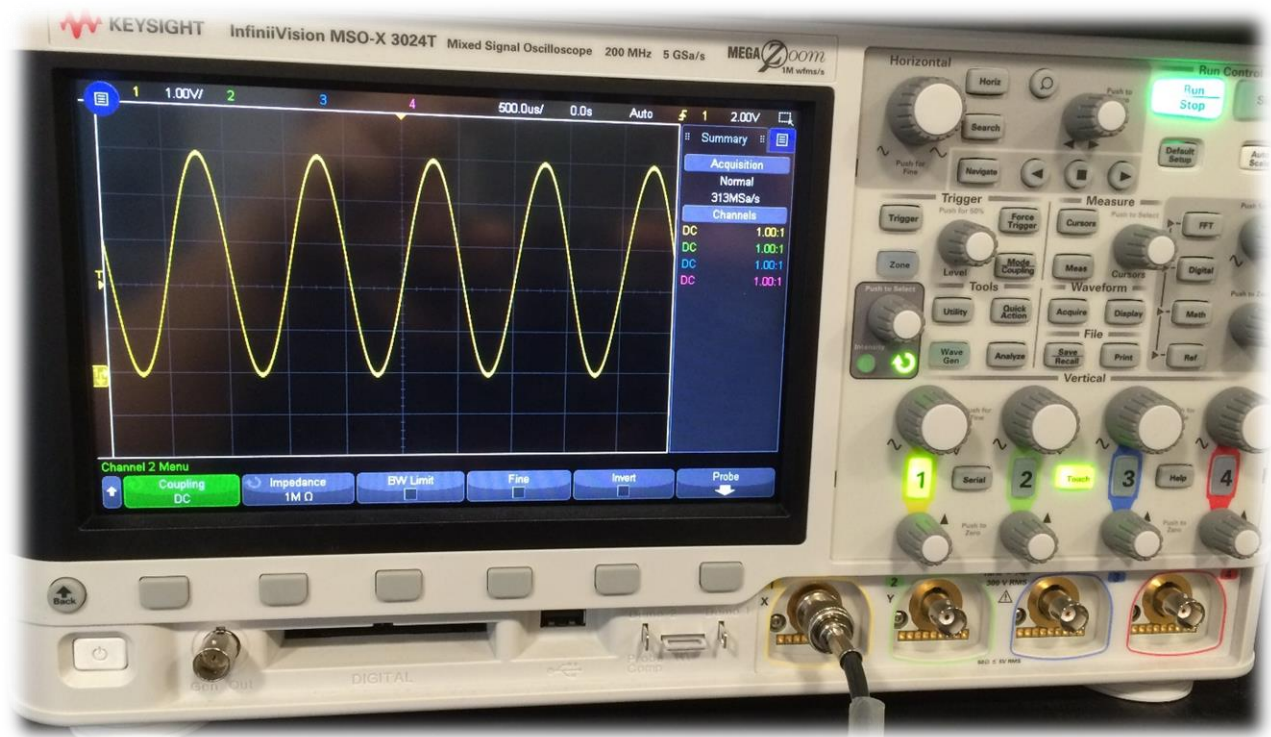


Port Oscilloscope Data to MATLAB using Keysight BenchVue

As an alternative of using a USB stick to download data from oscilloscope, we can use Keysight's BenchVue software to download data directly from oscilloscope. The generated file is easily read into MATLAB to plot our data.

Download single data set using BenchVue

Let us first start with a simple sine wave. As shown in the screen, we have a 5 V_{p-p} sine wave with 2.5 V offset at 1 kHz.

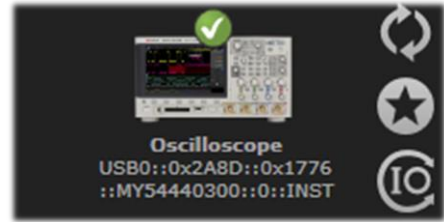


Open the Keysight BenchVue software. You will first see a welcome message as shown in 1. You may close the welcome screen and double click the oscilloscope icon shown in the bottom-right corner, which looks like 2. The same sine wave you generated should show on the screen.

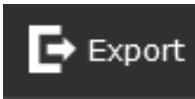
1.

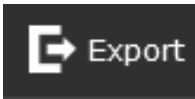


2.



