

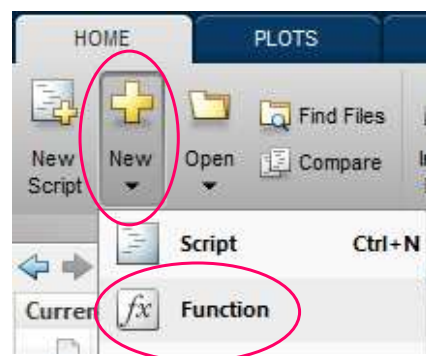
Introduction to MATLAB - 3

Instructor Özgür ZEYDAN

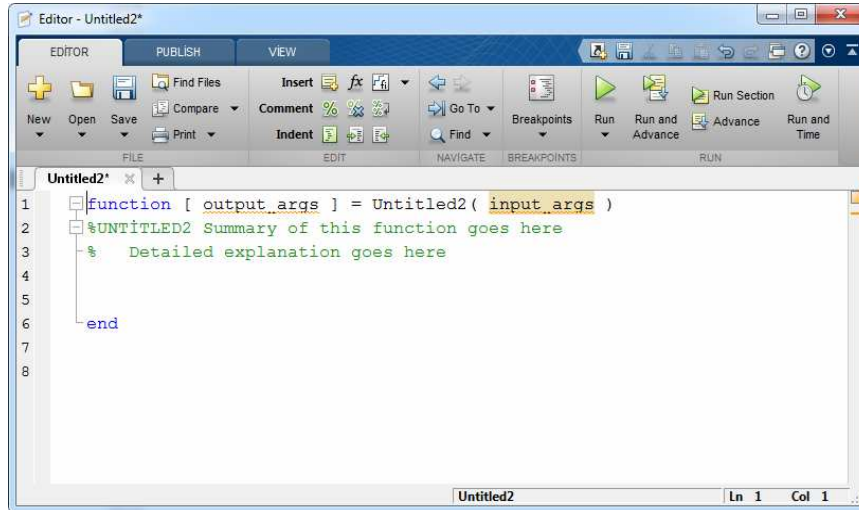
<http://cevre.beun.edu.tr/zeydan/>

Creating Your Functions

- Let us write a function called **cel2fah** which calculates Fahrenheit of a given Celsius degree.
- Use formula:
 $f=(c*9/5)+32$
- To write a function click **New → Function**



Editor Window



The screenshot shows the MATLAB Editor window with a function definition. The code is as follows:

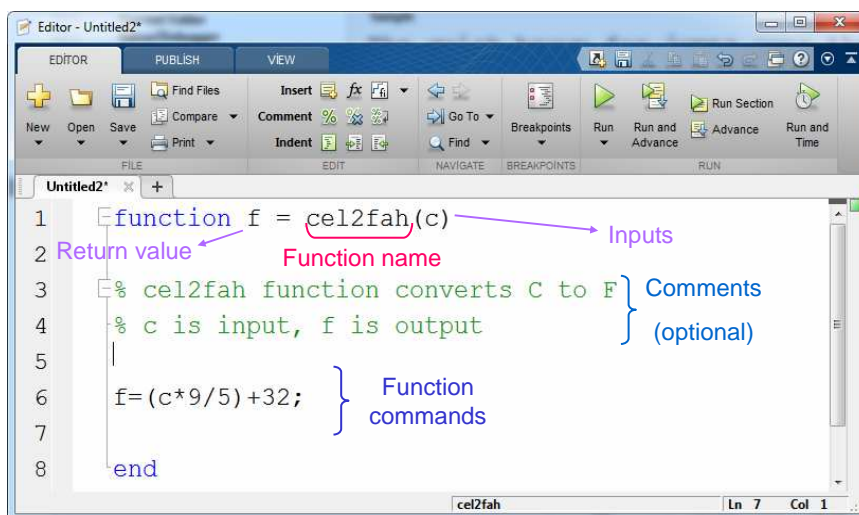
```
1 function [ output_args ] = Untitled2( input_args )
2 %UNTITLED2 Summary of this function goes here
3 % Detailed explanation goes here
4
5
6 end
```

The status bar at the bottom indicates the file name is 'Untitled2' and the cursor is at line 1, column 1.

