MATLAB EXPO

What's New for Managing, Testing, and Building your MATLAB Code

MathWorks®

Workshop Agenda

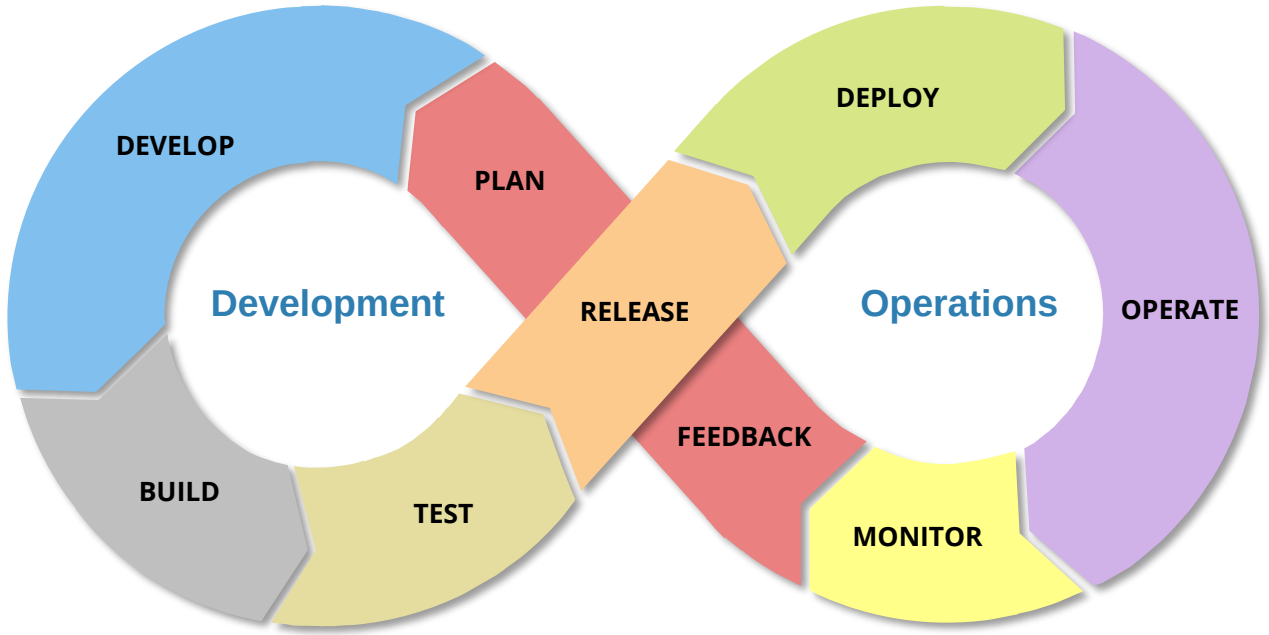
- High-level presentation of features (15-20 minutes)
  - Too many features for a hands-on workshop
  - Great introduction to some of the most important features to know about
- Hands-on workshop (60 minutes)
  - Walk through many of the features discussed in the presentation
- Q&A (10 minutes)
  - We'll set aside some time at the end to try and answer some questions
  - Please feel free to chat any questions, feedback, or feature requests you have
  - We'll also try to answer as many as we can in the chat as we go

"All companies are software companies" – Satya Nadella

- Software systems are becoming more complex, and involving more people
- The need for better software development practices is growing everywhere
- Automation systems are speeding up and standardizing the way we work

