

What's New for MATLAB

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Agenda

- MATLAB
- Image Processing and Computer Vision
- Statistics
- Computational Finance

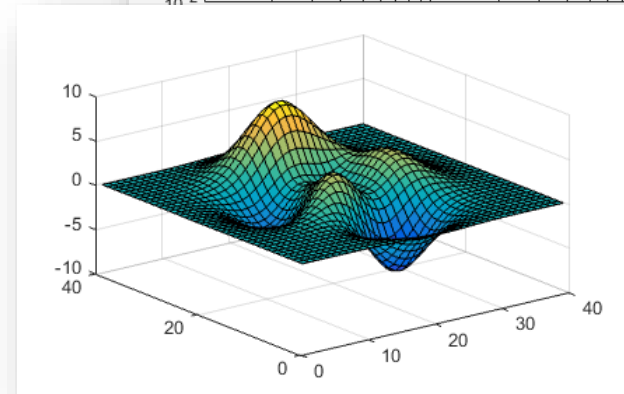
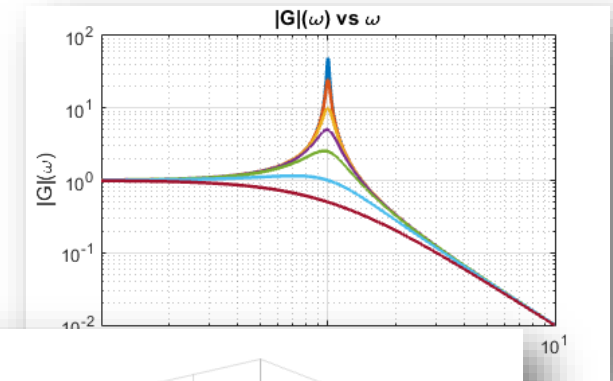
New Graphics System

Overview

- New look
 - New default colormap and line colors
 - Anti-aliased fonts and lines
 - Subtler grid lines

Data easier to interpret

- Easier to customize
 - Graphics objects now behave like other MATLAB objects
 - Support dot-notation to access and change properties

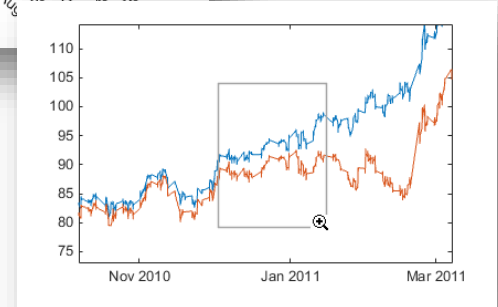
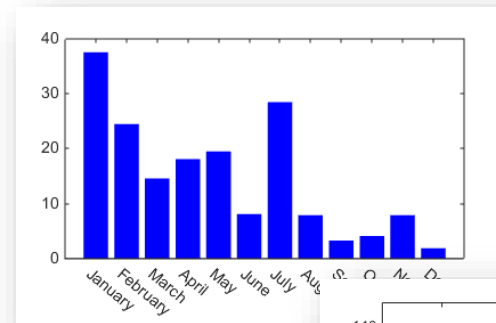
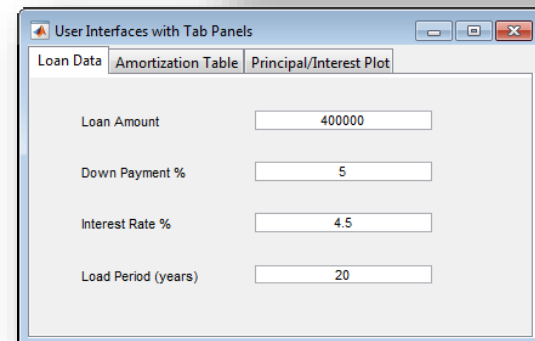


```
>> p = plot(x,y);  
>> p.Color = 'red';
```

New Graphics System

Features

- Rotatable tick labels
- Automatic updating of `datetime` tick labels
- New visualization functions
 - `histogram`
 - `animatedline`
- Multiple colormaps per figure
- Multilingual text and symbols
- User interfaces with tab panels

