

# MATLAB EXPO 2018

## Introduction to MATLAB

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# Key Takeaways

MATLAB can be used at all stages of your work.

How to automate analysis.

Many resources available to help you to learn basic and advanced MATLAB concepts.



**MATLAB**  
The Language of Technical Computing

# What is MATLAB?

High-level computer language **designed to be used by scientists and engineers** within an easy-to-use interactive environment.

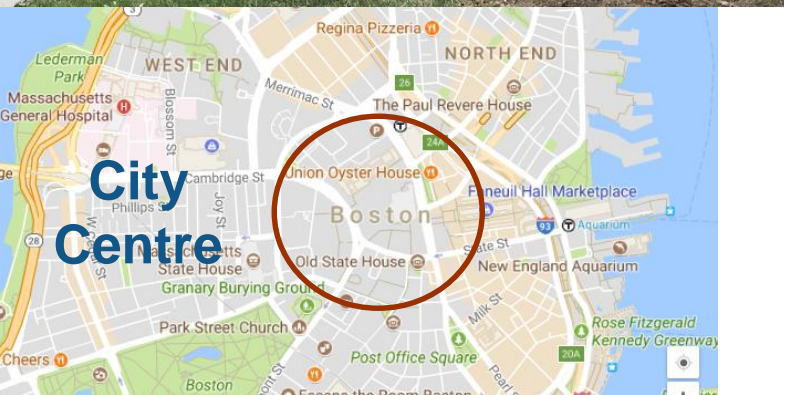
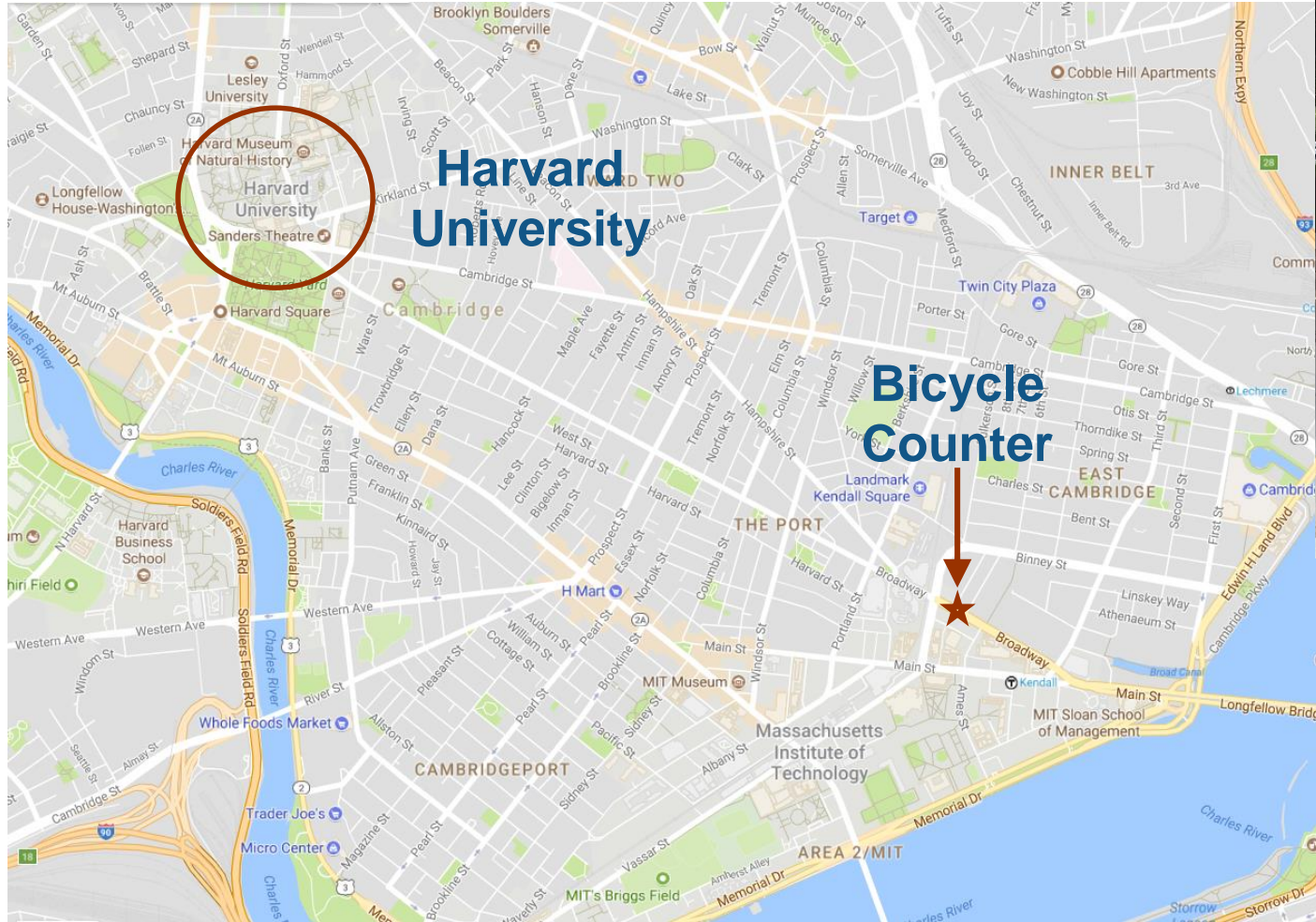
**Extendable** using toolboxes that provide targeted functionality for specific types of analysis or area of expertise.

