21+ MATLAB Features You Need Now!

This is a quick summary of the features covered in the talk 21 MATLAB Features You Need Now.

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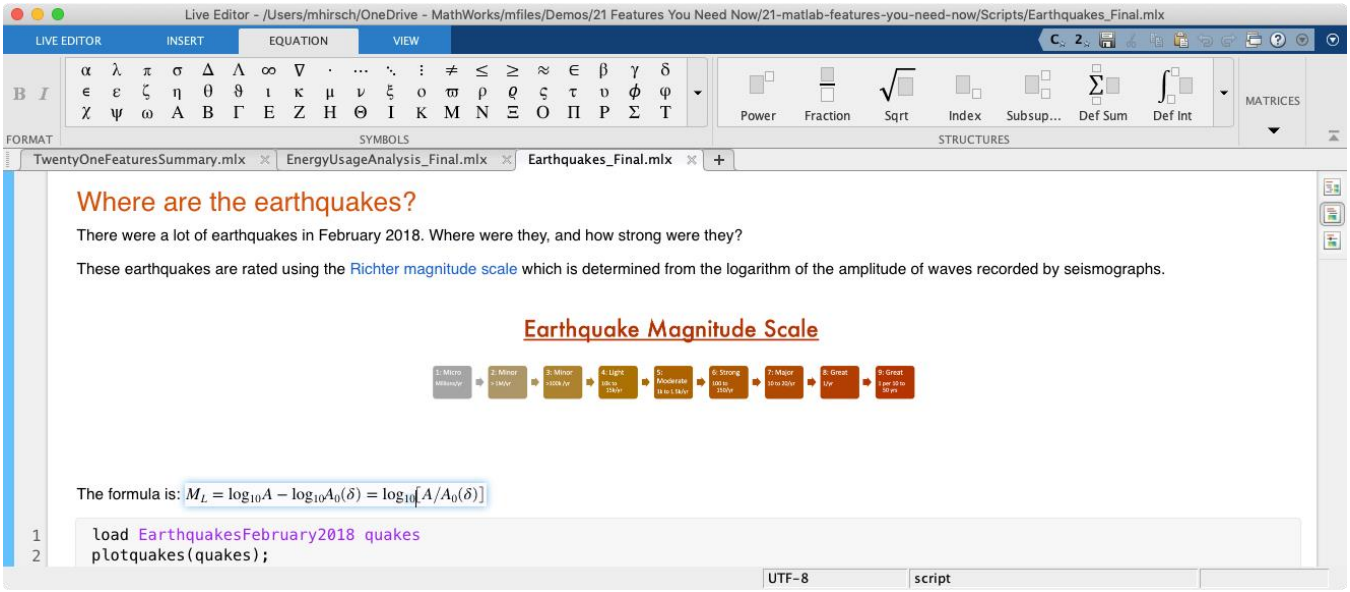
Live Editor

You can create scripts that combine code, output, and formatted text with the Live Editor. In fact, this document was created with the Live Editor. Some of our favorite features of the Live Editor are:

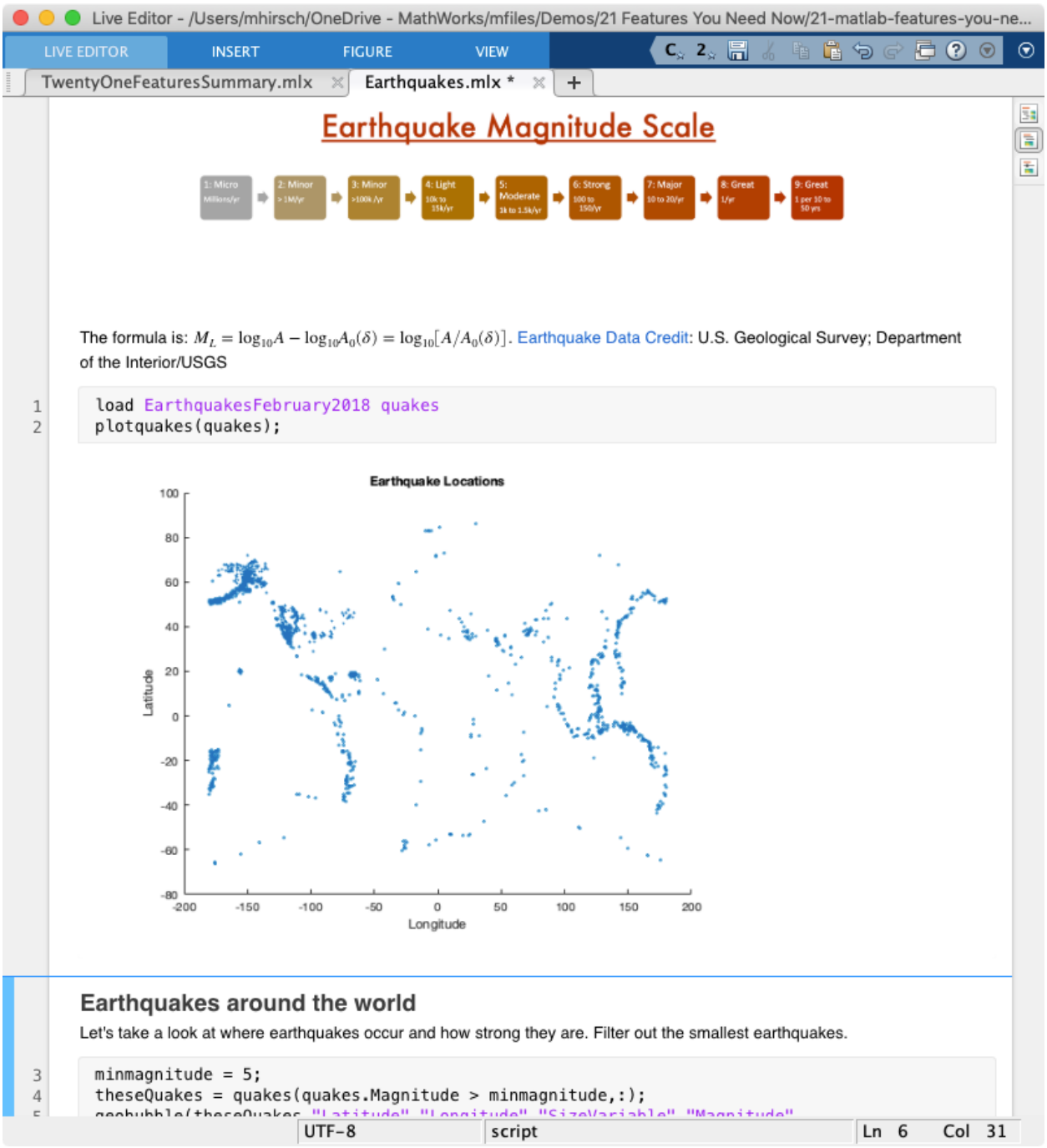
Formatted text, images, and equations

You can use formatted text and insert images and equations. There's a really nice equation editor, or you can use LaTeX if you prefer:



Output on right or inline

Output appears immediately adjacent to your code, either below or side-by-side:



Live Editor - /Users/mhirsch/OneDrive - MathWorks/mfiles/Demos/21 Features You Need Now/21-matlab-features-you-need-now/Earthquakes.mlx

LIVE EDITOR INSERT FIGURE VIEW

TwentyOneFeaturesSummary.mlx | Earthquakes.mlx

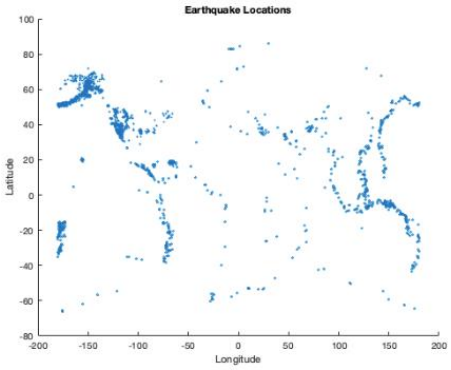
Where are the earthquakes?

