

MATLAB EXPO 2016

What's New in MATLAB

Ned Gulley



Features

- Live Editor
- Native string
- Timetable
- Moving averages
- Add-Ons
- MATLAB Drive
- MATLAB Online
- Datastore
- Functions in scripts
- App Designer

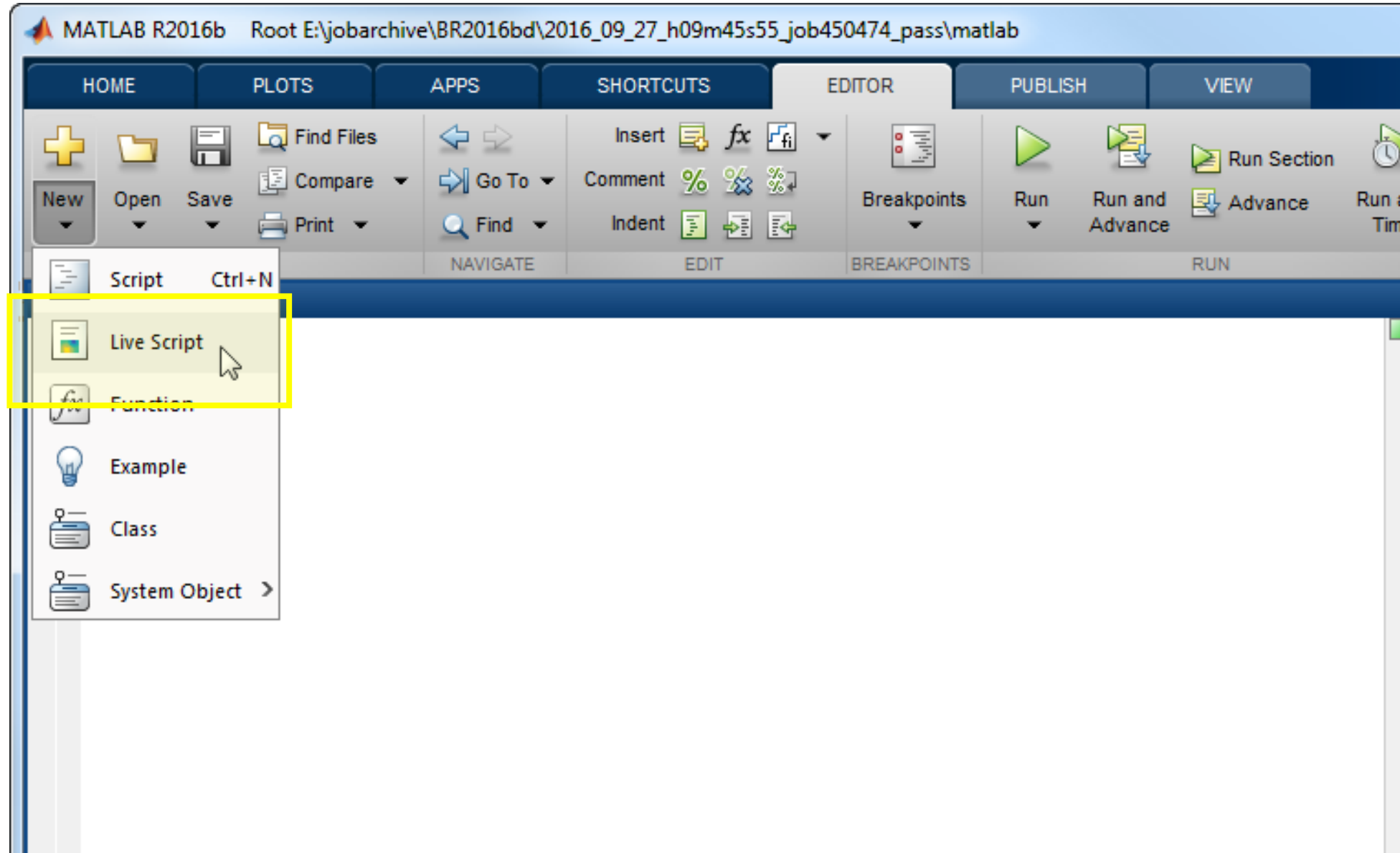
Features

- Live Editor
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- Add-Ons
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- MATLAB Online
- Datastore
- Functions in scripts
- App Designer

**Highlights from
2016a and 2016b**



Live Scripts



Football Analysis

Including games from English, German, and Italian leagues.

```
db = sqlite('soccer.sqlite');  
query = 'SELECT date,home_team_goal,away_team_goal,goal FROM Match  
goals = fetch(db,char(query));
```

```
t = cell2table(goals, ...  
    'VariableNames', ...  
    {'Date', 'HomeScore', 'AwayScore', 'GoalEventStr'});
```

```
t(1:3,:)
```

```
ans =
```

Date	HomeScore	AwayScore	
'2008-08-17 00:00:00'	1	1	'<goal><val
'2008-08-16 00:00:00'	1	0	'<goal><val
'2008-08-16 00:00:00'	0	1	'<goal><val

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Football Analysis

Including games from English, German, and Italian leagues.

```
db = sqlite('soccer.sqlite');  
query = 'SELECT date,home_team_goal,away_team_goal,goal FROM Match  
goals = fetch(db,char(query));  
  
t = cell2table(goals, ...  
    'VariableNames', ...  
    {'Date','HomeScore','AwayScore','GoalEventStr'});  
  
t(1:3,:)
```

ans =

Date	HomeScore	AwayScore	
'2008-08-17 00:00:00'	1	1	'<goal><val
'2008-08-16 00:00:00'	1	0	'<goal><val
'2008-08-16 00:00:00'	0	1	'<goal><val


```
{'Date', 'HomeScore', 'AwayScore', 'GoalEventStr'});
```

```
t(1:3,:)
```

```
ans =
```

<u>Date</u>	<u>HomeScore</u>	<u>AwayScore</u>	
'2008-08-17 00:00:00'	1	1	'<goal><val
'2008-08-16 00:00:00'	1	0	'<goal><val
'2008-08-16 00:00:00'	0	1	'<goal><val

Who scored the most?

```
sum(t.HomeScore)
```

```
ans = 13164
```

```
sum(t.AwayScore)
```

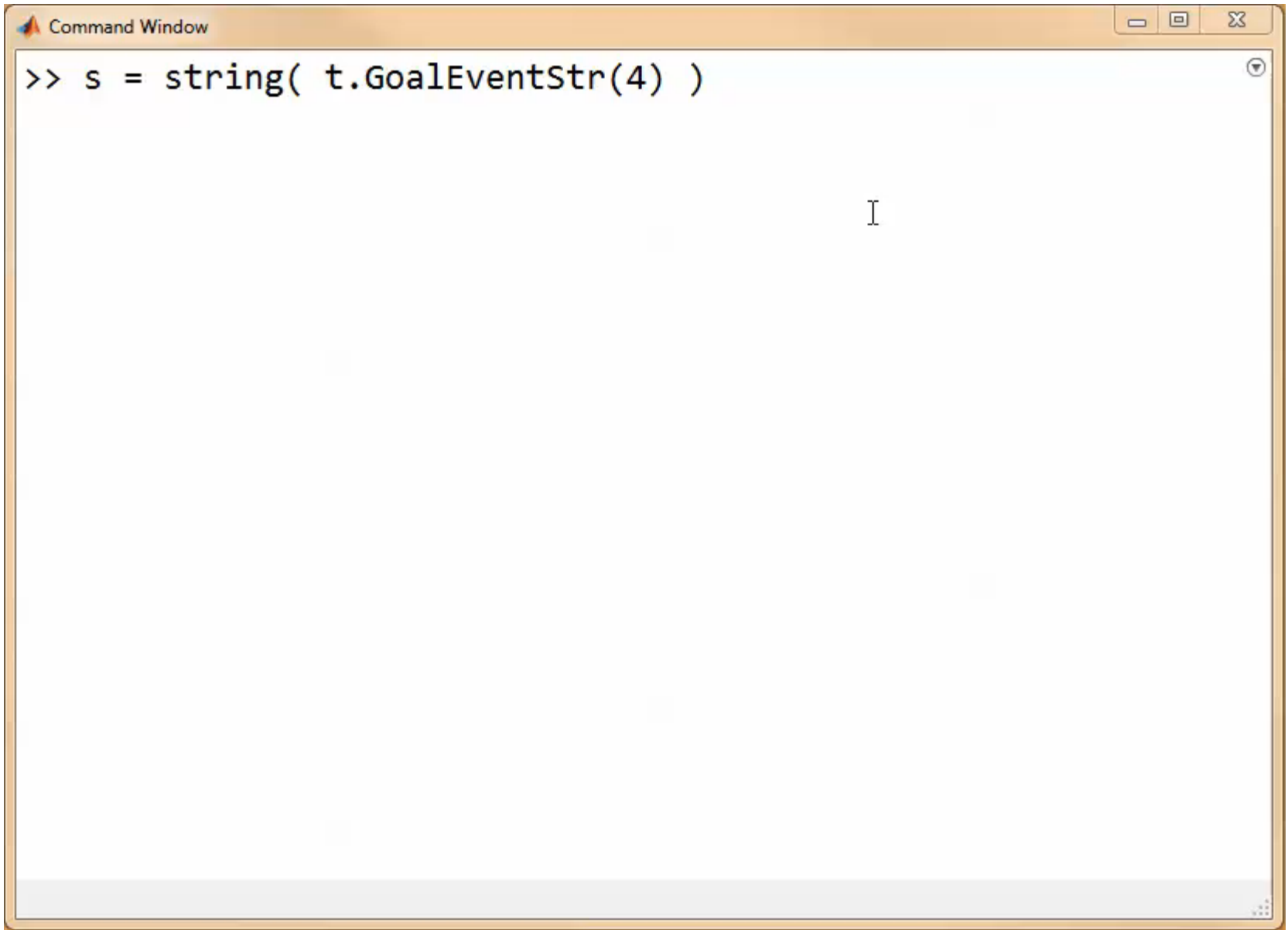
```
ans = 9972
```

<goal><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>393</event_incident_typefk><elapsed>3</elapsed><player2>27430</player2><subtype>shot</subtype><player1>30893</player1><sortorder>1</sortorder><team>10260</team><id>466901</id><n>190</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>406</event_incident_typefk><elapsed>23</elapsed><player2>23022</player2><subtype>header</subtype><player1>26143</player1><sortorder>0</sortorder><team>8667</team><id>467171</id><n>205</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>393</event_incident_typefk><elapsed>29</elapsed><player2>27430</player2><subtype>shot</subtype><player1>34944</player1><sortorder>1</sortorder><team>10260</team><id>467264</id><n>211</n><type>goal</type><goal_type>n</goal_type></value><value><comment>dg</comment><event_incident_typefk>298</event_incident_typefk><elapsed>40</elapsed><subtype>shot</subtype><player1>30829</player1><sortorder>1</sortorder><team>10260</team><id>467429</id><n>66</n><type>goal</type><goal_type>dg</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>406</event_incident_typefk><elapsed>44</elapsed><player2>40945</player2><subtype>header</subtype><player1>30893</player1><sortorder>0</sortorder><team>10260</team><id>467495</id><n>227</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>393</event_incident_typefk><elapsed>57</elapsed><player2>30829</player2><subtype>shot</subtype><player1>30865</player1><sortorder>4</sortorder><team>10260</team><id>467857</id><n>242</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>80</event_incident_typefk><elapsed>69</elapsed><subtype>shot</subtype><player1>32577</player1><sortorder>2</sortorder><team>8667</team><id>468051</id><n>250</n><type>goal</type><goal_type>n</goal_type></value><value><comment>p</comment><stats><penalties>1</penalties></stats><event_incident_typefk>20</event_incident_typefk><elapsed>82</elapsed><player1>39073</player1><sortorder>0</sortorder><team>8667</team><id>468239</id><n>267</n><type>goal</type><goal_type>p</goal_type></value></goal>

<goal><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>393</event_incident_typefk><elapsed>3</elapsed><player2>27430</player2><subtype>shot</subtype><player1>30893</player1><sortorder>1</sortorder><team>10260</team><id>466901</id><n>190</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>406</event_incident_typefk><elapsed>23</elapsed><player2>23022</player2><subtype>header</subtype><player1>26143</player1><sortorder>0</sortorder><team>8667</team><id>467171</id><n>205</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>393</event_incident_typefk><elapsed>29</elapsed><player2>27430</player2><subtype>shot</subtype><player1>34944</player1><sortorder>1</sortorder><team>10260</team><id>467264</id><n>211</n><type>goal</type><goal_type>n</goal_type></value><value><comment>dg</comment><event_incident_typefk>298</event_incident_typefk><elapsed>40</elapsed><subtype>shot</subtype><player1>30829</player1><sortorder>1</sortorder><team>10260</team><id>467429</id><n>66</n><type>goal</type><goal_type>dg</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>406</event_incident_typefk><elapsed>44</elapsed><player2>40945</player2><subtype>header</subtype><player1>30893</player1><sortorder>0</sortorder><team>10260</team><id>467495</id><n>227</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>393</event_incident_typefk><elapsed>57</elapsed><player2>30829</player2><subtype>shot</subtype><player1>30865</player1><sortorder>4</sortorder><team>10260</team><id>467857</id><n>242</n><type>goal</type><goal_type>n</goal_type></value><value><comment>n</comment><stats><goals>1</goals><shoton>1</shoton></stats><event_incident_typefk>80</event_incident_typefk><elapsed>69</elapsed><subtype>shot</subtype><player1>32577</player1><sortorder>2</sortorder><team>8667</team><id>468051</id><n>250</n><type>goal</type><goal_type>n</goal_type></value><value><comment>p</comment><stats><penalties>1</penalties></stats><event_incident_typefk>20</event_incident_typefk><elapsed>82</elapsed><player1>39073</player1><sortorder>0</sortorder><team>8667</team><id>468239</id><n>267</n><type>goal</type><goal_type>p</goal_type></value></goal>