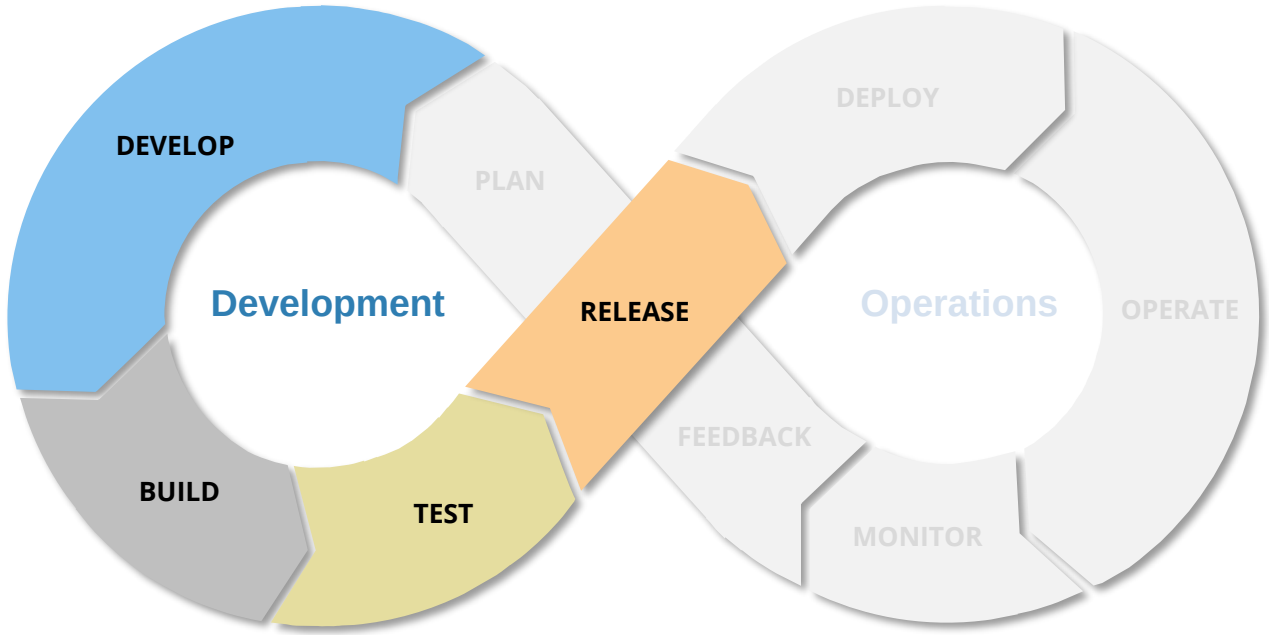
MATLAB is providing more tools to better support your software needs

- We want to help streamline your entire development workflow



MATLAB is providing more tools to better support your software needs

- We want to help streamline your entire development workflow
- Today, we're going to focus on the first half of the DevOps cycle