Large range of use cases from simple, **quick analysis** to in-depth programmes for **production** deployment.

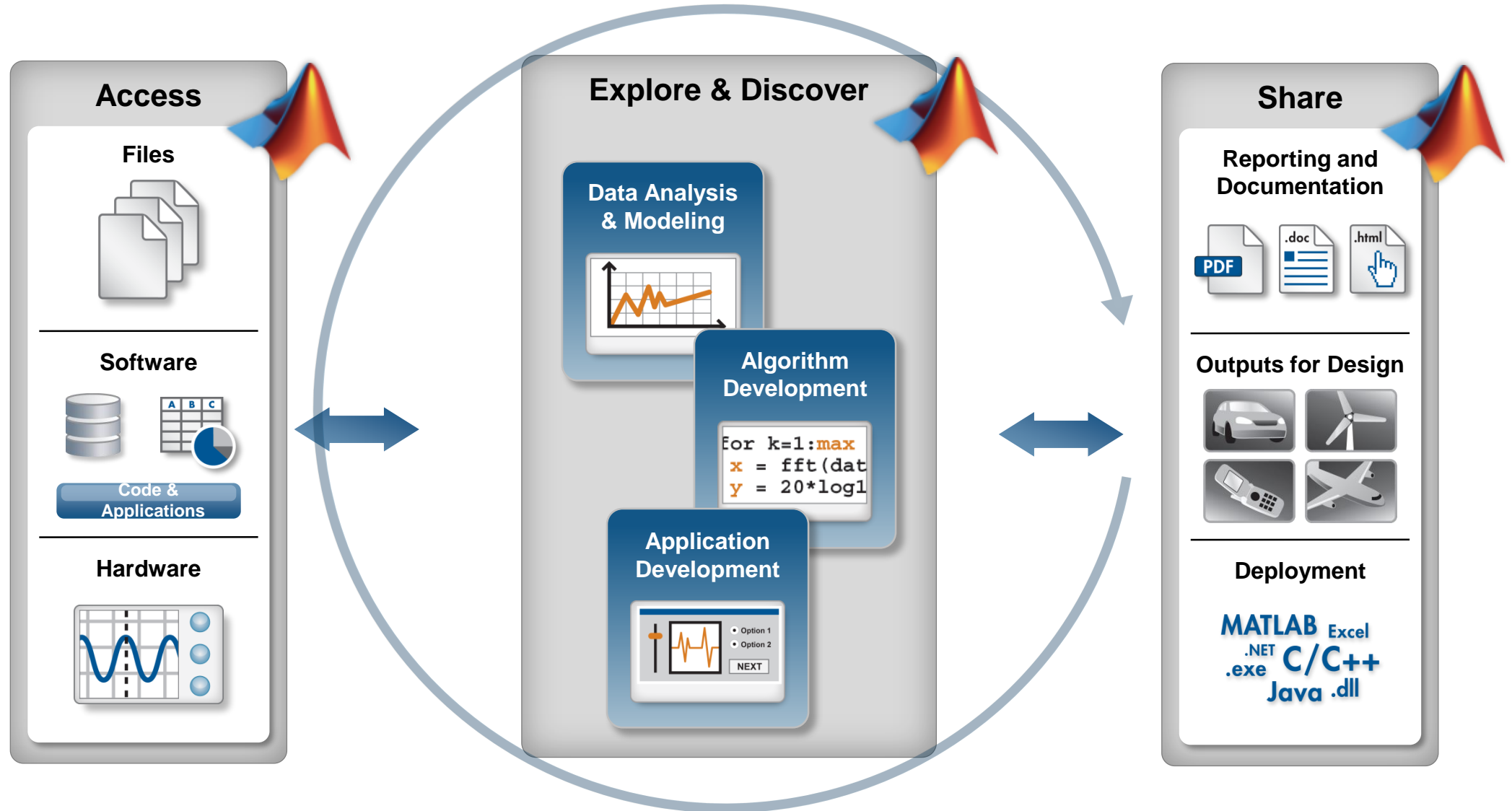


**MATLAB**  
The Language of Technical Computing

# Example: Bicycle Traffic Analysis



# Technical Computing Workflow



Automate

## Example: Bicycle Traffic Analysis

Bicycle count for journeys toward Harvard (**Westbound**) and toward City Centre (**Eastbound**).

Counts recorded every 15 minutes.

	A	B	C	D	E	F
1	Timestamp	Day	Total	Westbound	Eastbound	
38	01/01/2017 09:00	Sunday	1	0	1	
39	01/01/2017 09:15	Sunday	1	0	1	
40	01/01/2017 09:30	Sunday	1	0	1	
41	01/01/2017 09:45	Sunday	0	0	0	
42	01/01/2017 10:00	Sunday	2	1	1	
43	01/01/2017 10:15	Sunday	1	0	1	
44	01/01/2017 10:30	Sunday	2	0	2	
45	01/01/2017 10:45	Sunday	3	2	1	
46	01/01/2017 11:00	Sunday	2	0	2	
47	01/01/2017 11:15	Sunday	4	0	4	
48	01/01/2017 11:30	Sunday	1	0	1	
49	01/01/2017 11:45	Sunday	1	1	0	
50	01/01/2017 12:00	Sunday	2	1	1	
51	01/01/2017 12:15	Sunday	1	0	1	

# Compare with Weather Data



Home | Climate Information | Data Access | Customer Support | Contact | About | Search

Home > Climate Data Online > Data Tools > Find a Station

Datasets | Search Tool | Mapping Tool | Data Tools | Help

## Data Tools: Find a Station

Retrieve weather records from observing stations by entering the desired location, data set, data range, and data category. Location can be specified as city, county, state, country, or ZIP code.