Özgür ZEYDAN

3

Write “cel2fah” Function



The screenshot shows the MATLAB Editor window with the 'cel2fah' function definition. The code is as follows:

```
1 function f = cel2fah(c)
2 Return value ← f
3 % cel2fah function converts C to F } Comments
4 % c is input, f is output } (optional)
5
6 f=(c*9/5)+32; } Function
7 } commands
8 end
```

Annotations in the image include:

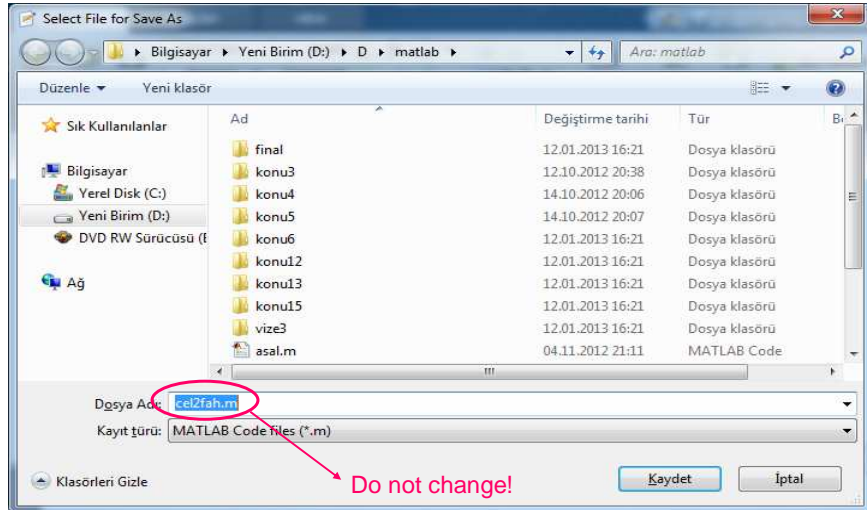
- A purple arrow pointing to 'cel2fah' in line 1, labeled 'Function name'.
- A purple arrow pointing to 'f' in line 1, labeled 'Return value'.
- A purple arrow pointing to 'c' in line 1, labeled 'Inputs'.
- A blue bracket on the right side of lines 3 and 4, labeled 'Comments (optional)'.
- A blue bracket on the right side of lines 6 and 7, labeled 'Function commands'.

The status bar at the bottom indicates the file name is 'cel2fah' and the cursor is at line 7, column 1.

Özgür ZEYDAN

4

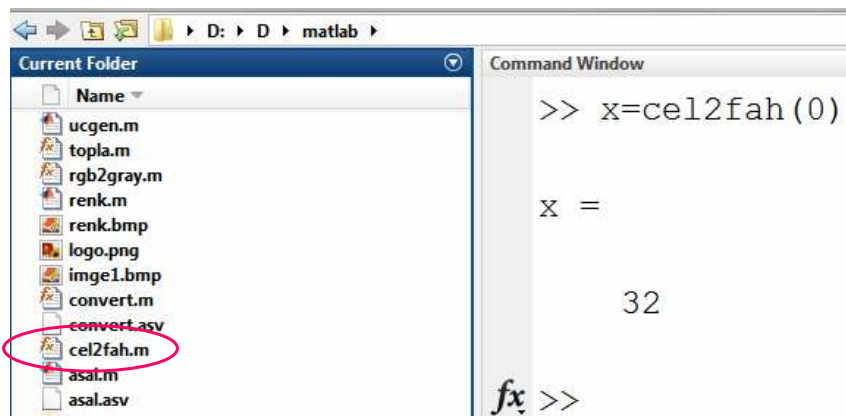
Saving Your Function



Özgür ZEYDAN

5

Using Your New Function



- To use `cel2fah` function, it must be saved in **Current Folder**.

