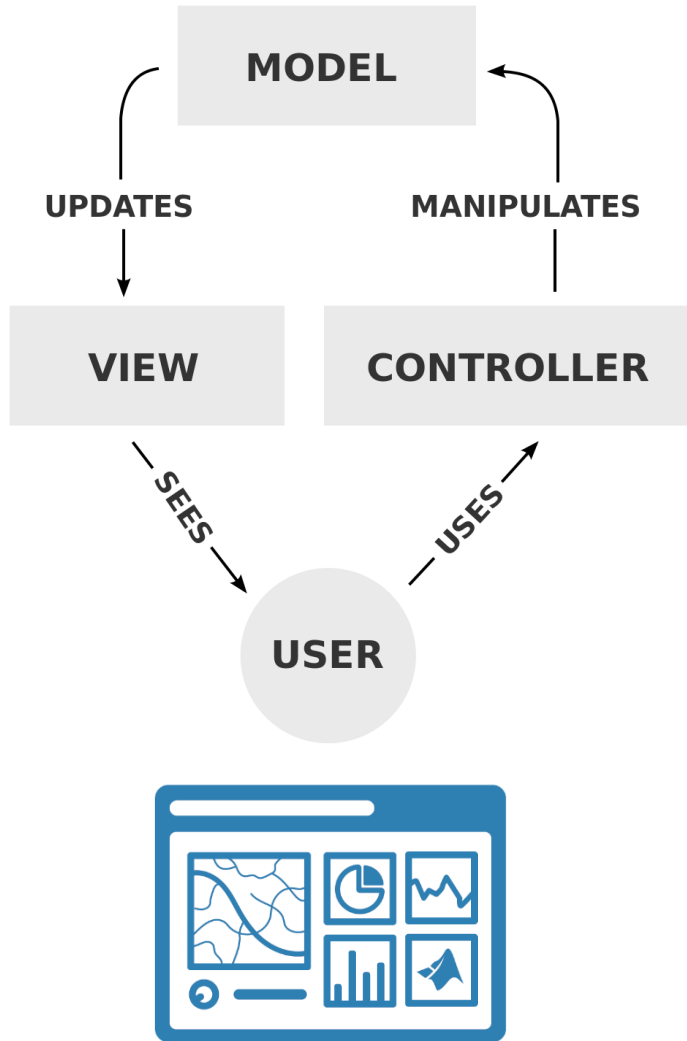


GUIDE



App Designer

Model-view-controller architecture



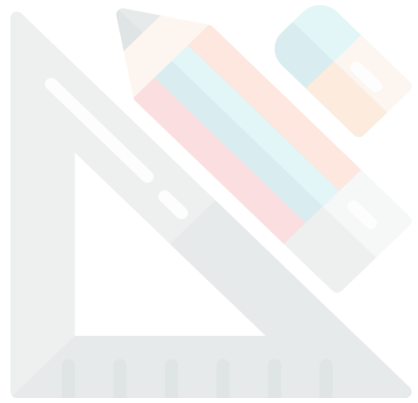
Design tips

1. Review your APIs
2. Organise your files
3. Include some apps

Resources:

- [“Best Practices – Adapt, then Adopt!”](#) on Developer Zone
- MATLAB naming guidelines
- Model-View-Controller example code from previous MATLAB EXPO proceedings





Design



Implement



Package



Distribute

```
>> y = timesTwo( 1:5 )
```

Index exceeds matrix dimensions.

```
Error in mypkg1.mypkg1a.mypkg1ab.myfunc1 (line 9)
```

```
y(idx) = u(idx)*log(u_hat(idx))+(1-u(idx))*log(1-u_hat(idx));
```

```
Error in mypkg2.mypkg2a.myfunc2 (line 5)
```

```
y = mypkg1.mypkg1a.mypkg1ab.myfunc1( myVar1 .* myVar2 );
```