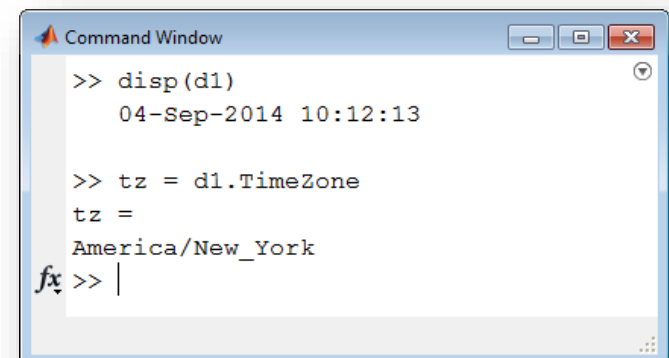
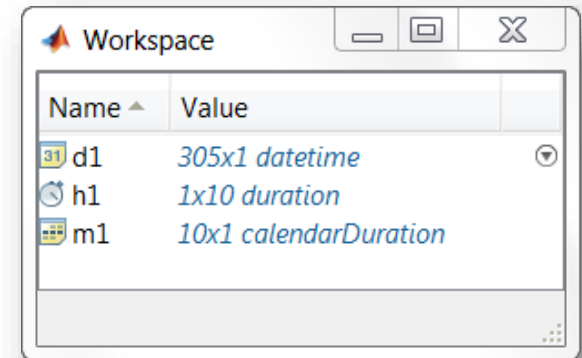



A screenshot of a MATLAB user interface window titled "User Interfaces with Tab Panels". It features three tabs: "Loan Data", "Amortization Table", and "Principal/Interest Plot". The "Loan Data" tab is active, showing four input fields with their respective values:

Parameter	Value
Loan Amount	400000
Down Payment %	5
Interest Rate %	4.5
Load Period (years)	20

Date and Time Arrays

- **`datetime`** for representing a point in time
- **`duration`**, **`calendarDuration`** for representing elapsed time
- Same data type for computation and display
 - Add, subtract, sort, compare, and plot
 - Customize display formats
 - Nanosecond precision
- Support for time zones
 - Accounts for daylight saving time



Big Data Capabilities in MATLAB

Memory and Data Access

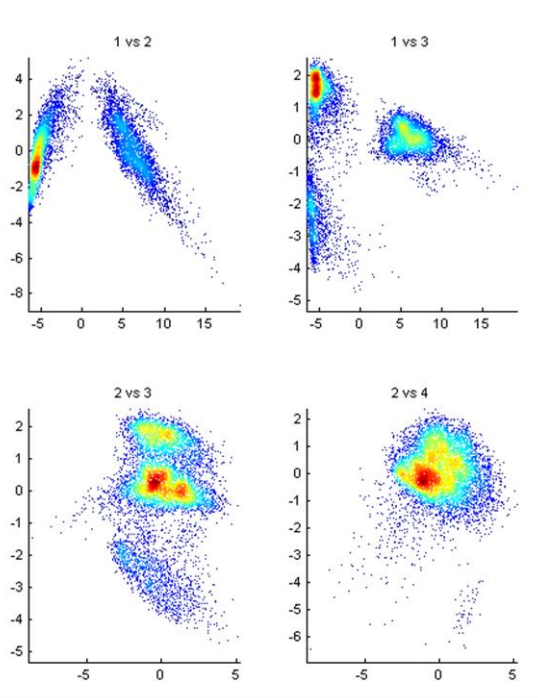
- 64-bit processors
- Memory Mapped Variables
- Disk Variables
- Databases
- **Datastores** **R2014b**

Programming Constructs

- Streaming
- Block Processing
- Parallel-for loops
- GPU Arrays
- SPMD and Distributed Arrays
- **MapReduce** **R2014b**

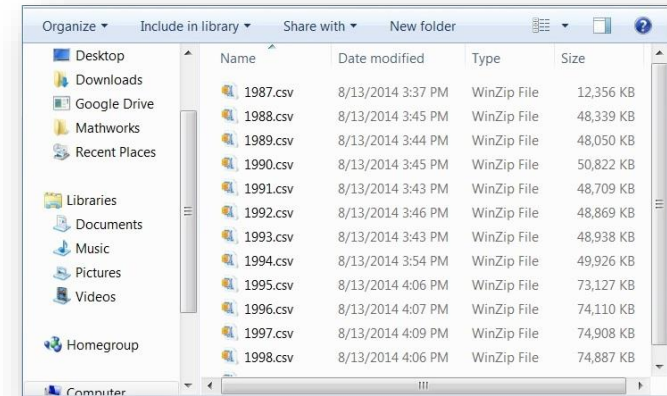
Platforms

- Desktop (Multicore, GPU)
- Clusters
- Cloud Computing (MDCS on EC2)
- **Hadoop** **R2014b**