Native Strings





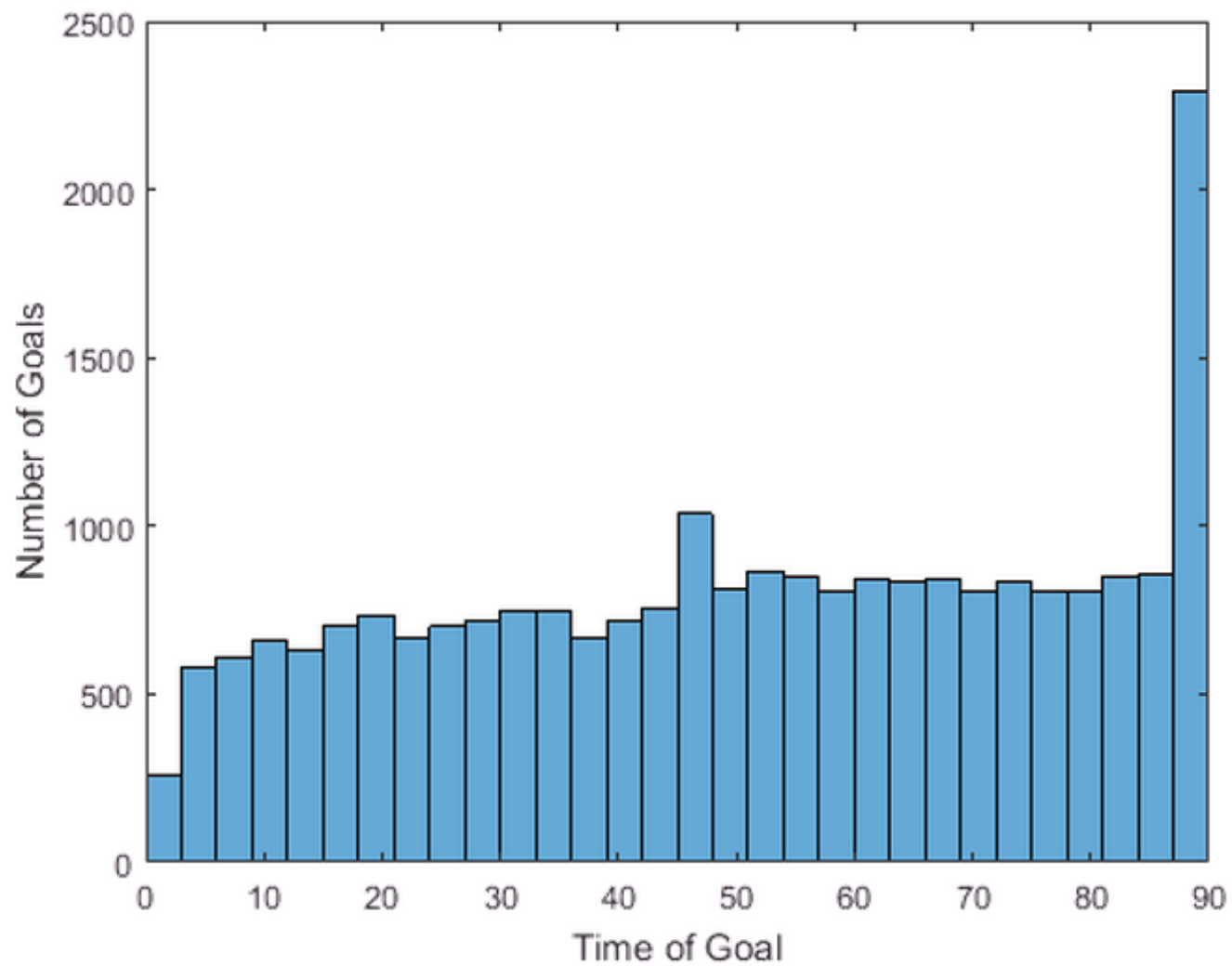
The image shows a MATLAB Command Window with a light blue header bar containing the text "Command Window" and standard window control icons (minimize, maximize, close). The main area is white and contains the command `>> s = string(t.GoalEventStr(4))` at the top. A vertical cursor is positioned to the right of the closing parenthesis. A small circular icon with a downward arrow is in the top right corner of the window area. A grey horizontal bar is visible at the bottom of the window.

Native Strings vs. Regular Expressions

```
tk = regexp(s, '<elapsed>(.*?)</elapsed>', 'tokens');  
g = zeros(size(tk))  
for i = 1:length(tk)  
    g(i) = str2num(tk{i}{1})  
end
```

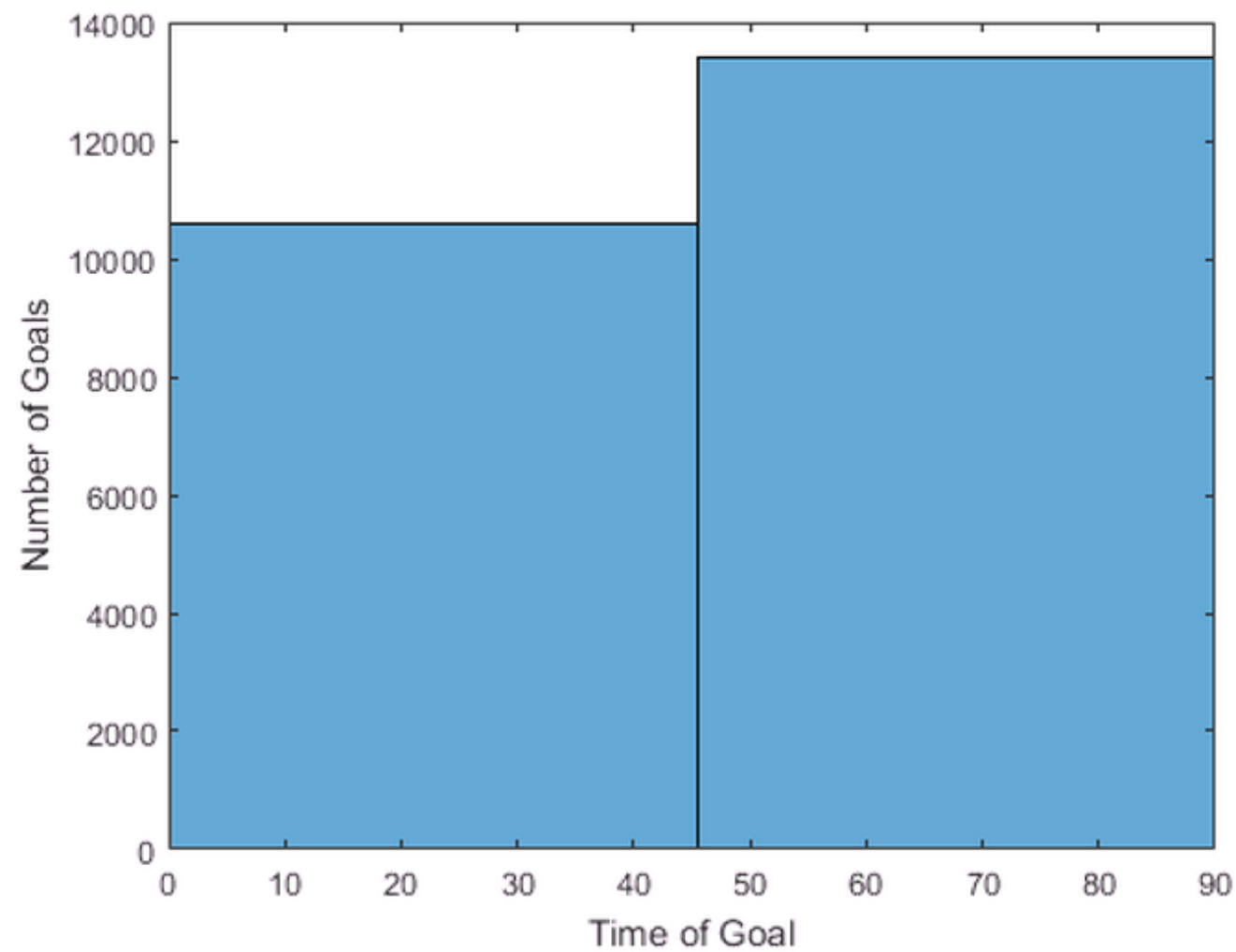
```
s = string(s);  
g = s.extractBetween('<elapsed>', '</elapsed>').double
```

```
histogram([t.GoalTime{:}])  
xlabel('Time of Goal')  
ylabel('Number of Goals')
```



First Half vs. Second Half Goals

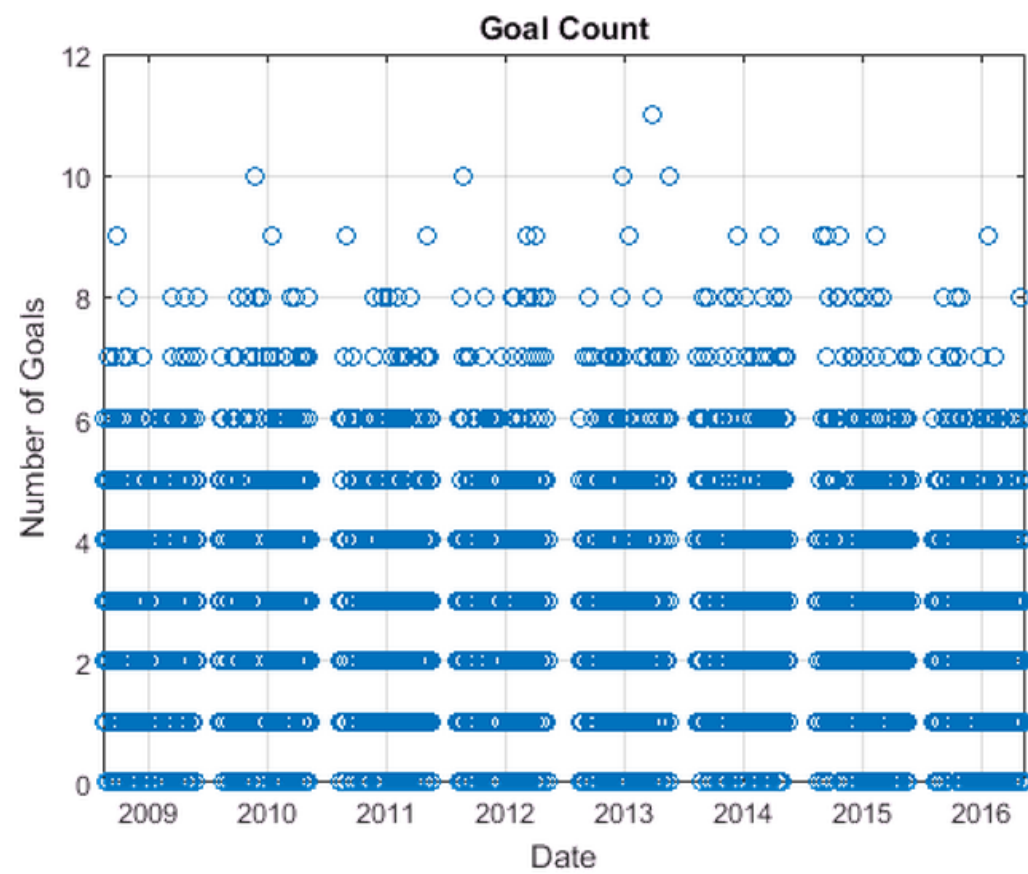
```
histogram([t.GoalTime{:}], [0 45.5 90])  
xlabel('Time of Goal')  
ylabel('Number of Goals')
```



Time Table

```
t.Date = datetime(t.Date);  
tt = table2timetable(t);  
tt = sortrows(tt, 'Date');
```

```
allGoals = tt.HomeScore + tt.AwayScore;  
plot(tt.Date, allGoals, 'o')  
grid  
title('Goal Count')  
xlabel('Date')  
ylabel('Number of Goals')
```



Moving Average

```
xf = filter(ones(1,7)/7, 1, x);
```

```
xf = movmean(x, 7);
```

Moving Average

```
s = timerange('01-Aug-2008', '01-Jun-2009');
allGoals = tt.HomeScore(s) + tt.AwayScore(s);

n = 60;
movGoals = movmean(allGoals,n);
plot(tt.Date(s),movGoals,'o')

ylim([1.5 4])
grid
title(sprintf('Moving Average (2008-2009) n=%d',n))
xlabel('Date')
ylabel('Number of Goals')
```

Moving Average

```
s = timerange('01-Aug-2008', '01-Jun-2009');  
allGoals = tt.HomeScore(s) + tt.AwayScore(s);
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n = 60;  
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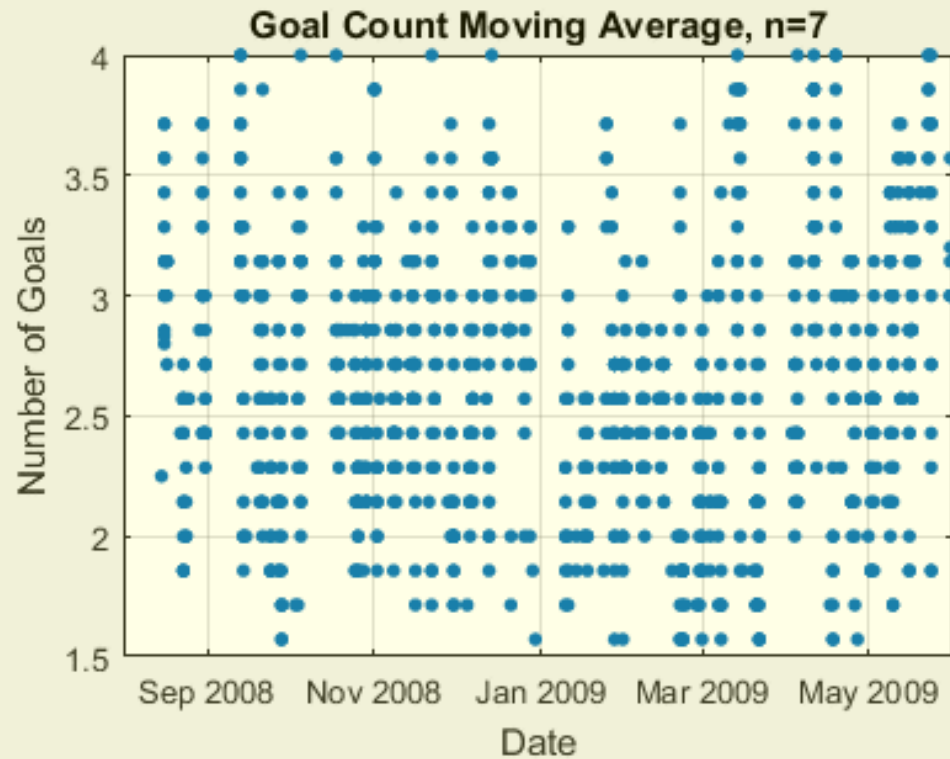
```
ylim([1.5 4])  
grid  
title(sprintf('Moving Average (2008-2009) n=%d',n))  
xlabel('Date')  
ylabel('Number of Goals')
```

Moving Average

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s = timerange('01-Aug-2008', '01-Jun-2009');  
allGoals = tt.HomeScore(s) + tt.AwayScore(s);
```

```
n = 60;  
movGoals = movmean(allGoals,n);  
plot(tt.Date(s),movGoals,'o')
```

```
ylim([1.5 4])  
grid  
title(s)  
xlabel('Date')  
ylabel('Number of Goals')
```