Özgür ZEYDAN

6

Using Your New Function

```
Current Folder: D:\matlab\final
Name:
fonk3.m
fonk2.m
fonk1.m
final.m

Command Window:
>> x=cel2fah(0)
x =
    32
>> x=cel2fah(0)
Undefined function 'cel2fah' for input arguments of type 'double'.
```

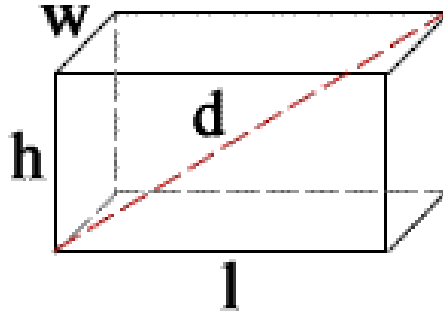
- If **Current Folder** does not contain `cel2fah` function, it can not be used.
- MATLAB shows undefined function error.

Özgür ZEYDAN

7

Function Example

- Write a MATLAB function which calculates
 - ❖ diagonal of prism ($d^2 = l^2 + h^2 + w^2$)
 - ❖ Volume of prism ($V = l * h * w$)
- Function displays results but returns nothing!



Özgür ZEYDAN

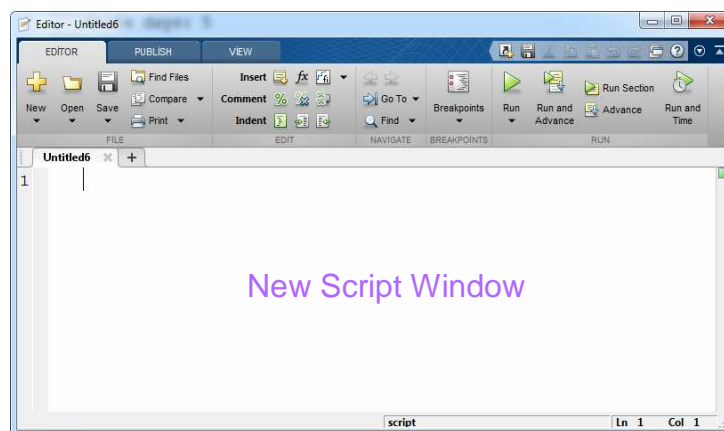
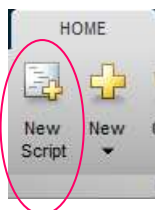
8

Answer

- `function prism(l,h,w)`
 - `%prism calculates diagonal and volume of rectangular prism`
 - `d=sqrt(l^2+h^2+w^2);`
 - `disp(['Diagonal: ',num2str(d)])`
 - `V=l*h*w;`
 - `disp(['Volume: ',num2str(V)])`
 - `end`
- ```
>> prism(8,9,12)
Diagonal: 17
Volume: 864
```

## Writing Your Scripts

- Click **New Script** button or **CTRL + N**



## Resolve BOD Example by Script

- `L=input('Write value of ultimate BOD (mg/l): ');`
- `k1=input('Write value of decay constant (1/day): ');`
- `t=input('Write days: ');`
- `y=L*(1-exp(-k1*t));`
- `disp([num2str(t), ' days BOD is ', num2str(y), ' (mg/l)'])`

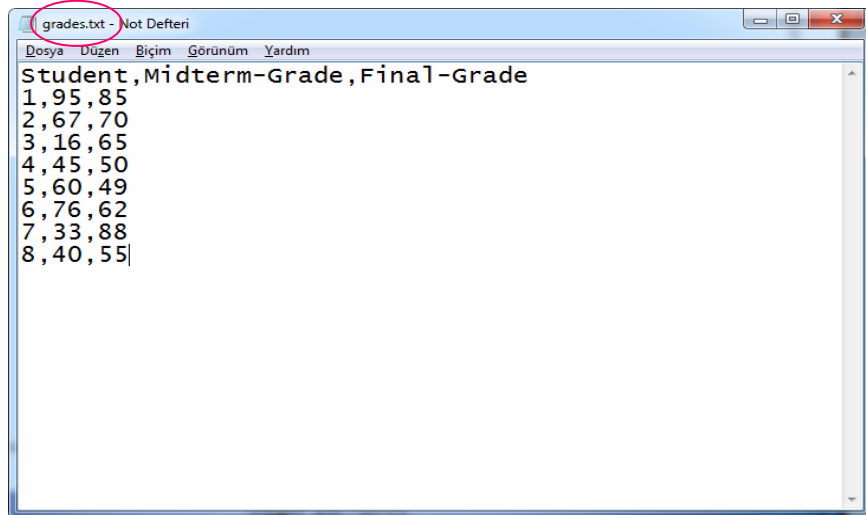
Save script as “bod.m”

