

MATLAB EXPO 2016

MATLAB - die vielseitige
Programmier- und
Entwicklungsumgebung

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New Key Features in the Areas of...

- Analysis and Visualization
- Testing and Performance
- Sharing and Collaboration

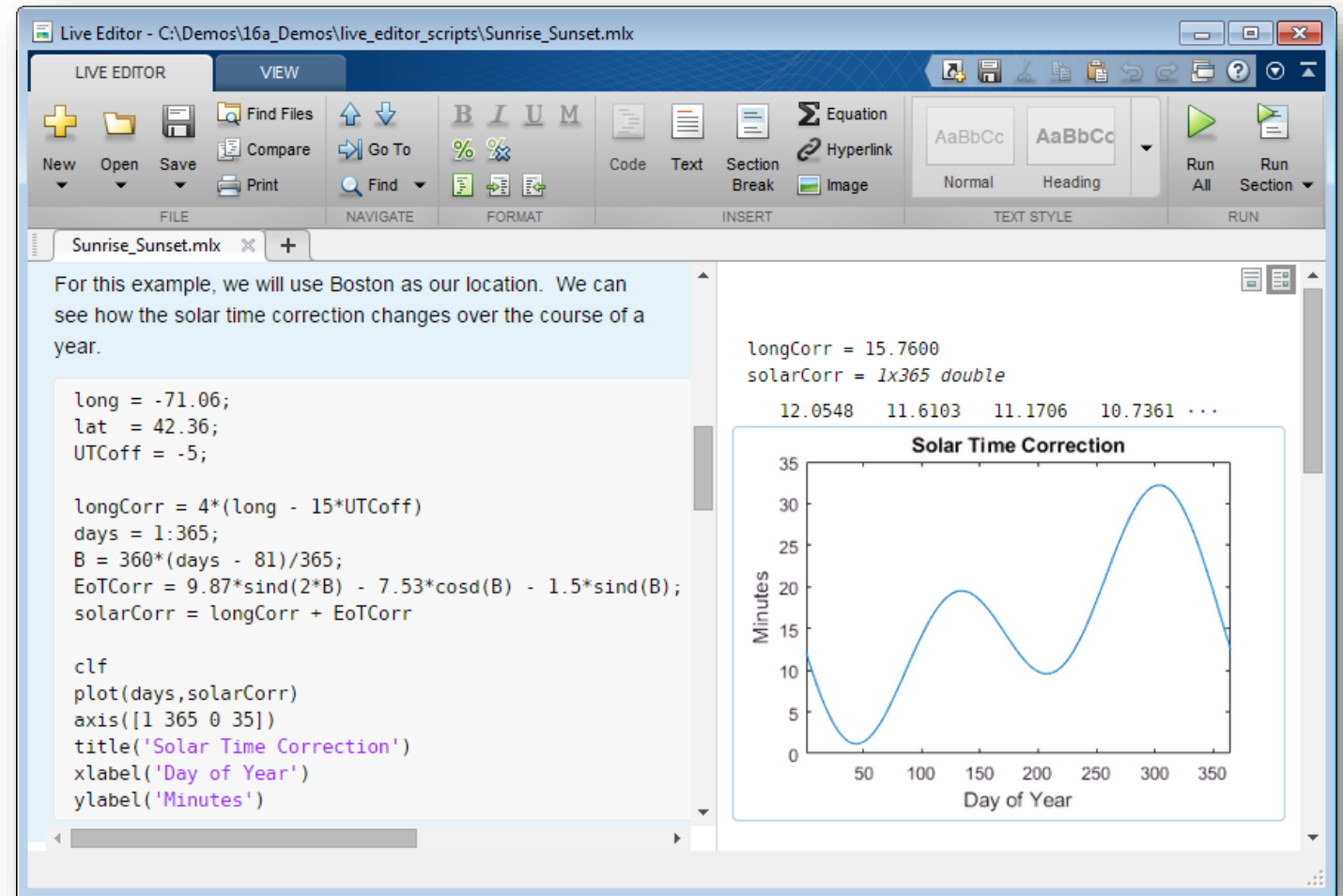
R2015b

R2016a

...Make MATLAB Even Easier and More Productive

Live Editor

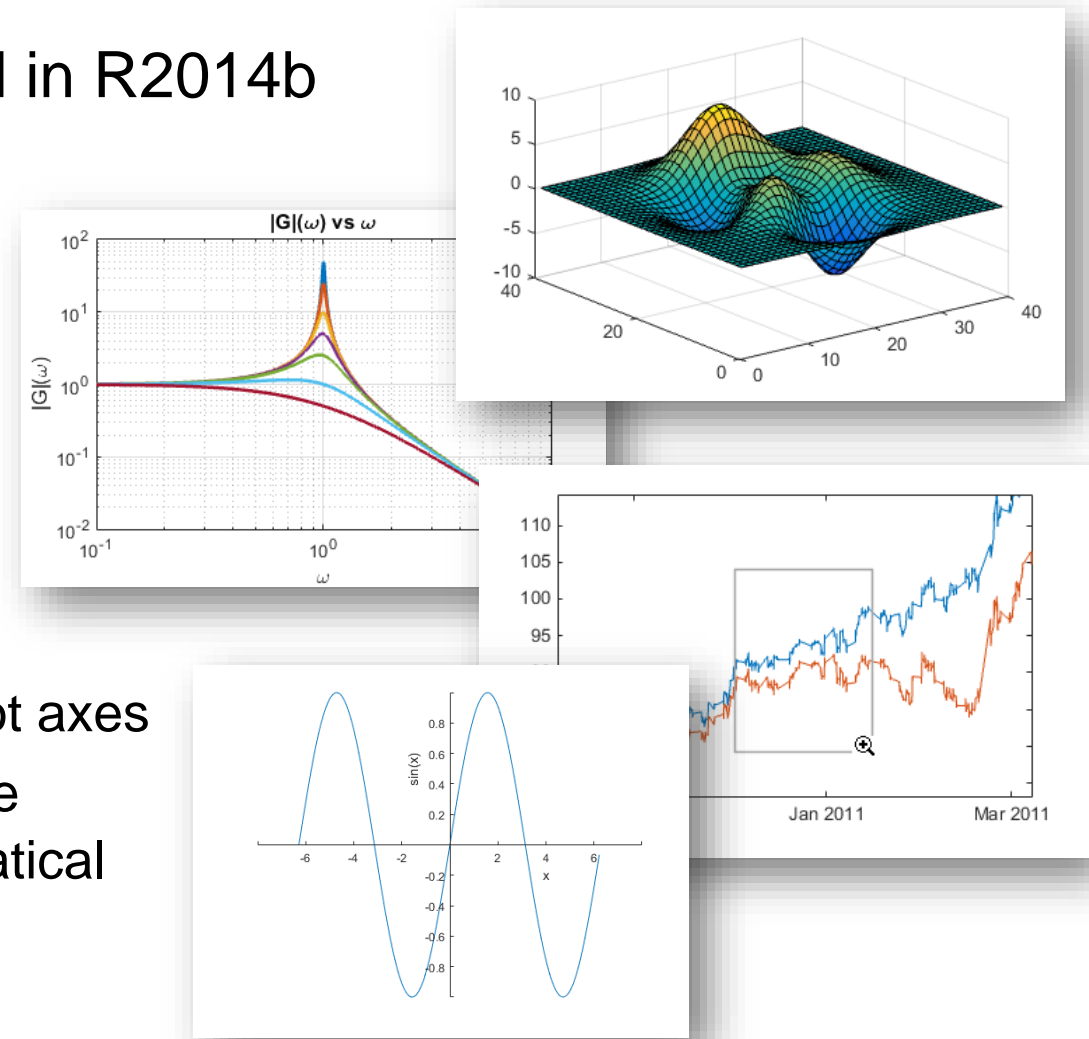
- Accelerate exploratory programming and analysis
- Create interactive narratives
- Use live scripts to teach