Moving Statistics

movmean

movsum

movmedian

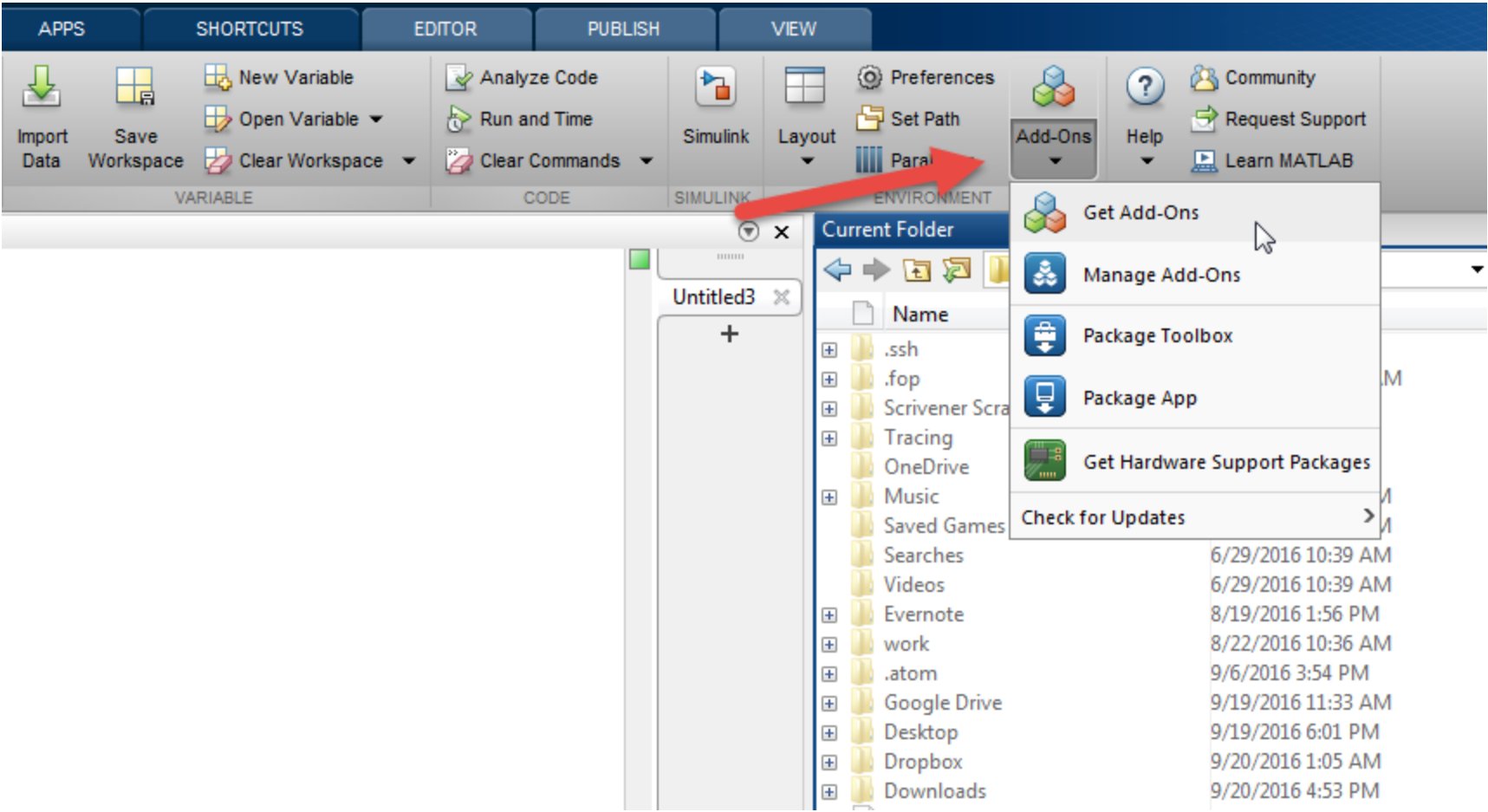
movmax

movmin

movvar

movstd

MATLAB Add-Ons





Refine by Source

- MathWorks 3
- Community 24

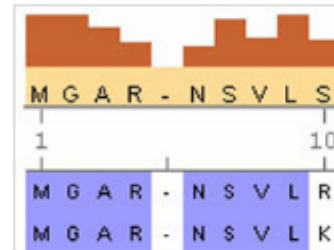
Refine by Type

- Toolboxes and Products 2
- Apps 1
- Functions 25

Refine by Product Family

- MATLAB 14

27 RESULTS



Bioinformatics Toolbox R2017a by MathWorks



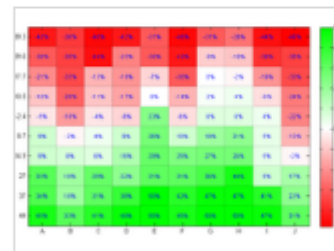
Read, analyze, and visualize genomic and proteomic data

sequence browsers, spatial **heatmaps**, and clustergrams. The toolbox also provides statistical techniques for detecting peaks, imputing values for missing data, and selecting features. You can combine toolbox

fx **HeatMap** - Display heat map of matrix data and create **HeatMap** object

fx **HeatMap object** - Object containing matrix and heat map display properties

MathWorks Toolbox



Customizable Heat Maps version 1.5 by Ameya Deoras



172 Downloads

Updated 3 Oct 2014

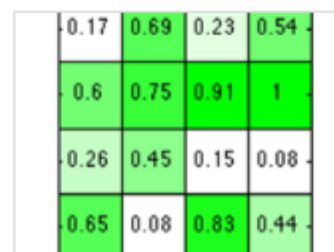
Visualize data as a **heatmap** with many customizable options.

***** Updated for 2014b ***** **HEATMAP** displays a matrix as an image whose color intensities reflect the magnitude of its values. In addition, it enables you to specify the following

Heatmap Examples - This scripts demonstrates the capabilities of the **heatmap** vis...

fx **heatmap(mat, xlab, ylab, textmat, varargin)** - **HEATMAP** displays a matrix as a **heat...**

Toolbox

Visualize matrix by a **heatmap** version 1.0 by zhang

3 Downloads

Updated 13 May 2015

PCOLORMAT allows you to visualize the matrix with color gradient

Collection



Customizable Heat Maps version 1.5 by Ameya Deoras

Visualize data as a heatmap with many customizable options.

Toolbox



172 Downloads

Updated 3 Oct 2014

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Description

Functions

Examples

***** Updated for 2014b *****

HEATMAP displays a matrix as an image whose color intensities reflect the magnitude of its values. In addition, it enables you to specify the following properties:

* X- and Y-axes tick labels:

Display the row/column indices or any other numeric or text labels. X-axis tick labels can even be rotated.

* Text labels:

Overlay the heatmap image with formatted text labels. The text labels can be derived from the original numeric matrix or a different matrix or cell array for displaying another dimension of data. You can control the font size and font color of the labels. The labels update automatically with zooming, panning or resizing the figure.

* Custom color maps:

Use MATLAB's default color maps or specify your own. The function provides two additional color maps - "money" (shown in the example image) and "red" (a color map of red color intensities). Specify Linear or Logarithmic color maps and the number of color levels. You can even use different color maps for different heat maps within a figure.

* Other configurable parameters such as grid lines, color bars.

For detailed examples, see the associated document `heatmap_examples.m`

NOTE: If using rotated tick labels, HEATMAP will resize the axes to make room for the tick labels. When overwriting existing heatmap plots with a new heatmap, use CLF to first clear the figure. See `heatmap_examples` for an illustration.

File Exchange



Customizable Heat Maps

by [Ameya Deoras](#)
24 May 2009 (Updated 01 Sep 2016)

Visualize data as a heatmap with many customizable options.

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4.9 | 33 ratings
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File Size: 1.17 MB

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Version: 1.5.0.1

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Requires R2014b or newer

[Download Zip](#)

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[» Watch video](#)

File Information

Description ***** Updated for 2014b *****
HEATMAP displays a matrix as an image whose color intensities reflect the magnitude of its values. In addition, it enables you to specify the following properties:

- * X- and Y-axis tick labels:
Display the row/column indices or any other numeric or text labels. X-axis tick labels can even be rotated.
- * Text labels:
Overlay the heatmap image with formatted text labels. The text labels can be derived from the original numeric matrix or a different matrix or cell array for displaying another dimension of data. You can control the font size and font color of the labels. The labels update automatically with zooming, panning or resizing the figure.
- * Custom color maps:
Use MATLAB's default color maps or specify your own. The function provides two additional color maps - "money" (shown in the example image) and "red" (a color map of red color intensities). Specify Linear or Logarithmic color maps and the number of color levels. You can even use different color maps for different heat maps within a figure.

* Other configurable parameters such as grid lines, color bars.

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Acknowledgements This file inspired [An Introduction To Dataset Arrays](#), [Credit Risk Modeling With Matlab](#), [Natural Gas Storage Valuation](#), [Steamgraph](#), and [Scattertext](#).

Highlights from Customizable Heat Maps

[Heatmap Examples](#)
 `heatmap(mat, xlab, ylab, ...)`
HEATMAP displays a matrix as a heatmap image

[» View all files](#)



Scoring Heat Map

What are the most common goal scoring scenarios?

```
labels = string(0:5);  
heatmap(a(1:6,1:6),labels,labels,'%3d');  
  
xlabel('Away Team Goals')  
ylabel('Home Team Goals')  
set(gca,'XAxisLocation','top')  
axis square  
colorbar
```



Save as PDF

Football Analysis

Including games from English, German, and Italian leagues.

```
db = sqlite3.connect('eg11a.db')
query = """SELECT date,time,team_goal,away_team_goal,goal FROM match WHERE league_id=1"""
goals = fetchall(db,query)
t = pd.DataFrame(goals, columns=['date', 'time', 'home_score', 'away_score', 'goal_time'])
t[0:3,:]
```

date	home_score	away_score
'2008-08-17 00:00:00'	1	1
'2008-08-16 00:00:00'	1	0
'2008-08-16 00:00:00'	0	1

Who scored the most?

```
sum(t.home_score)
ans = 13164

sum(t.away_score)
ans = 9273

t.goal_time[4]
ans =
'equal>value<command>/command><escape>equal</escape><tab></tab><escape>event_incident_t
```

Add a new GoalTime column to the table.

```
t[0,5] = 1
t.columns = t.columns + ('GoalTime',)
t = t[0:5,0:5]
```

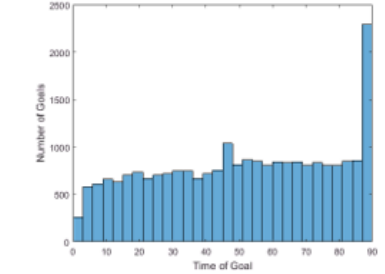
Extract the Elapsed Time Information.

```
for i in range(1, len(t)):
    str = string(t.goal_time[i])
    t.goal_time[i] = str.replace(' ','').replace(':','').replace('.', '')

t[0:3,5:]

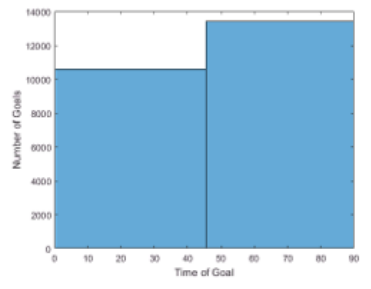
ans =
_____
date          home_score  away_score  goal_time
'2008-08-16 00:00:00'  1          0          [ 4]
'2008-08-16 00:00:00'  0          1          [33]
'2008-08-16 00:00:00'  1          0          [33]
```

```
histogram([t.goal_time[0:5]])
xlabel('Time of Goal')
ylabel('Number of Goals')
```



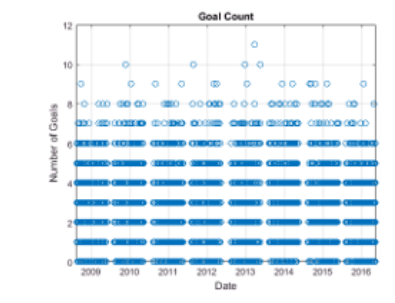
First Half vs. Second Half Goals

```
histogram([t.goal_time[0:45], t.goal_time[45:90]])
xlabel('Time of Goal')
ylabel('Number of Goals')
```



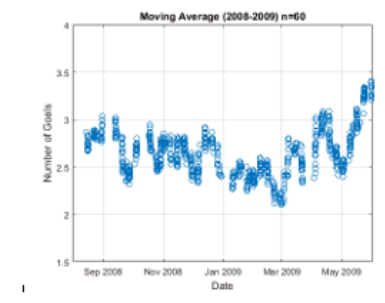
Time Table

```
t.date = datetime.strptime(t.date, '%Y-%m-%d %H:%M:%S')
tt = table(t.date, t.home_score, t.away_score)
allGoals = tt.home_score + tt.away_score
plot(tt.date, allGoals, 'o')
grid
title('Goal Count')
xlabel('date')
ylabel('number of Goals')
```



Moving Average

```
s = timearray('01-Aug-2008', '01-Jun-2009');
allGoals = tt.home_score[s] + tt.away_score[s];
n = 60;
movGoals = movmean(allGoals, n);
plot(tt.date[s], movGoals, 'o')
ylim([1.5 4])
grid
title(sprintf('Moving Average (2008-2009) n=%d', n))
xlabel('date')
ylabel('number of Goals')
```

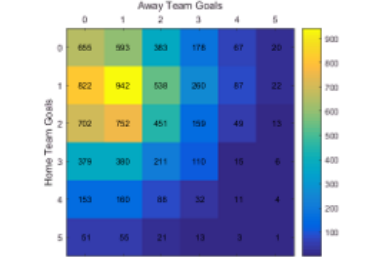


```
s = range(1); for i in range(1, len(s)):
    hgin = t.home_score[s[i]-1];
    agin = t.away_score[s[i]-1];
    a(hgin, agin) = a(hgin, agin) + 1;
end
```

