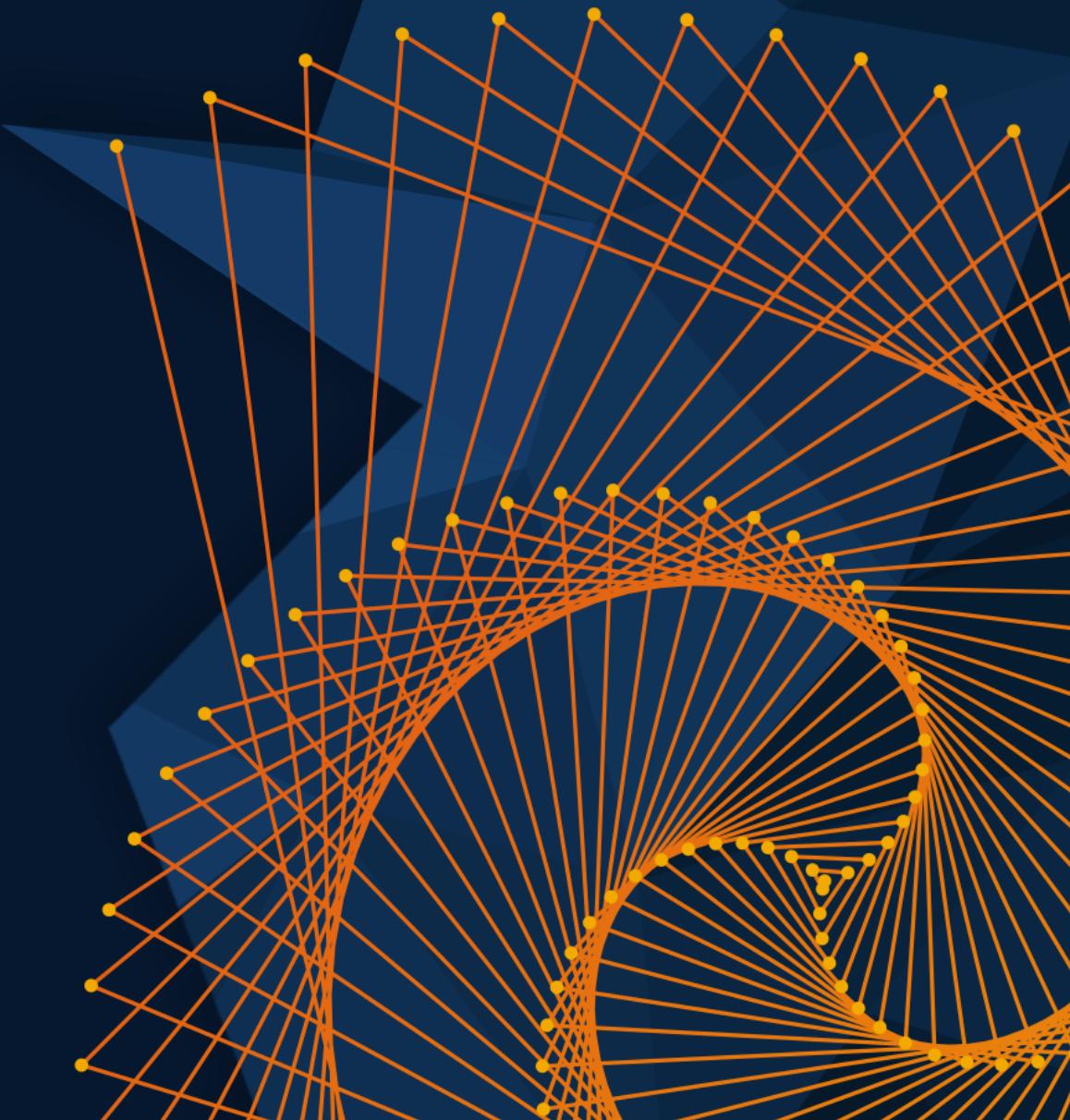


# MATLAB EXPO

## Generating Tests for Your MATLAB Code Workshop



This workshop will focus on 3 major aspects of software testing



## Test Generation

- Command History
- MATLAB Copilot



## Code Coverage

- Statement
- Decision
- Condition



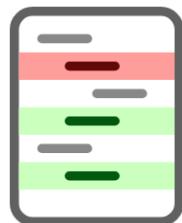
## CI Automation

- GitHub Actions
- Publish results

## At the end of the workshop, you will...



See that software testing is easier than you expect



Know how to measure, understand, and use code coverage



Know how to automatically test and publish your results  
every time you push changes to your repository