Access Big Data datastore

- Easily specify data set
 - Single text file (or collection of text files)
- Preview data structure and format
- Select data to import using column names
- Incrementally read subsets of the data



```
>> preview(ds)
ans =
```

Year	Month	DayofMonth	DayOfWeek
1987	10	21	3
1987	10	26	1
1987	10	23	5
1987	10	23	5

```
airdata = datastore('*.csv');
airdata.SelectedVariables = {'Distance', 'ArrDelay'};

data = read(airdata);
```

Analyze Big Data

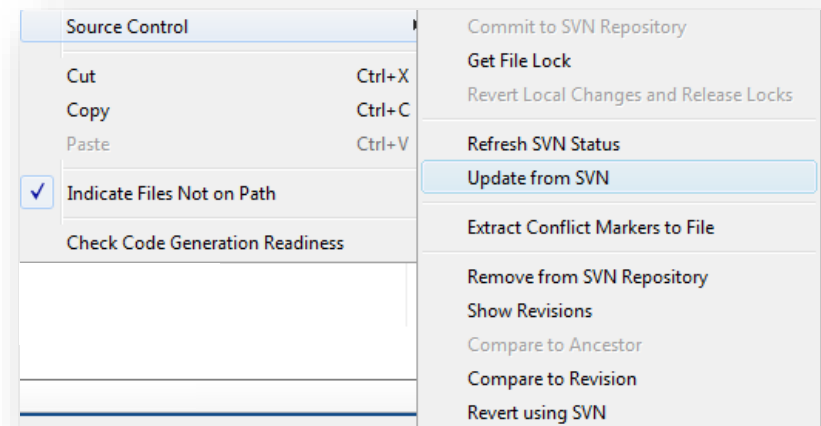
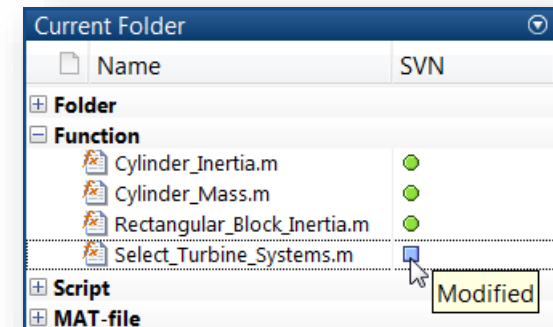
mapreduce

- Use the powerful MapReduce programming technique to analyze big data
 - **mapreduce** uses a **datastore** to process data in small chunks that individually fit into memory
 - Useful for problems with complex grouping, or when intermediate results do not fit in memory
- **mapreduce** on the desktop
 - Increase compute capacity (Parallel Computing Toolbox)
 - Analyze big database tables (Database Toolbox)
 - Access data on HDFS to develop algorithms for use on Hadoop
- **mapreduce** with Hadoop
 - Run on Hadoop using MATLAB Distributed Computing Server
 - Deploy applications and libraries for Hadoop using MATLAB Compiler

```
*****
*          MAPREDUCE PROGRESS          *
*****
Map 0%          Reduce 0%
Map 20%         Reduce 0%
Map 40%         Reduce 0%
Map 60%         Reduce 0%
Map 80%         Reduce 0%
Map 100%        Reduce 25%
Map 100%        Reduce 50%
Map 100%        Reduce 75%
Map 100%        Reduce 100%
```


Source Control Integration

- Manage your code from within the MATLAB Desktop
- Leverage modern source control capabilities
 - GIT and Subversion integration in Current Folder browser
- Use Comparison Tool to view and merge changes between revisions