Scoring Heat Map

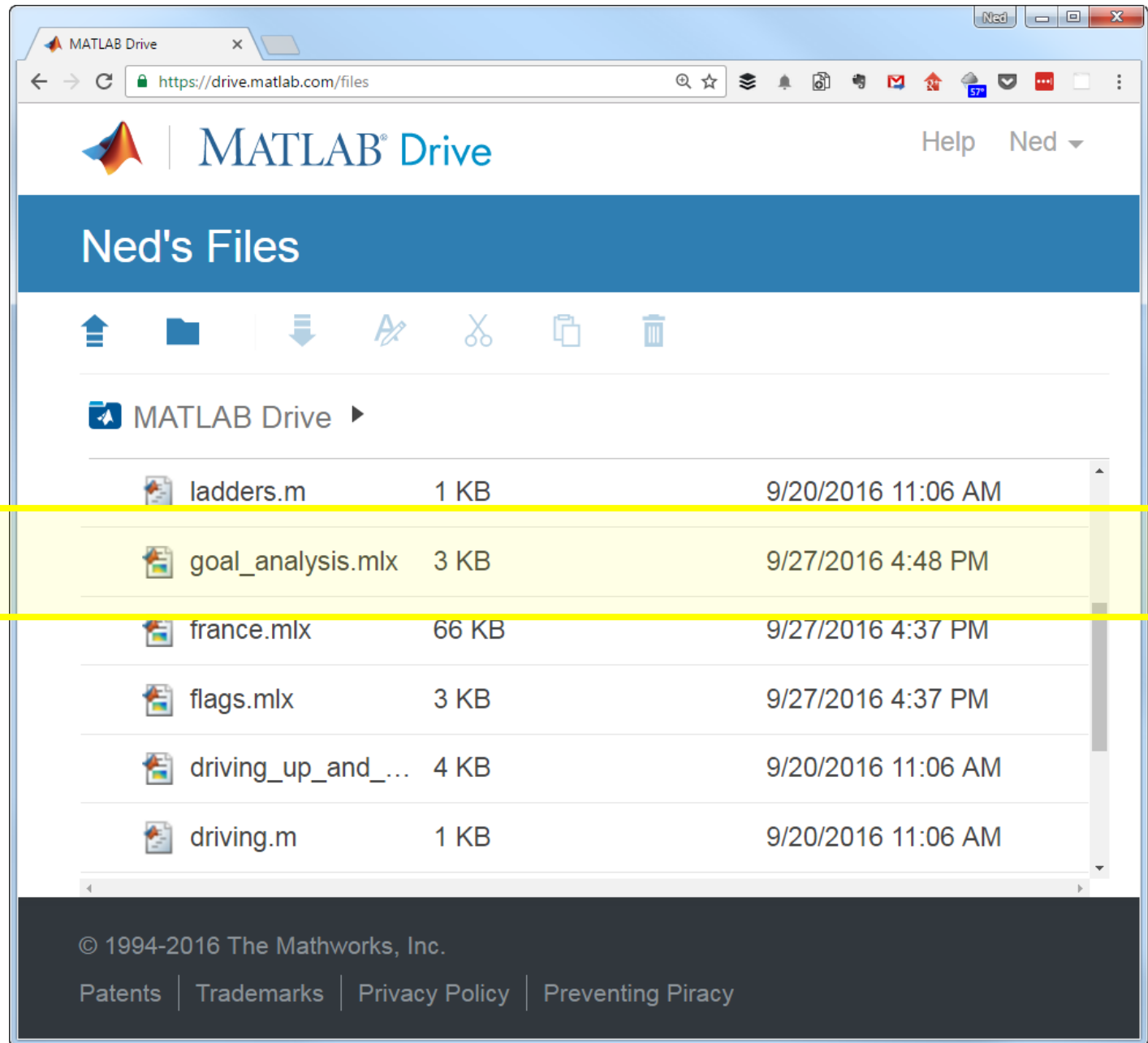
```
What are the most common goal scoring scenarios?
labels = string(0:5);
heatmap(a(1:6,1:6), labels, labels, 'hd');

xlabel('Away Team Goals')
ylabel('Home Team Goals')
set(gca, 'XAxisLocation', 'top')
axis square
colorbar
```



Note: Data comes from <https://www.kaggle.com/hugomathien/soccer>

MATLAB Drive



The screenshot shows the MATLAB Drive web interface. The browser address bar displays <https://drive.matlab.com/files>. The page title is "MATLAB Drive" and the user is logged in as "Ned". The main heading is "Ned's Files". Below the heading is a navigation bar with icons for home, folder, download, edit, delete, copy, and trash. A "MATLAB Drive" folder is expanded, showing a list of files:

File Name	Size	Modified
ladders.m	1 KB	9/20/2016 11:06 AM
goal_analysis.mlx	3 KB	9/27/2016 4:48 PM
france.mlx	66 KB	9/27/2016 4:37 PM
flags.mlx	3 KB	9/27/2016 4:37 PM
driving_up_and_...	4 KB	9/20/2016 11:06 AM
driving.m	1 KB	9/20/2016 11:06 AM

The file "goal_analysis.mlx" is highlighted with a yellow box. The footer contains the copyright notice "© 1994-2016 The Mathworks, Inc." and links for "Patents", "Trademarks", "Privacy Policy", and "Preventing Piracy".

MATLAB Online

The screenshot displays the MATLAB Online web interface. The browser address bar shows <https://matlab.mathworks.com>. The interface includes a top navigation bar with tabs for HOME, PLOTS, APPS, LIVE EDITOR, and VIEW. Below this is a rich toolbar with icons for file operations (New, Save, Go To, Find), text formatting (Bold, Italic, Underline, Monospace), and insertion (Equation, Hyperlink, Image). The main workspace is divided into three panes: a file browser on the left, a code editor in the center, and a command window at the bottom.

The file browser shows the current folder structure under `/users/gulley`. The file `goal_analysis.mlx` is highlighted with a yellow box. The workspace pane is currently empty.

The code editor displays the following MATLAB code for a football analysis script:

```
Football Analysis

Including games from English, German, and Italian leagues.

db = sqlite('soccer.sqlite');
query = 'SELECT date,home_team_goal,away_team_goal,goal FROM Match WHERE league_id=1729 OR
goals = fetch(db,char(query));

t = cell2table(goals, ...
    'VariableNames', ...
    {'Date','HomeScore','AwayScore','GoalEventStr'});

t(1:3,:)

Who scored the most?

sum(t.HomeScore)
sum(t.AwayScore)

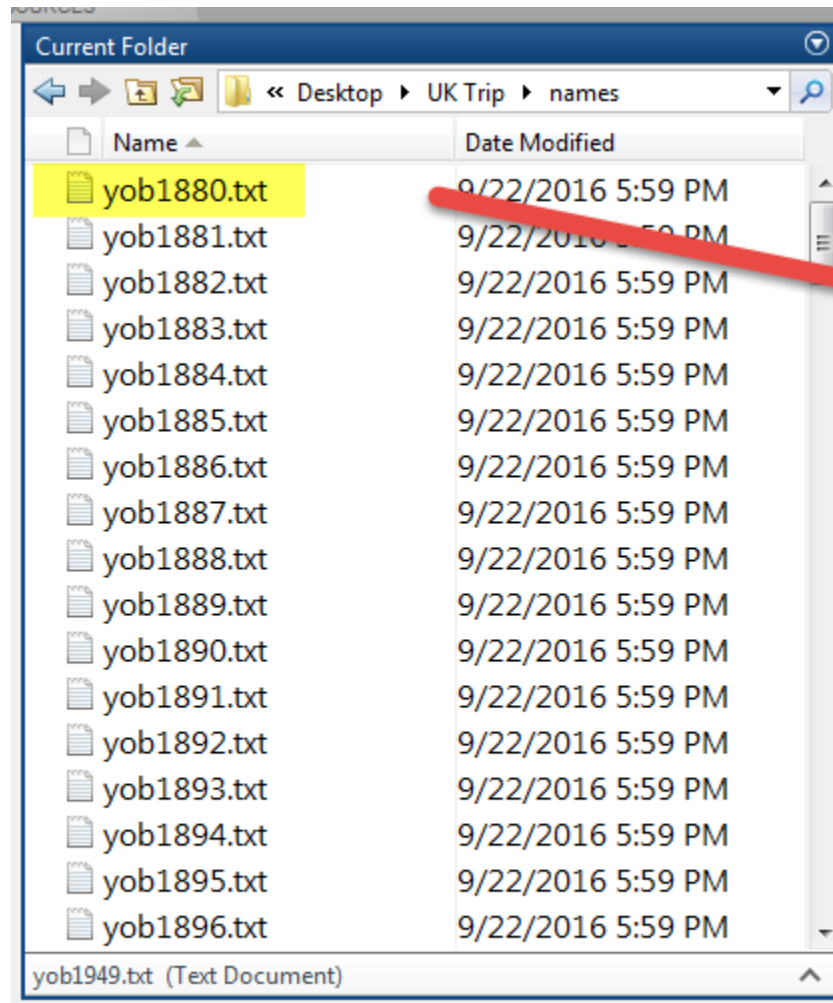
t.GoalEventStr(2)

Add a new GoalTime column to the table.

t(:,end+1) = cell(height(t),1);
t.Properties.VariableNames{end} = 'GoalTime';
t = t(:,[1 2 3 5 4]);
```

The command window at the bottom shows the prompt `>>`.

U.S. Naming Records 1880-2015



Editor - C:\Users\gulle\Desktop\UK Trip\names\yob1880.txt

- 1 Mary, F, 7065, 1880
- 2 Anna, F, 2604, 1880
- 3 Emma, F, 2003, 1880
- 4 Elizabeth, F, 1939, 1880
- 5 Minnie, F, 1746, 1880
- 6 Margaret, F, 1578, 1880
- 7 Ida, F, 1472, 1880
- 8 Alice, F, 1414, 1880
- 9 Bertha, F, 1320, 1880
- 10 Sarah, F, 1288, 1880
- 11 Annie, F, 1258, 1880
- 12 Clara, F, 1226, 1880
- 13 Ella, F, 1156, 1880
- 14 Florence, F, 1063, 1880
- 15 Cora, F, 1045, 1880
- 16 Martha, F, 1040, 1880
- 17 Laura, F, 1012, 1880
- 18 Nellie, F, 995, 1880
- 19 Grace, F, 982, 1880
- 20 Carrie, F, 949, 1880
- 21 Maude, F, 858, 1880
- 22 Mabel, F, 808, 1880
- 23 Bessie, F, 796, 1880
- 24 Jennie, F, 793, 1880

More fun with Strings...

Names Over the Years

```
filepaths = string('names/yob') + (1880:2015)' + string('.txt')
```

```
filepaths =  
"names/yob1880.txt"  
"names/yob1881.txt"  
"names/yob1882.txt"  
"names/yob1883.txt"  
"names/yob1884.txt"  
"names/yob1885.txt"  
"names/yob1886.txt"  
"names/yob1887.txt"  
"names/yob1888.txt"  
"names/yob1889.txt"  
"names/yob1890.txt"  
"names/yob1891.txt"  
"names/yob1892.txt"  
"names/yob1893.txt"  
"names/yob1894.txt"  
"names/yob1895.txt"  
"names/vob1896.txt"
```


Datastore Tall Tables

```
dat = datastore('names/yob*.txt',...  
    'ReadVariableNames',false, ...  
    'VariableNames',{'Name','Gender','Number','Year'});
```

```
tallNames = tall(dat)
```

tallNames =

M×4 tall table

<u>Name</u>	<u>Gender</u>	<u>Number</u>	<u>Year</u>
'Mary'	'F'	7065	1880
'Anna'	'F'	2604	1880
'Emma'	'F'	2003	1880
'Elizabeth'	'F'	1939	1880
'Minnie'	'F'	1746	1880
'Margaret'	'F'	1578	1880
'Ida'	'F'	1472	1880
'Alice'	'F'	1414	1880
:	:	:	:
:	:	:	:

Datastore

Tal

```
dat = datastore('names/yob*.txt',...  
    'ReadVariableNames',false, ...  
    'VariableNames',{'Name','Gender','Number','Year'})
```

Talk

Application Track 1, 11.15

Big Data

Demo

Big Data with MATLAB

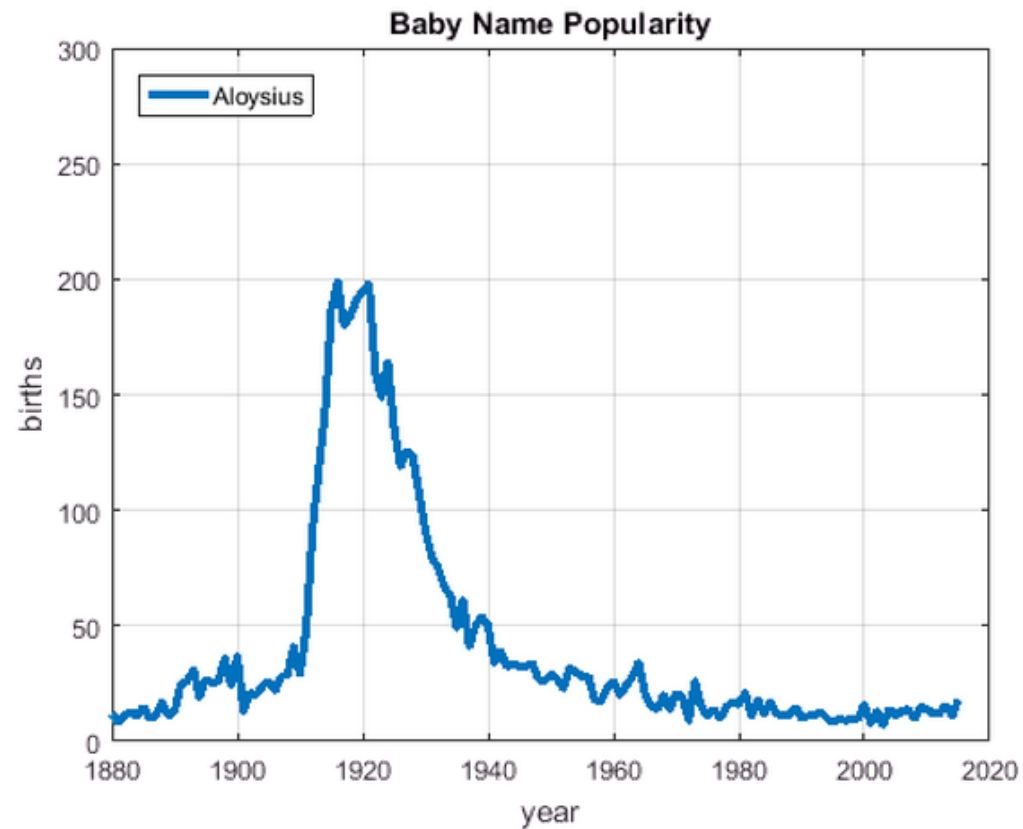
Datastore Tables

```
dat = datastore('names/yob*.txt',...  
              'ReadVariableNames',false, ...  
              'VariableNames',{'Name','Gender','Number','Year'});
```