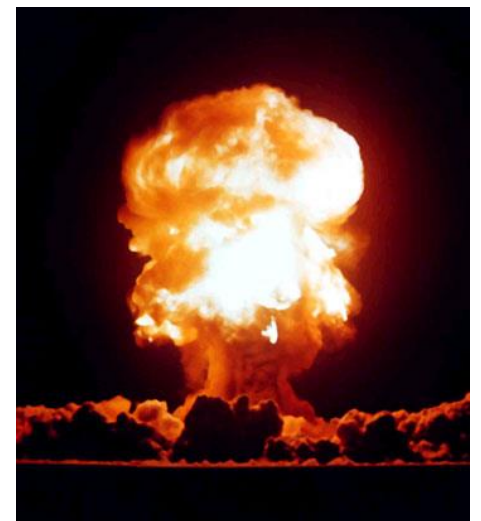
```
Error in mypkg3.mypkg3a.myfunc3>@(x)mypkg2.mypkg2a.myfunc2(x) (line 4)
```

```
y = arrayfun( @(x) mypkg2.mypkg2a.myfunc2( x ), myVar );
```

```
Error in mypkg3.mypkg3a.myfunc3 (line 4)
```

```
y = arrayfun( @(x) mypkg2.mypkg2a.myfunc2( x ), myVar );
```

```
Error in timesTwo (line 10)
```



Validate inputs

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

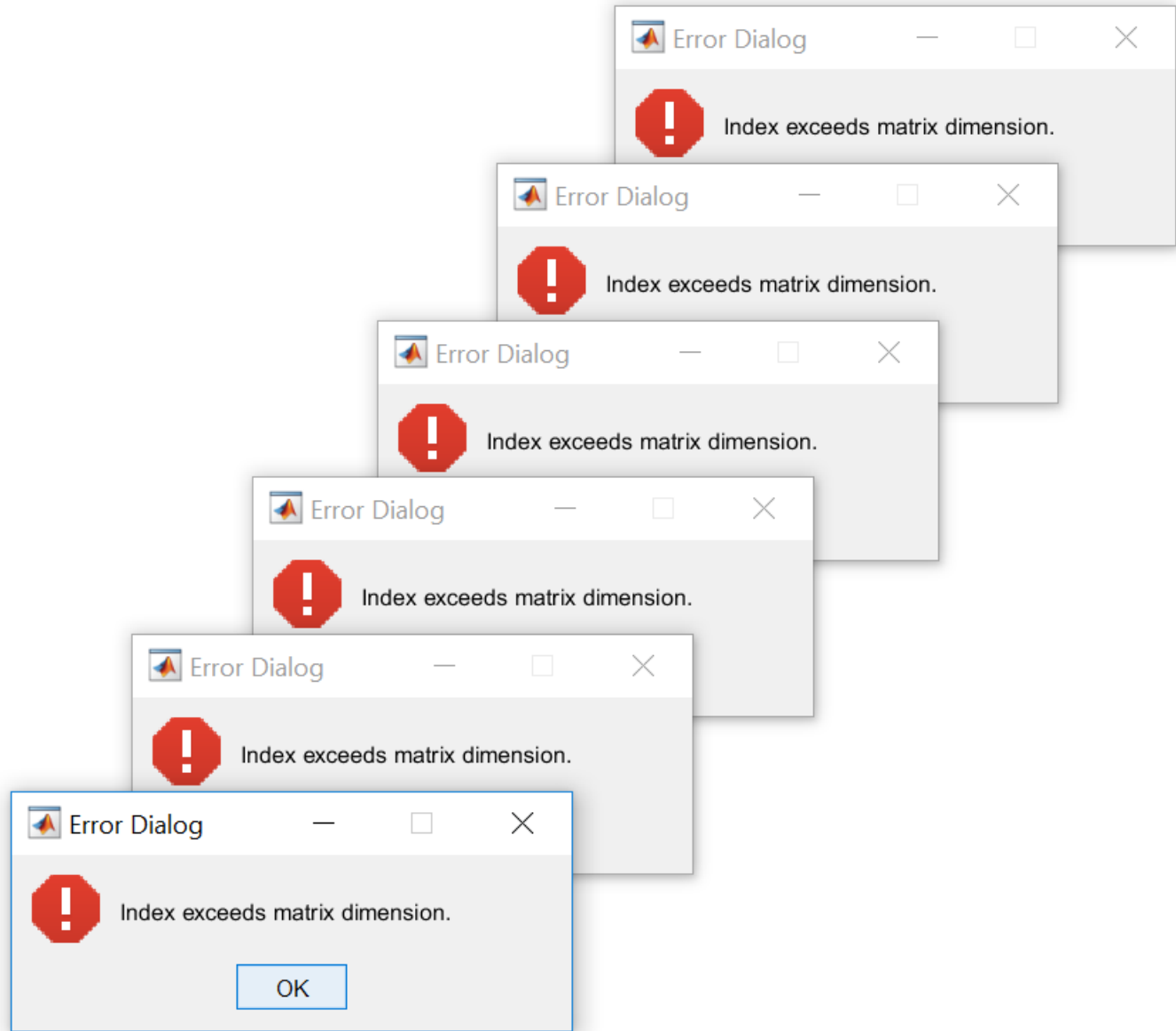
```
1 function y = timesTwo( x )
2
3 % Validate
4 validateattributes( x, {'double'}, {'size',[1 3], 'increasing'} );
5
```

```
>> 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`



Test early, test often, test automatically

- Function and class-based tests
- Setup and teardown
- Parameterised tests
- Select and run tests
- Analyse test results



