What’s New in MATLAB R2020a

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MathWorks®
2,611
Agenda

1. Core MATLAB
2. Server Suite
3. AI Applications
4. Industrial Tools
5. Financial Models

“High level to low level – Deep or Wide – you choose for you”
Core MATLAB

1. Live scripts and task
2. Stateflow for MATLAB
3. Projects

“Abstraction allows for rapid development”
Create executable notebooks for sharing, presenting, teaching

Contextual hints while coding

View interactive outputs next to the code

Add rich text formatting, equations, images, and hyperlinks

Code + Output + Formatted Text = Executable Notebook

Live Editor
Turn a script into a simple app

Add **interactive controls** to modify script variables
- Numeric sliders
- Drop-down lists
- Edit fields

Hide the code to create simple applications and dashboards
Complete steps interactively

Use **tasks** to explore parameters and options

Automatically generate MATLAB code for the completed task
Design decision logic at a higher level of abstraction

Graphically program, debug and execute state machines

Stateflow
Design decision logic at a higher level of abstraction – in MATLAB
Manage system complexity with projects

**Projects** in MATLAB help you to organize, manage, and share your code and models.
Explore file dependencies and impact analysis

Explore and visualize project structure
Use source control systems (Git, Subversion) with projects
Server Products

1. Overview of our server products
2. New WebApp Server
3. Scaling with reference architectures
4. Support DevOps workflows

“Server suite scales with your needs”
Big picture of our server products

I want to….

- **Speed up computation**
- **Integrate with enterprise applications**
- **Publish Web Apps**
- **Use MATLAB in a browser**

- MATLAB Parallel Server
- MATLAB Production Server
- MATLAB Web App Server
- MATLAB Online Server
Share MATLAB apps as browser-based web apps

Create apps using App Designer and host them using MATLAB Web App Server

For IT: full authentication support

For domain experts: upload your app on demand
Scale as you need

AWS
AZURE
Public Clouds
On-Premise/Private Cloud
Hosting Provider
MathWorks Cloud

Reference Architectures
Cloud Data Services
Cloud Center
MATLAB Dockerfile
Deep Learning Container
MATLAB Online Server

MATLAB Online
MATLAB Drive
Reference Architectures on GitHub

- Official MathWorks guidelines
- One click to deploy
  - After some initial setup 😅
- Monolithic Architectures
- Connectors/Utilities
- Containers

https://github.com/mathworks-ref-arch
Scale Out Production Server with Parallel Server

1. User submits a request (recommend using asynchronous for long running calls)

2. Production Server acts as the request dispatcher, sending long running calls to a cluster running MATLAB Parallel Server

3. Long-running calls (jobs) can execute as serial or parallel. Parallel jobs will use parallel language and a parallel pool

4. App periodically polls using the correlation ID to determine if request is complete. The results are displayed when complete

Automated Testing with Continuous Integration (CI)

- A system to automate the building, testing, integration, and deployment of code as it is being developed and maintained

- Popular CI systems: Jenkins, Travis, CircleCI, Azure DevOps, and others...

- Benefits:
  - Detect integration bugs early
  - Allow you to stop bugs from being accepted
  - Track and report testing history
  - Flexible testing schedules and triggers
MATLAB Plugin for Jenkins

- Install MATLAB Plugin for Jenkins directly from the Jenkins Plugin Manager
- Easily connect and configure MATLAB with Jenkins
- Schedule automatic code and model testing
  - MATLAB Unit Test Framework
  - Simulink Test
Testing Reports in Jenkins

- View testing results
- View code coverage
- View testing reports
AI: Machine and Deep Learning

1. The MATLAB Advantage
2. Deep Network Designer App
3. Experiment Manager App
4. AutoML

“Apps to simplify your dev cycle with code to scale”
Interactively access models, and develop and train networks

Deep Network Designer App
Interactively access models, and develop and train networks

Import pretrained networks for transfer learning
Interactively access models, and develop and train networks

Import pretrained networks for transfer learning

Train networks and generate MATLAB code

Deep Learning Toolbox

Deep Network Designer App
Manage multiple deep learning experiments

Keep track of training parameters

Reuse training data across multiple networks

Analyze and compare results

Experiment Manager App
Machine Learning – AutoML

- Automated machine learning
  - Choose a classification model automatically, across a selection of classifier types and hyperparameter values (fitcauto)
  - Uses Bayesian optimization
Industrial Tools

1. OPC UA
2. Feature Extraction

“Secure data connectivity with MATLAB analytics drives your insights”
Access plant data securely from OPC UA servers

- Establish secure OPC UA connections
  - Authenticate with username and password or X509 user certificate credentials
  - Sign and encrypt messages
OPC Data Access Explorer App

- Rapidly connect
- Visually browse data
- Export data to the workspace
OPC UA drives IoT

- OPC UA is vendor neutral
- Access PLCs or data aggregators directly from MATLAB and Simulink

Enables predictive maintenance workflows
Diagnostic Feature Designer

- Import multiple data sources
- Interactively visualise base features
- Generate new features, e.g. timeseries
- Prognostic ranking to estimate remaining useful life
- Automatically generate code

Predictive Maintenance Toolbox
Financial Tools

1. Object Framework for Pricing
2. Econometrics Models

“Object Orientated framework encourages speed and code reuse”
Pricing and Valuation

- Price various types of financial instruments individually or collectively as a portfolio using new **object-oriented framework**

- The object-based workflow is an alternative to pricing financial instruments using functions

- Modular objects can easily be reused to compare instrument prices for different models and pricing engines
Econometrics Toolbox

- Bayesian vector autoregression models
- Markov-switching autoregression models
- Granger Causality Test
Risk Management Toolbox

- Support for constraints in credit scorecards
- Predictor screening for credit scorecards
  - Support for data that is too big to fit in memory (Big Data)
Summary

1. Core MATLAB
   1. Live scripts; Stateflow; Projects

2. Server Suite
   1. Four core products; Web Apps Server; Reference architectures

3. AI Applications
   1. Deep Network Designer; Experiment; AutoML

4. Industrial Tools
   1. OPC UA, Diagnostic Feature Designer

5. Financial Models
   1. New object framework