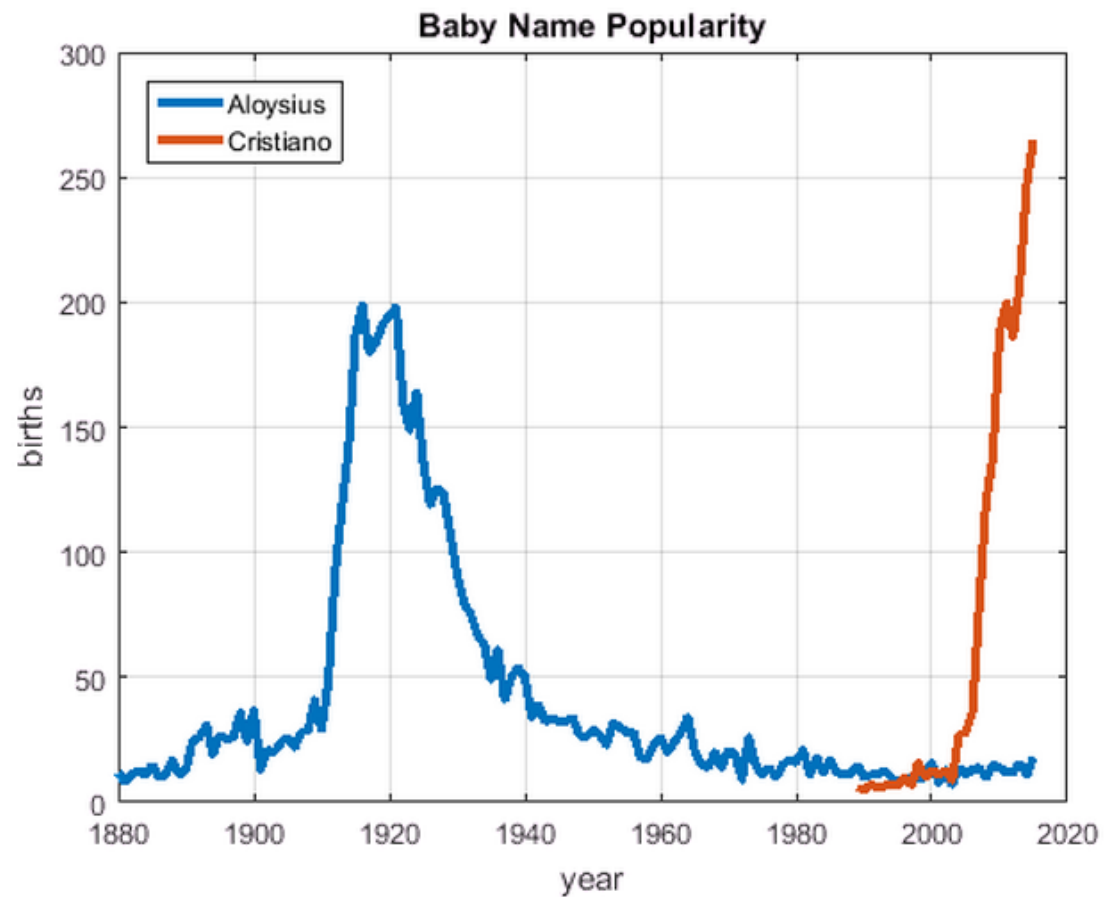
```
names = readall(dat)
```

```
names =  
      Name      Gender  Number  Year  
-----  
'Mary'      'F'      7065   1880  
'Anna'      'F'      2604   1880  
'Emma'      'F'      2003   1880  
'Elizabeth' 'F'      1939   1880  
'Minnie'    'F'      1746   1880  
'Margaret'  'F'      1578   1880  
'Ida'       'F'      1472   1880  
'Alice'     'F'      1414   1880  
'Bertha'    'F'      1320   1880  
'Sarah'     'F'      1288   1880  
'Annie'     'F'      1258   1880  
'Clara'     'F'      1226   1880  
'Ella'      'F'      1156   1880  
'Florence'  'F'      1063   1880
```

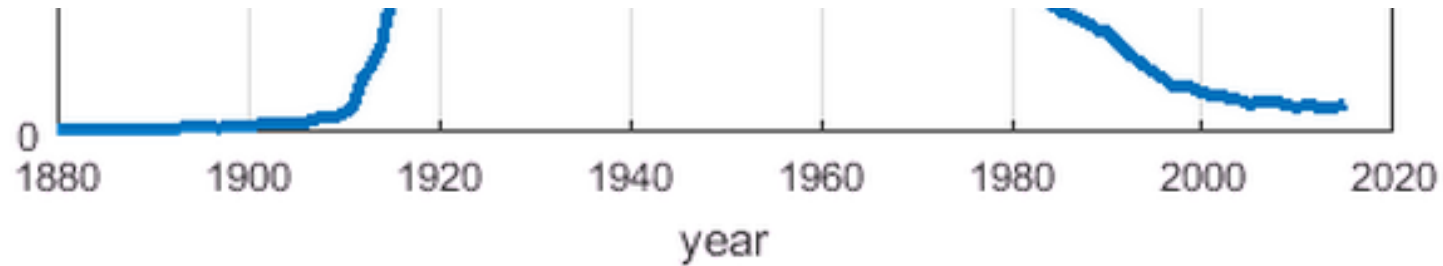
```
keep = names.Name=='Aloysius';  
plot(names.Year(keep), names.Number(keep), 'LineWidth', 3);  
  
grid  
title('Baby Name Popularity')  
legend({'Aloysius'}, 'Location', 'NorthWest')  
xlabel('year')  
ylabel('births');  
ylim([0 300])
```



```
cla
hold on
plotNames('Aloysius', names)
plotNames('Cristiano', names)
hold off
legend({'Aloysius', 'Cristiano'}, 'Location', 'northwest')
```



Functions in Scripts

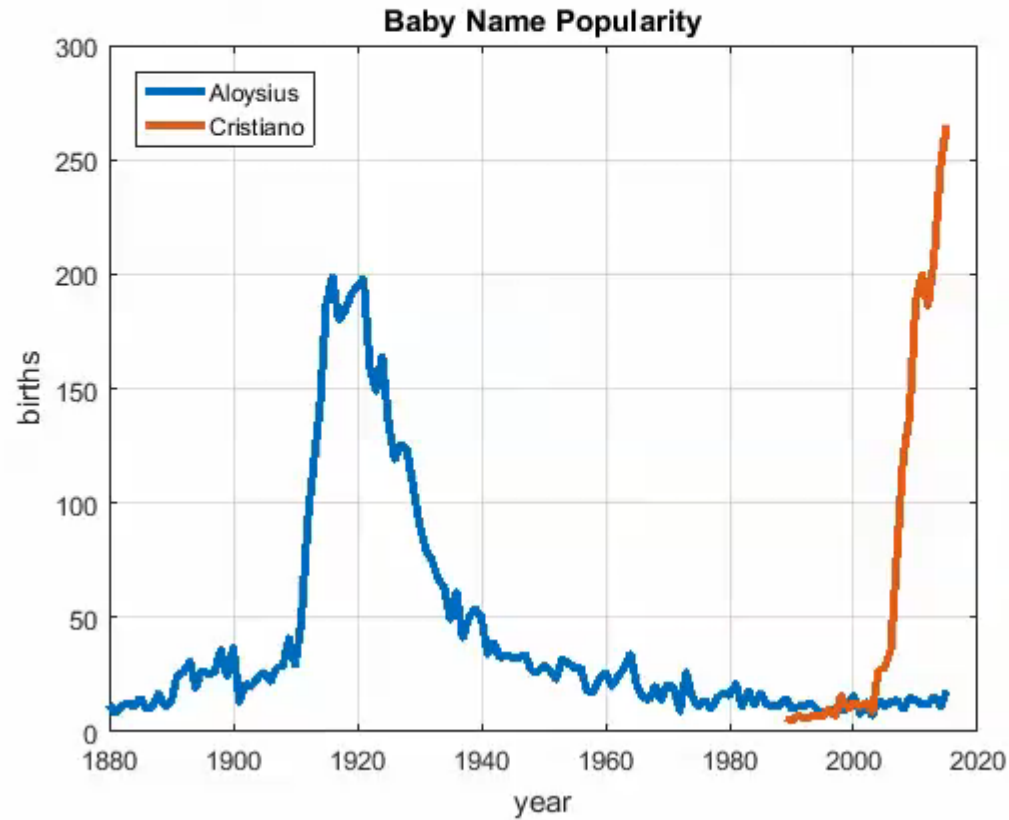


```
function plotNames(inputName, names)
    % Local function for plotting names

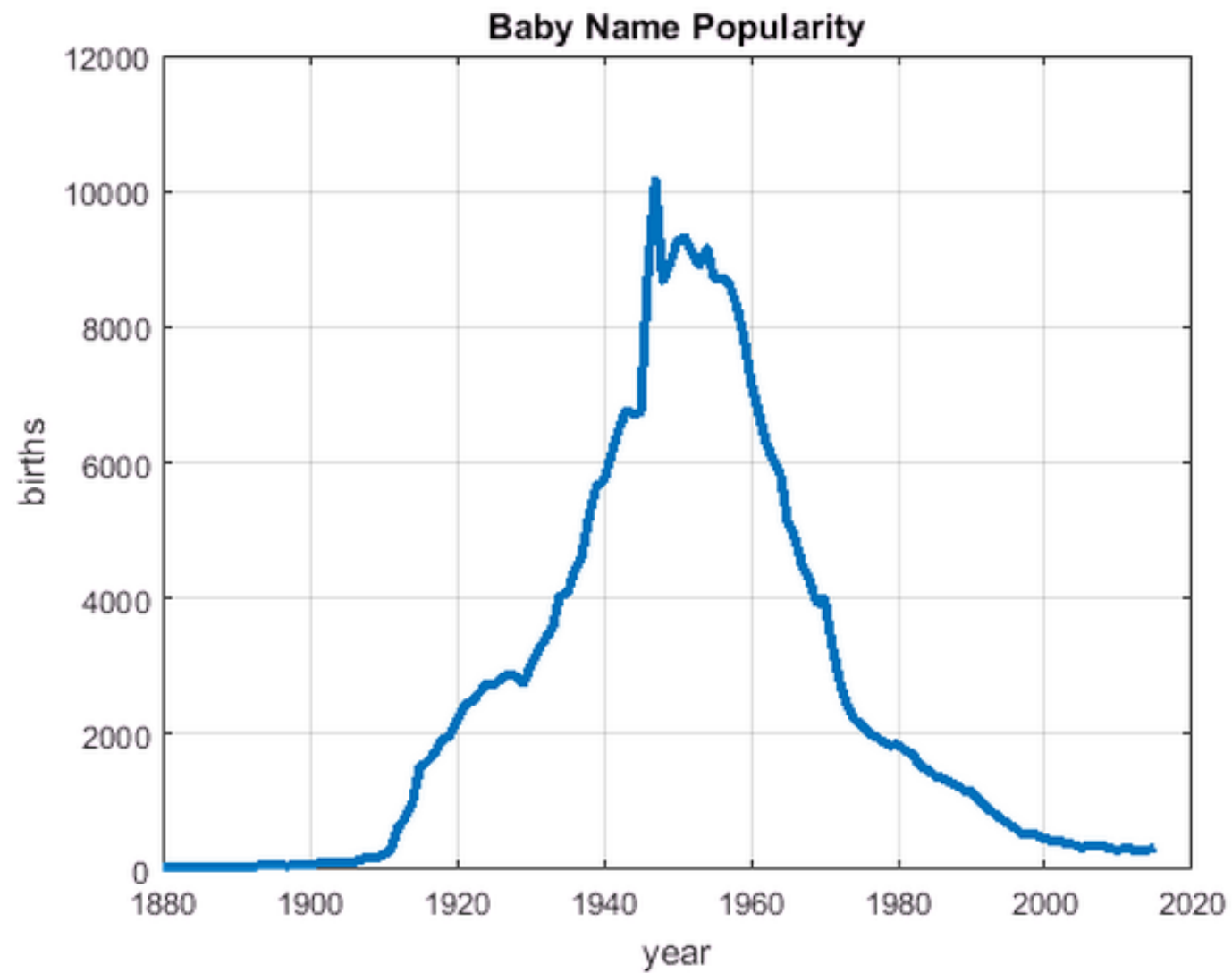
    keep = (names.Name==inputName)&(names.Gender=='M');
    plot(names.Year(keep), names.Number(keep), 'LineWidth',3);
    grid on
    title('Baby Name Popularity')
    xlabel('year')
    ylabel('births');
end
```

Zooming in Live Script Plots

```
name = 'Cristiano';  
keep = names.Name==name;  
hold on  
plot(names.Year(keep), names.Number(keep), 'LineWidth', 3);  
legend({'Aloysius', 'Cristiano'}, 'Location', 'NorthWest')  
hold off
```



```
plotNames('Wayne', names)
```



Can you predict a child's football career based solely on their name?

Jamie

Lionel

Jos

Wayne

???