```
classdef ExampleTest < matlab.unittest.TestCase
    methods(Test)
        function testA(testCase)
            testCase.verifyTrue(true)
        end
        function testB(testCase)
            testCase.assertEqual(0,1)
            % remaining test code is not exercised
        end
        function testC(testCase)
            testCase.verifyFalse(true)
        end
    end
end
end
```

Verification

verifyTrue

verifyFalse

verifyEqual

verifyNotEqual

verifySameHandle

verifyNotSameHandle

verifyReturnsTrue

verifyFail

verifyThat

Version control

- Giant 'UNDO' key
- Change management
- Software release management
- Collaborative development
- Git and Subversion Integration



Implementation tips

1. Catch errors early and provide actionable feedback
2. Write some unit tests
3. Use version control

Resources:

- [MATLAB Testing framework](#)
- [MATLAB Source Control Integration](#)





Design



Implement



Package



Distribute

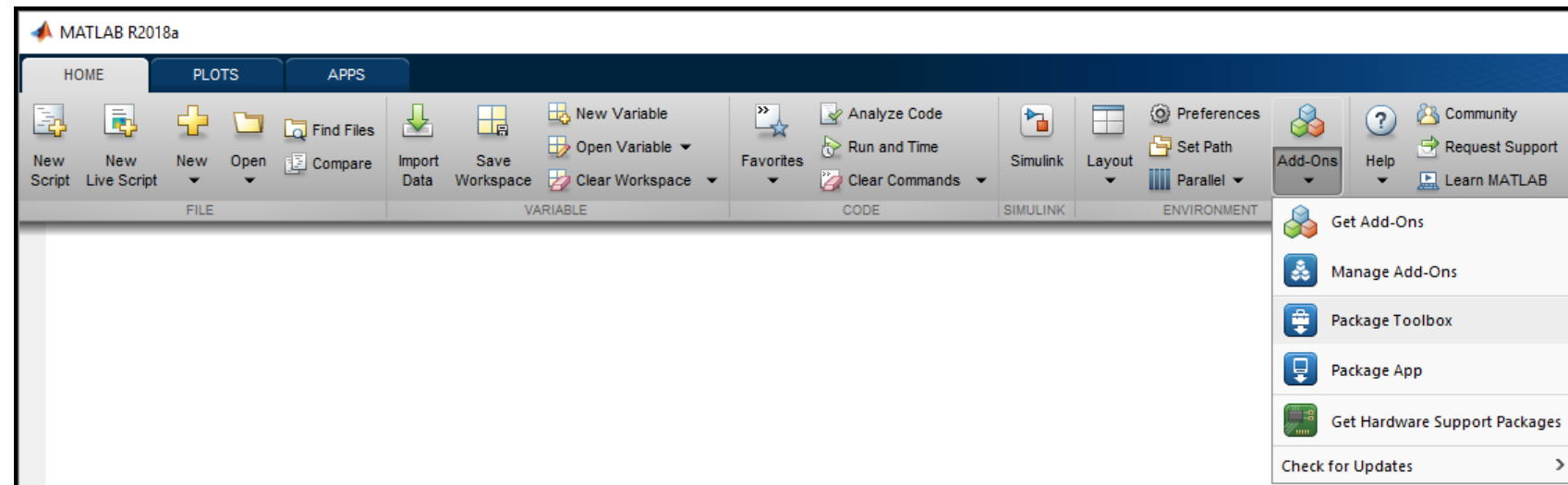
The bad old days

1. Unzip the zip file
2. Find the instructions and release notes
3. Decide whether you want the thing
4. Remove folders from old versions from the path
5. Add folders to the path
6. Save the path for next time
7. Find the documentation
8. Do work



MATLAB Toolbox

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



MATLAB Toolbox

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

Package a Toolbox - tbxtools.prj*

PACKAGER

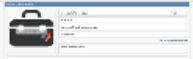
New Open Project Save

tbx

Package

FILE TOOLBOX FOLDER PACKAGE

Toolbox Information


 Remove toolbox image

Toolbox Tools 1.0.1
 Amy Koh
 amy.koh@mathworks.co.uk
 MathWorks
[Set as default contact](#)

A toolbox for developing custom toolboxes in MATLAB.

This toolbox provides tools to create a sandbox for developing custom MATLAB toolbox. It uses a convention enforcing best practices in order to help streamline and standardise your toolbox development and packaging process.
<http://blogs.mathworks.com/developer/2017/01/13/matlab-toolbox-best-practices/>

Examples, Apps, and Documentation

Examples

No examples were found in the toolbox.

Apps

myApp

Getting Started Guide

The Getting Started Guide is "tbx\doc\GettingStarted.mlx". Customize the guide using the Live Editor.

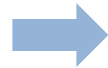
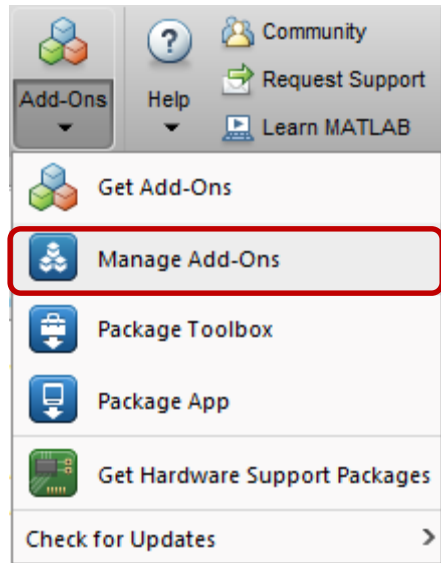
[Edit](#)

Help Browser Integration

When the toolbox is installed the documentation will display in the MATLAB Help browser under the "Supplemental Software" section.

[Preview](#)

Add-On Manager



Add-On Manager (Installed (92))

Get Add-Ons | Import