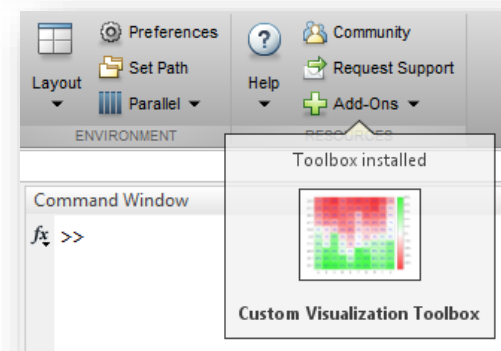
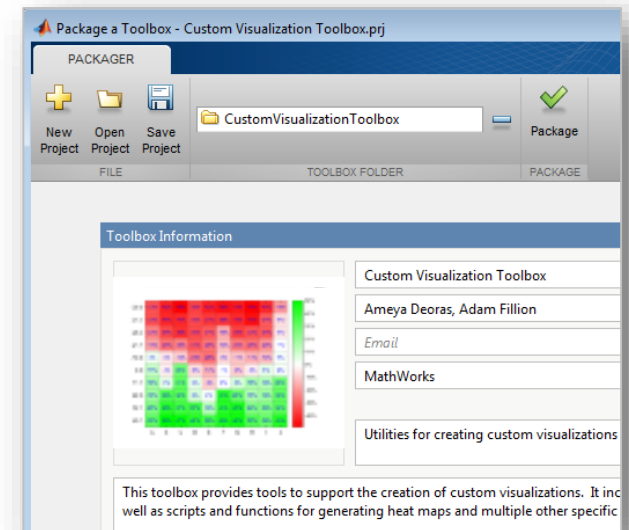


Toolbox Packaging

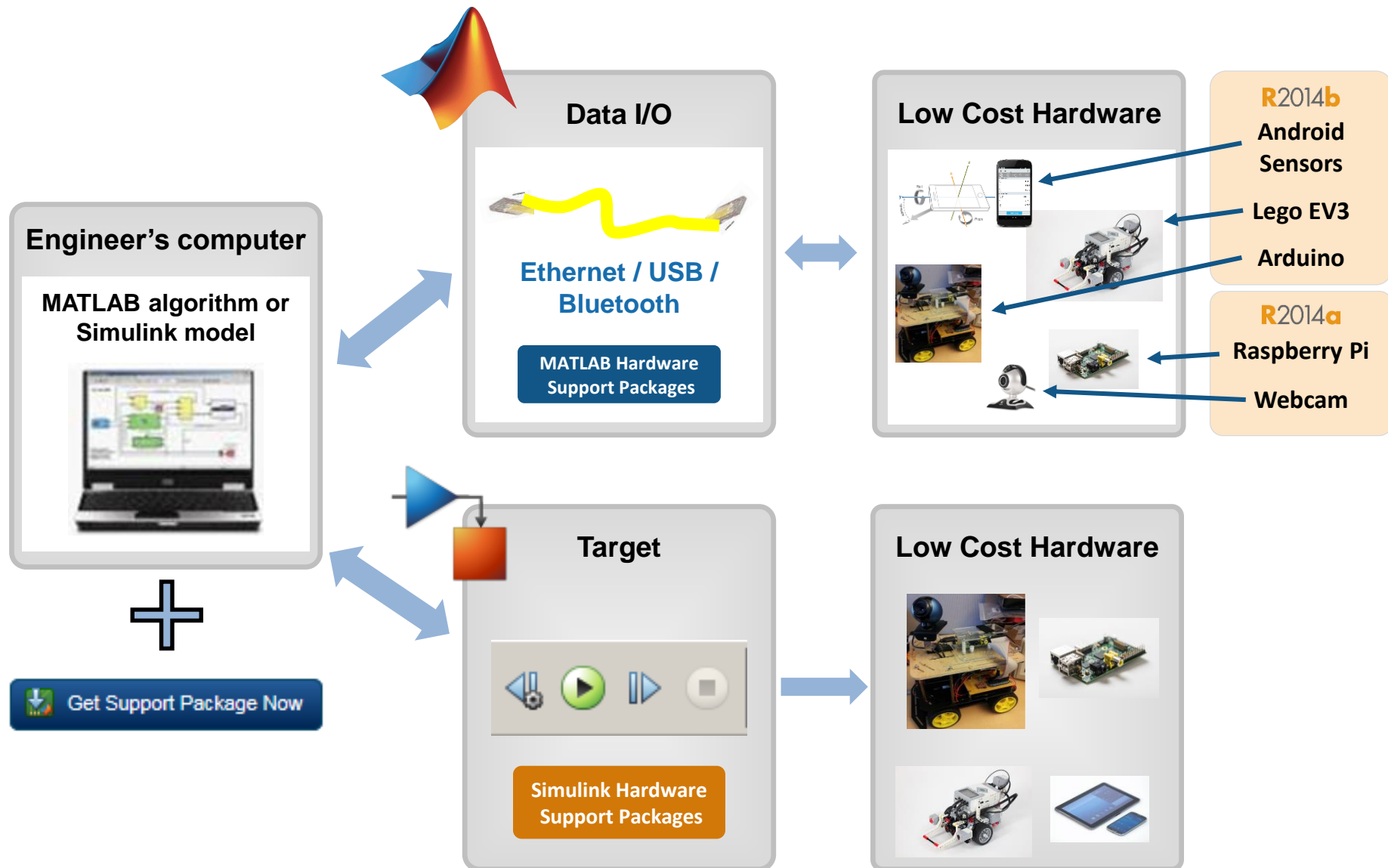
- Package your toolbox as a single installer file
 - Contains all of the code, data, apps, documentation, and examples
 - Checks for dependent files and automatically includes them
 - Documents required products