There were a lot of earthquakes in February 2018. Where were they, and how strong were they?

These earthquakes are rated using the Richter magnitude scale which is determined from the logarithm of the amplitude of waves recorded by seismographs.

The formula is: $M_L = \log_{10}A - \log_{10}A_0(\delta) = \log_{10}[A/A_0(\delta)]$. Earthquake Data Credit: U.S. Geological Survey; Department of the Interior/USGS

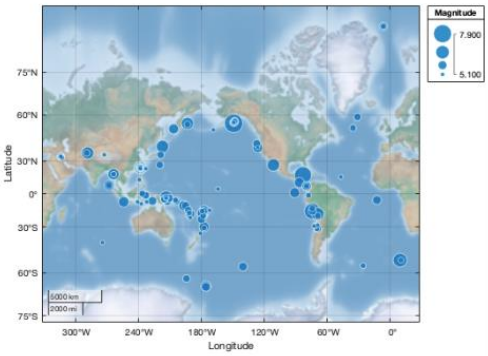
```
load EarthquakesFebruary2018 quakes
plotquakes(quakes);
```



Earthquakes around the world

Let's take a look at where earthquakes occur and how strong they are. Filter out the smallest earthquakes.

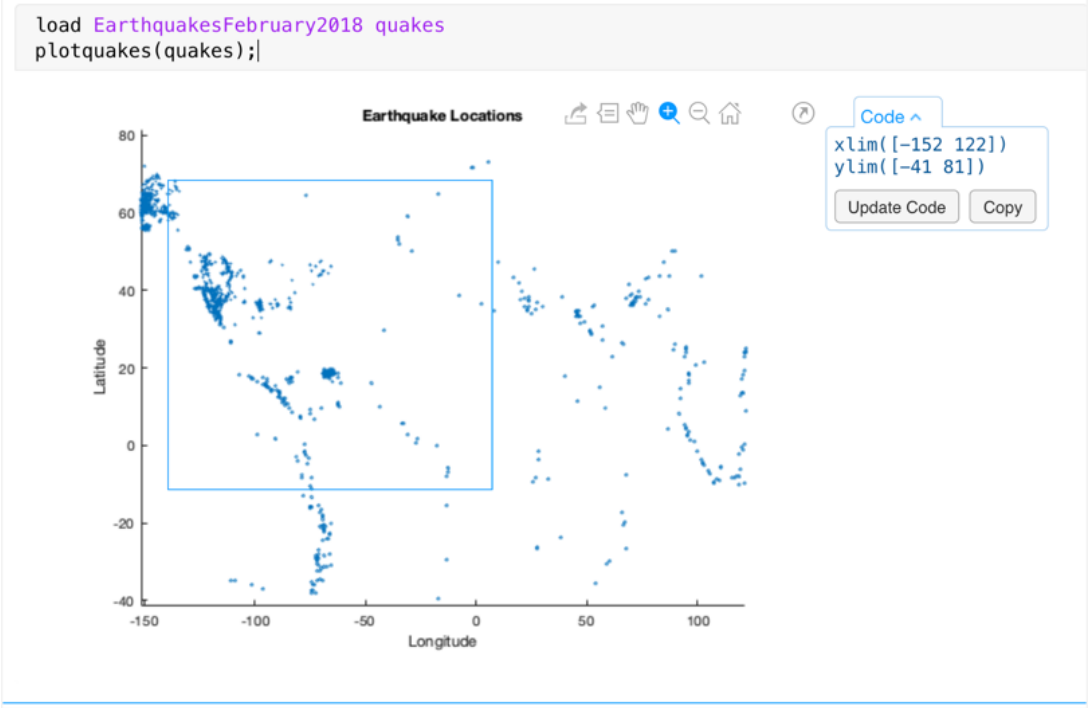
```
minmagnitude = 5;
theseQuakes = quakes(quakes.Magnitude > minmagnitude,:);
geobubble(theseQuakes,"Latitude","Longitude","SizeVariable","Magnitude"
    "Basemap","colorterrain");
```



UTF-8 | script | Ln 6 Col 31

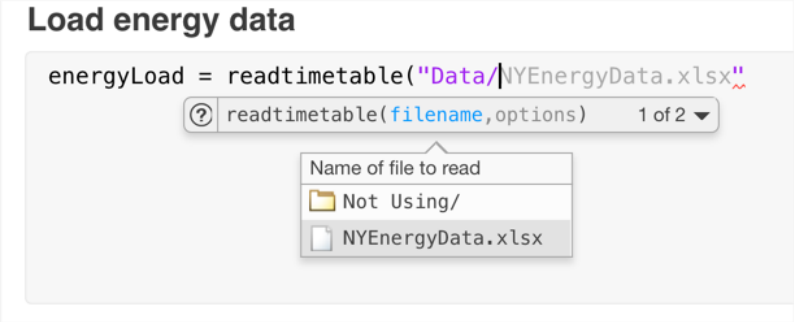
Interactive outputs

You can interact with outputs and generate MATLAB code for your interactions. For instance, you can zoom into a plot and then automatically update your program to set the new axis limits.



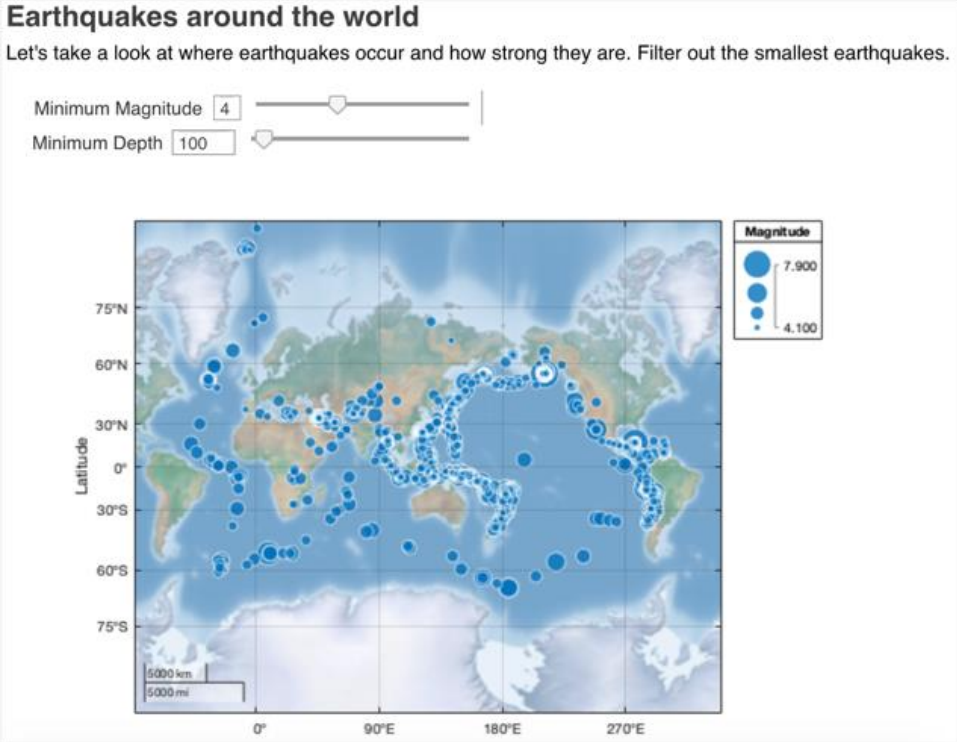
Function hints

Function hints make it easy to call functions without having to look at the documentation, and even to navigate to select files to import:



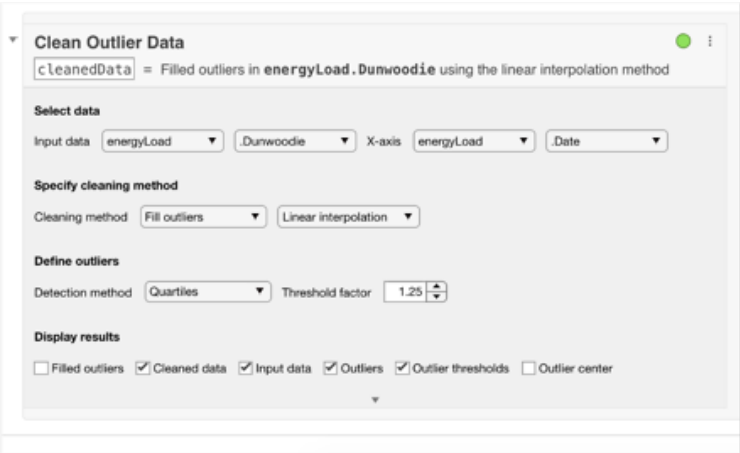
Interactive controls

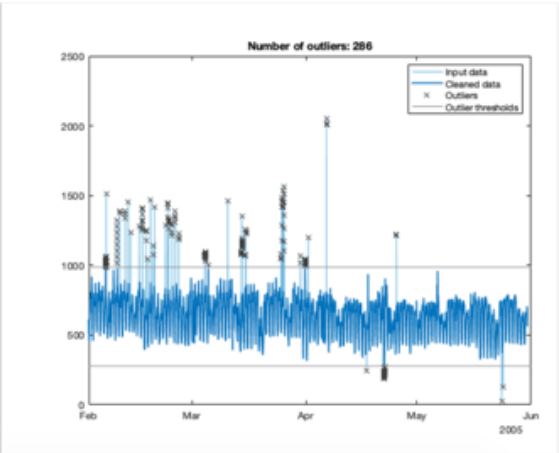
You can replace the value of variables with interactive controls to make it easy to interact with your program, and even hide the code altogether:



Live Editor Tasks

You can use Live Editor tasks to preprocess data interactively and the MATLAB code is automatically written for you. There are also Live Editor tasks for working with symbolic expressions, designing control systems, and more.





Document export

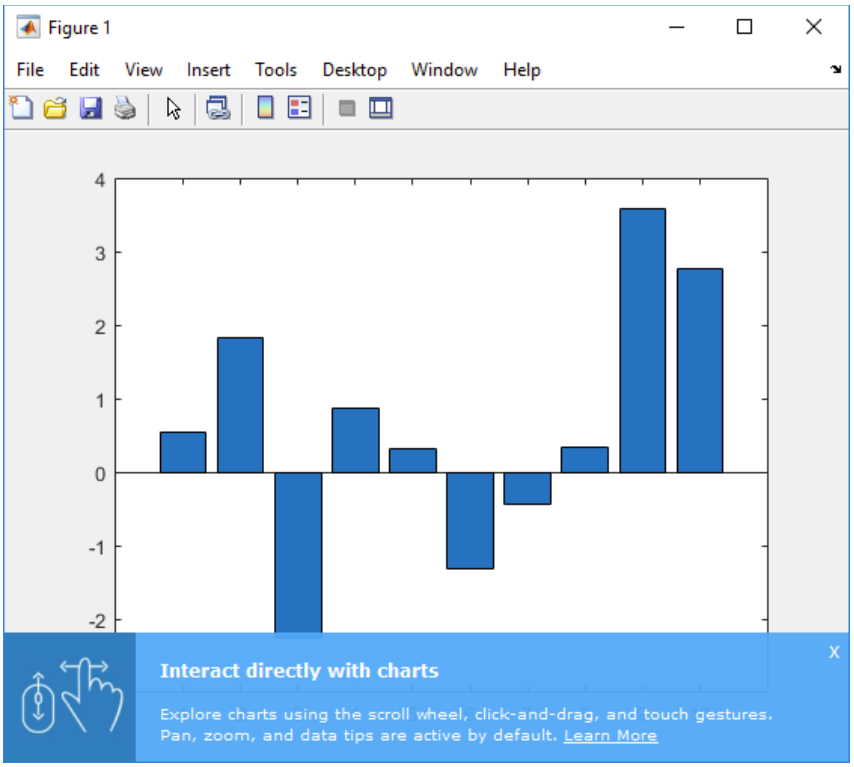
You can export your Live Scripts to PDF, Word, HTML, or LaTeX documents.

Graphics

There are a lot of new and some undiscovered graphics features. Here are just a few of our favorites:

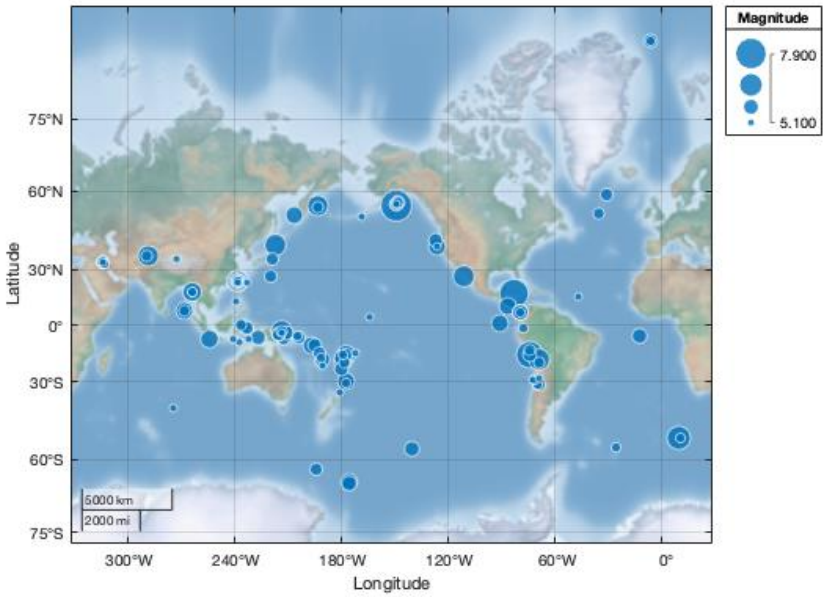
Default plot interactivity

You can use your mouse or trackpad to zoom, pan, rotate, and add datatips without having to click separate toolbar buttons first:



Geographic plots

You can now create geographic plots in MATLAB, such as this geographic bubble chart showing the location and magnitude of earthquakes around the world:

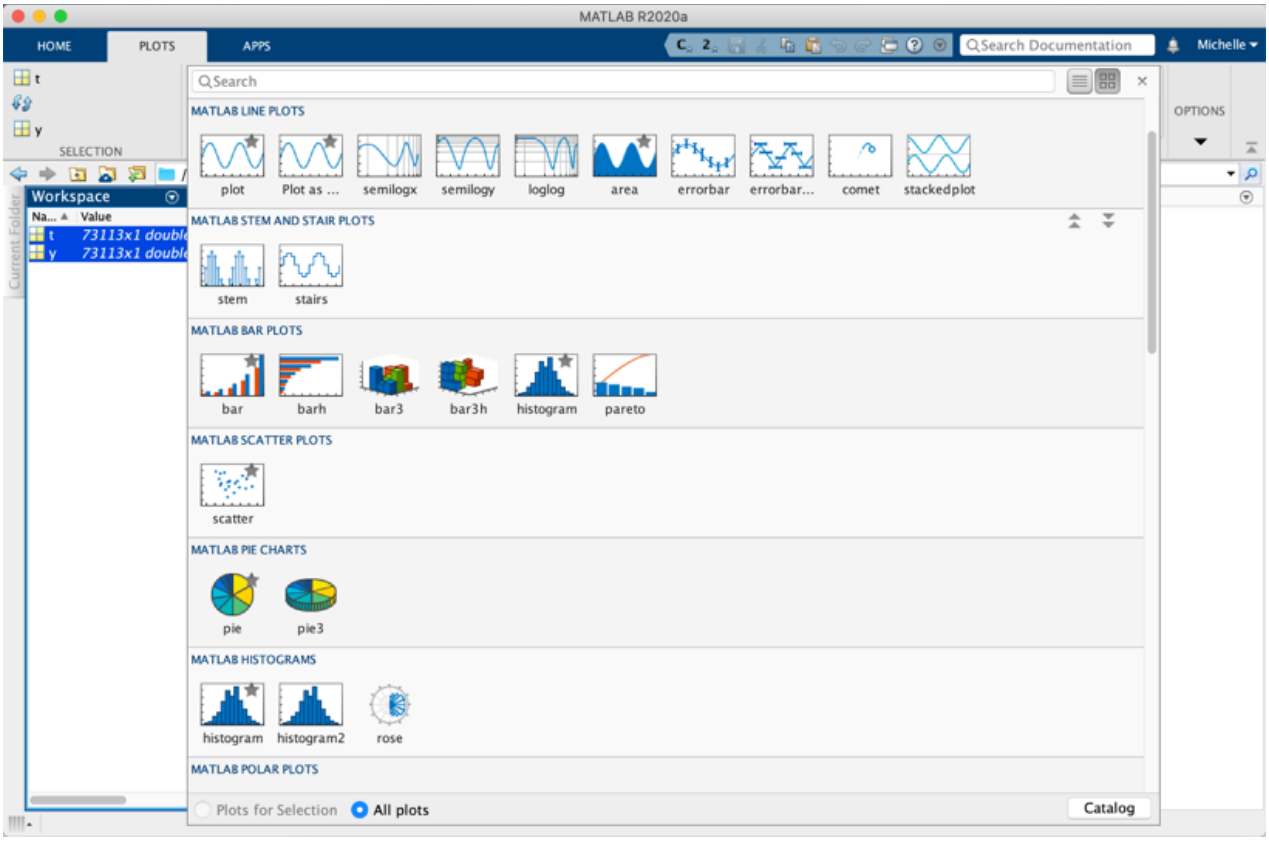


`tiledlayout`

You can much more easily control the layout of figures with multiple plots using `tiledlayout` instead of `subplot`.

Plots tab

You can easily plot your data with the Plots tab of the MATLAB Toolstrip. Just select your data in the Workspace browser or Variable Editor and you'll get a list of plots that work with your specific data. The equivalent MATLAB code is automatically entered in the command window for you to access later.

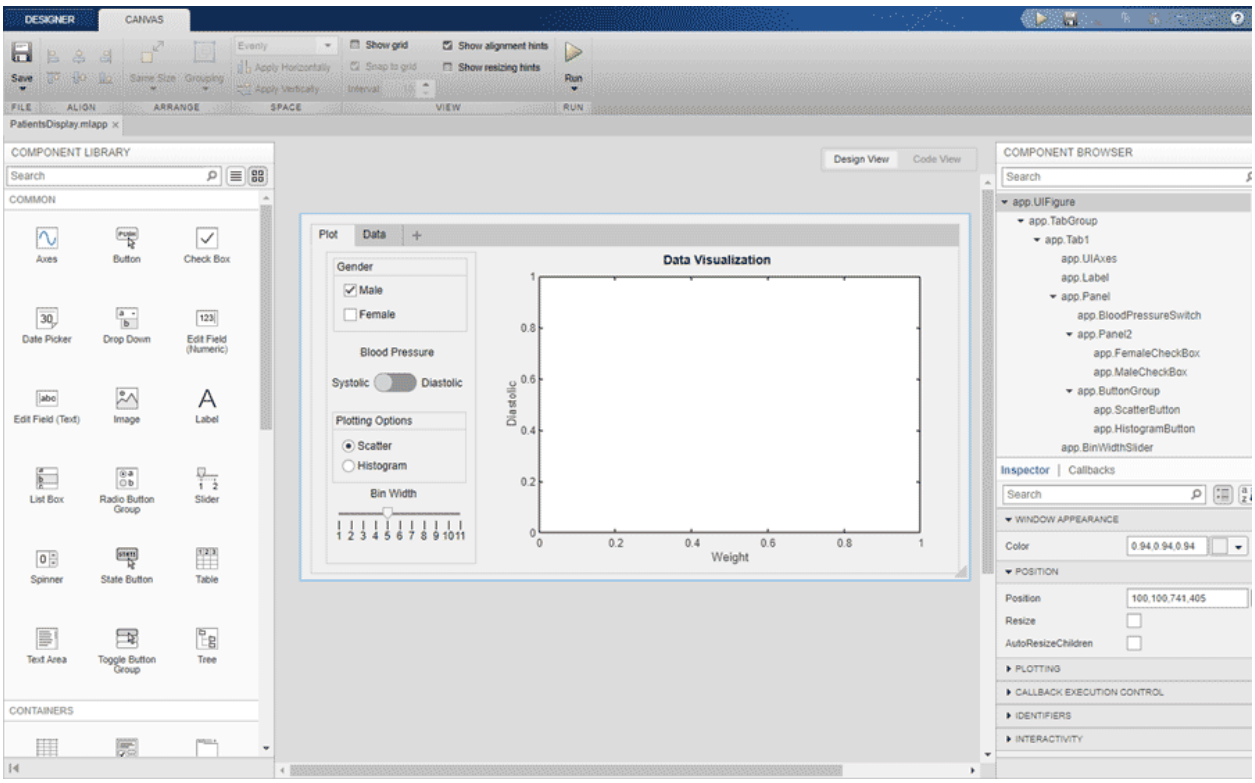


Building and Sharing Apps

You can build and share custom apps with MATLAB.