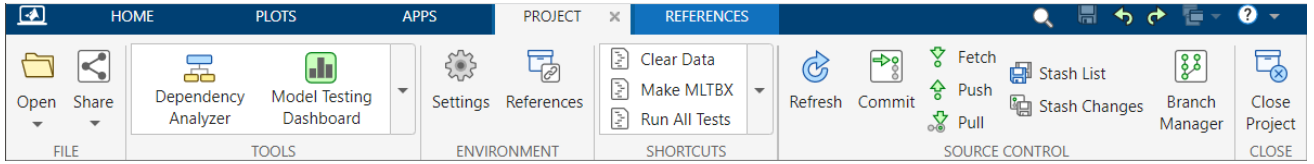
What's new for…

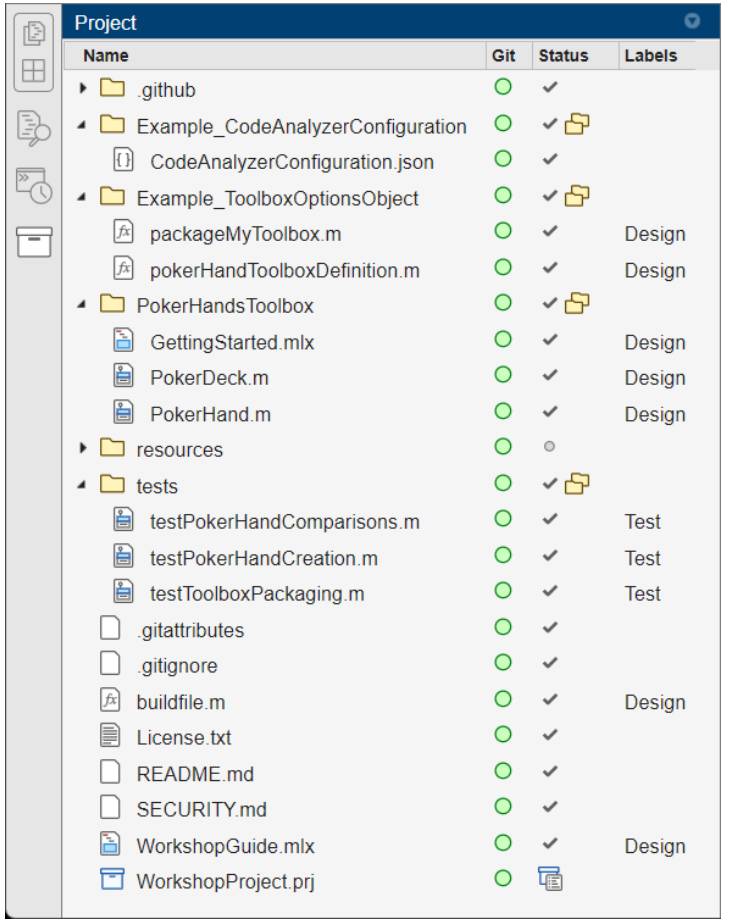
Understanding and managing your code

Reproducible development environment – MATLAB projects

R2019a

- Automatic path setup (add/remove)
- Deeper refactoring/renaming tools
- Customizable startup/shutdown actions
- Group and filter files using labels
- Project-specific tools and shortcuts
- Project-to-project dependencies

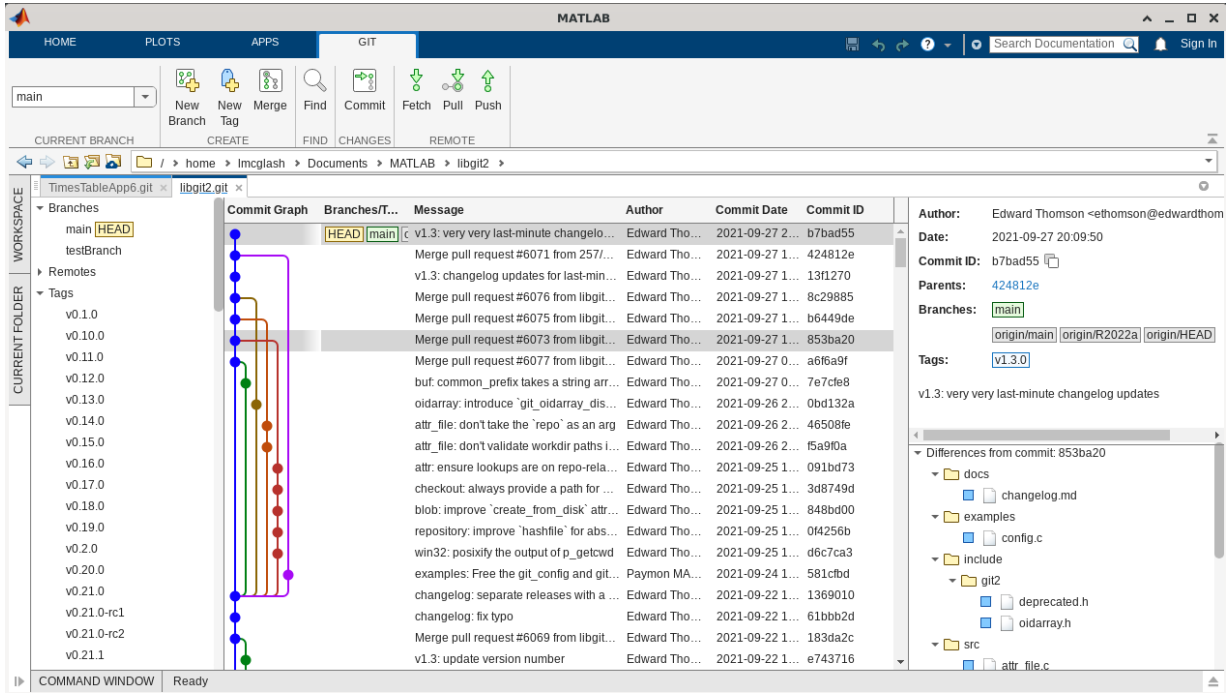




Improved source control interfaces - Branch Manager

MATLAB Online only (for now)