## Running Script

- Don't forget that, script must be on **Current Folder**
- Write name of the script to run it or select script from current folder the press **F9**

```
>> bod
Write value of ultimate BOD (mg/l): 282
Write value of decay constant (1/day): 0.348
Write days: 5
5 days BOD is 232.5032 (mg/l)
```

## Reading Text Files



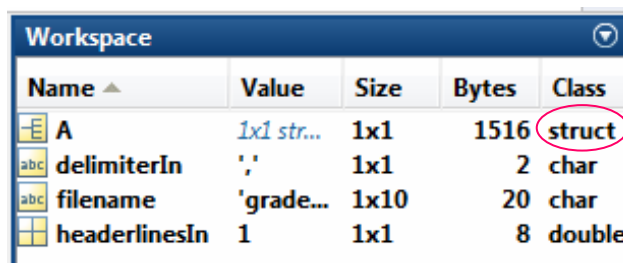
```
grades.txt - Not Defteri
Dosya Düzen Biçim Görünüm Yardım
Student,Midterm-Grade,Final-Grade
1,95,85
2,67,70
3,16,65
4,45,50
5,60,49
6,76,62
7,33,88
8,40,55
```

Özgür ZEYDAN

13

## Reading Text Files

- `filename = 'grades.txt';`
- `delimiterIn = ',';`
- `headerlinesIn = 1;`
- `A = importdata(filename, delimiterIn, headerlinesIn);`



| Name          | Value      | Size | Bytes | Class  |
|---------------|------------|------|-------|--------|
| A             | 1x1 str... | 1x1  | 1516  | struct |
| delimiterIn   | ','        | 1x1  | 2     | char   |
| filename      | 'grade...  | 1x10 | 20    | char   |
| headerlinesIn | 1          | 1x1  | 8     | double |

Özgür ZEYDAN

14

## Assigning Read Values to Variables

- 2. column will be assign for "m" and 3. column for "f" variables:

- `for i=1`
- `m=A.data(:,2);`
- `f=A.data(:,3);`
- `end`

```
>> m >> f
m = f =
 95 85
 67 70
 16 65
 45 50
 60 49
 76 62
 33 88
 40 55
```

Özgür ZEYDAN

15

## Calculate Average Grades

- `ave=0.4*m+0.6*f`

- You may save calculated average grades to new text file.

```
>> ave=0.4*m+0.6*f
ave =
 89.0000
 68.8000
 45.4000
 48.0000
 53.4000
 67.6000
 66.0000
 49.0000
```

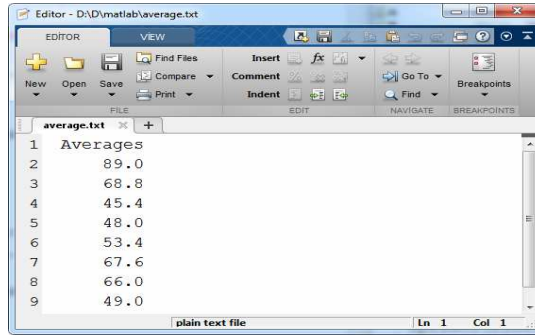
Özgür ZEYDAN

16



## Saving Text Files

- `fileID = fopen('average.txt','w');`
- `fprintf(fileID,'%8s\n','Averages');`
- `fprintf(fileID,'%8.1f\n',ave);`
- `fclose(fileID);`