## Software Testing and Code Coverage

# MATLAB Unit Test Framework

- Built-in qualifications and diagnostics
- Advanced code coverage metrics
- Testing and coverage reports (e.g., TAP, SARIF, Cobertura, PDF)
- Support for IEC certification workflows (with IEC Certification Kit)

## MATLAB® Test Report

**Timestamp:** 09-Feb-2024 10:54:02

**Host:** AH-DHRUSKA

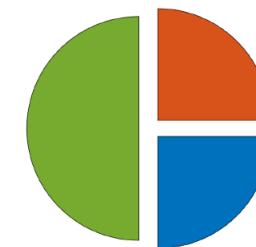
**Platform:** win64

**MATLAB Version:** 24.2.0.2510308 (R2024b) Prerelease

**Number of Tests:** 4

**Testing Time:** 0.6628 seconds

**Overall Result:** FAILED



2 passed  
1 incomplete  
1 failed



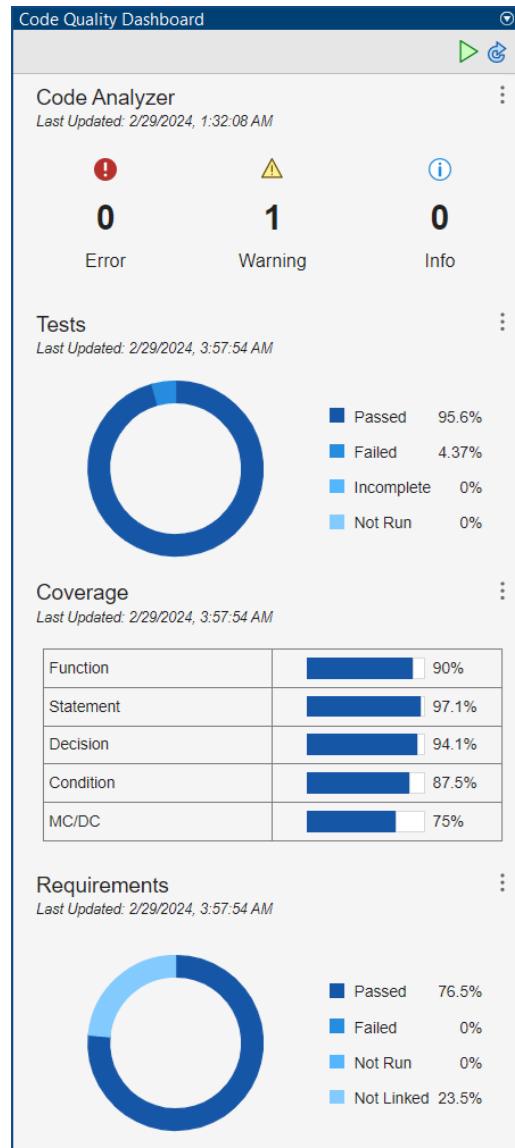
## "There's a qualification for that..."

- Built-in qualifications with customized error diagnostics
  - No more `disp` statements!
- Compare values with tolerances
- Support for custom qualifications

`verifyEqual`  
`verifyNotEqual`  
`verifyGreaterThan`  
`verifyGreaterThanOrEqual`  
`verifyLessThan`  
`verifyLessThanOrEqual`  
`verifyEmpty`  
`verifySize`  
`verifyClass`  
`verifySubstring`  
...and more!

# Drive quality-first workflows with the Code Quality Dashboard

- At-a-glance view of your overall project quality
- Jump directly to relevant reports and tools
  - Static code analysis
  - Test and coverage results
  - Requirements
- Update all results with the click of a button
- Available in MATLAB Test



# Test generation with MATLAB Test!

R2025a



Starter  
Tests



Command  
History



Equivalence  
Testing



MATLAB  
Copilot

- Works with and without MATLAB Copilot
- Generate "fill in the blanks" starter tests
- Generate complete tests (with MATLAB Copilot)
- Spend less time writing tests

The screenshot shows the MATLAB Test ribbon with several options:

- Generate Test ▾
- Find Tests
- Run Section Break
- Run and Advance
- Run to End
- Run ▾
- Step
- Stop

