MATLAB EXPO 2017
What’s New in MATLAB and Simulink

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Platform Productivity

Getting your work done faster

Workflow Depth

Support for your entire workflow

Application Breadth

Products for the work you do
Platform
Productivity

Getting your work done faster
See results together with your MATLAB code in the Live Editor *(introduced in R2016a)*

- Add equations, images, hyperlinks, and formatted text
- Present, share, and collaborate using interactive documents
- Interactive figure updates
  - Pan, zoom, and rotate axes
  - Interactive plot customization, with MATLAB code generation to automate work
- Interactive equation editor
App Designer

Environment for building MATLAB apps
(introduced in R2016a)

- Full set of standard user interface components, as well as gauges, knobs, switches, and lamps
- Rich design environment for laying out apps
- Object-based code format for easily sharing data between parts of the app

- Enhancements include:
  - Majority of 2-D plots supported
  - Embed tabular displays using uitable
  - Zoom and pan plots in apps
MATLAB Online

- Provides access to MATLAB desktop and full MATLAB language support from any standard web browser
- No downloads or installs
- Cloud Storage and synchronization via MATLAB Drive
- Log in here with your MathWorks Account: https://matlab.mathworks.com/
Working with Data Just Got Easier

Effective handling of data is crucial in various fields such as finance, engineering, and science. MATLAB, a widely used software for numerical computing, has evolved to improve data handling capabilities, making it easier for users to manage and analyze their data effectively.

### New Data Storage Formats
- **Numeric Data**: In MATLAB R2013b, various numeric types were introduced, including double, single, and logical types. These numeric data types allow for more efficient storage and manipulation of numerical data.

### New Data Manipulation Tools
- **String Arrays**: Introduced in MATLAB R2013b, string arrays are memory-efficient and enable faster string operations. New functions have also been added for common string manipulation tasks.

### New Data Preprocessing Capabilities
- **Preprocessing Tools**: MATLAB R2016b has added new capabilities for preprocessing data. This includes finding, filling, and removing missing data, as well as detecting and replacing outliers, and smoothing noisy data.

### New Data Types and Functionality
- **Heterogeneous Data**: New data types and functionality have been introduced for more efficient storage and managing of data. These include numeric, datetime, duration, calendarDuration, logical, categorical, cell, structure, table, double, single, char, str, cell str, {c|h}, str, and tall.
Working with **Big** Data Just Got Easier

Use tall arrays to manipulate and analyze data that is too big to fit in memory

- Tall arrays let you use familiar MATLAB functions and syntax to work with big datasets, even if they don’t fit in memory
- Support for hundreds of functions in MATLAB and Statistics and Machine Learning Toolbox
- Works with Spark + Hadoop Clusters
Working with Big Data Just Got Easier in Simulink Too

Stream large input signals from MAT-files without loading the data into memory

- Provides a big data workflow for Simulink simulations
- Use big data in Simulink logging and loading
- Especially useful when running many simulations where data retrieved is too large to fit into memory
Create Your Models Faster

Use automatic port creation and reduced bus wiring

- Add inports and outports to blocks when routing signals
- Quickly group signals as buses and automatically create bus element ports for fewer signal lines
Define your Data Faster

Reduces the need to open separate dialog boxes

- Model and block parameter data is now accessible within the main editor window
- Accessing and defining Stateflow data is also much easier
Simulate your Model Faster

Use JIT acceleration and the new parsim command to speed up your simulations

- Quickly build the top-level model for improved performance when running simulations in Accelerator mode
- Directly run multiple parallel simulations from the parsim command
- Especially use for Monte Carlo simulations and Design of Experiments
Platform
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Workflow
Depth

Support for your entire workflow
Connecting MATLAB Analytics to IoT Systems
New Hardware Support

Run Simulink models on low-cost hardware devices

- Run Simulink models on Raspberry Pi 3 and Google Nexus devices
- Adds to existing hardware support, including LEGO, Arduino, iPhone, and Android devices
More Connections to 3rd Party Tools

Connect your models to Onshape and DOORS Next Generation

- Convert an Onshape CAD assembly into a Simscape Multibody model
- Link and trace model elements to requirements in DOORS Next Generation
Efficient Code Generation

Improve code quality with clone detection and dynamic memory allocation

- Refactor repeating library patterns and subsystem clones
  - Reduces redundancy
  - Improves reusability

- Generate C code that uses dynamic memory allocation from MATLAB Function blocks
  - Allocate memory as needed at runtime
Floating Point HDL Code Generation