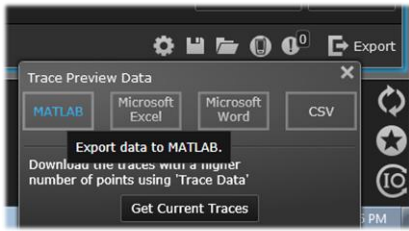
Feel free to maximize the window. You can play with the control buttons and see how the system



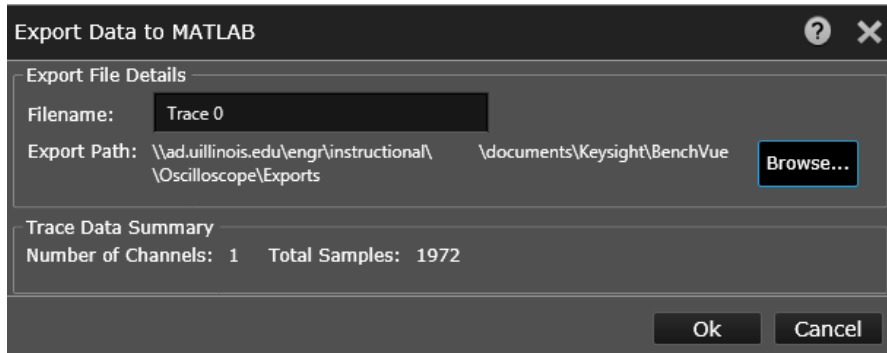
interacts with the oscilloscope. In order to download the sine wave signal, double click  which is located on the bottom-right corner.



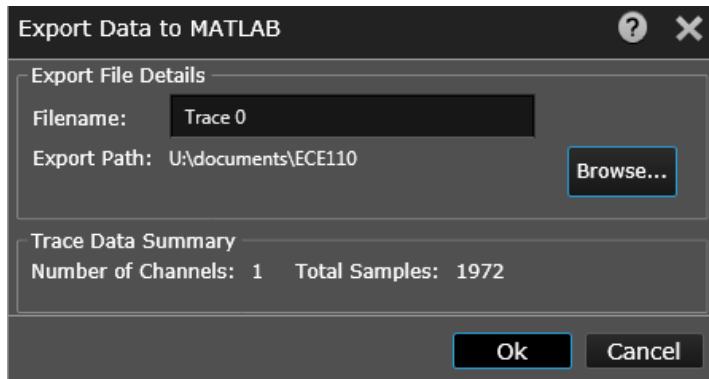
BenchVue can support four different file types. In our case, we will choose “MATLAB.”



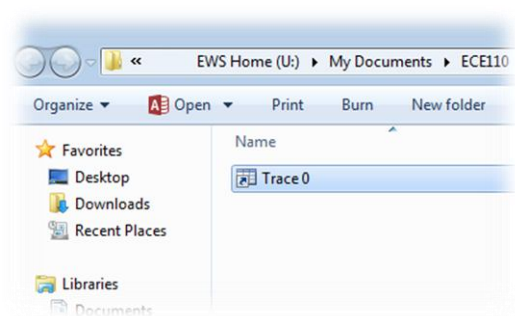
A window will pop up and you will need to **change the Export Path to your local directory** instead of network directory. BenchVue cannot see or save to the network directory.



You need to **create a new local folder in your U:\ drive** and set it as your Export Path. *Don't use the C:\drive!* Any data in C:\ drive can easily be modified or plagiarized by others.



After you click OK, you will see Trace 0 stored in your folder.



Plot data using MATLAB

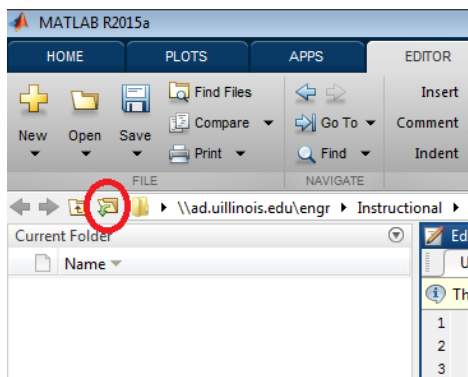
As a prerequisite, it is highly recommended to read APPENDIX A: MATLAB Introduction

(<https://courses.engr.illinois.edu/ece110/content/labs/ReferenceMaterial/MatlabHelp/MATLABGuide.pdf>) and APPENDIX B: Creating and Using MATLAB Scripts