MATLAB Graphics

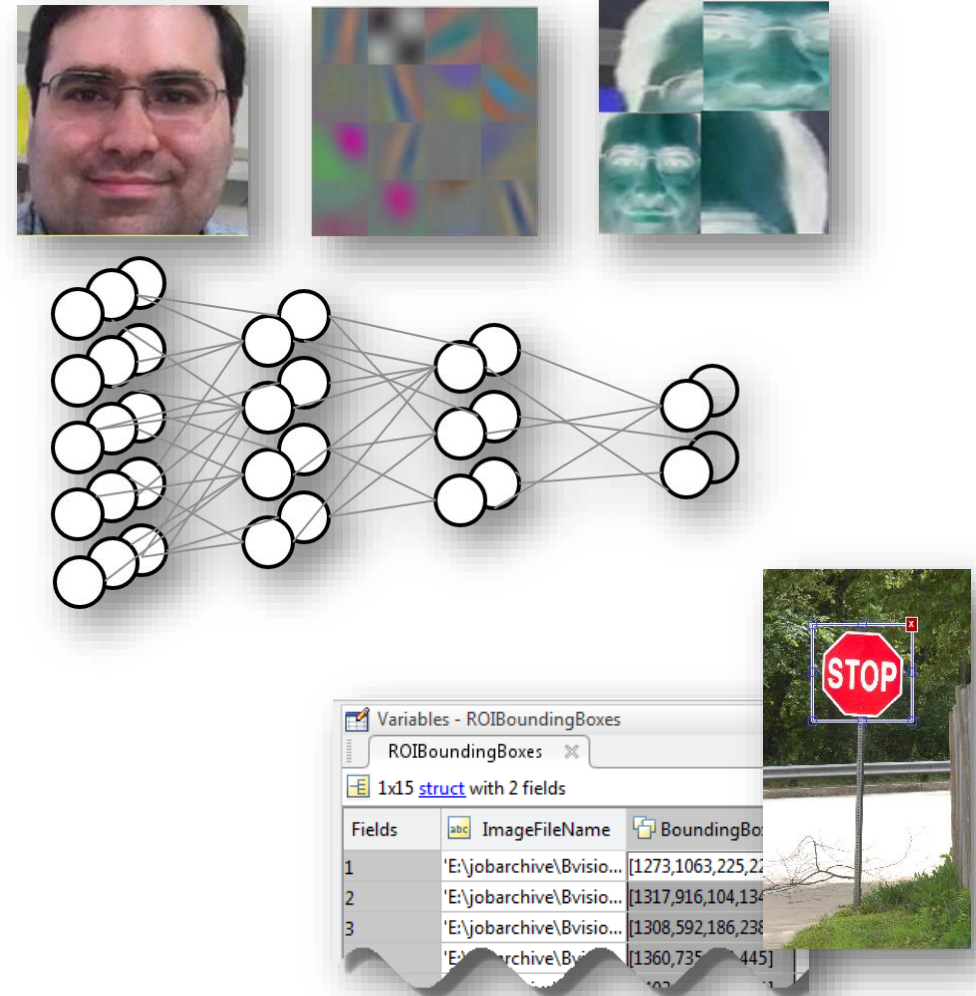
R2016a

- New MATLAB graphics system introduced in R2014b
 - Improved look (*anti-aliased fonts and lines*) with new default colormap and line colors
 - Easier to customize
 - Many new features
- Steady stream of new graphics features in subsequent releases
 - R2015b – increased control for customizing plot axes
 - R2016a – new functions for polar plots, multiple y-axis plots, and functions for plotting mathematical expressions and equations