**Unit Tests**

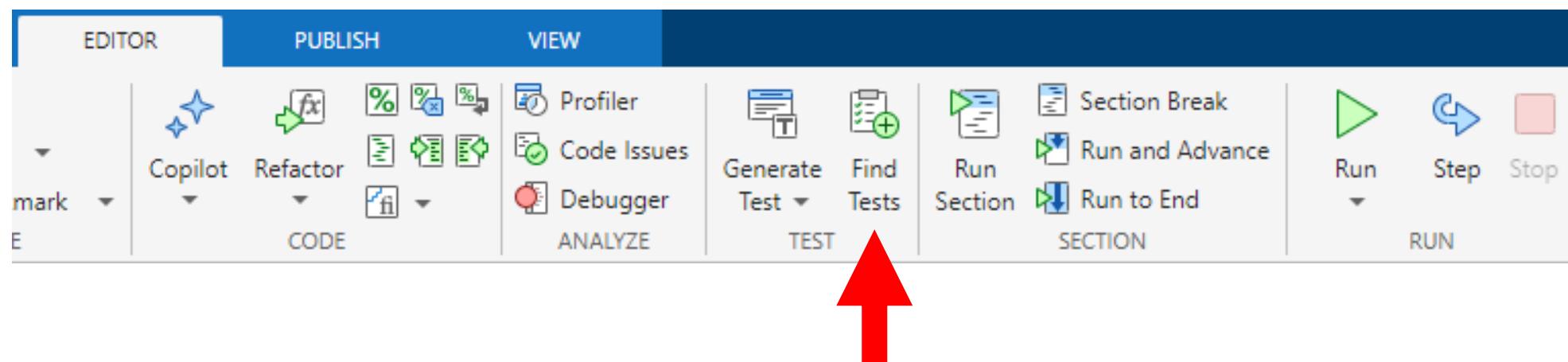
- Generate basic test (Ctrl+Shift+H) - Generate basic test for the current file
- Generate test for the current file using Copilot - Generate test for the current file

**Equivalence Tests**

- C/C++ Code Generation - Generate equivalence test for MATLAB Coder C/C++ code
- Python Package - Generate equivalence test for MATLAB Compiler SDK Python packages
- Java Package - Generate equivalence test for MATLAB Compiler SDK Java packages
- .NET Assembly - Generate equivalence test for MATLAB Compiler SDK .NET assemblies
- Production Server Archive - Generate equivalence test for MATLAB Compiler SDK production server archives
- C++ Shared Library - Generate equivalence test for MATLAB Compiler SDK C++ shared libraries

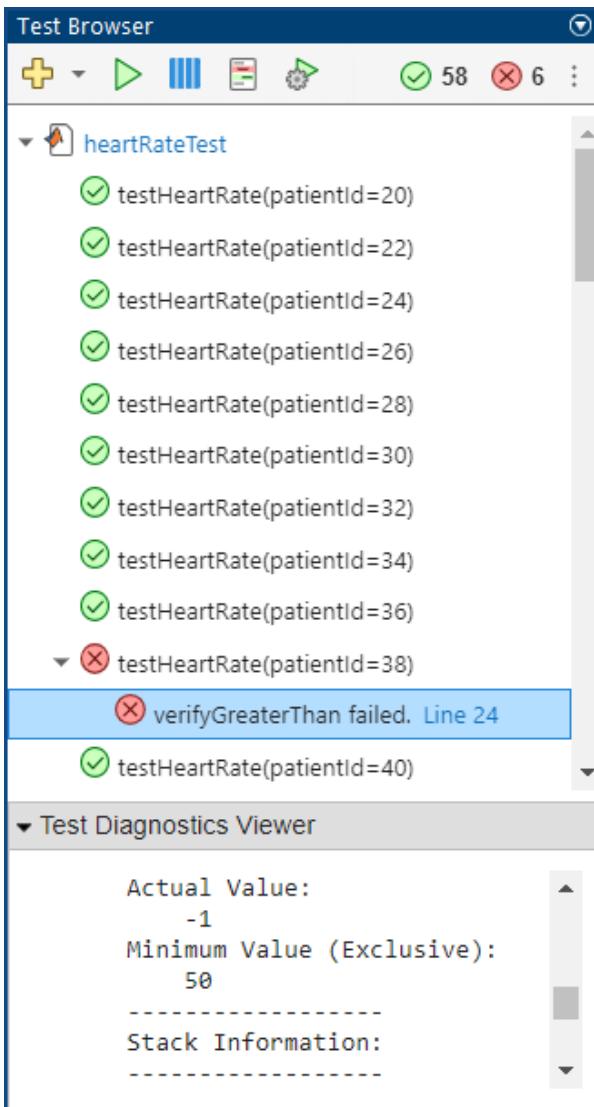
# Faster testing cycles with "Find Tests"