- Included folders and files automatically appear on path when installed

- View details and uninstall toolboxes with Manage Custom Toolboxes dialog box



Connecting to Low Cost Hardware



Additional Support for Importing Data

- Access online data (**webread**)
 - JSON, CSV, and image data
- Faster data import from text files
- Import data directly as **categorical** or **datetime**
- Read and write data from network-connected devices (**tcpclient**)

Read Image Data from Web Map Service (WMS) Server

Image data from a Web service is returned as a numeric matrix, in this case a 256-by-512-by-3 uint8 matrix. You can use `webread` to read image data from a WMS server.

```
url = 'http://neowms.sci.gsfc.nasa.gov/wms/wms';  
RGB = webread(url, 'Service', 'WMS', 'Layers', 'BlueMarbleNG', ...  
    'CRS', 'CRS:84', 'Format', 'image/jpeg', ...  
    'Height', 256, 'Width', 512, ...  
    'BBOX', '-180.0,-90.0,180.0,90.0', ...  
    'Request', 'GetMap', 'Version', '1.3.0');  
figure  
imshow(RGB)
```

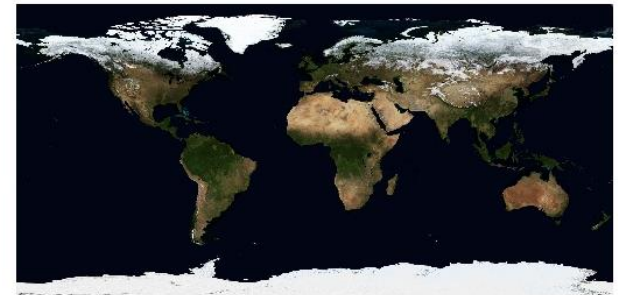
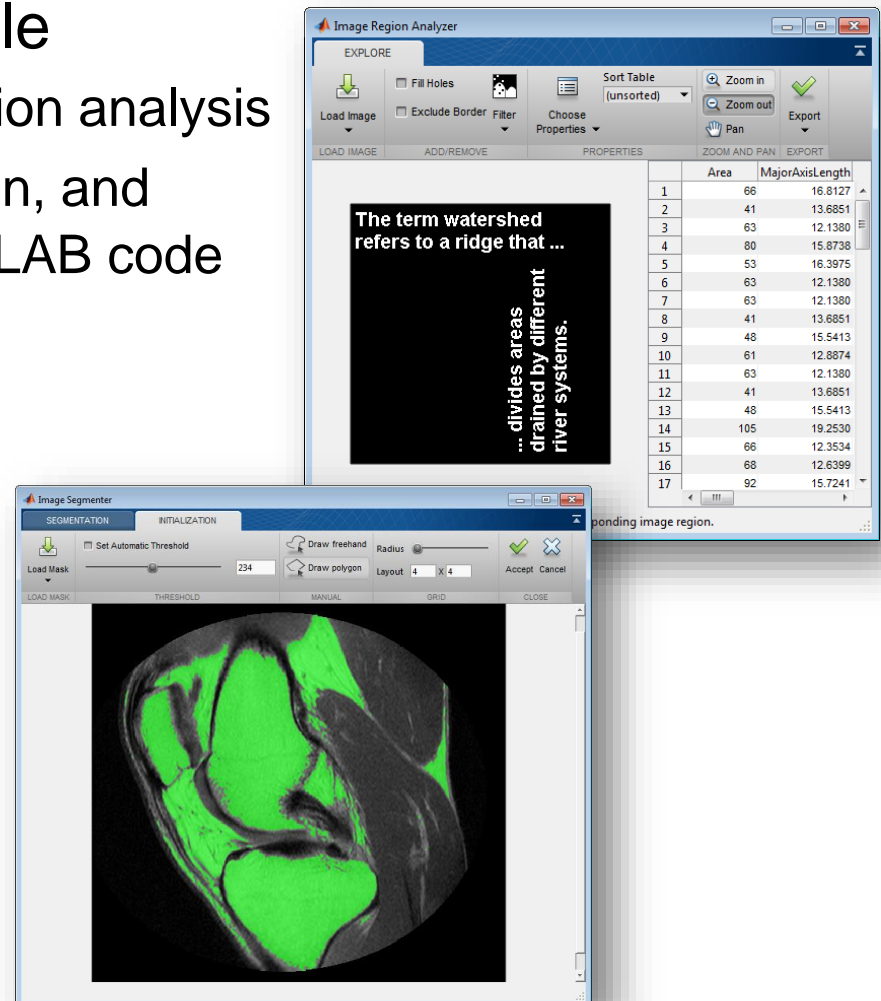