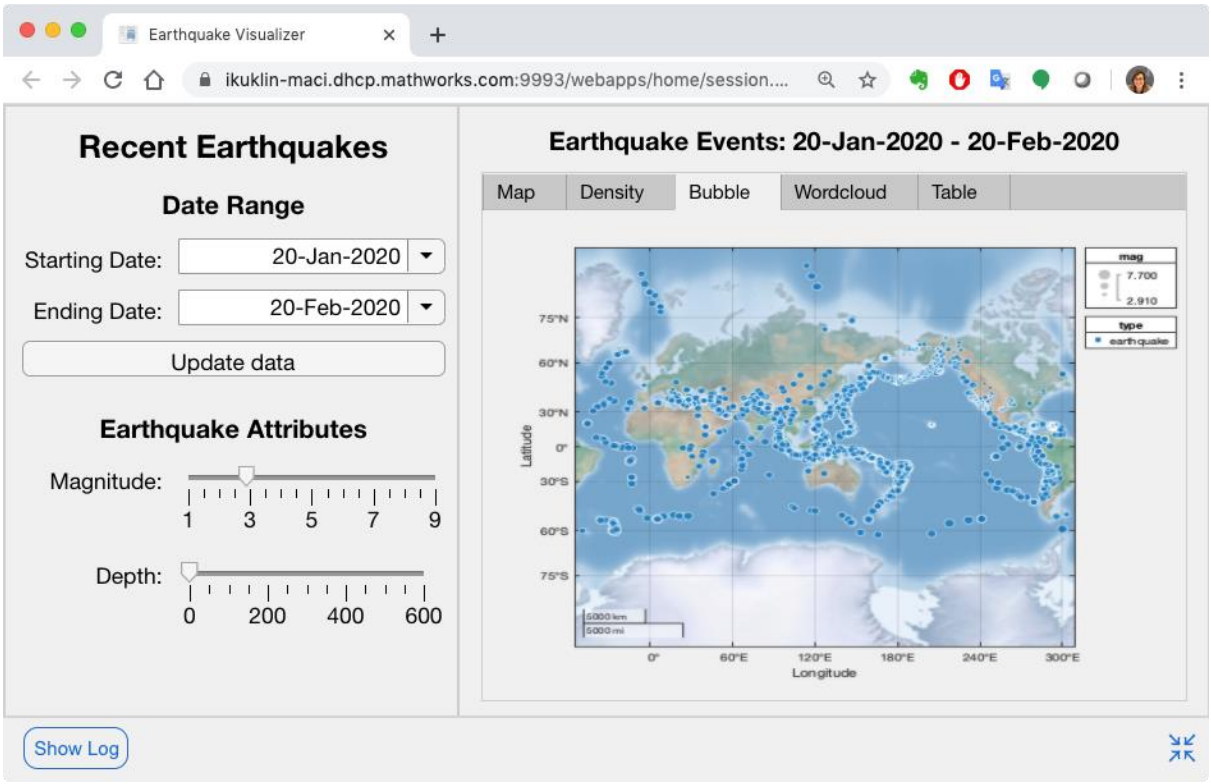
App Designer

App Designer lets you create professional apps without having to be a professional software developer. Drag and drop visual components to lay out the design of your graphical user interface (GUI) and use the integrated editor to quickly program its behavior.



Web Apps

Using the MATLAB Compiler and the MATLAB Web App Server, you can share your apps as web apps that anybody in your organization can access from their web browser.



Data Preprocessing

MATLAB takes the pain out of preprocessing your data to get it ready for analysis.

`table` and `timetable`

You can organize tabular data, such as you might store in spreadsheets, using the `table` and `timetable` data types. Timetables provide additional capabiities for managing data that varies vs. time, such as synchronizing and resampling.

Load energy data

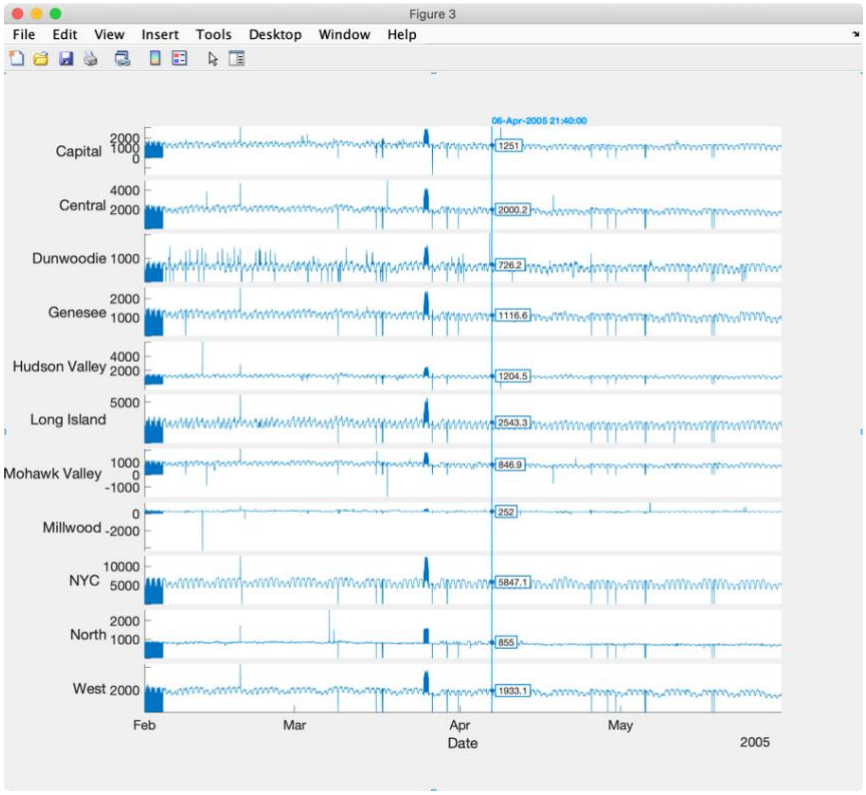
```
energyLoad = readtimetable("Data/NYEnergyData.xlsx","PreserveVariableNames",true)
```

energyLoad = 34471×11 timetable

	Date	Capital	Central	Dunwoodie	Genesee	Hudson Valley	Long Is
1	01-Feb-200...	1.2504e+03	1.9421e+03	612.2000	1.1316e+03	1.1549e+03	2.:
2	01-Feb-200...	0	0	0	0	0	
3	01-Feb-200...	1.2325e+03	1.9781e+03	581.1000	1.1195e+03	1.1494e+03	2.:
4	01-Feb-200...	1.2364e+03	1.9716e+03	569.5000	1.1016e+03	1.1015e+03	
5	01-Feb-200...	1.2135e+03	1.9556e+03	599.3000	1.1049e+03	1.1449e+03	2.:
6	01-Feb-200...	1.2021e+03	1.9728e+03	581.1000	1.0918e+03	1.1465e+03	2.:
7	01-Feb-200...	1.2194e+03	1.9769e+03	586.0000	1.0936e+03	1115	2.:
8	01-Feb-200...	1.2278e+03	1.9644e+03	584.8000	1.0897e+03	1.1026e+03	2.:
9	01-Feb-200...	1.2022e+03	1970	527.8000	1.0914e+03	1.1093e+03	2.:

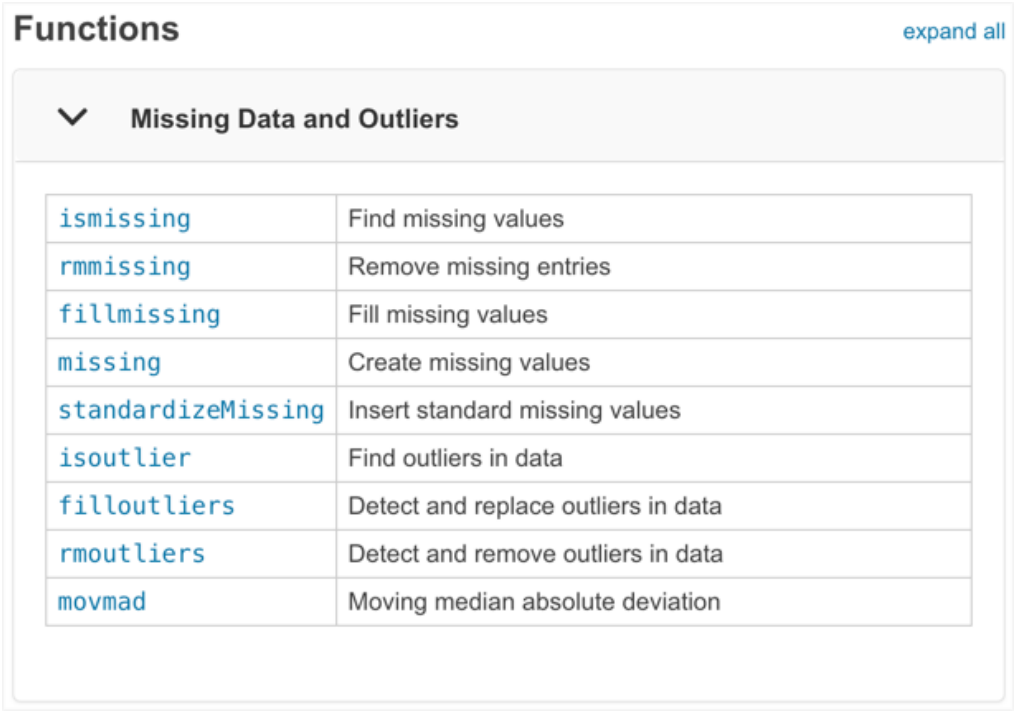
`stackedplot`

Visualize every variable in your table or timetable with a `stackedplot`:



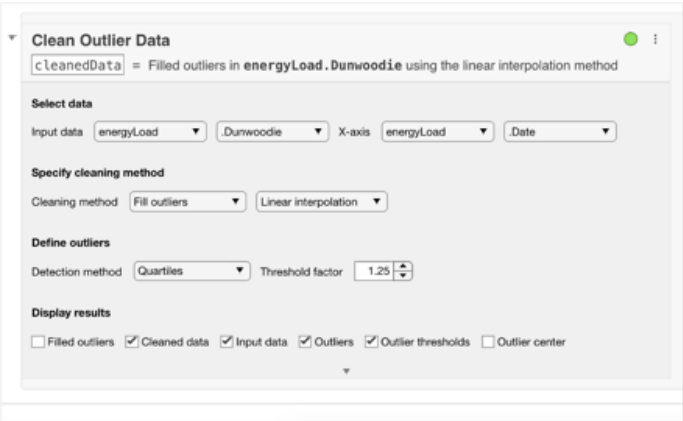
Missing data functions

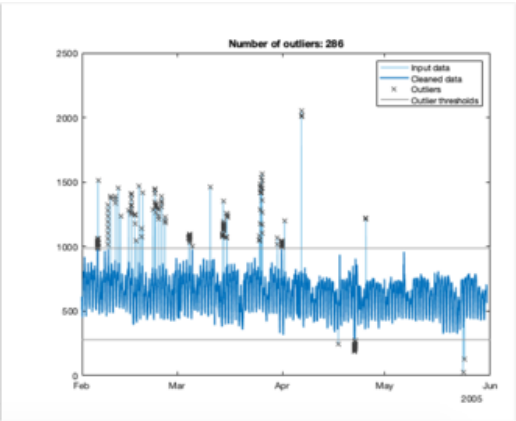
Use a straightforward collection of functions for cleaning up missing data and outliers:



Preprocessing Live Editor Tasks

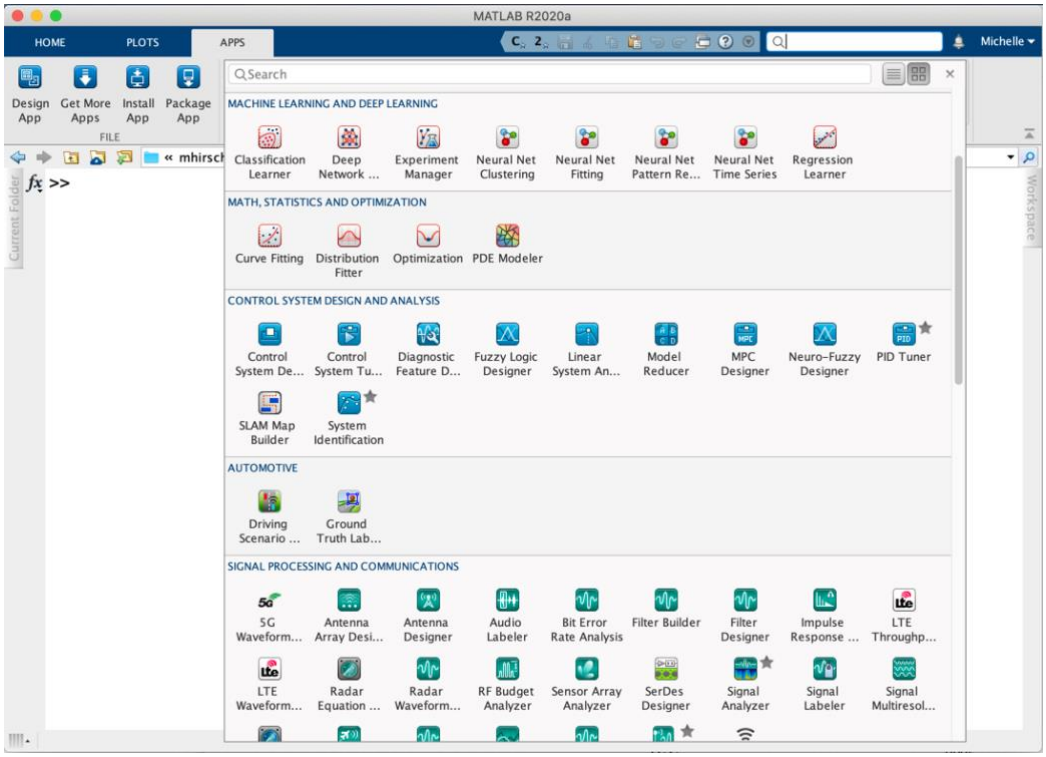
As mentioned above, you can use Live Editor tasks to preprocess data interactively and the MATLAB code is automatically written for you.