- Find all tests impacted by your current file
- Ignore tests unrelated to your current file
- Smallest set of relevant tests means faster testing



# Test Browser – Run tests without leaving your source code

- Monitor tests as they run
- Quick access to test diagnostics
- Quickly focus on failed tests with test filters
- Enable code coverage and parallel testing



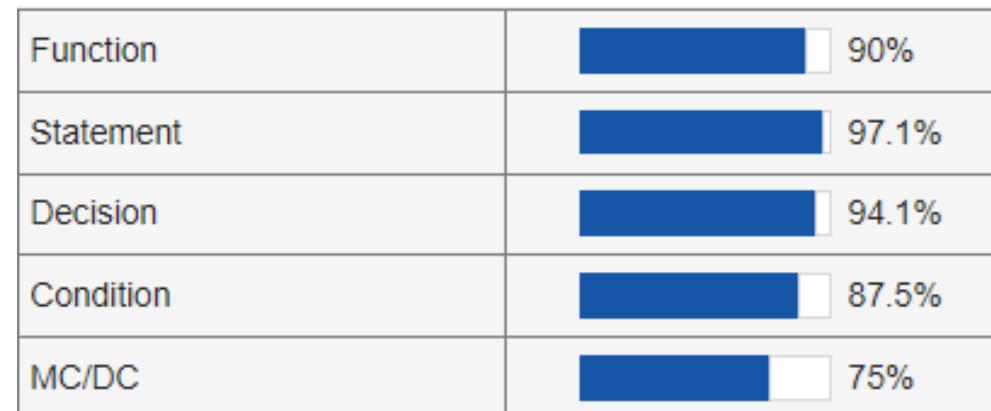
# Build confidence in your codebase with code coverage

- Identify and target testing gaps
- Measure code coverage for generated C/C++ code
- Enable code coverage from:
  - Test Browser
  - MATLAB Test Manager
  - runtests
  - Build tool TestTask

```
% Breath rate validation  
if ~ (b_rate > 8) && b_rate < 25)  
    b_rate = -1;  
end
```

T: 96:: F: 0

R2023a -





## Continuous Integration (CI)

# MATLAB and Simulink in CI

- Available plugins for most major platforms
  - GitHub® Actions
  - GitLab™ CI/CD
  - Azure® Pipelines
  - Jenkins™
  - CircleCI®
  - TeamCity®
- Examples to help get you started
  - [CI Configuration Examples](#)
  - [Advanced CI Configuration Examples](#)
  - [CI with MATLAB and GitHub Actions Workshop](#)
- Automatic YAML generation using  
CI Support Package for Simulink



GitHub Actions



Azure Pipelines



Jenkins



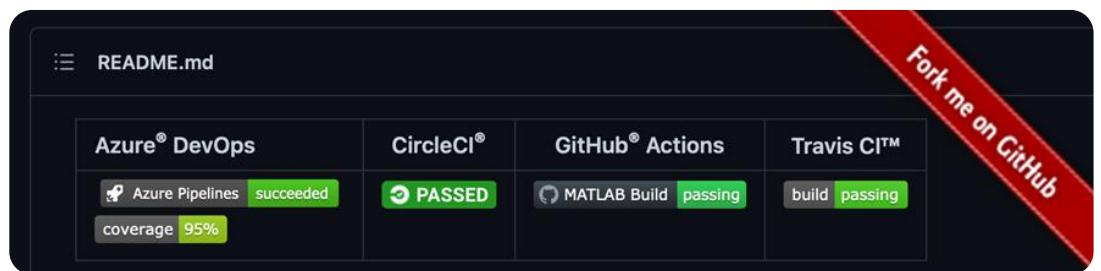
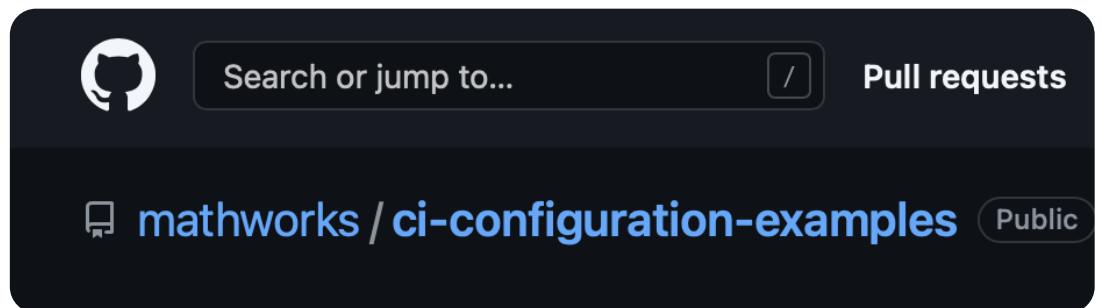
circleci