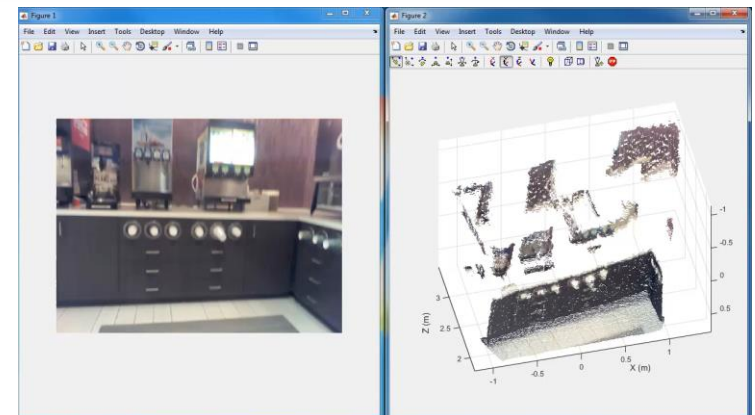
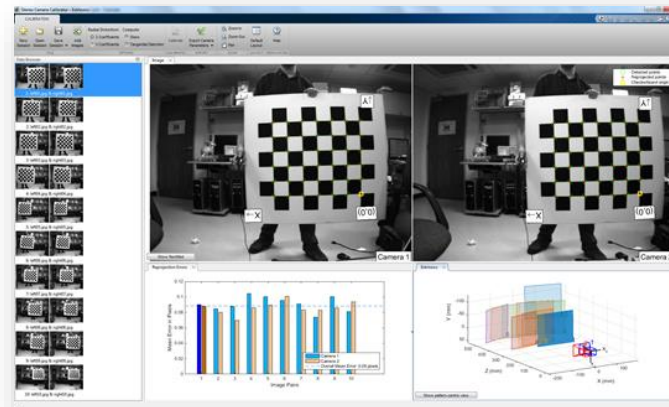
Image Processing Toolbox

- New MATLAB apps available
 - For image segmentation, region analysis
 - Support interactive exploration, and automatic generation of MATLAB code
- Expanded support for C code generation for
 - 16 functions added



Computer Vision System Toolbox

- New stereo camera calibration app
- Point cloud viewer
 - Supports visualization of 3D information for stereo vision applications
- **imageSet** class for handling large collections of image files



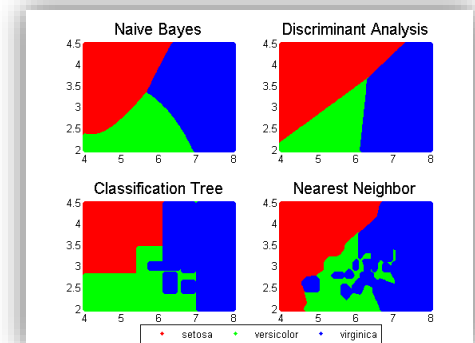
Statistics Toolbox

Machine Learning

■ Classification

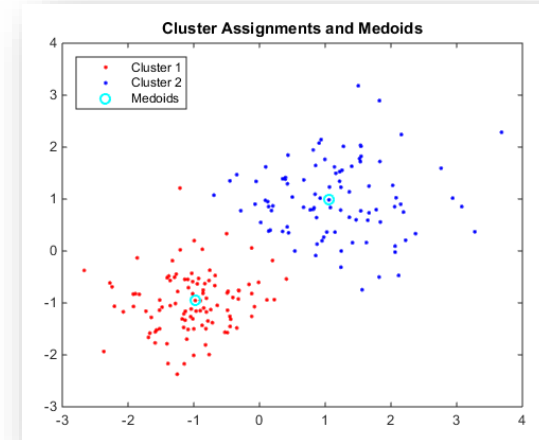
- Multiclass SVM (Support Vector Machine)
 - Consistent interface with other algorithms