Enter Location  
Boston, MA, United States

Select Dataset  
Daily Summaries

Select Date Range  
2017-08-21

Data Categories

- Air Temperature
- Evaporation
- Land
- Precipitation

## Historical weather data for Boston, MA.

	A	B	C	D	E	F	G
1	DATE	AvWindSpeed	Precipitation	TAVG	TMAX	TMIN	
2	01/01/2017	14.09	0.07	40	44	33	
3	02/01/2017	4.47	0	35	41	28	
4	03/01/2017	18.12	0.89	41	44	40	
5	04/01/2017	12.53	0.06	43	48	33	
6	05/01/2017	14.76	0	32	34	27	
7	06/01/2017	8.05	0.06	29	31	24	
8	07/01/2017	14.32	0.53	23	24	17	
9	08/01/2017	13.42	0.01	18	22	13	
10	09/01/2017	11.10	0	15	20	11	

Same time period as bicycle traffic data.

# Importing Data: Interactive or Generate Code

Interactively import data with the Import Tool:

**Access**

**Files**

**Software**

Code & Applications

**Hardware**

The screenshot shows the MATLAB Import Tool interface. The 'VIEW' tab is active, displaying the following settings:

- Delimited:** Selected. Column delimiters: Comma. Range: A2:E23421. Variable Names Row: 1.
- Output Type:** Table.
- Text Options:** Unimportable Cells.

The imported data is shown in a table with the following columns: Timestamp, Day, Total, Westbound, and Eastbound. The data is for January 1, 2017, from 00:00:00 to 02:45:00.