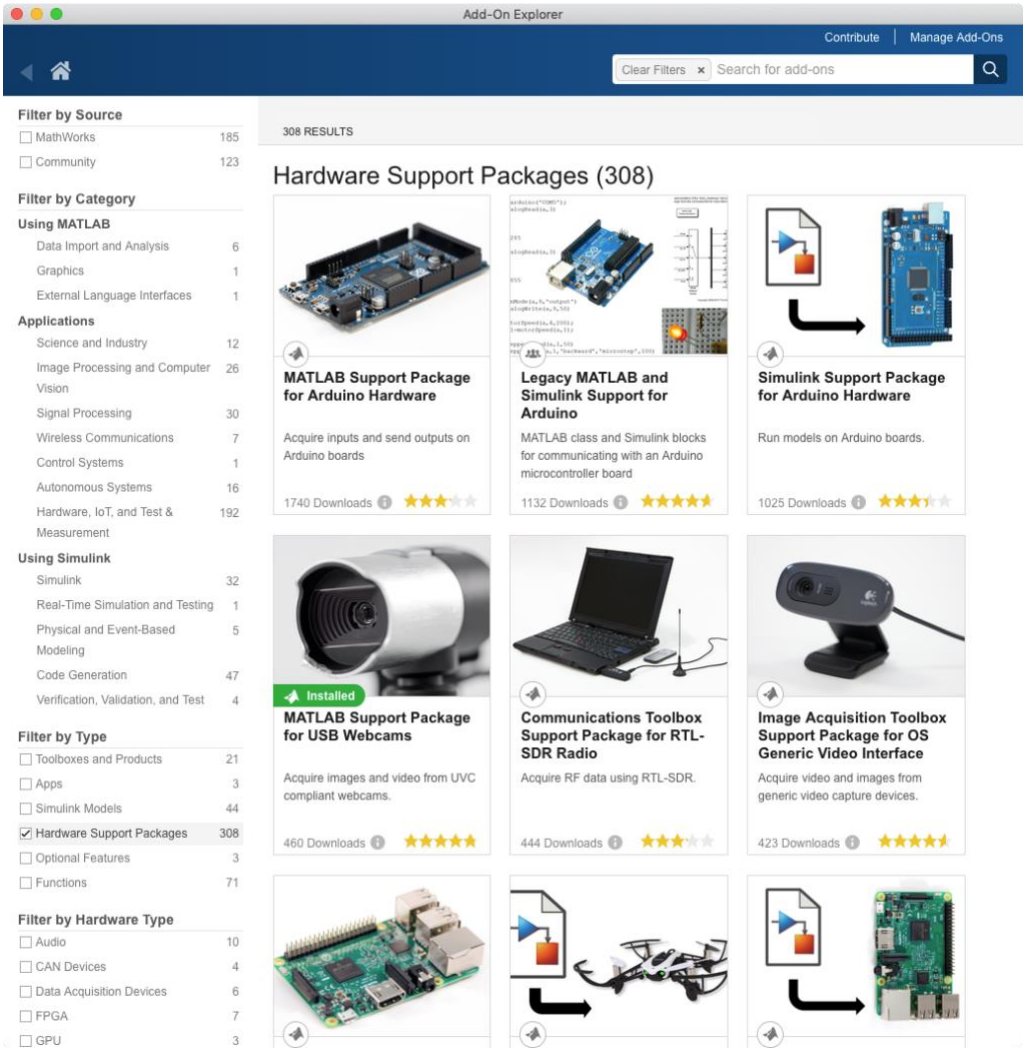
Apps

Even though a programming language is the heart of MATLAB, you don't have to write code to complete common tasks in MATLAB. You can design control systems or deep neural networks, analyze signals or radar waveforms, process images and videos, and so much more, without writing a single line of code. Even better - they write the code for you, so you don't have to choose between the ease and speed of using an app and the automation and flexibility of writing a program. Here are some of the almost 100 different MATLAB Apps available on the Apps tab of the MATLAB Toolstrip:



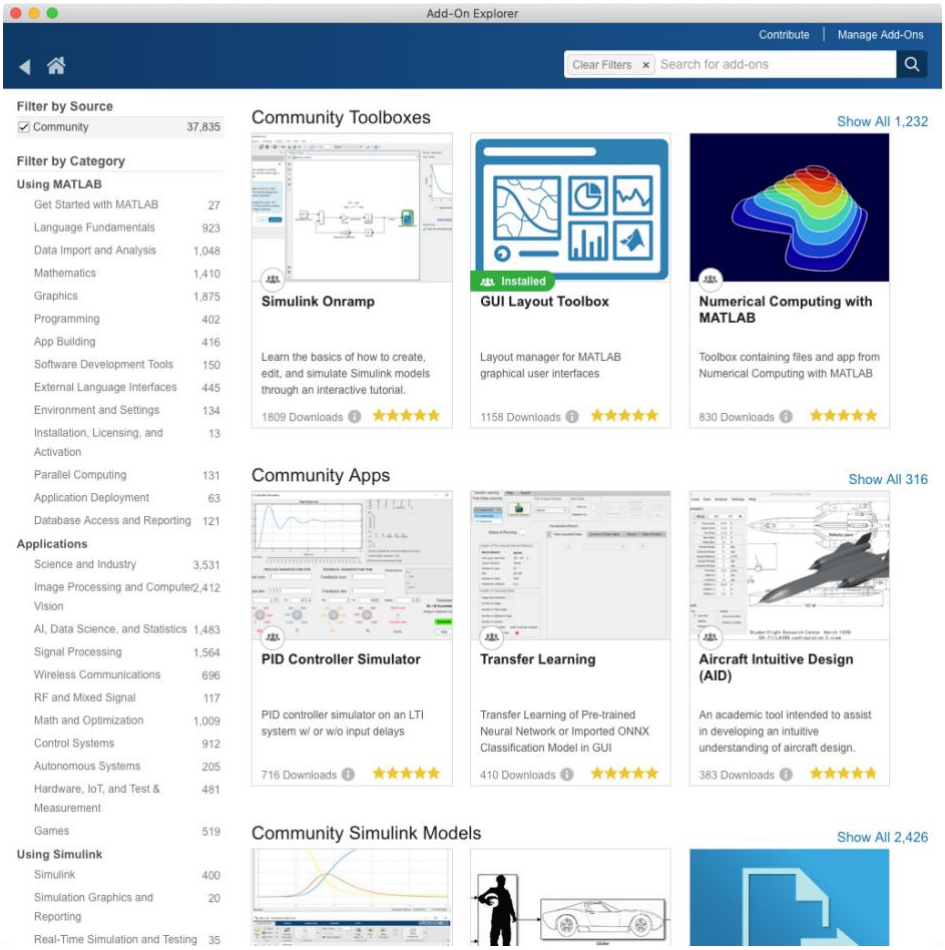
Hardware support

MATLAB and Simulink connect to the hardware you use, whether you want to capture images from a webcam or a high-end IP camera, automatically generate real-time C code for rapid prototyping or deploying on an embedded processor, or give students hands-on experiences for project-based learning. Find and install hardware support directly within MATLAB:



Add-On Explorer

Download, install, and use add-ons without leaving the MATLAB environment, using the Add-On Explorer. Whether you need additional toolboxes, apps, hardware support packages, or community submissions, you can easily browse and find what you're looking for.