Bamboo

# Free MATLAB in CI for public repositories

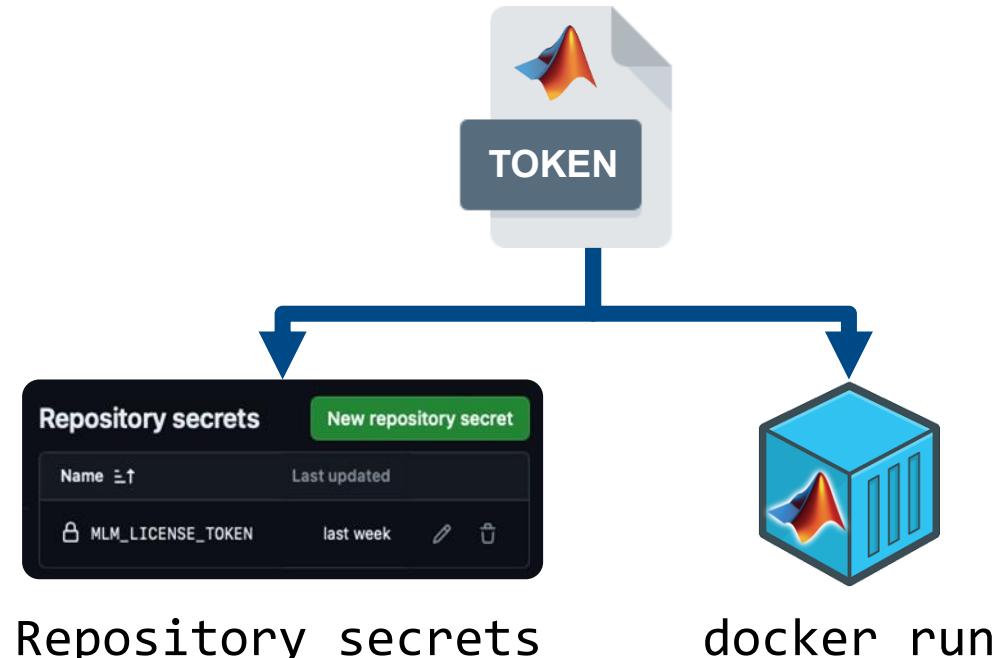
- Free way to learn and explore CI
  - Even if you can't share your code online, use dummy code to get free experience with CI systems
- Includes most products  
(excludes transformation products)
- Examples to help get you started
  - [CI Configuration Examples](#)
  - [Advanced CI Configuration Examples](#)
  - [CI with MATLAB and GitHub Actions Workshop](#)





## Batch License Token pilot available to enable modern scalability and cloud-native workflows

- New licensing mechanism built to better support CI/CD workflows
- Batch Licensing Tokens...
  - Scale more efficiently
  - Can be used with hosted runners and cloud-native architectures
- Enables support for private repositories

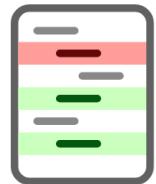


**Batch Token Sign-Up Form**  
[mathworks.com/support/batch-tokens](http://mathworks.com/support/batch-tokens)



## Hands-On Workshop

# Workshop Steps



1. Fork the workshop to your GitHub account
2. Generate tests
3. Measure code coverage
4. Use code coverage to uncover testing gaps (and maybe a bug?)
5. Push changes back to GitHub and watch GitHub Actions automatically test your changes and publish your results



Let's get started with the hands-on workshop!

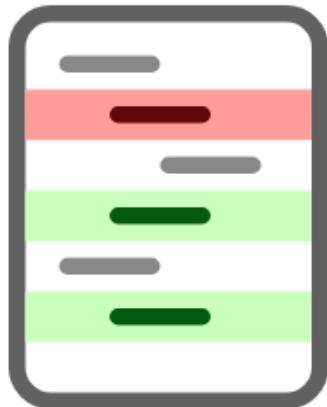
<https://github.com/mathworks/Generating-Tests-for-Your-MATLAB-Code-Workshop>

# Workshop Summary



## Test Generation

Testing isn't as hard as you thought it was



## Code Coverage

Code coverage helps identify testing gaps and potential bugs



## CI Automation

CI enables automated testing and reporting

# MATLAB EXPO

## Thank you



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