Generate HDL code directly from single-precision floating point Simulink models

- Generates native floating-point arithmetic HDL code complying to IEEE-754 standard
- Optimize for speed versus area using custom block-level settings
- Balance numerical accuracy versus hardware resource usage by mixing integer, fixed-point, and floating point operations.
Complying with Safety-Critical Standards

Detect and fix standards compliance issues at design time with edit-time checking

- Quickly address compliance and modeling standards issues before running the model
- For example, check for prohibited blocks or block names
- Especially useful for applications that require compliance to standards such as DO-178, ISO 26262, IEC 62304
Code Verification

Detect and prove the absence of run-time errors in your source code using static analysis

- Identify CERT C violations using defect checkers and coding rules
- Detect security vulnerabilities highlighted by the CERT C standard
- Addresses growing concern over software security with the rise in system connectivity
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Gas Domain and Block Library

Model gas systems with various levels of idealization

- Pneumatic actuation
- Gas transport in pipe networks
- Gas turbines for power generation
- Air cooling of thermal components
- Perfect gas, semiperfect gas, or real gas
Model and simulate automotive powertrain systems

Accelerate your powertrain controls development process

- Simulate engine and controller subsystems, transmission assemblies, battery packs
- Use pre-built conventional, EV, and HEV vehicle models that can be parameterized and customized
- Run fuel economy and performance simulations
- Deploy fast-running models onto HIL systems
- Connect to 3rd party engine models for specific components of the system
Support for the Latest Wireless Standards

Generate IEEE 802.11ad compliant waveforms and simulate 3GPP 5G radio technologies

- IEEE 802.11ad is a new Wi-Fi standard intended for high data rate short range communication
  - e.g., streaming video between a phone and a TV

- A new 5G library is available to explore the behavior and performance of new proposed 5G radio technologies
Machine Learning

“Learn" information directly from data without assuming a predetermined equation as a model

- Regression Learner app
  - Choose from multiple algorithms
  - Train and validate multiple models
  - Assess model performance, compare results, and choose the best model

- Code generation
  - Generate C code for predictive models that can be deployed directly to hardware devices

Statistics and Machine Learning Toolbox
Deep Learning

Apply deep learning to computer vision problems

- Configure and train models using object detection algorithms (R-CNN, Fast R-CNN, Faster R-CNN)
- Leverage pretrained models for transfer learning (AlexNet, VGG-16, VGG-19)
- Import models from Caffe
- Train networks using multiple GPUs (including on Amazon EC2)
Design, simulate, and test ADAS and autonomous driving systems

- Algorithm development
  - Sensor Fusion
  - Computer Vision
  - Deep learning

- Visualization tools

- Testing and verification
  - Ground Truth Labeling App
  - Traffic scenario generation
What’s New in MATLAB and Simulink?

**Platform Productivity**
- Live Editor
- MATLAB Apps
- New (big) data types
- Modeling enhancements
- Release adoption

**Workflow Depth**
- Enterprise applications
- IoT systems
- 3rd party tool integration
- Standards compliance
- Code generation and verification

**Application Breadth**
- Powertrain systems
- New wireless standards
- Machine learning
- Deep learning
- Autonomous driving
What’s new in Training

Public

On-Site
MATLAB®

Data Analytics
- Data Processing and Visualization
- Statistics
- Machine Learning
- Optimization Techniques
- Parallel Computing

Application-Specific
- Control System Design
- Signal Processing
- Communication Systems
- LTE Systems

Computational Finance
- Risk Management
- Time-Series Modelling

Signal Processing
- Using MATLAB
- Using Simulink

Image and Video Processing
- Image Processing
- Computer Vision

Code Generation
- MATLAB Coder
- Interfacing with C-code

SIMULINK®

Model-Based Design
- Implementing MBD Workflow
- Model Management and Architecture
- Verification and Validation

Stateflow®
- Event-Based Modeling

Code Generation
- Rapid Prototyping and HIL-Simulation
- Embedded Systems
- FPGA Design
- Generating HDL Code
- Xilinx Zynq SoCs
- AUTOSAR

Simscape™
- General Simscape™
- Simscape Multibody™
- Simscape Drivelime™
- Simscape Fluids™
- Simscape Power Systems™

Code Integration
- Integrating C and MATLAB

Polyspace®
- Polyspace Code Prover™

https://nl.mathworks.com/services/training.html