	A	B	C	D	E
	BicycleCounts2017				
	Timestamp	Day	Total	Westbound	Eastbound
	Datetime	Categorical	Number	Number	Number
1	Timestamp	Day	Total	Westbound	Eastbound
2	01/01/2017 00:00:00	Sunday	0	0	0
3	01/01/2017 00:15:00	Sunday	0	0	0
4	01/01/2017 00:30:00	Sunday	0	0	0
5	01/01/2017 00:45:00	Sunday	0	0	0
6	01/01/2017 01:00:00	Sunday	0	0	0
7	01/01/2017 01:15:00	Sunday	1	1	0
8	01/01/2017 01:30:00	Sunday	2	2	0
9	01/01/2017 01:45:00	Sunday	0	0	0
10	01/01/2017 02:00:00	Sunday	0	0	0
11	01/01/2017 02:15:00	Sunday	0	0	0
12	01/01/2017 02:30:00	Sunday	0	0	0
13	01/01/2017 02:45:00	Sunday	0	0	0

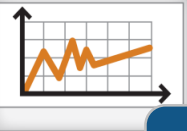


# Are bicycle counts related to the weather?

Live Editor allows for quick and easy exploration of data

**Explore & Discover**

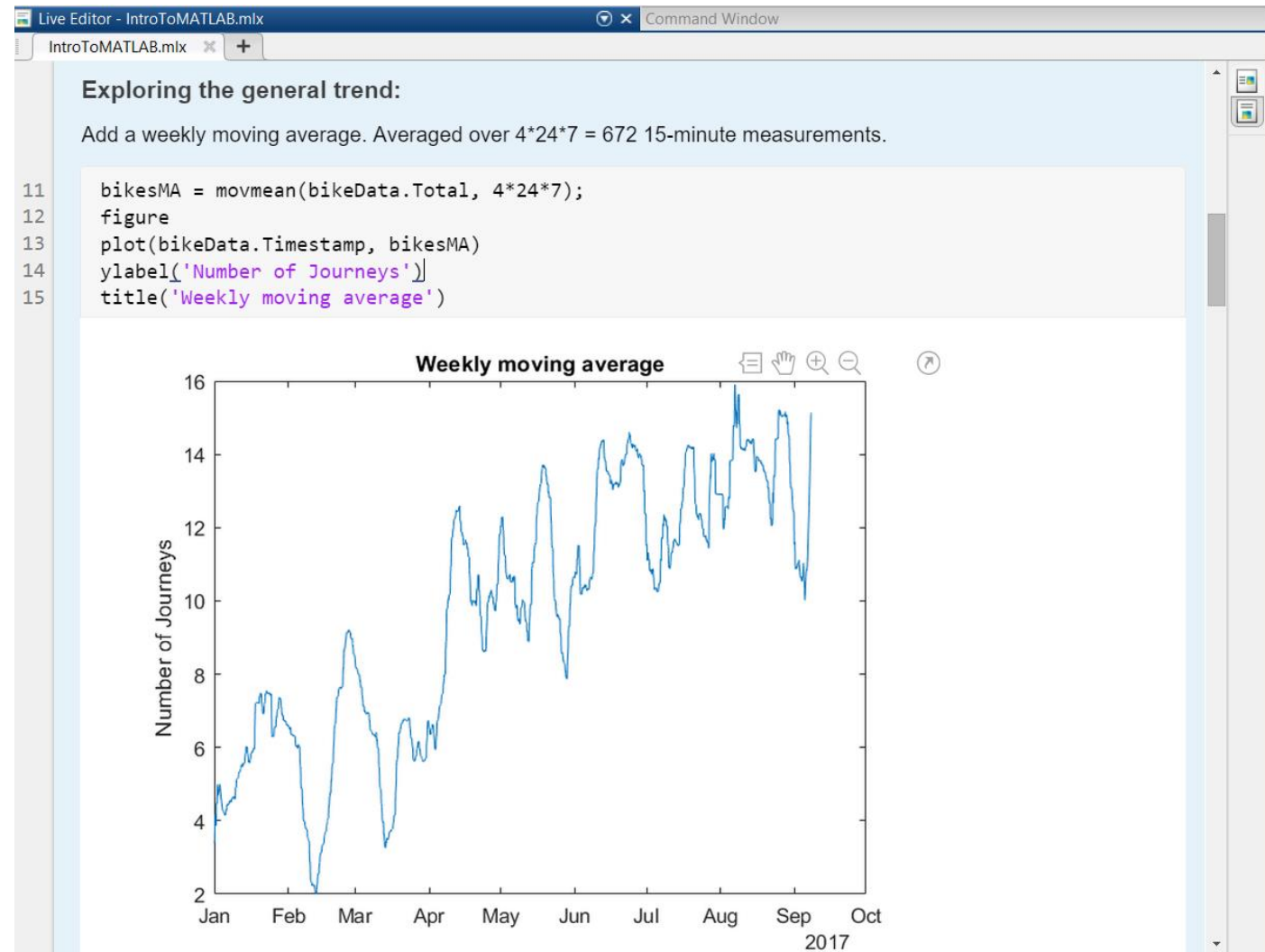

**Data Analysis & Modeling**



**Algorithm Development**

```
for k=1:max
x = fft(dat
y = 20*log1
```

**Application Development**



# Sharing Code and Applications

## Share

### Reporting and Documentation





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### Outputs for Design