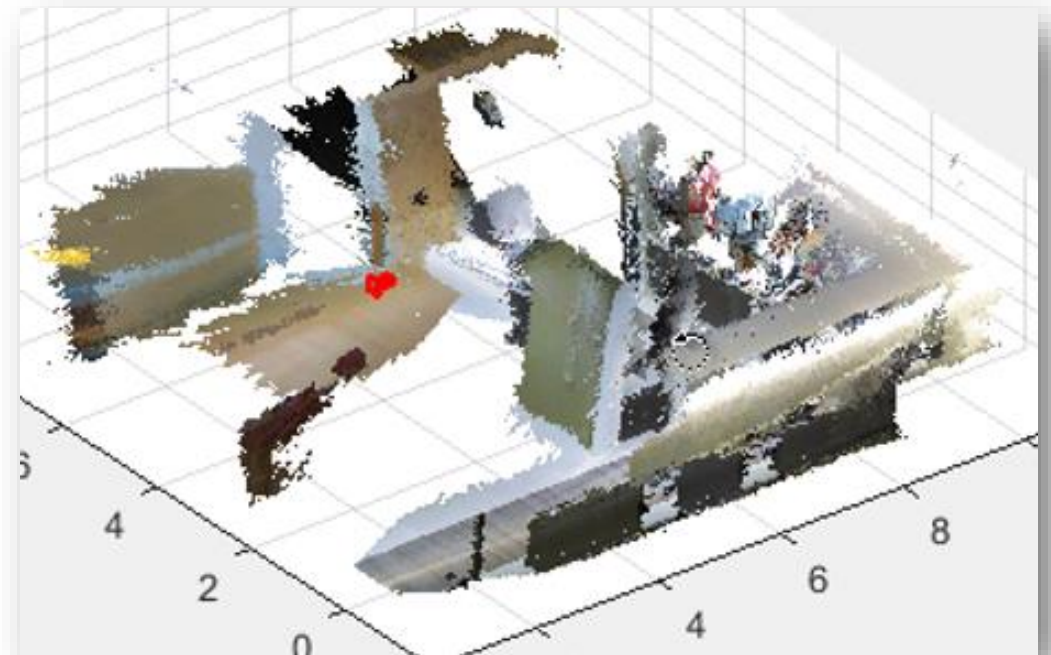
Deep Learning for Object Classification

- Deep learning for face detection, autonomous robotics, ADAS, etc.
- Convolutional neural network (CNN) algorithm added to Neural Network Toolbox
- Uses cuDNN (a GPU-accelerated library from NVIDIA) (*requires Parallel Computing Toolbox*)



3D Vision

- 3D vision enables autonomous systems to see
 - ADAS, autonomous robotics, self-driving cars
- New advanced algorithms added to Computer Vision System Toolbox
 - Structure from motion
 - Bundle adjustment



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Effectively Test Your Code in MATLAB

R2013a ... R2016a

- Testing **improves quality** and **saves development time**
 - Ensures that your code functions properly
 - Enables you to easily identify problems
 - Allows you to improve or rewrite your code without fear of breaking it
- The **MATLAB unit testing framework**:
 - Includes a set of readily available qualification methods
 - Supports automation, and provides easy reuse of test-cases
 - Includes **script**-based, **function**-based, and **object-oriented** interfaces

```
%% Test Class Definition
classdef MyComponentTest < matlab.unittest.TestCase

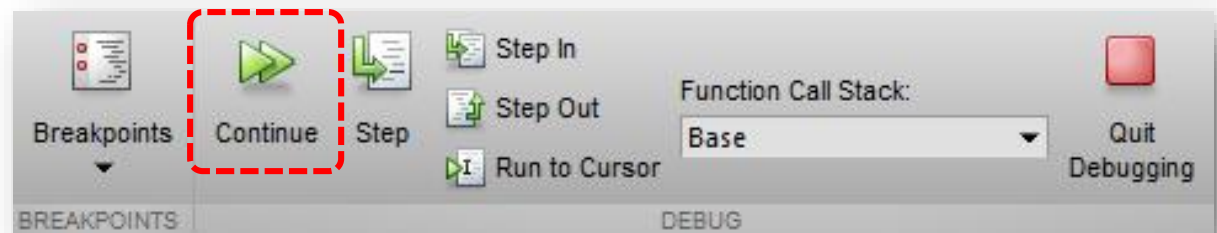
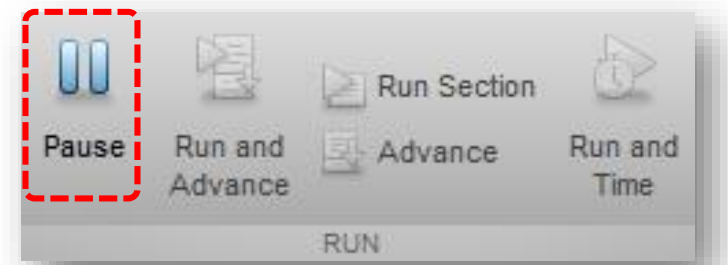
    %% Test Method Block
    methods (Test)

        %% Test Function
        function testASolution(testCase)
            %% Exercise function under test
            % act = the value from the function under test

            %% Verify using test qualification
            % exp = your expected value
            % testCase.<qualification method>(act,exp);
        end
    end
end
```