Raheem

Sham

Aloysius

Diego

Can you predict a child's football career

Talk

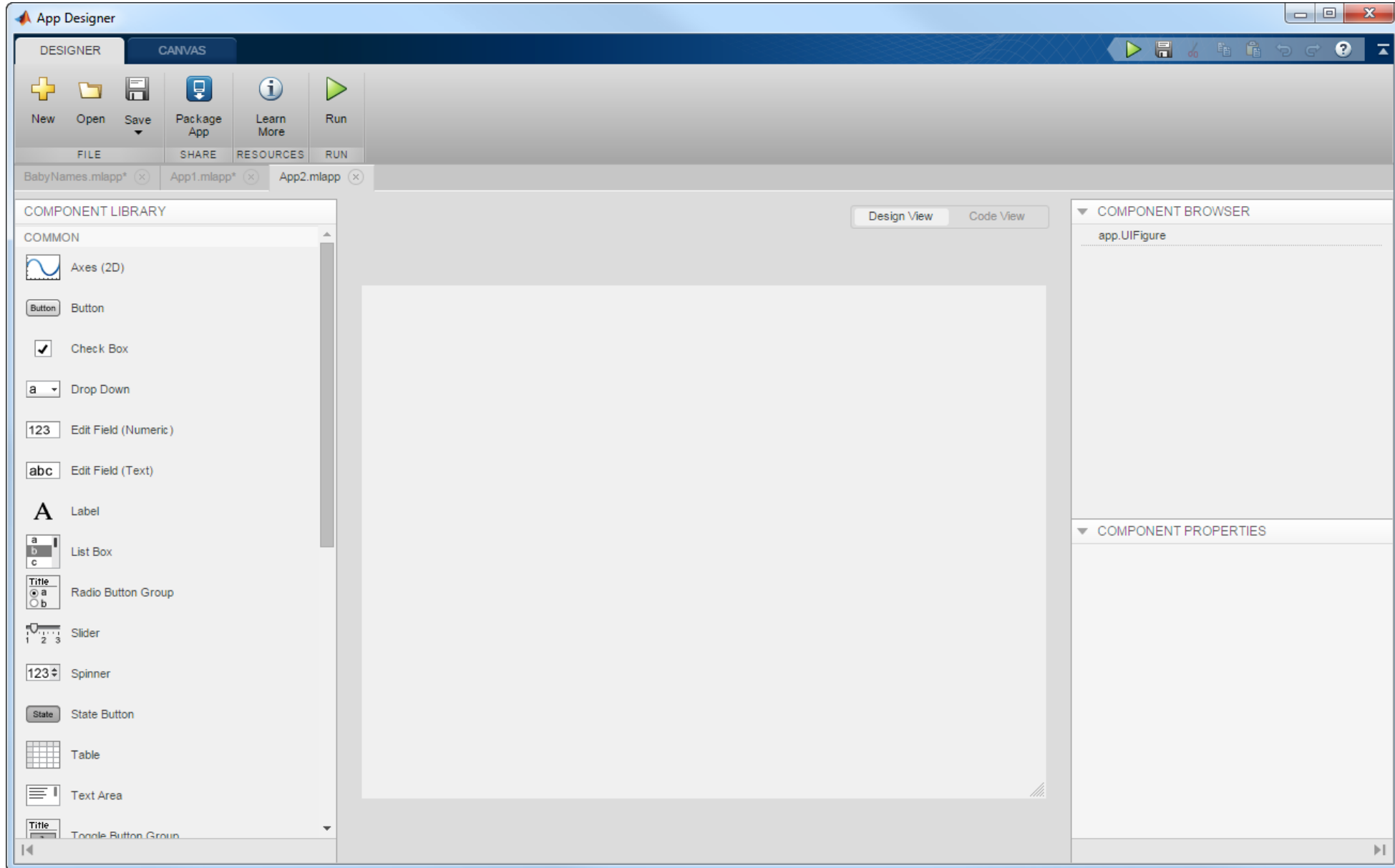
Application Track 1, 12.15

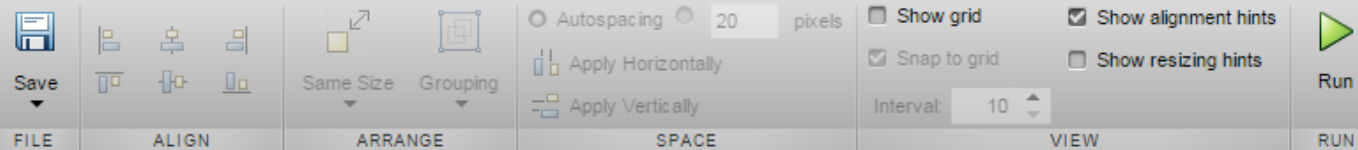
Machine Learning and Deep Learning

Demo

Machine Learning with MATLAB

App Designer



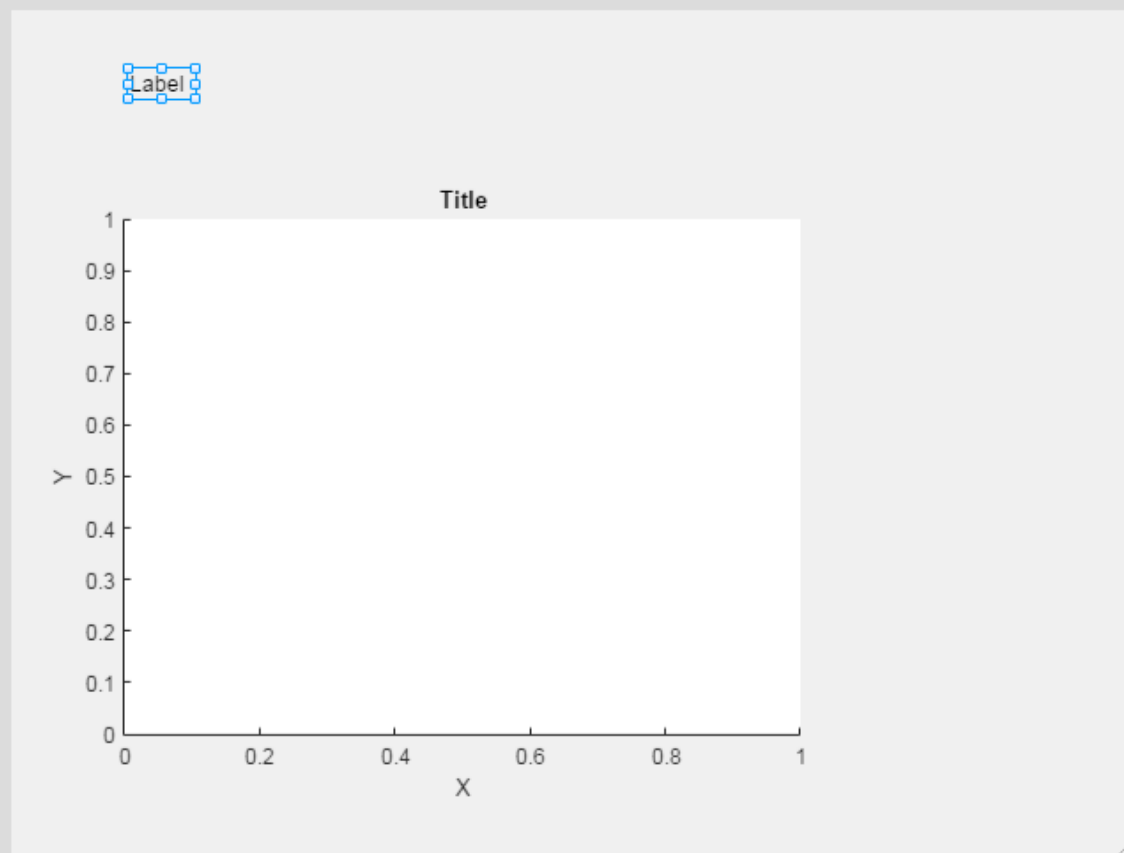


BabyNames.mlapp* x App1.mlapp* x

COMPONENT LIBRARY

COMMON

- Axes (2D)
- Button
- Check Box
- Drop Down
- Edit Field (Numeric)
- Edit Field (Text)
- Label
- List Box
- Radio Button Group
- Slider
- Spinner
- State Button
- Table
- Text Area
- Toggle Button Group



COMPONENT BROWSER

- app.UIFigure
 - app.UIAxes
 - app.Label

LABEL PROPERTIES

Configuration | Callbacks

TEXT

Text: Label

Alignment: Left, Center, Right

Text Alignment: Left, Center, Right

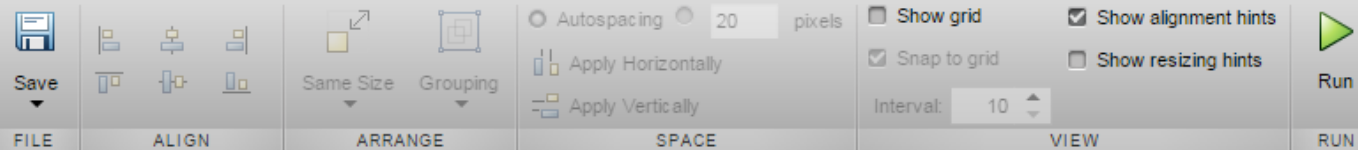
FONT

Name: Helvetica

Size: 12

Style: **B** *I*

Color: Black

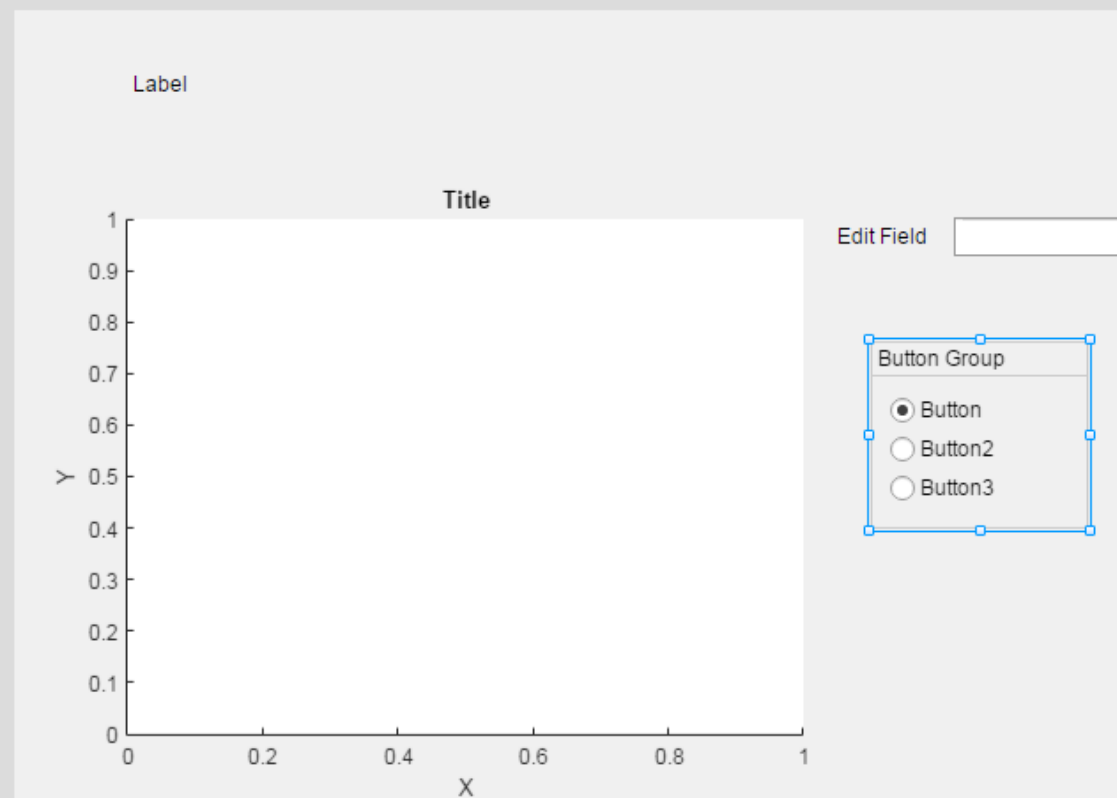


BabyNames.mlapp* App1.mlapp*

COMPONENT LIBRARY

COMMON

- Axes (2D)
- Button
- Check Box
- Drop Down
- Edit Field (Numeric)
- Edit Field (Text)
- Label
- List Box
- Radio Button Group
- Slider
- Spinner
- State Button
- Table
- Text Area
- Toggle Button Group



Design View Code View

COMPONENT BROWSER

- app.UIFigure
 - app.UIAxes
 - app.Label
 - app.EditField
 - app.ButtonGroup
 - app.Button
 - app.Button2
 - app.Button3

BUTTON GROUP PROPERTIES

Configuration | Callbacks

Title Button Group

 Show Border

BUTTONS

Selected	Text
<input checked="" type="radio"/>	Button
<input type="radio"/>	Button2
<input type="radio"/>	Button3

Save | Same Size | Grouping | Autospacing: 20 pixels | Show grid | Show alignment hints | Run

Apply Horizontally | Snap to grid | Show resizing hints

Apply Vertically | Interval: 10

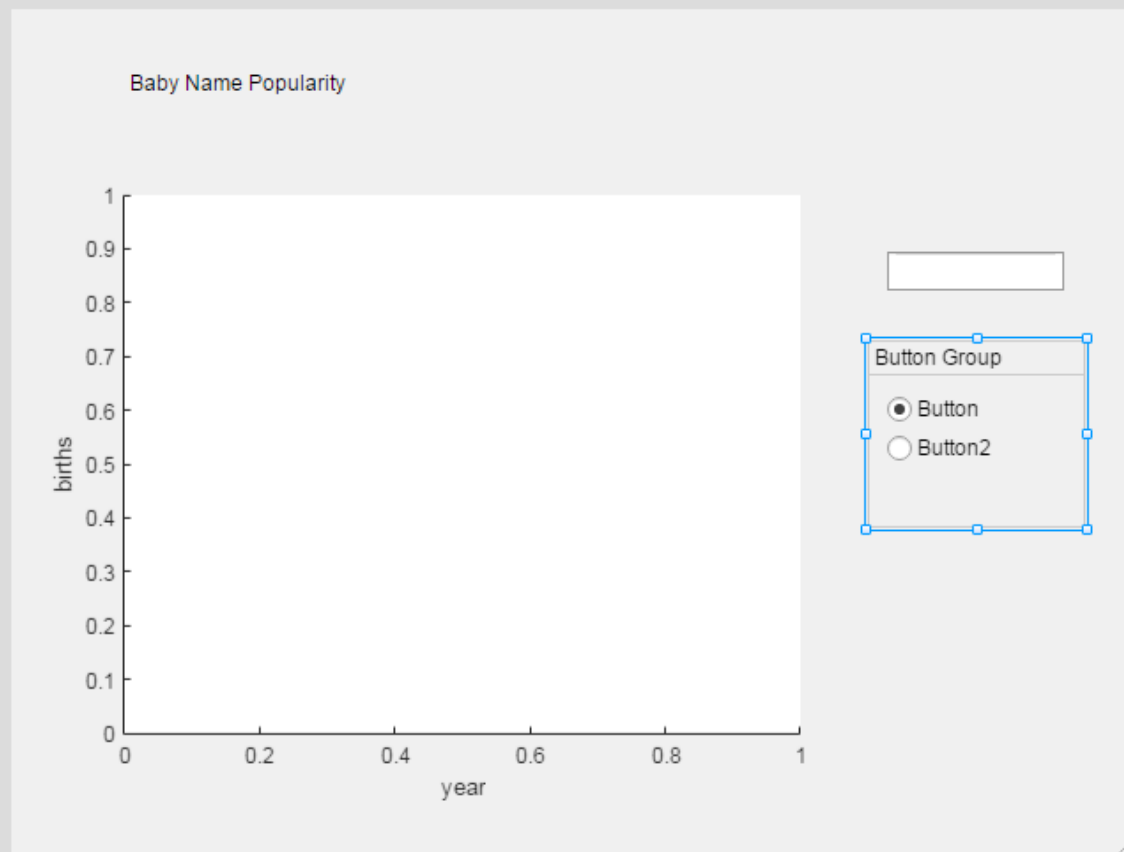
FILE | ALIGN | ARRANGE | SPACE | VIEW | RUN

BabyNames.mlapp* | App1.mlapp*

COMPONENT LIBRARY

COMMON

- Axes (2D)
- Button
- Check Box
- Drop Down
- Edit Field (Numeric)
- Edit Field (Text)
- Label
- List Box
- Radio Button Group
- Slider
- Spinner
- State Button
- Table
- Text Area
- Toggle Button Group



Design View

Code View

COMPONENT BROWSER

- app.UIFigure
 - app.UIAxes
 - app.BabyNamePopularityLabel
 - app.ButtonGroup
 - app.Button
 - app.Button2
 - app.EditField