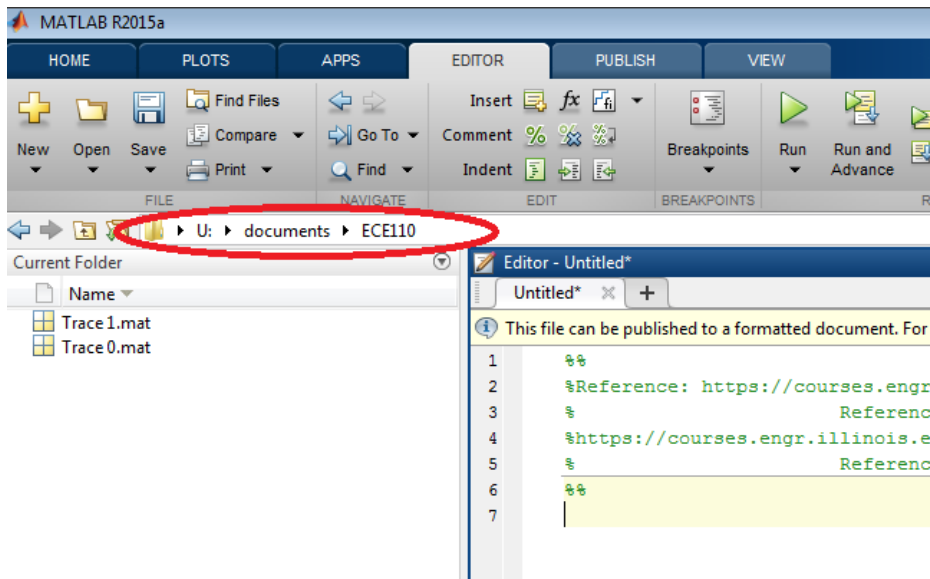
(<https://courses.engr.illinois.edu/ece110/content/labs/ReferenceMaterial/MatlabHelp/MatlabUsingScripts.pdf>).



To plot your data, first open MATLAB on your computer. Click on the “Browse for folder” icon and find the U:\drive directory in which BenchVue saved your data earlier.



Located the file called Trace 0.mat listed under the “Current Folder.” Note that Trace 0.mat is a 1972 by 2 matrix. That is the matrix has 1972 rows and 2 columns. In our case, the first column contains the time data, and the second column contains the voltages from channel 1.



1972x2 double		
	1	2
1	-0.0025	2.9898
2	-0.0025	2.9496
3	-0.0025	2.8692
4	-0.0025	2.8290
5	-0.0025	2.8290
6	-0.0025	2.7486
7	-0.0025	2.7084
8	-0.0025	2.7486
9	-0.0025	2.6682
10	-0.0025	2.6280
11	-0.0025	2.5878
12	-0.0025	2.5476
13	-0.0025	2.5074
14	-0.0025	2.4672
15	-0.0025	2.4270
16	-0.0025	2.3868
17	-0.0025	2.3466
18	-0.0025	2.3064

Create a script that will plot Trace 0.mat as you learned to do in APPENDIX B: Creating and Using MATLAB Scripts.

Here is an example code that you can use. Note that Trace 0.mat has a space between Trace and 0.

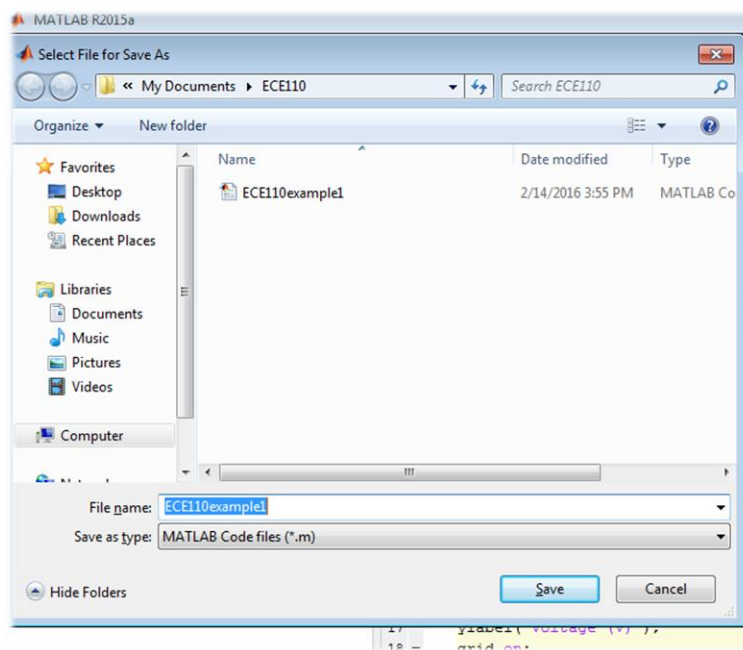
```
%%  
%Reference: https://courses.engr.illinois.edu/ece110/sp2016/content/labs/  
%           ReferenceMaterial/MatlabHelp/MatlabUsingScripts.pdf  
%https://courses.engr.illinois.edu/ece110/sp2016/content/labs/  
%           ReferenceMaterial/MatlabHelp/MATLABGuide.pdf  
%%  
clc % clear all command lines  
clear all; % clear all previous data  
close all; % close all previous windows
```

```
data1=importdata('Trace 0.mat'); % load data file.
```