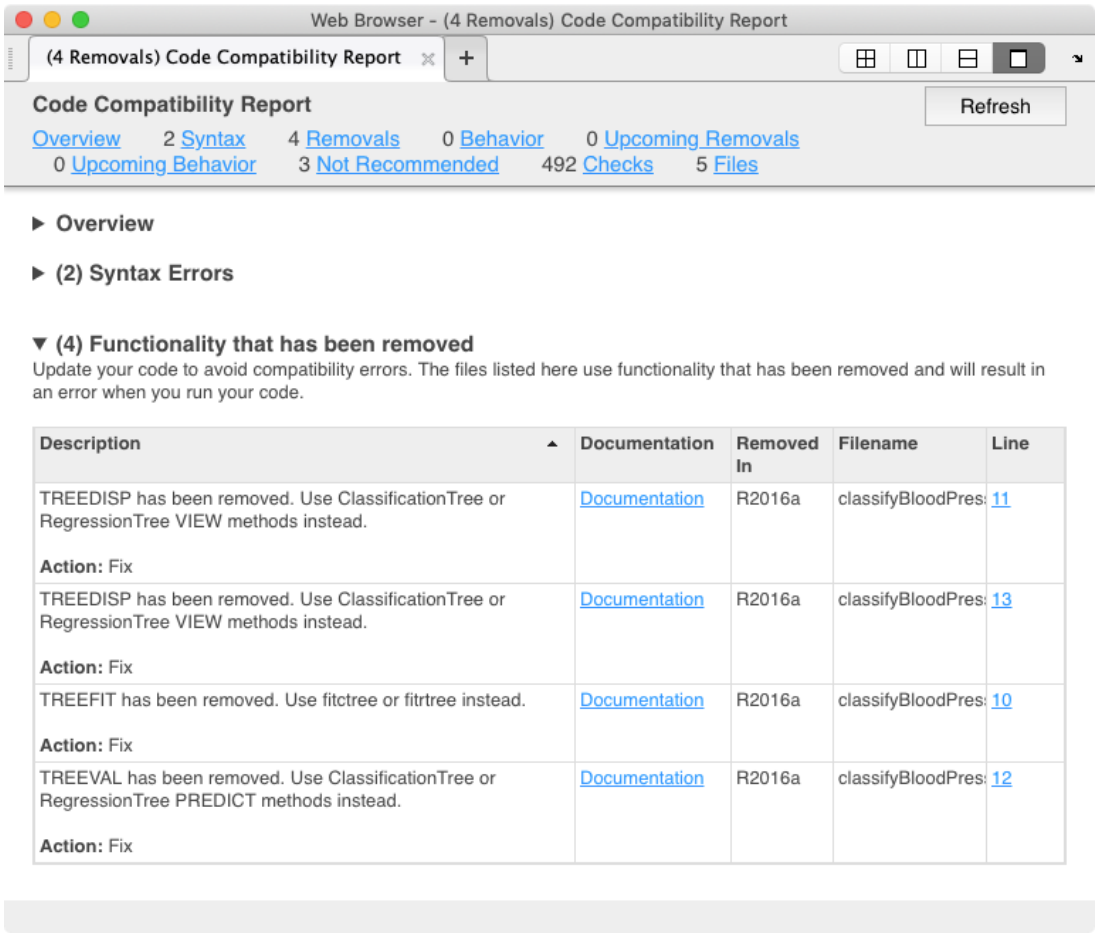


Programming

We barely scratched the surface on programming, but touched on a few of our favorite tools that make programming easier:

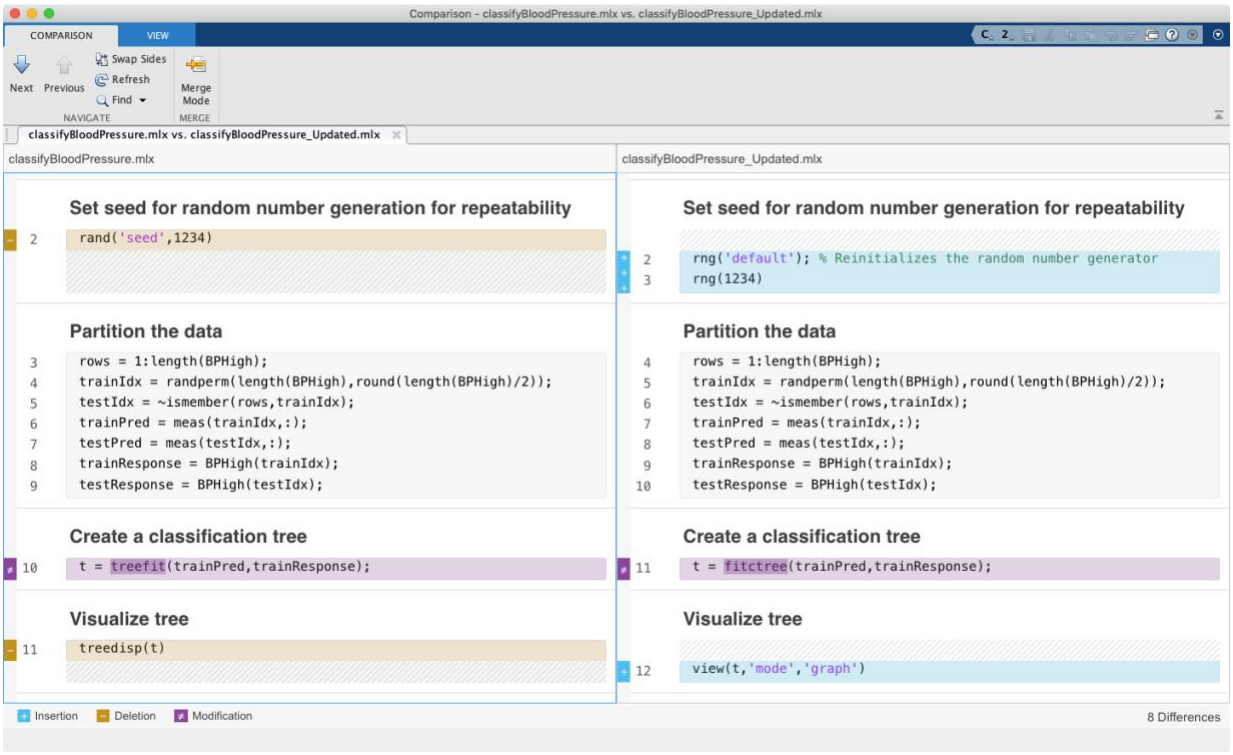
Code Compatibility Report

You can run the Code Compatibility Report to analyze compatibility of your code. This report helps you identify and address any potential compatibility issues, and estimate the effort required (if any) to upgrade to a newer MATLAB release.



File Comparison Tool

Compare two versions of a program and merge changes using the File Comparison Tool.



Code Analyzer

Did you ever wonder what those orange and red squiggles in your code meant? These are the Code Analyzer at work, telling you about code that will definitely error when you try to run it (red), or that could potentially be improved (orange).

```
% Find input indices that are not line objects
nothandle = ~ishandle(hline);
for nh = 1:prod(size(hline))
    notline(nh) = ~ishandle(hline(nh)) || ~strcmp('line',lower(get(hline(nh),'type')));
end
```

Use STRCMPI(str1,str2) instead of using UPPER/LOWER in a call to STRCMP. Fix

```
len = zeros(size(hline));
for nl = 1:prod(size(hline))
    % If it's a line, get the data and compute the length
    if ~notline(nl)
        flds = get(hline(nl));
        fdata = {'XData','YData','ZData'};
        for nd = 1:length(fdata)
            data{nd} = getfield(flds,fdata{nd});
        end
        % If there's no 3rd dimension, or all the data in one dimension is
        % unique, then consider it to be a 2D line.
        if isempty(data{3}) | ...
```

Multi-release Release Notes

We know it's hard to keep up with so many great new capabilities released twice a year, every year. That's why we've given you more control over the release notes, so you can view all of the changes for a given section of MATLAB or add-on product across a range of releases.