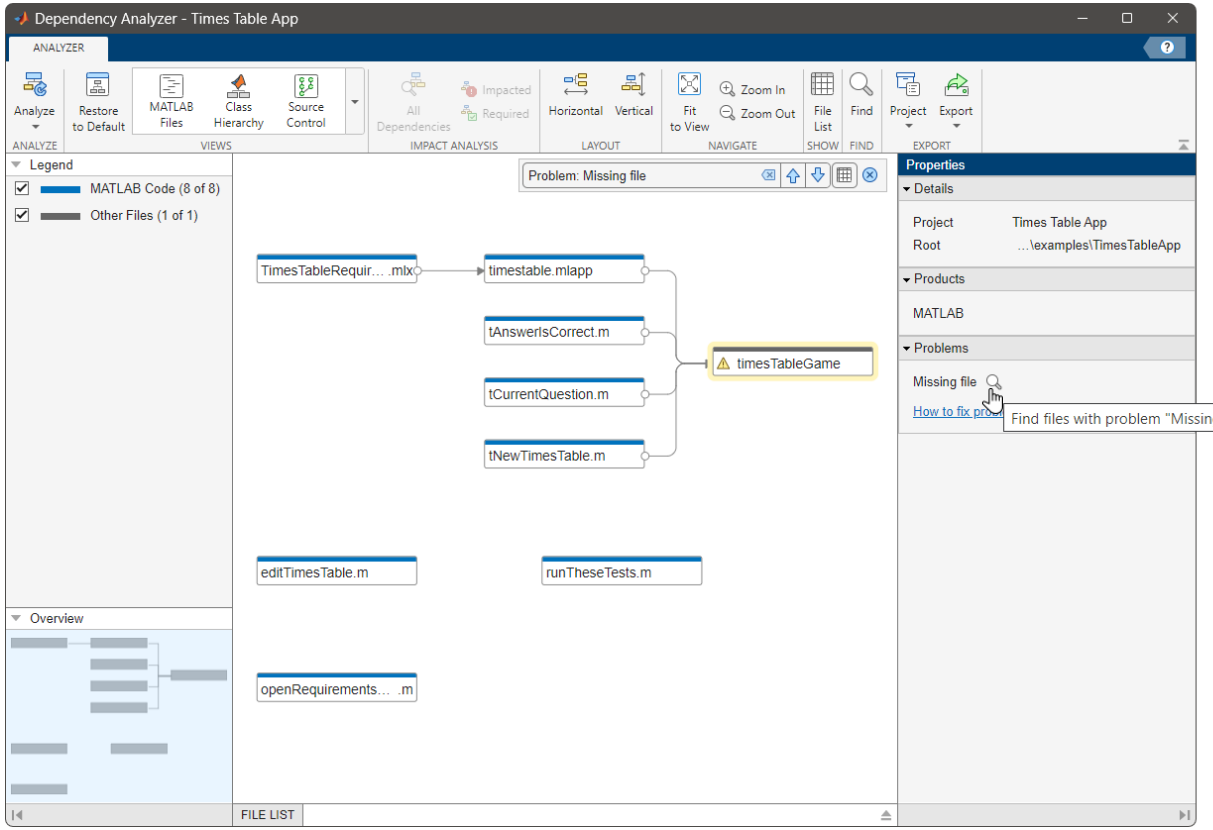
- Create, switch, merge, and delete branches
- Find and compare commits
- View the history of a repository
- Fetch, prune, and delete remotes
- Manage multiple repositories at once
- And more…



Understanding code dependencies – Dependency Analyzer

R2020a

- Find required products and add-ons
- Investigate and resolve problems
- Perform impact analysis to determine the impact of changing files
- Perform block-level analysis on Simulink models
- Export dependency analysis results
- Available outside of a MATLAB project R2023a