Name	Type	Author	Install Date	
Toolbox Tools version 1.0.1	Toolbox	Amy Koh	20 September 2017	⋮
GUI Layout Toolbox version 2.3.1	Toolbox	David Sampson	20 September 2017	⋮
Embedded Coder Support Package for AUTOSAR Standard version 17.2.0	Hardware Support Package		5 September 2017	⋮
WLAN System Toolbox version 1.4	MathWorks Toolbox		25 August 2017	⋮
Wavelet Toolbox version 4.19	MathWorks Toolbox		25 August 2017	⋮
Vision HDL Toolbox version 1.5	MathWorks Toolbox		25 August 2017	⋮
Vehicle Network Toolbox version 3.4	MathWorks Toolbox		25 August 2017	⋮
Trading Toolbox version 3.3	MathWorks Toolbox		25 August 2017	⋮
Text Analytics Toolbox version 1.0	MathWorks Toolbox		25 August 2017	⋮
System Identification Toolbox version 9.7	MathWorks Toolbox		25 August 2017	⋮

Context menu for the selected item:

- Open Documentation
- Open Folder
- View Details
- View in Add-On Explorer
- Enabled
- Uninstall...

Help | MATLAB Documentation

Documentation

CONTENTS Close Explore Examples Explore Add-Ons Edit Preferences

My Products

- MATLAB
- Simulink
- Aerospace Blockset
- Aerospace Toolbox
- Audio System Toolbox
- Automated Driving System Toolbox
- Bioinformatics Toolbox
- Communications System Toolbox
- Computer Vision System Toolbox
- Control System Toolbox
- Curve Fitting Toolbox
- Data Acquisition Toolbox
- Database Toolbox
- Datafeed Toolbox
- DO Qualification Kit (for DO-178)
- DSP System Toolbox
- Econometrics Toolbox
- Embedded Coder
- Financial Instruments Toolbox
- Financial Toolbox
- Fixed-Point Designer

Supplemental Software

MATLAB Minimart
MATLAB Web Maps

Control Systems

- Aerospace Toolbox
- Automated Driving System Toolbox
- Control System Toolbox

Control Systems

- Aerospace Blockset
- Powertrain Blockset
- Robotics System Toolbox
- Simulink Control Design

Supplemental Software

MATLAB Minimart
MATLAB Web Maps

Where is the doc ?

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

The screenshot shows a web browser window displaying the MATLAB Minimart documentation page. The browser's address bar shows the file path: `file:///C:/work/store/demo/www/index.html`. The page title is "MATLAB Minimart" and it features a search bar at the top right. On the left side, there is a "CONTENTS" sidebar with a tree view showing the following structure:

- < Documentation Home
- ▼ MATLAB Minimart (Supplemental Software)
 - ▼ Getting Started
 - Distribution
 - System requirements
 - Release notes
 - ▼ User Guide
 - Creating a store
 - Browsing and installing toolboxes from a store
 - Updating toolboxes from the store
 - ▼ Functions
 - > minimart.installToolbox