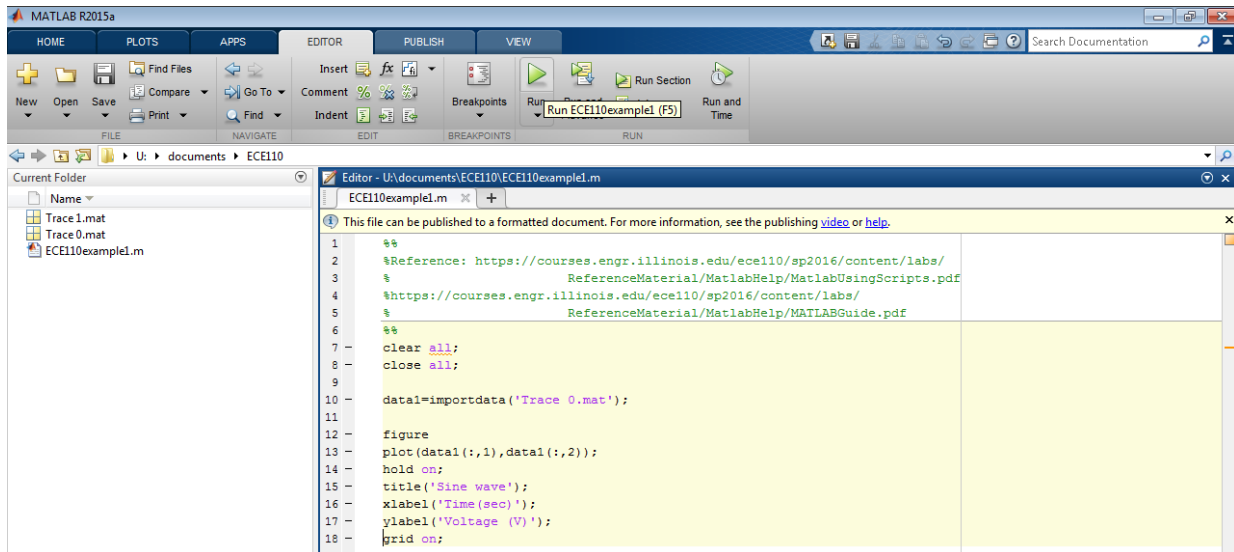
```
figure % open figure window: You can make multiple figures using this  
command.  
% If you want to create and number your figure window, type "figure(1)" in  
% order to make a figure window and make it figure #1.
```

```
plot(data1(:,1),data1(:,2)); % By using ":", we can call all elements in the  
relevant columns  
% Also, you can specify the style of your line.  
%http://www.mathworks.com/help/matlab/ref/linespec.html  
hold on;  
title('Sine wave');  
xlabel('Time(sec)');  
% reference: http://www.mathworks.com/help/matlab/ref/xlabel.html  
ylabel('Voltage (V)');  
grid on;
```

Save your script to the same file location as the data.