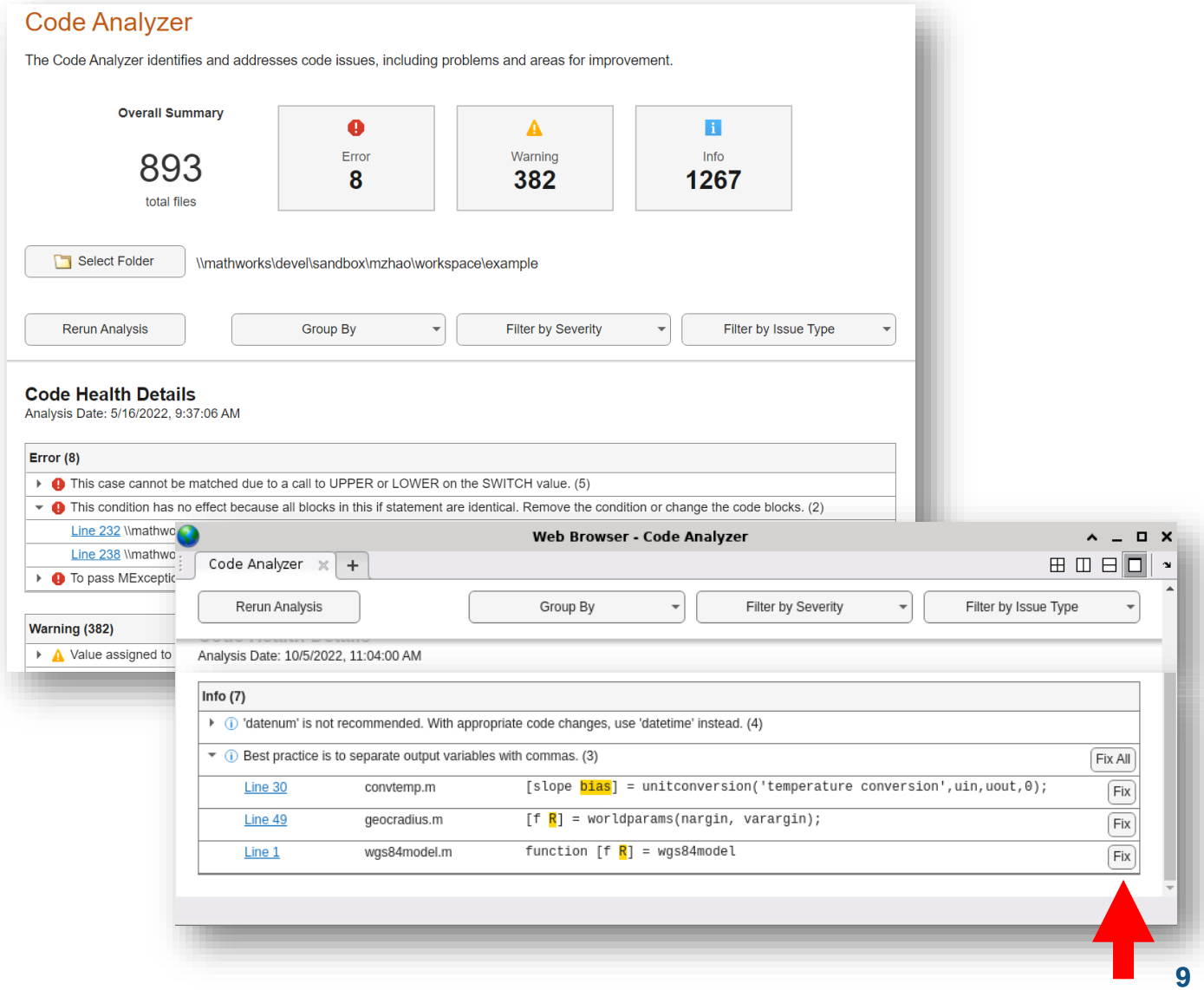


Identifying issues in your code – Code Analyzer

R2022b

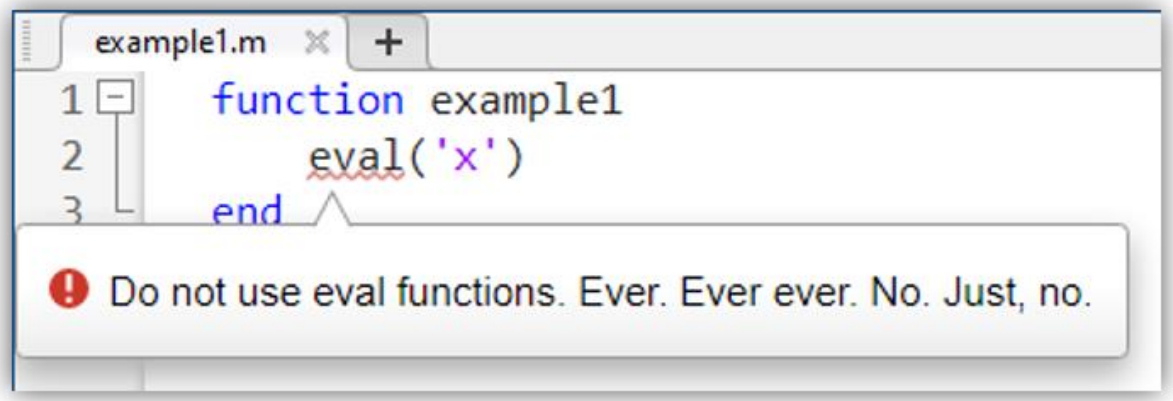
Not yet available in MATLAB Online

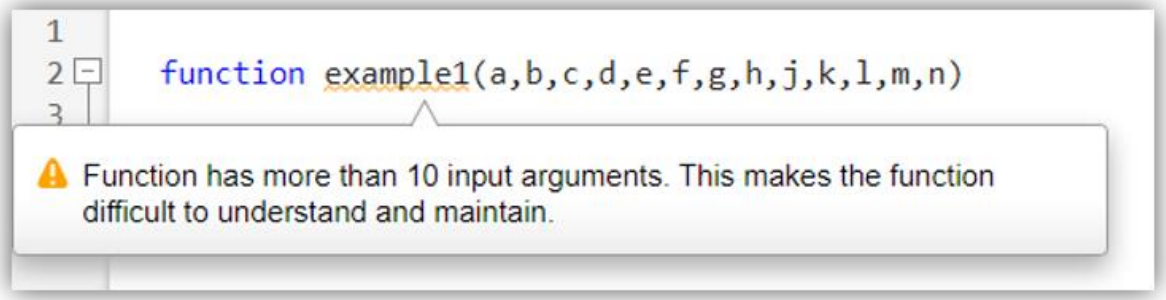
- Summary of code issues
- Easy to identify and focus on most important issues
- Interactive and programmatic workflows
  - Code Analyzer app
  - **`codeIssues`** object
- Auto-fix select issues R2023a



Customize the issues that Code Analyzer finds and reports

- Configuration stays with code
  - Source control friendly file (JSON)
  - Applies to folder and all child folders
- Configure existing MATLAB checks
  - Enable/disable checks
  - Configure message text and severity
- Enable new custom checks
  - Disallow specific functions (e.g., **`eval`**)
  - Configurable line length, control statement nesting depth, number of inputs/outputs, …