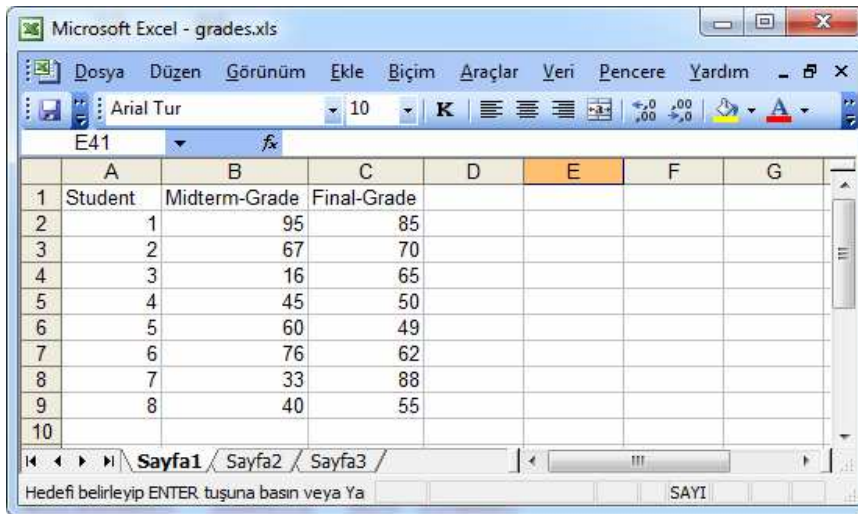
The screenshot shows a text editor window titled 'Editor - D:\D\matlab\average.txt'. The window contains the following text:

```
1 Averages
2 89.0
3 68.8
4 45.4
5 48.0
6 53.4
7 67.6
8 66.0
9 49.0
```

Özgür ZEYDAN

17

## Read Data from MS Excel



The screenshot shows a Microsoft Excel window titled 'Microsoft Excel - grades.xls'. The spreadsheet contains the following data:

|    | A       | B             | C           | D | E | F | G |
|----|---------|---------------|-------------|---|---|---|---|
| 1  | Student | Midterm-Grade | Final-Grade |   |   |   |   |
| 2  | 1       | 95            | 85          |   |   |   |   |
| 3  | 2       | 67            | 70          |   |   |   |   |
| 4  | 3       | 16            | 65          |   |   |   |   |
| 5  | 4       | 45            | 50          |   |   |   |   |
| 6  | 5       | 60            | 49          |   |   |   |   |
| 7  | 6       | 76            | 62          |   |   |   |   |
| 8  | 7       | 33            | 88          |   |   |   |   |
| 9  | 8       | 40            | 55          |   |   |   |   |
| 10 |         |               |             |   |   |   |   |

Özgür ZEYDAN

18

## Read Data from MS Excel

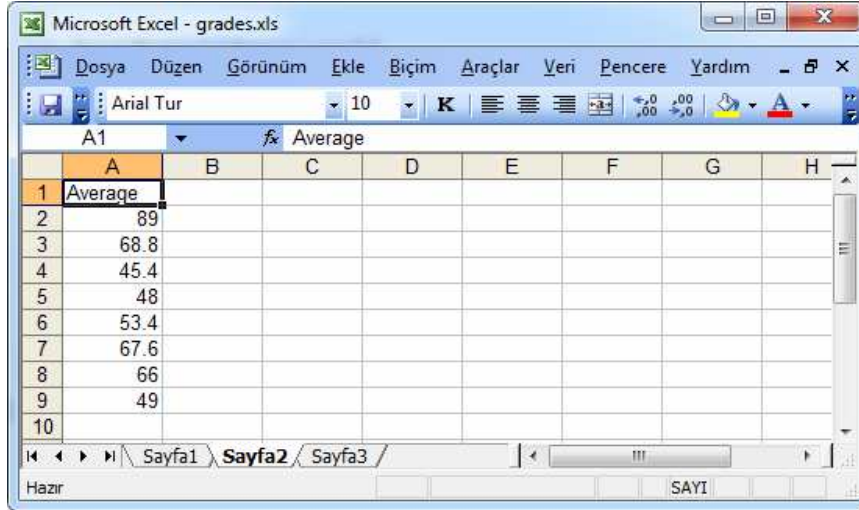
- **xlsread** function is used to read data from excel.
- `xlsread('file_name','sheet_name','range')`
- `m=xlsread('grades.xls','Sayfa1','B2:B9')`

```
>> m=xlsread('grades.xls','Sayfa1','B2:B9')
m =
 95
 67
 16
 45
 60
 76
 33
 40
```