Pause Long Running Programs

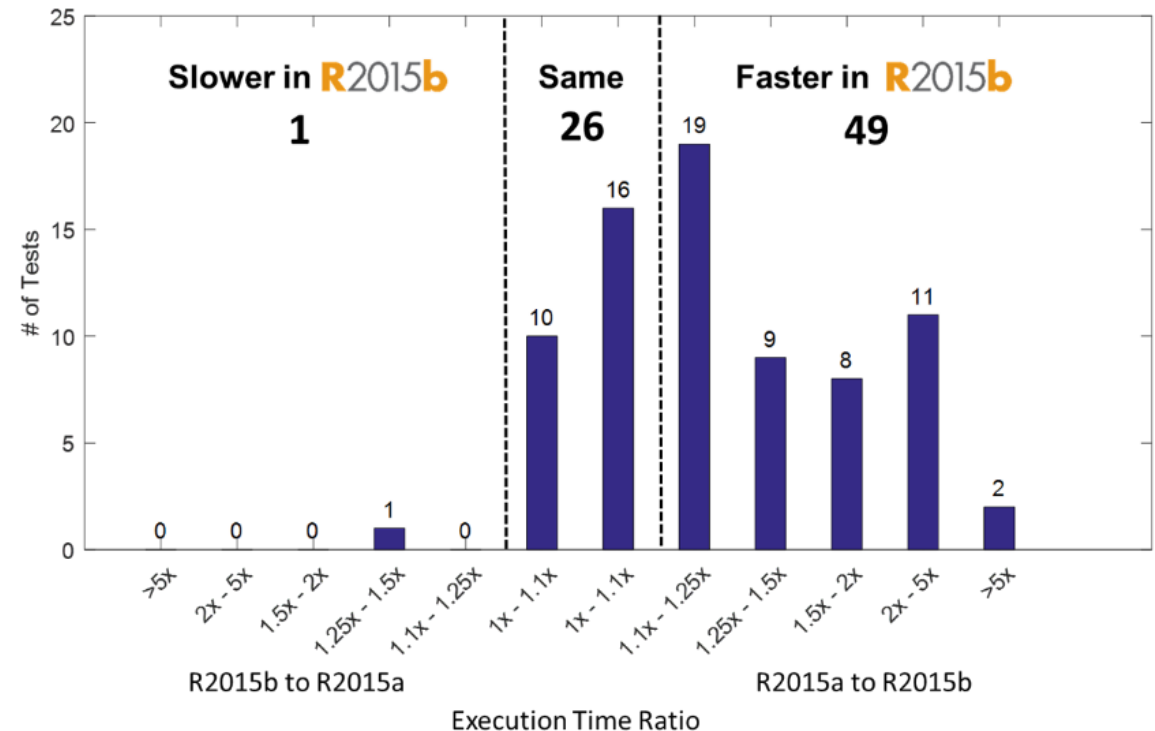
- New feature allows you to troubleshoot problems without specifying breakpoints in advance
 - Pause execution of a program from the Editor
 - Enter debug mode
 - Resume program execution



MATLAB Execution Engine

- Redesigned **execution engine** runs MATLAB code faster
 - All MATLAB code can be JIT compiled
 - A platform for future improvements
- Average performance improvement of **40%** on **76 performance-sensitive user applications**
- Performance testing framework
 - Measure MATLAB code performance
 - Interface leverages the unit testing framework

R2016a



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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

The screenshot displays the MATLAB App Designer interface for a mortgage calculator application. The top window, titled "Mortgage Calculator", is in Design View. It features three input fields: "Loan Amount" (300000), "Interest Rate %" (4), and "Loan Period (Years)" (30). A "Monthly Payment" button is located below these fields. To the right is a plot titled "Principal and Interest" showing two curves: a blue line representing principal and an orange line representing interest over time. The plot axes range from 500 to 1500 on the y-axis and 0 to 1 on the x-axis.

The bottom window is in Code View, showing the MATLAB code for the app. The code defines the app class and includes a function to calculate the monthly payment.