What's new for…

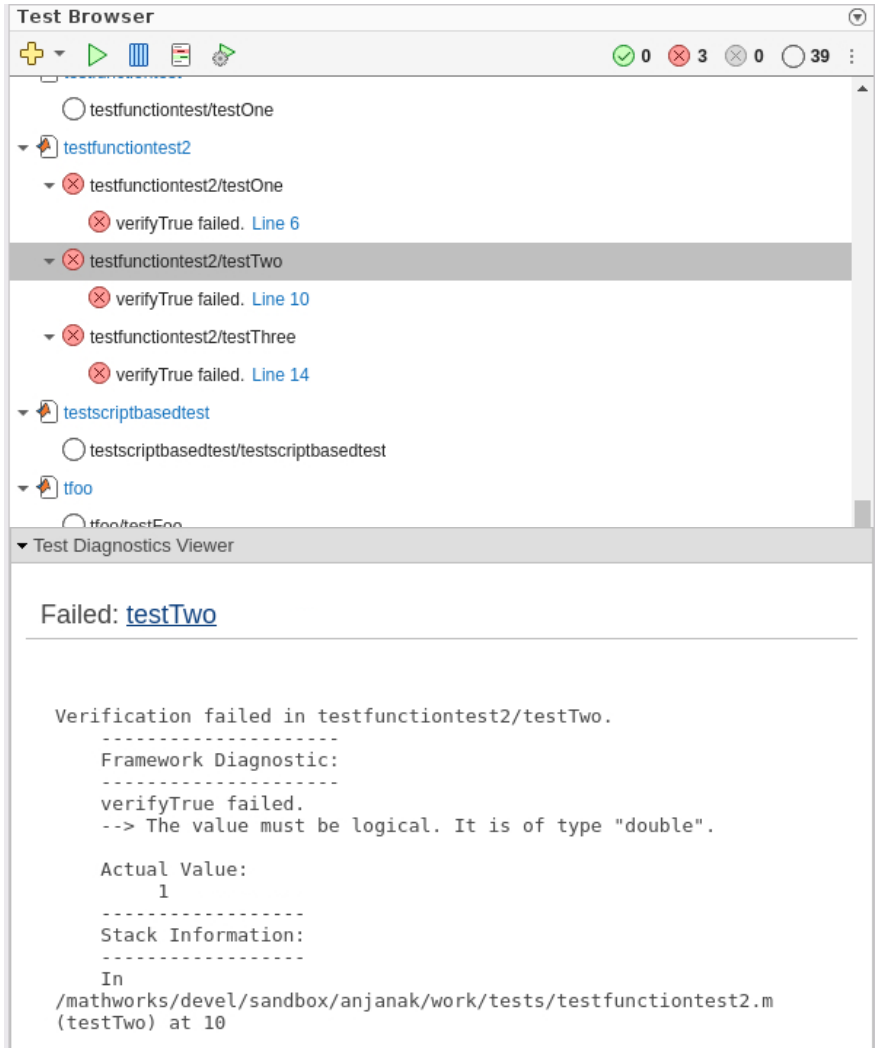
Testing

Test your code as you develop it – Test Browser

R2023a

Not yet available in MATLAB Online

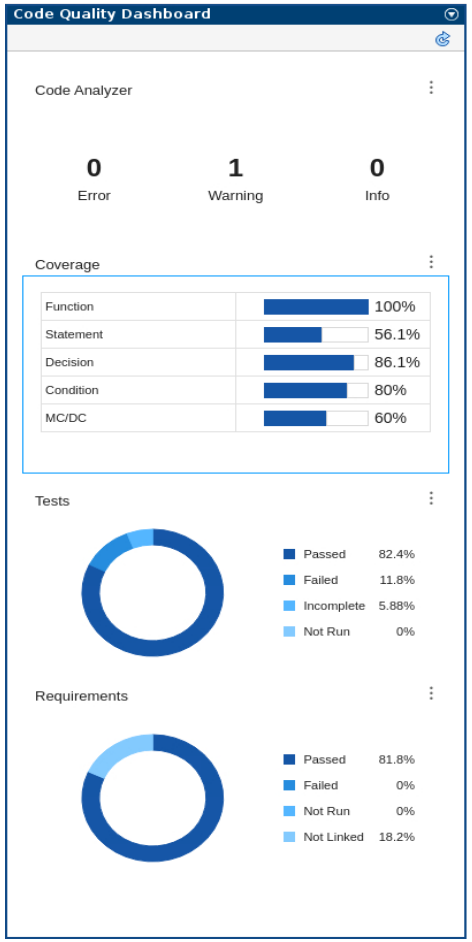
- New panel for iterative testing workflows
  - Running your tests is always a click away
  - Quickly dive into failed tests
- Open the Test Browser via:
  - "Run Tests" Editor toolstrip buttons
  - "Test Browser" in Apps Gallery
  - "Right-click > Run" a test file in Current Folder Browser
- Easily adjust test run configurations
  - Enable testing in parallel, code coverage metrics, …



Increase verification rigor with MATLAB Test

R2023a

Not yet available in MATLAB Online



"Adoption and implementation of testing rigor provides a 10x return on investment"

- Reduce risk of software failures with comprehensive and systematic testing
- Increase verification rigor
  - Advanced code coverage to identify coverage gaps
  - Requirements-based MATLAB code verification
  - Equivalence testing between MATLAB code and generated artifacts
- Streamline verification workflows
  - Dashboards provide clear measurement of code quality
  - Interactive tools to manage large numbers of tests
  - Persistent test results to improve productivity

What's new for…

Toolbox packaging and build automation

Fully scriptable toolbox creation – `ToolboxOptions` object

R2023a

- A toolbox is collection of useful code, apps, data, …
  - Often packaged as an .MLTBX file
  - Often published to GitHub / File Exchange
- UI to guide you through toolbox packaging
- Fully scriptable toolbox creation R2023a
  - Configure your toolbox directly in code
  - Enables CI/CD packaging workflows

```
% Create ToolboxOptions object
toolboxFolder = "code";
identifier = "c5520e2f-fedd-4f9a-bc7b-753a7bab5412";
opts = matlab.addons.toolbox.ToolboxOptions(toolboxFolder,identifier);

% Customize toolbox
opts.ToolboxName = "Poker Hand Toolbox";
opts.Summary = "Create poker hands using MATLAB!";
opts.Description = "Provides tools to create and compare poker hands.";
opts.ToolboxVersion = "1.0.1";
opts.MinimumMatlabRelease = "R2019a";
opts.MaximumMatlabRelease = "";

% Set output file name
tbxFileName = "PokerHandToolbox_" + opts.ToolboxVersion + ".mltbx";
opts.OutputFile = fullfile("derived",tbxFileName);

% Package toolbox
matlab.addons.toolbox.packageToolbox(opts);
```