## Writing Data to Excel

- First make calculations
- `f=xlsread('grades.xls','Sayfa1','C2:C9')`
- `ave=0.4*m+0.6*f`
- Then use **xlswrite** function to write data on excel.
- `xlswrite('file_name',variable_name,'Sheet','Range')`
- `xlswrite('grades.xls',ave,'Sayfa2','A2:A9')`
- `header={'Average'};`
- `xlswrite('grades.xls',header,'Sayfa2','A1')`

## Writing Data to Excel



Microsoft Excel - grades.xls

File Edit View Insert Format Tools Data Window Help

Arial Tur 10

Average

|    | A       | B | C | D | E | F | G | H |
|----|---------|---|---|---|---|---|---|---|
| 1  | Average |   |   |   |   |   |   |   |
| 2  | 89      |   |   |   |   |   |   |   |
| 3  | 68.8    |   |   |   |   |   |   |   |
| 4  | 45.4    |   |   |   |   |   |   |   |
| 5  | 48      |   |   |   |   |   |   |   |
| 6  | 53.4    |   |   |   |   |   |   |   |
| 7  | 67.6    |   |   |   |   |   |   |   |
| 8  | 66      |   |   |   |   |   |   |   |
| 9  | 49      |   |   |   |   |   |   |   |
| 10 |         |   |   |   |   |   |   |   |