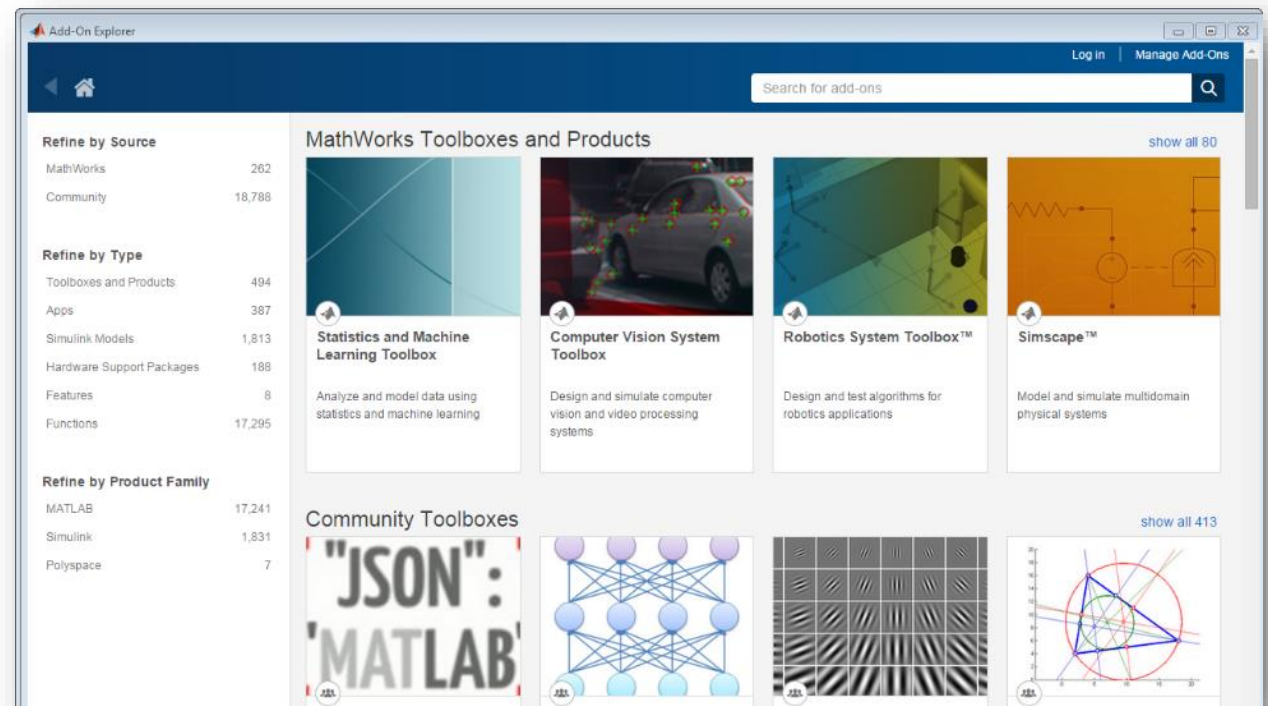
```

1 classdef Mortgage_Calculator_start < matlab.apps.AppBase
2
3     % Properties that correspond to app components
4     properties (Access = public)
5         AppWindow          matlab.ui.Figure          % Mortgage
6         axPrincipalInterest matlab.ui.control.UIAxes % Princip
7         numInterestRate    matlab.ui.control.NumericEditField % [0 100]
8         lbInterestRate     matlab.ui.control.Label   % Interest
9         numLoanAmount      matlab.ui.control.NumericEditField % [0 1000]
10        lbLoanAmount       matlab.ui.control.Label   % Loan Am
11        NumericEditField   matlab.ui.control.NumericEditField % [-Inf 1
12
13    end
14
15    methods (Access = private)
16
17        % Code that executes after component creation
18        function startupFcn(app)
19
20        end
21
22        % btnMonthlyPayment button pushed function
23        function btnMonthlyPaymentButtonPushed(app)
24            % Calculate the monthly payment
25            amount = app.numLoanAmount.Value ;
  
```

The interface also includes a Component Browser on the right side, listing the app components: app.AppWindow, app.axPrincipalInterest, app.numInterestRate, app.numLoanAmount, and app.NumericEditField. Below the Component Browser is the Component Properties panel.

Add-On Explorer

- Add capabilities to MATLAB, including **community-authored** and **MathWorks** toolboxes, apps, functions, models, and hardware support
 - Browse and install add-ons directly from MATLAB
 - Access **community-authored** content from File Exchange



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