Standardizing your build process – Build Tool

R2022b

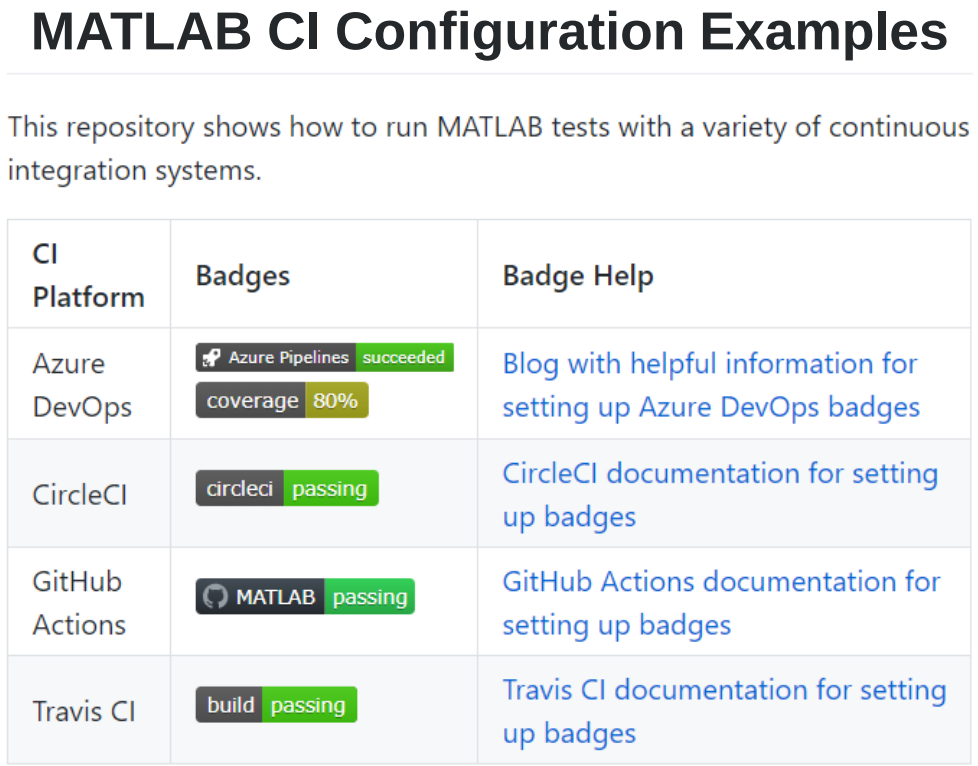
- Create automated build and test pipelines that run the same in MATLAB and in CI
- Task dependencies guarantee your tasks run in the right order every time
- Simple interface to discover and run tasks
- Skip unnecessary rebuilds R2023a
- Built-in tasks for common actions R2023b

Command Window

```
>> buildtool -tasks
check   - Identify code issues
test    - Run all tests
toolbox - Package toolbox

>> buildtool toolbox
** Skipped check: up-to-date

** Starting test
.
** Finished test

** Starting toolbox
** Finished toolbox
```

Free continuous integration (CI) for public GitHub repositories R2020a

- Free access to MATLAB and Simulink in cloud-based CI services for public GitHub repositories
- Currently supported CI platforms:
  - Azure DevOps
  - CircleCI
  - GitHub Actions
  - Travis CI
- Getting started:
  - Example CI configuration files
    - https://github.com/mathworks/ci-configuration-examples
  - Step-by-step guide to using MATLAB with GitHub Actions
    - https://github.com/mathworks/ci-with-matlab-and-github-actions-workshop



MATLAB CI Configuration Examples

This repository shows how to run MATLAB tests with a variety of continuous integration systems.

CI Platform	Badges	Badge Help
Azure DevOps	Azure Pipelines succeeded coverage 80%	Blog with helpful information for setting up Azure DevOps badges
CircleCI	circleci passing	CircleCI documentation for setting up badges
GitHub Actions	MATLAB passing	GitHub Actions documentation for setting up badges
Travis CI	build passing	Travis CI documentation for setting up badges

Time for some hands-on experience!

Time for some hands-on experience!

- Our workshop will cover:
  - Working with Git using the Branch Manager
  - Understanding your code better with the Dependency Analyzer
  - Identifying issues in your code with **`codeIssues`**
  - Scriptable toolbox packaging with **`ToolboxOptions`**
  - Automating build operations with the build tool

- To get started:
  1. Go to the following URL:
     - https://github.com/mathworks/Expo-2023-Whats-New-for-Managing-Testing-and-Building-your-MATLAB-Code
  2. Click on the "Open in MATLAB Online" button
  3. Walk through the **`WorkshopGuide.mlx`** file

MATLAB EXPO

Thank you