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### Deployment

**MATLAB**

.NET

.exe

Excel

C/C++

Java

.dll

## Export as PDF/HTML/LaTeX

### Introduction to MATLAB

In this script, we will import in data from .csv files interactively, and then generate code to bring in the data programmatically.

The bicycle counts data comes from sensors on Broadway, Cambridge, Massachusetts, and counts the number of bikes travelling toward *Harvard* (**Westbound**) and toward the *city centre* (**Eastbound**) every 15 minutes.



### Importing Data

Data can be imported interactively using the Import Tool.

# Sharing Code and Applications

Create stand-alone application for MATLAB and Non-MATLAB users.

Share

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**Reporting and Documentation**

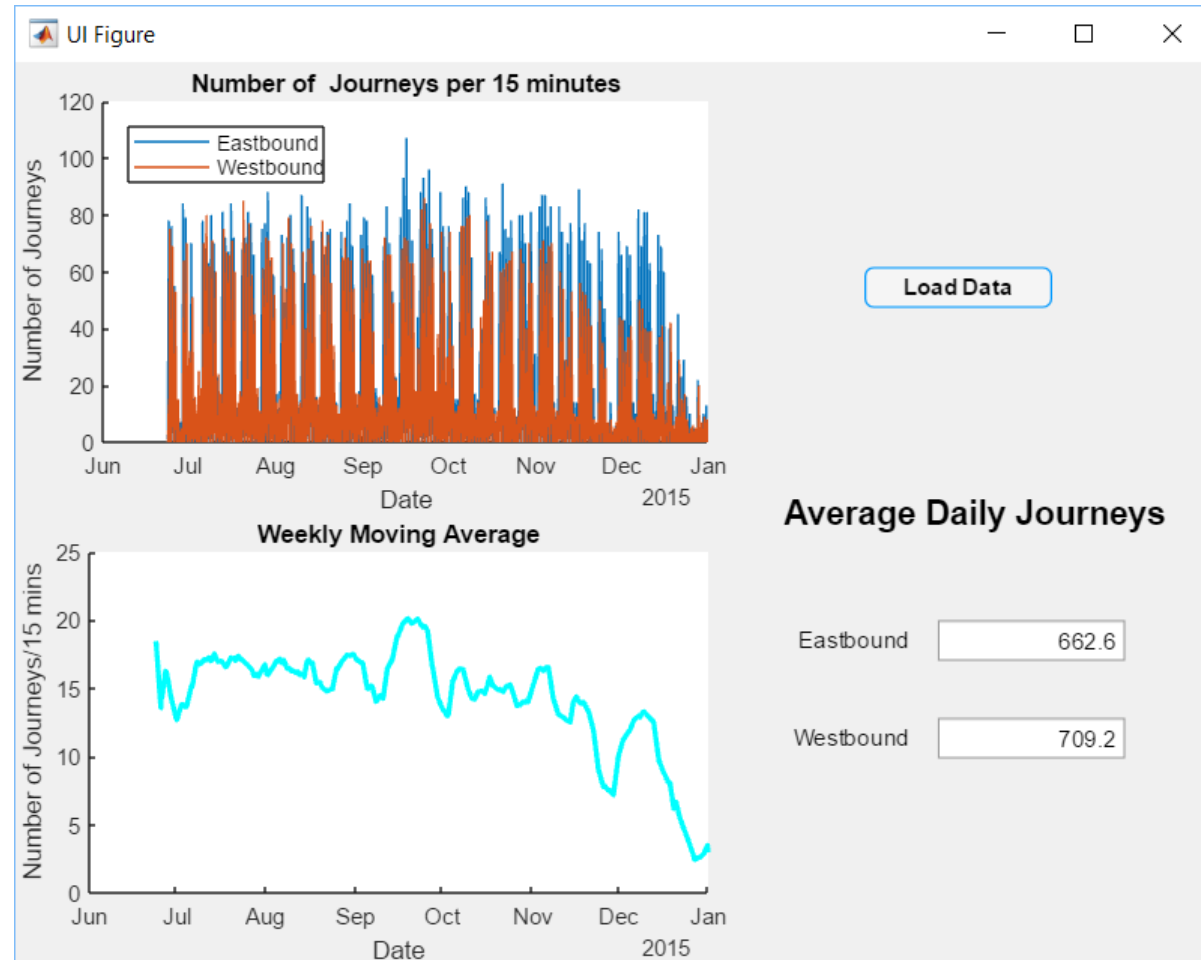
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**Outputs for Design**