 - > minimart.publishedToolboxes
 - > minimart.buildStore
 - > minimart.showStore
 - > minimart.toolboxMetadata
 - > minimart.updateToolboxes

The main content area displays the "MATLAB Minimart" section, which includes a description: "Share and manage MATLAB toolboxes" and "MATLAB Minimart provides tools for sharing and managing your MATLAB toolboxes. Storekeepers can generate stores so that MATLAB users can browse and install toolboxes. Users can automatically update their installed toolboxes to the latest versions in a store." Below this, there is a grid of four toolbox cards, each with an icon and a "More info..." button:

- Aeroplane Toolbox**: Praesent condimentum diam ut metus malesuada congue.
- Alloy Wheel Toolbox**: Nunc et hendrerit nisl.
- Ambulance Toolbox**: Integer fermentum, odio eget semper congue, metus augue placerat nulla, non venenatis nunc nisi id elit.
- Bicycle Toolbox**: Cras venenatis neque a neque dapibus feugiat.

Packaging tips

1. Package to .mltbx
2. Bundle documentation and examples with your code
3. Automate the packaging process

Resources:

- [“Give Them A Care Package”](#) on Developer Zone
- [“Packaging Pitfalls”](#) on Developer Zone
- [MATLAB Toolbox Tools](#) on File Exchange





Design



Implement




































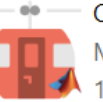


Package



Distribute


The image shows a web browser window displaying the Google Play Store 'Top Charts' page. The browser address bar shows 'https://play.google.com/store/apps/top'. The page features a search bar, navigation tabs for 'Apps', 'Categories', 'Home', 'Top Charts', and 'New Releases', and a list of top apps including WhatsApp, Messenger, Football Strike, and Wish. An overlaid Android phone interface on the right shows the 'My apps & games' screen with a list of 8 updates available, including reddit is fun GP, Dropbox, Instagram, Messenger, Chrome Canary, Yelp, and Slack.

 Aeroplane Toolbox 1.2 MATLAB Toolbox 14.8 KB	 88 bytes Aeroplane Toolbox 1.3 MATLAB Toolbox 14.6 KB	 14.5 KB Aeroplane Toolbox 1.4 MATLAB Toolbox 14.4 KB	 14.6 KB Aeroplane Toolbox 2.0 MATLAB Toolbox 14.5 KB
 Aeroplane Toolbox 2.1 MATLAB Toolbox 14.8 KB	 Aeroplane Toolbox 2.2 MATLAB Toolbox 14.8 KB	 Aeroplane Toolbox 3.0 MATLAB Toolbox 14.9 KB	 Aeroplane Toolbox 3.1 MATLAB Toolbox 14.5 KB
 Aeroplane Toolbox 3.2 MATLAB Toolbox 15.0 KB	 Aeroplane Toolbox 3.3 MATLAB Toolbox 15.2 KB	 Alloy Wheel Toolbox 1.0 MATLAB Toolbox 16.5 KB	 Alloy Wheel Toolbox 1.1 MATLAB Toolbox 16.1 KB