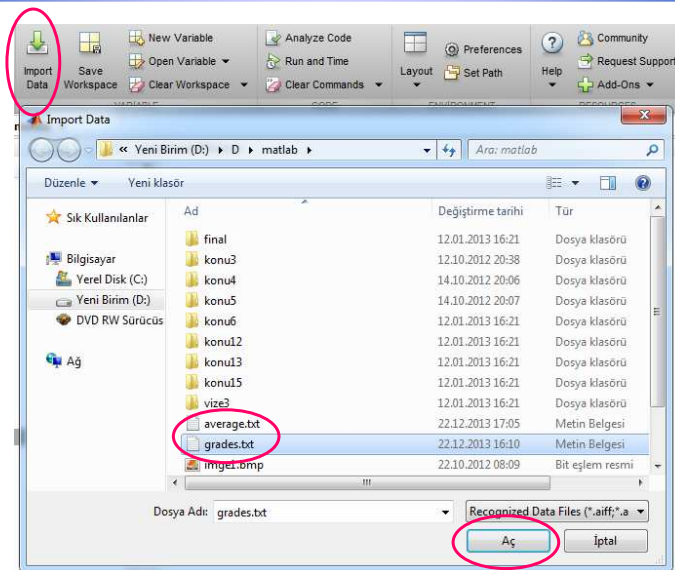
Sayfa1 Sayfa2 Sayfa3

Hazır SAYI

Özgür ZEYDAN

21

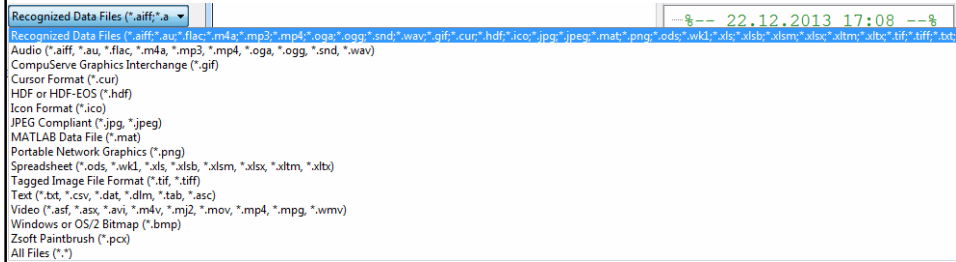
## Importing Data



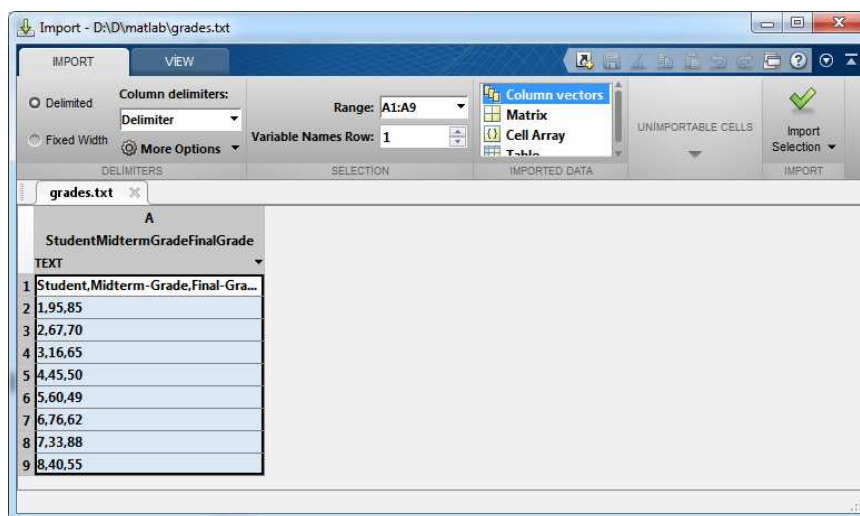
Özgür ZEYDAN

22

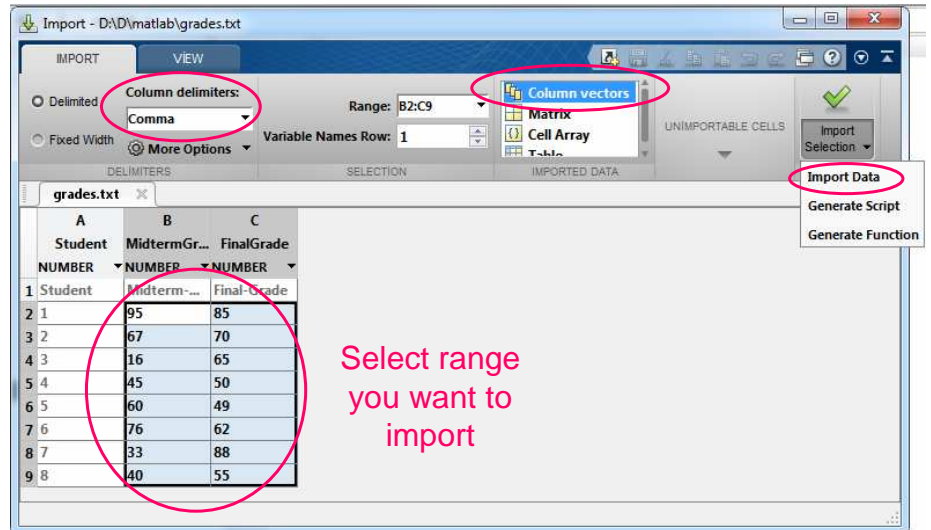
# Supported File Types



# Importing Data



# Importing Data



Özgür ZEYDAN

25

# Imported Data on Workspace

- Imported data as **column vectors** format.

| Name          | Value      | Size | Bytes | Class  |
|---------------|------------|------|-------|--------|
| FinalGrade    | [85;70;... | 8x1  | 64    | double |
| MidtermGra... | [95;67;... | 8x1  | 64    | double |

- Imported data as **matrix** format.

| Name   | Value     | Size | Bytes | Class  |
|--------|-----------|------|-------|--------|
| grades | 8x2 da... | 8x2  | 128   | double |

Özgür ZEYDAN

26