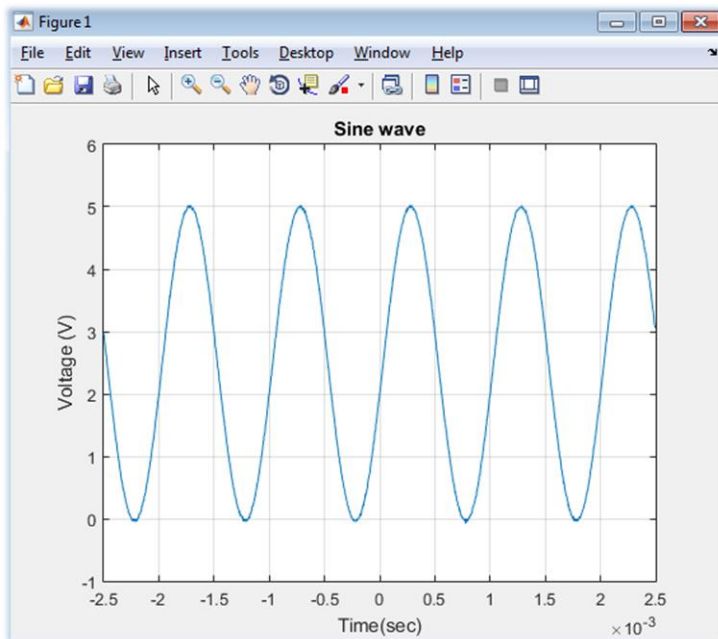


Once you save your script, your .m file will show up in the current folder.



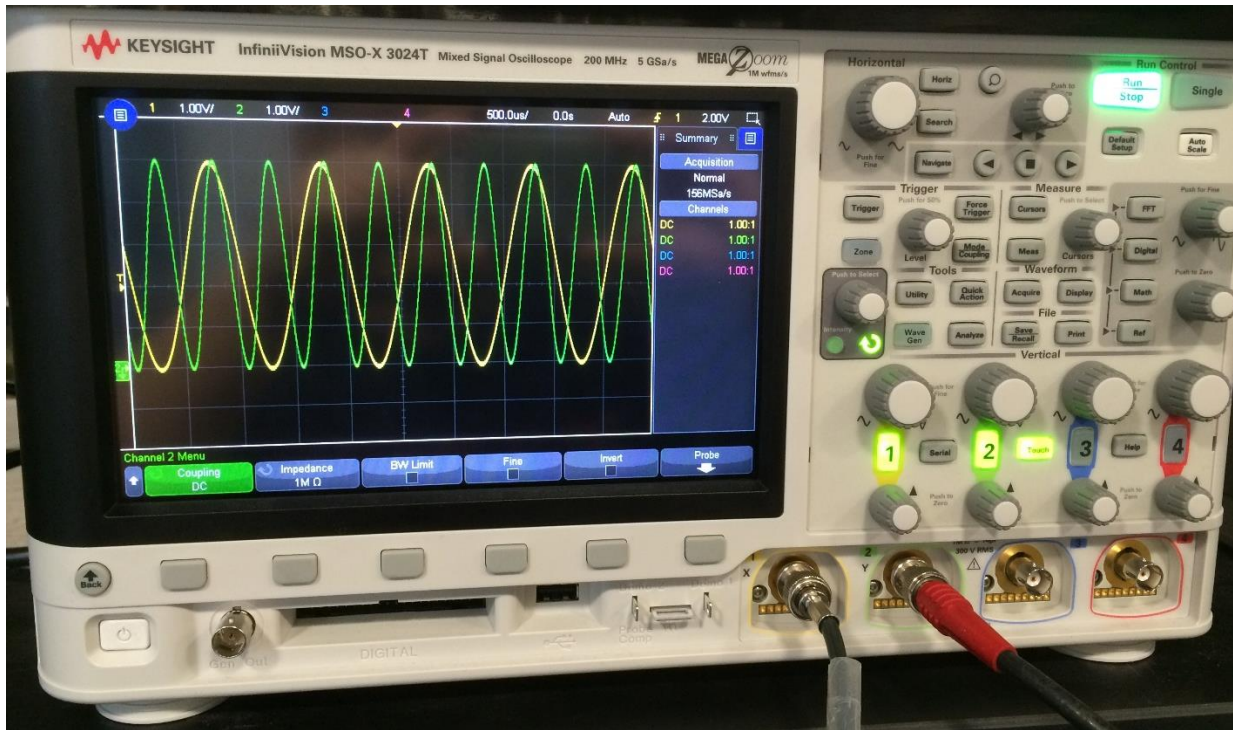
Then click Run

As a result, you will get the following figure.



Download two data sets and plot on a single figure.