✓ SVM ✓ Decision Trees ✓ kNN
 ✓ Discriminant ✓ Naïve Bayes



■ Clustering

- Performance improvements for k-means and GMM clustering
- New k-medoids algorithm that is robust to outliers



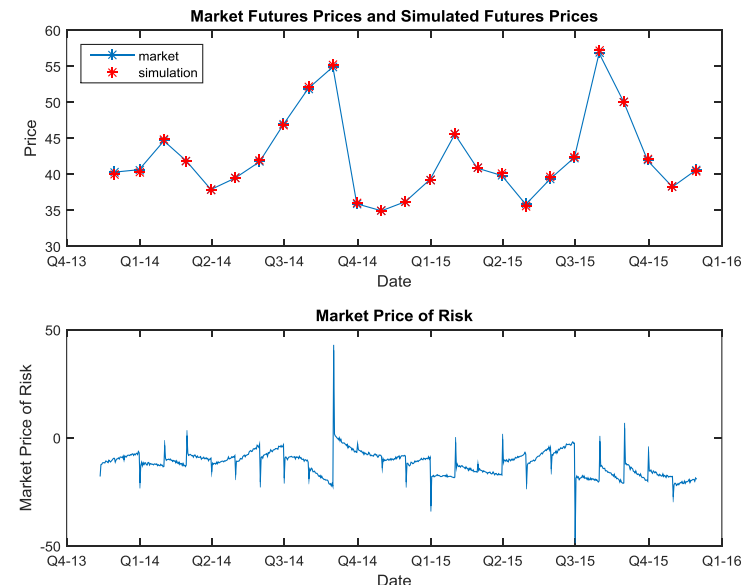
Computational Finance

- Datafeed Toolbox – data access via:

- Bloomberg Server
- Bloomberg B-PIPE
- Thomson Reuters Eikon

- Financial Instruments Toolbox

- Pricing functionality for commodity/energy futures
- Forecasting contract prices (jump-diffusion models)



Learn More – R2014b

R2014b Release Highlights



00:00 02:06

Feedback

Release 2014b includes:

- Major release of MATLAB, with a new graphics system, increased support for big data, features for packaging and sharing code, and source control integration
- New Simulink features for accelerating model building and running consecutive simulations
- Updates to 81 other products

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MATLAB Product Family

MATLAB

- New MATLAB graphics system
- New functions for processing big data on your desktop that can scale for use with Hadoop
- Git and Subversion source control integration and access to projects on GitHub from File Exchange

Simulink Product Family

Simulink

- Smart editing cues for accelerated model building, and editor views for annotations and interfaces
- Fast simulation restart for running consecutive simulations quickly
- Simulink Functions for creating and calling reusable functions from anywhere in Simulink and Stateflow

Learn More – MATLAB R2014b



0.1270	0.5463	0.3000
0.9134	0.9575	0.4667
0.6324	0.9649	0.1300



datastore('airline.csv', 'TreatAsM...
SelectedVariableNames = 'ArrDelay';
maxDelay = mapreduce(ds, @maxArrivalDe...
Compare Sele...
Source Control

**New graphics. Big data.
Source control integration.
And more...**



R2014b

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MATLAB Graphics

MATLAB R2014b introduces a new MATLAB graphics system. New default colors, fonts, and styles make your data easier to interpret. Anti-aliased fonts and lines provide smoother text and graphics. Graphics objects are easier to use – you can display common properties in the command window, and objects support familiar structure-like syntax for changing property values. Many other new features have been added as well.

[» Learn more](#)





ds = datastore('airline.csv', 'TreatAsM...
ds.SelectedVariableNames = 'ArrDelay';
maxDelay = mapreduce(ds, @maxArrivalDe...

Big Data Capabilities

New features and performance improvements target working with big data. The `datastore` function enables you to easily and efficiently format and import data into your desktop from files – and collections of files – that don't fit into memory. `mapreduce` is a programming