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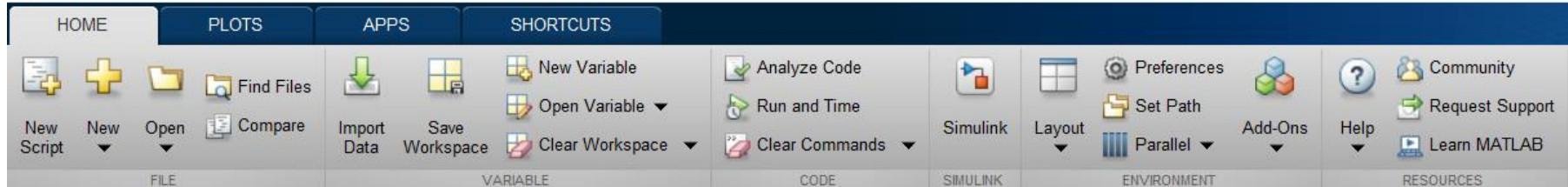
**Deployment**

**MATLAB** Excel  
 .NET C/C++  
 .exe Java .dll



# MATLAB Onramp

MATLAB R2017b



MATLAB Onramp 15% complete
>> MATLAB academy

Chapter 9.1 Plotting Vectors

**Practice**  
Complete the tasks below.

**Task 1**

**Info:** Two vectors of the same length can be plotted against each other using the `plot` function.

```
>> plot(x,y)
```

Try creating a plot with `sample` on the x-axis and `mass1` on the y-axis.

Hint
Get solution

**Task 2**

**Task 3**

**Task 4**

**Task 5**

**Task 6**

**Task 7**

**Task 8**

Further practice

```
>> load datafile
>> sample = data(:,1);
>> density = data(:,2);
>> v1 = data(:,3);
>> v2 = data(:,4);
>> mass1 = density.*v1;
>> mass2 = density.*v2;
```

Task 1 ✓

```
>> plot(sample,mass1,'*-.')
```

Correct!

Press `Space` to continue, or `Esc` to try an alternative solution.

Figure 1

# MATLAB Training



Classroom  
Training



Customized training  
at your work site



Live Online  
Courses



Self-paced  
training



Certification

# MATLAB Central

MATLAB® Central

Support ▾ 

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## An open exchange for the MATLAB and Simulink user community

A place where you can get answers, challenge yourself and others, and share your knowledge.

Tap into the knowledge and experience of over 100,000 community members and MathWorks employees.

Ask and Answer

Get & Share Code

Read and Learn

Play

Explore IoT Data

## Summary and Benefits

- Easy and fast to explore ideas.
- Easy deployment and reporting
- Single software for entire workflow.
- Numerous resources for learning and getting help in MATLAB.