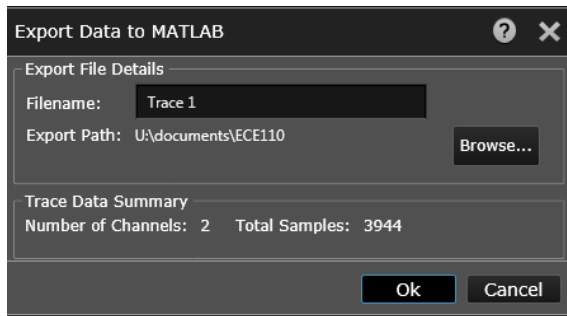
For practice, let us measure two different wave forms using the oscilloscope. As can be seen, the first channel shows the same sine wave we measured previously and the second channel shows a sine wave with a frequency of 2 kHz.



You should see the same waveforms in BenchVue.



Follow the same steps as before. You should have 2 channels in the trace data summary.



Take a closer look at Trace 1.mat. Trace 1.mat consists of two data sets called data1.Trace_1 and data1.Trace_2. Each data set is a 1972 by 2 matrix as we dealt with previously. We can see that Trace 1.mat contains the data obtained from each channel.

MATLAB R2015a

HOME PLOTS APPS VARIABLE VIEW

U: > documents > ECE110

Current Folder

- Trace 1.mat
- Trace 0.mat
- ECE110example1.m

Workspace

Name	Value
data1	1x1 struct

Editor - ECE110example1.m

data1

1x1 struct with 2 fields

Field	Value
Trace_1	1972x2 double
Trace_2	1972x2 double

data1

data1.Trace_1

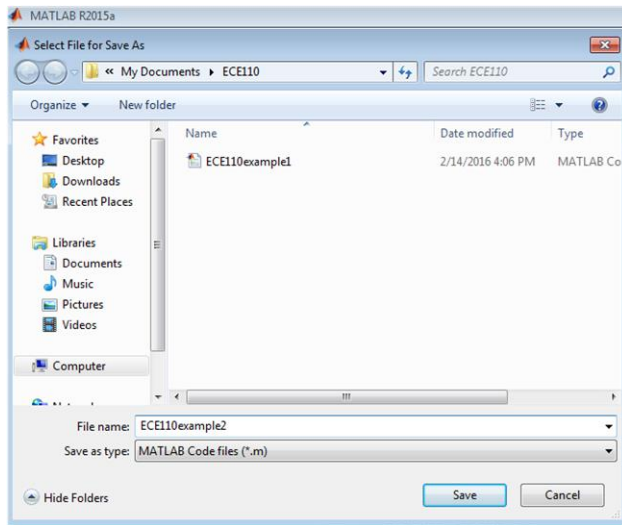
data1.Trace_2

	1	2	3	4
1	-0.0025	2.9898		
2	-0.0025	2.9496		
3	-0.0025	2.8692		
4	-0.0025	2.8290		
5	-0.0025	2.8290		
6	-0.0025	2.7486		
7	-0.0025	2.7084		
8	-0.0025	2.7486		
9	-0.0025	2.6682		
10	-0.0025	2.6280		
11	-0.0025	2.5878		
12	-0.0025	2.5476		
13	-0.0025	2.5074		
14	-0.0025	2.4672		
15	-0.0025	2.4270		
16	-0.0025	2.3868		
17	-0.0025	2.3466		
18	-0.0025	2.3064		
19	-0.0025	2.2662		
20	-0.0025	2.2260		
21	-0.0024	2.1858		

Here is an example code to plot these data sets on the same figure. Notice that you must indicate the exact matrix in Trace 1.mat. Also, as we learned in lab 1, we use `hold on` to overlay additional plots.

```
%%  
%Reference: https://courses.engr.illinois.edu/ece110/sp2016/content/labs/  
%           ReferenceMaterial/MatlabHelp/MatlabUsingScripts.pdf  
%https://courses.engr.illinois.edu/ece110/sp2016/content/labs/  
%           ReferenceMaterial/MatlabHelp/MATLABGuide.pdf  
%%  
clear all;  
close all;  
  
data1=importdata('Trace 1.mat');  
  
figure  
plot(data1.Trace_1(:,1),data1.Trace_1(:,2));  
hold on;  
plot(data1.Trace_2(:,1),data1.Trace_2(:,2));  
title('Sine wave');  
xlabel('Time(sec)');  
ylabel('Voltage (V)');  
legend('Channel 1', 'Channel 2');  
grid on;
```

After saving your script, your *.m file will show up in the current folder.



Finally, click **Run**. You should get the following figure.