BUTTON GROUP PROPERTIES

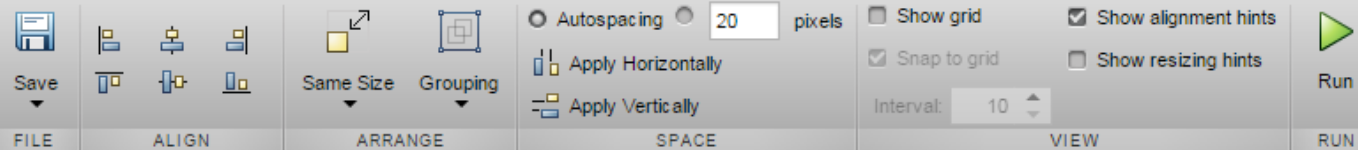
Configuration | Callbacks

Title: Button Group

 Show Border

BUTTONS

Selected	Text
<input checked="" type="radio"/>	Button
<input type="radio"/>	Button2



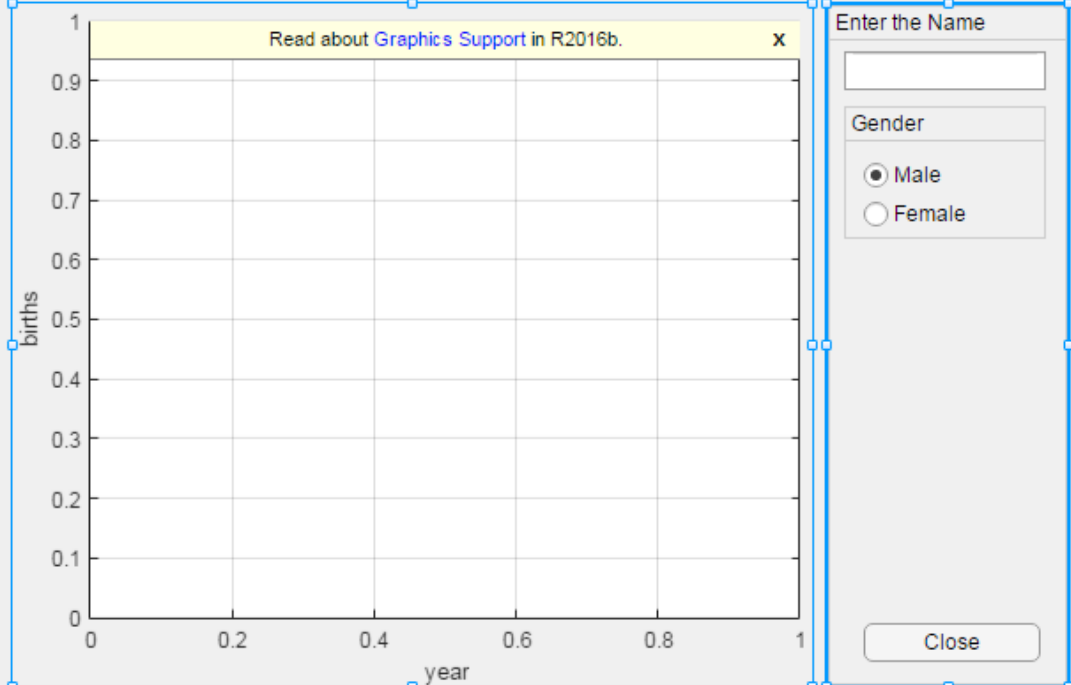
BabyNames.mlapp* App1.mlapp*

COMPONENT LIBRARY

COMMON

- Axes (2D)
- Button
- Check Box
- Drop Down
- Edit Field (Numeric)
- Edit Field (Text)
- Label
- List Box
- Radio Button Group
- Slider
- Spinner
- State Button
- Table
- Text Area
- Toggle Button Group

Baby Name Popularity



Design View

Code View

COMPONENT BROWSER

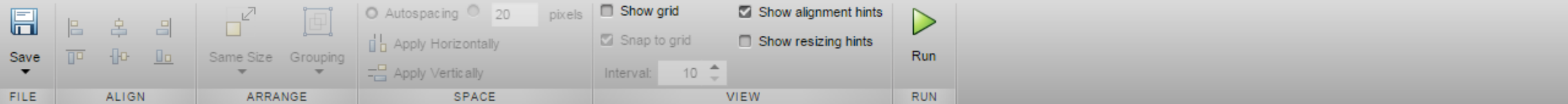
- app.UIFigure
 - app.BabyNamePopularityLabel
 - app.UIAxes
 - app.EntertheNamePanel
 - app.GenderButtonGroup
 - app.MaleButton
 - app.FemaleButton
 - app.NameEditField
 - app.CloseButton

MULTIPLE COMPONENTS PROPERTIES

Configuration | Callbacks

FONT

- Name Helvetica
- Size 12
- Style **B I**



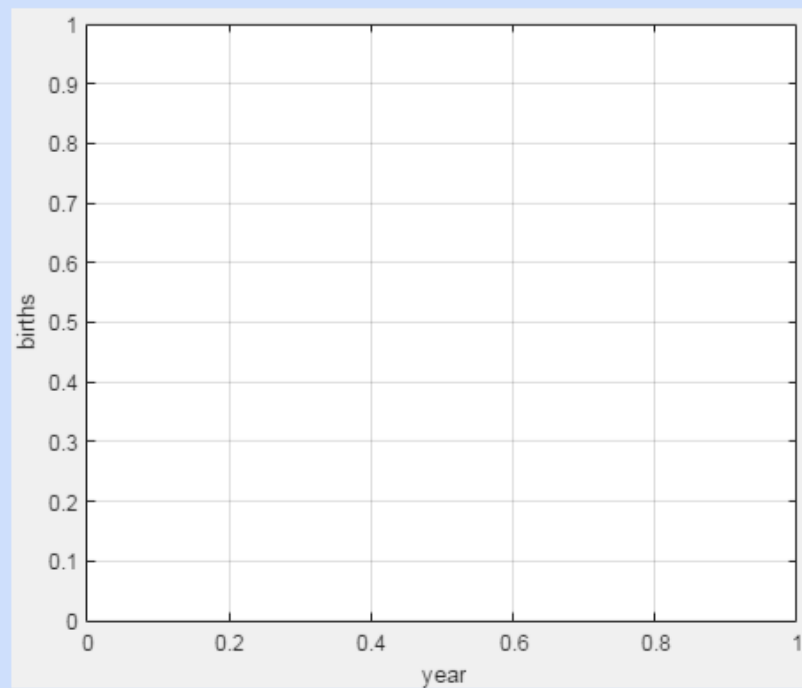
BabyNames.mlapp* × App1.mlapp* ×

COMPONENT LIBRARY

COMMON

- Axes (2D)
- Button
- Check Box
- Drop Down
- Edit Field (Numeric)
- Edit Field (Text)
- Label
- List Box
- Radio Button Group
- Slider
- Spinner
- State Button
- Table
- Text Area
- Toggle Button Group

Baby Name Popularity



Enter the Name

Gender

- Male
 Female

Close

Design View

Code View

COMPONENT BROWSER

- app.UIFigure
 - app.BabyNamePopularityLabel
 - app.UIAxes
 - app.EntertheNamePanel
 - app.GenderButtonGroup
 - app.MaleButton
 - app.FemaleButton
 - app.NameEditField
 - app.CloseButton

UI FIGURE PROPERTIES

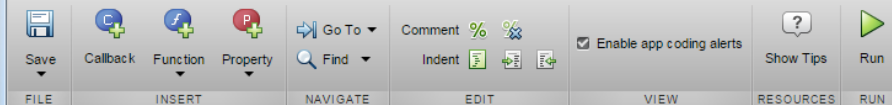
Configuration | Callbacks

APPEARANCE

Title UI Figure

Background Color





BabyNames.mlapp* (x)

CODE BROWSER

Callbacks | Functions | Properties

+ Callback

startupFcn

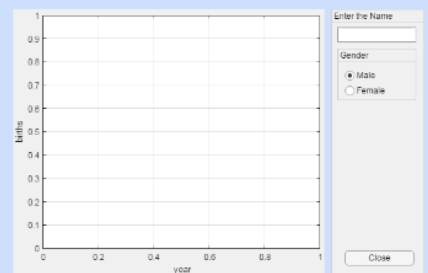
NameEditField/ValueChanged

GenderButtonGroup/SelectionChanged

CloseButton/Pushed

APP LAYOUT

Baby Name Popularity



Design View Code View

COMPONENT BROWSER

app.UIFigure

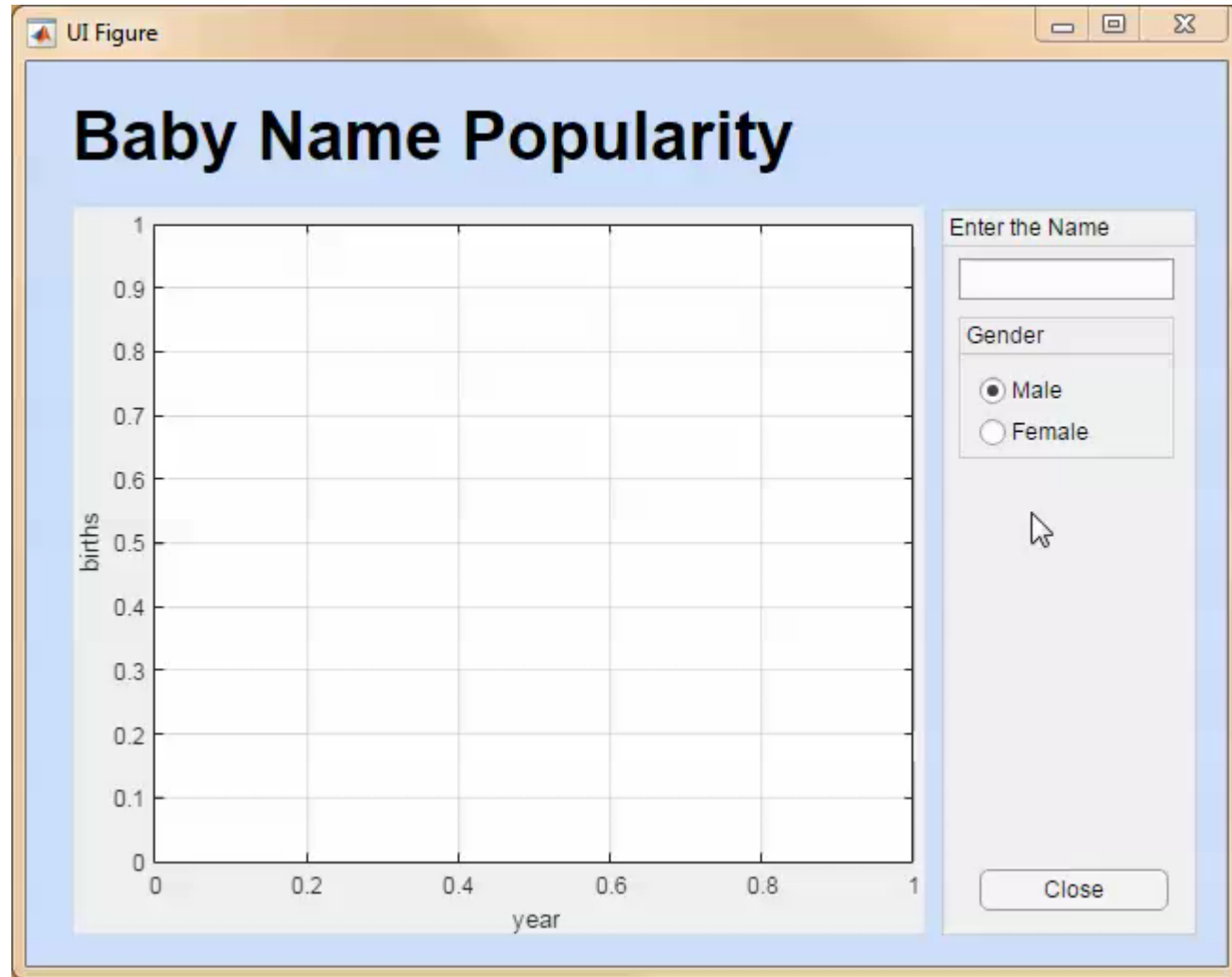
- app.BabyNamePopularityLabel
- app.UIAxes
- app.EntertheNamePanel
 - app.GenderButtonGroup
 - app.MaleButton
 - app.FemaleButton
 - app.NameEditField
 - app.CloseButton