 Alloy Wheel Toolbox 1.2 MATLAB Toolbox 16.3 KB	 Alloy Wheel Toolbox 2.0 MATLAB Toolbox 16.1 KB	 Alloy Wheel Toolbox 2.1 MATLAB Toolbox 16.7 KB	 Alloy Wheel Toolbox 3.0 MATLAB Toolbox 16.6 KB
 Alloy Wheel Toolbox 3.1 MATLAB Toolbox 16.6 KB	 Alloy Wheel Toolbox 3.2 MATLAB Toolbox 16.4 KB	 Alloy Wheel Toolbox 3.3 MATLAB Toolbox 16.6 KB	 Alloy Wheel Toolbox 3.4 MATLAB Toolbox 16.6 KB
 Ambulance Toolbox 1.0 MATLAB Toolbox 11.6 KB	 Ambulance Toolbox 1.1 MATLAB Toolbox 11.7 KB	 Ambulance Toolbox 1.2 MATLAB Toolbox 11.5 KB	 Ambulance Toolbox 1.3 MATLAB Toolbox 11.3 KB
 Ambulance Toolbox 1.4 MATLAB Toolbox 11.9 KB	 Bicycle Toolbox 1.0 MATLAB Toolbox 10.3 KB	 Bicycle Toolbox 1.1 MATLAB Toolbox 10.0 KB	 Bicycle Toolbox 1.2 MATLAB Toolbox 10.1 KB
 Bicycle Toolbox 1.3 MATLAB Toolbox 10.7 KB	 Bus Toolbox 1.0 MATLAB Toolbox 15.6 KB	 Bus Toolbox 1.1 MATLAB Toolbox 14.9 KB	 Bus Toolbox 1.2 MATLAB Toolbox 15.1 KB
 Cable Car Toolbox 1.0 MATLAB Toolbox 12.8 KB	 Cable Car Toolbox 1.1 MATLAB Toolbox 12.3 KB	 Cable Car Toolbox 2.0 MATLAB Toolbox 12.5 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...](#)

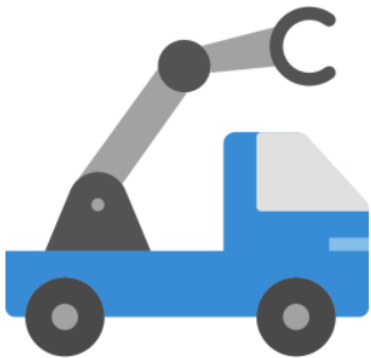


Dump Truck Toolbox

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. Pro 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. 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 mo tincidunt nunc id velit venenatis, at ultrices mi porta. Duis blandit gravida mauris, malesuada elementum leo finibus vitae. Donec efficitur ex fermentum, elemer interdum mi. Cras ornare lorem orci, ac dictum leo molestie eu. Etiam pretium risus non arcu posuere interdum nec ut neque. Vivamus molestie sodales blandi ac vehicula ante, eget rutrum ante. In venenatis euismod justo, a eleifend nisi pulvinar vel. Curabitur ut condimentum felis. Praesent purus dolor, viverra vel sa 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 n

- 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


MATLAB Store



 Upload Add-On

Contact Administrator

Request Tag

 Search
X

Author X

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

Type X

- App
- Toolbox


Tag X


Control Panel: Administrator Recommender

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

Clear filters - Sort by: Title

Add-ons per page: 10







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

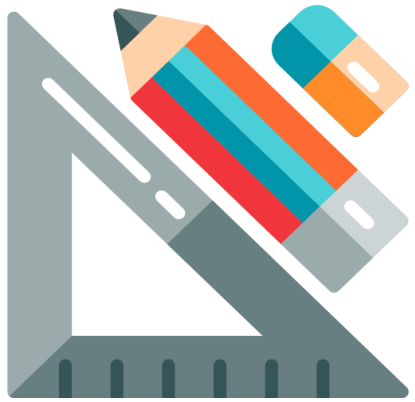
Distribution tips

1. Corral your toolboxes
2. Help users browse and update
3. Start simple and scale up

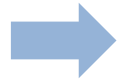
Resources:

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

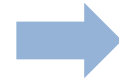




Design



Implement



Package



Distribute

Thank you.

Questions?