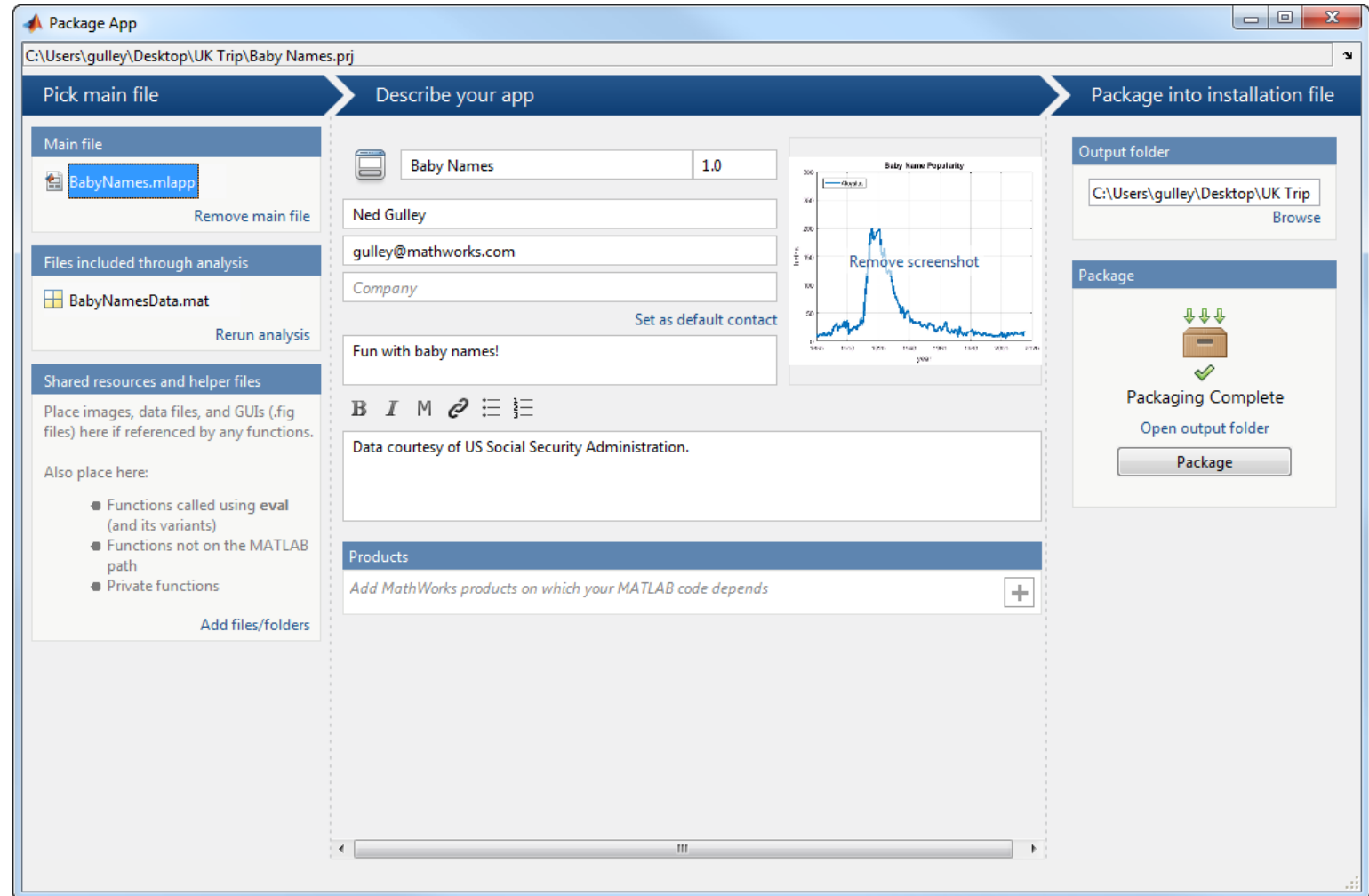
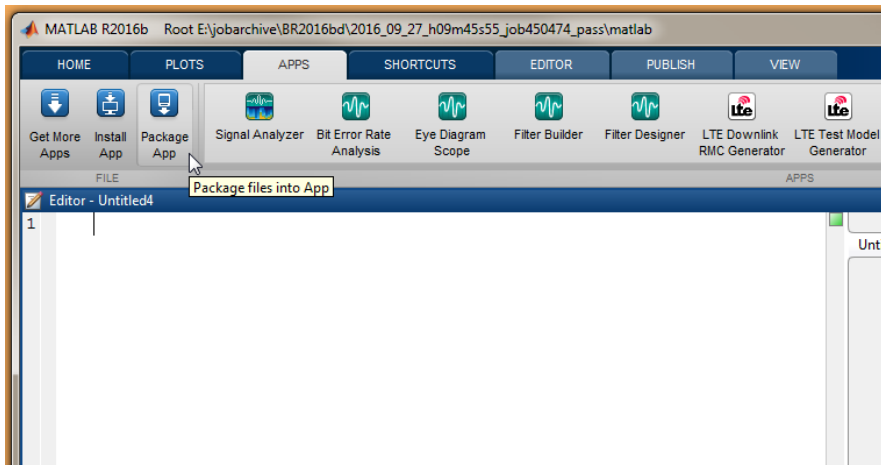
COMPONENT PROPERTIES

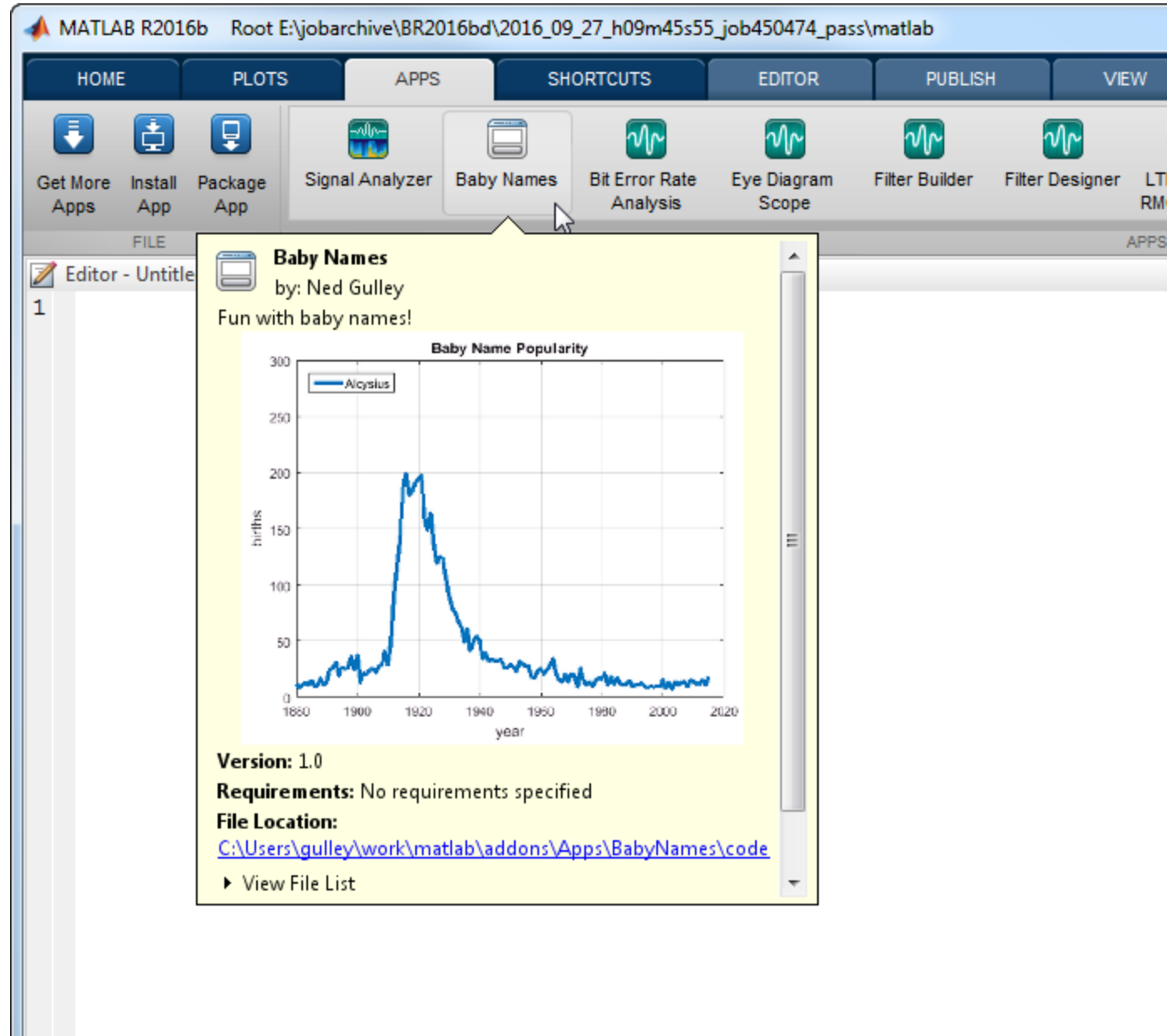
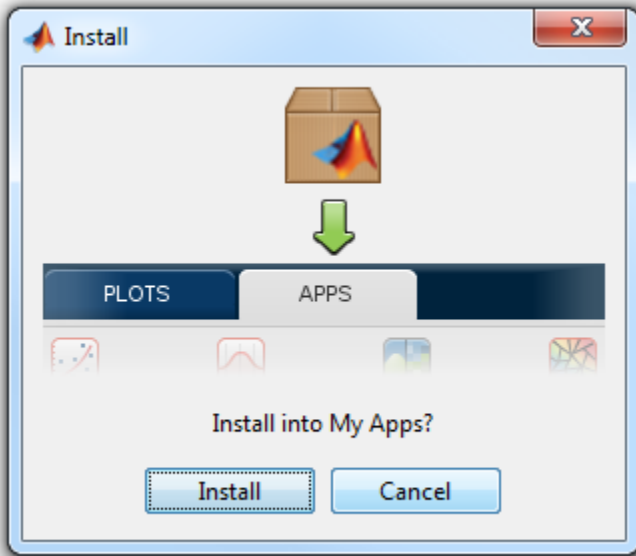
```

1  classdef BabyNames < matlab.apps.AppBase
2
3  % Properties that correspond to app components
4  properties (Access = public)
5      UIFigure          matlab.ui.Figure
6      BabyNamePopularityLabel  matlab.ui.control.Label
7      UIAxes            matlab.ui.control.UIAxes
8      EntertheNamePanel  matlab.ui.container.Panel
9      GenderButtonGroup  matlab.ui.container.ButtonGroup
10     MaleButton         matlab.ui.control.RadioButton
11     FemaleButton       matlab.ui.control.RadioButton
12     NameEditField      matlab.ui.control.EditField
13     CloseButton        matlab.ui.control.Button
14
15
16
17     allBabyNames
18
19
20
21
22     % Code that executes after component creation
23     function startupFcn(app)
24         load('BabyNamesData.mat');
25         app.allBabyNames = names;
26     end
27
28     % Value changed function: NameEditField
29     function NameEditFieldValueChanged(app, event)
30         theName = app.NameEditField.Value;
31         names = app.allBabyNames;
32
33         selectedGenderButton = app.GenderButtonGroup.SelectedObject.Text;
34         gender = selectedGenderButton(1);
35
36         keep = (names.Name==theName)&(names.Gender==gender);
37
38         plot(app.UIAxes,names.Year(keep), names.Number(keep),'LineWidth',3);
39         legend(app.UIAxes,{theName},'Location','NorthWest')
40     end
41
42     % Selection changed function: GenderButtonGroup
43     function GenderButtonGroupSelectionChanged(app, event)
44         NameEditFieldValueChanged(app)
45     end
46
47     % Button pushed function: CloseButton
48     function CloseButtonPushed(app, event)
49         close(app.UIFigure)
50     end
51
52 end

```







MATLAB R2016b interface showing the "APPS" tab selected. The "Baby Names" app is highlighted. A tooltip for the "Baby Names" app is displayed, showing a line graph of "Baby Name Popularity" (births vs. year) and details about the app.

Baby Names
by: Ned Gulley
Fun with baby names!

Baby Name Popularity

births

year

Version: 1.0
Requirements: No requirements specified
File Location: <C:\Users\gulley\work\matlab\addons\Apps\BabyNames\code>
▶ View File List

Finishing up...

- Live Editor
- Native string
- Timetable
- Moving averages
- Add-Ons
- MATLAB Drive
- MATLAB Online
- Datastore
- Functions in scripts
- App Designer

More details in...

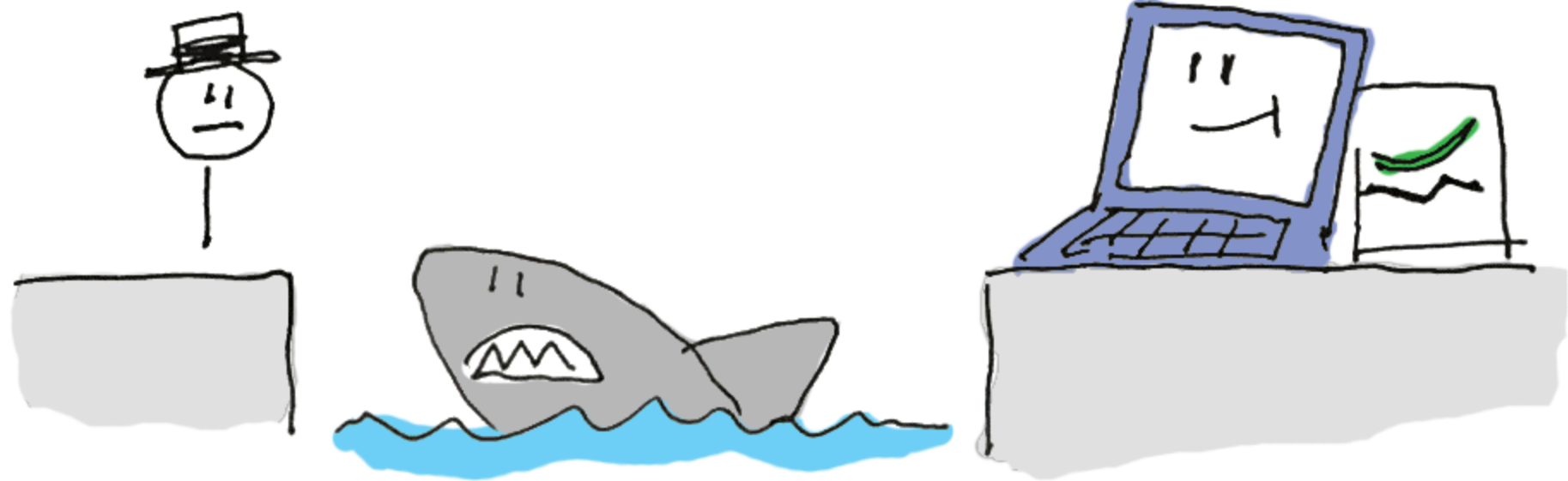
	Application Track 1	Application Track 2	Introductory Sessions	Master Classes
11:15	Big Data	What's New in Simulink Release R2016a and R2016b		
11:45	MATLAB and Advanced Analytics at Shell	Fast-Paced Development in F1 Control and Analysis Systems	Introduction to MATLAB	Signal Processing
12:15	Machine Learning and Deep Learning	New Capabilities in Testing	Introduction to Parallel Computing	Hardware-in-the-Loop: Real-Time Simulation
12:45	Lunch			
13:15	Lunchtime Talk - Science Capital			
14:00	The Adoption of MATLAB Apps and Toolboxes at Jaguar Land Rover	Physical Modelling Integration and Cosimulation in a Real-Time Environment		
14:30	Developing and Sharing MATLAB Apps and Toolboxes	Connecting to Hardware and Rapid Prototyping	Introduction to Simulink and Stateflow	Simulink for Teams: High-Productivity Workflows
15:15	Break			
15:45	MATLAB Algorithm Development and Verification for Eurofighter Typhoon Praetorian	Applying MathWorks Tools to Automotive Embedded Software Development		
16:15	Modelling and Simulating RF Sensor Systems	Verification of Automatically Generated Code	Modelling Physical Systems in Simscape	Developing Robust MATLAB Code and Apps

More details in...

	Application Track 1	Application Track 2	Introductory Sessions	Master Classes
11:15	Big Data	What's New in Simulink Release R2016a and R2016b		
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12:45	Lunch			
13:15	Lunchtime Talk - Sci...			
14:00	The Adoption of MATLAB Apps and Toolboxes at Jaguar Land Rover	Physical Modelling Integration and Cosimulation in a Real-Time Environment		
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16:15	Modelling and Simulating RF Sensor Systems	Verification of Automatically Generated Code	Modelling Physical Systems in Simscape	Developing Robust MATLAB Code and Apps











That is all.

