MA2252 Introduction to Computing

Lecture 4: Variables and Arrays (contd.)

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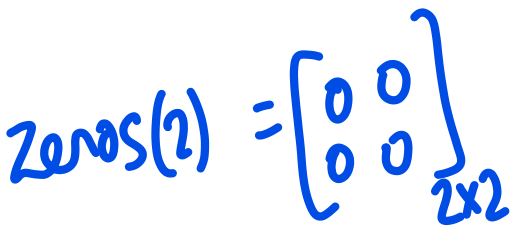
Learning outcomes

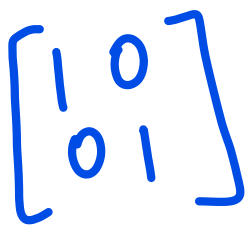
- Create some special matrices
- Learn array indexing and arithmetic operations
- Understand Char Arrays
- Use load and save functions

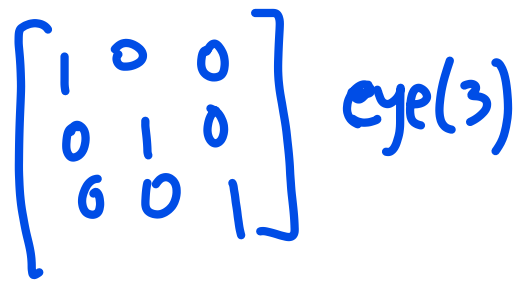
Special matrices

- Matrix of ones: use function 'ones'
- Null matrix: use function 'zeros'

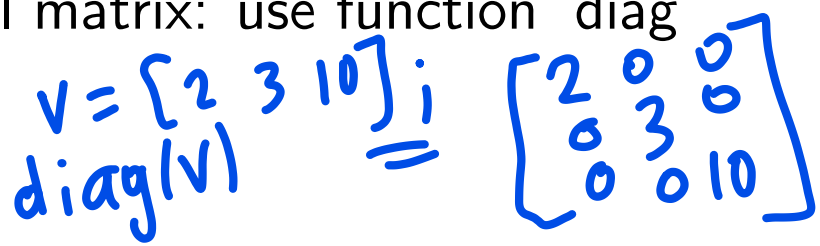


- Identity matrix: use function 'eye'





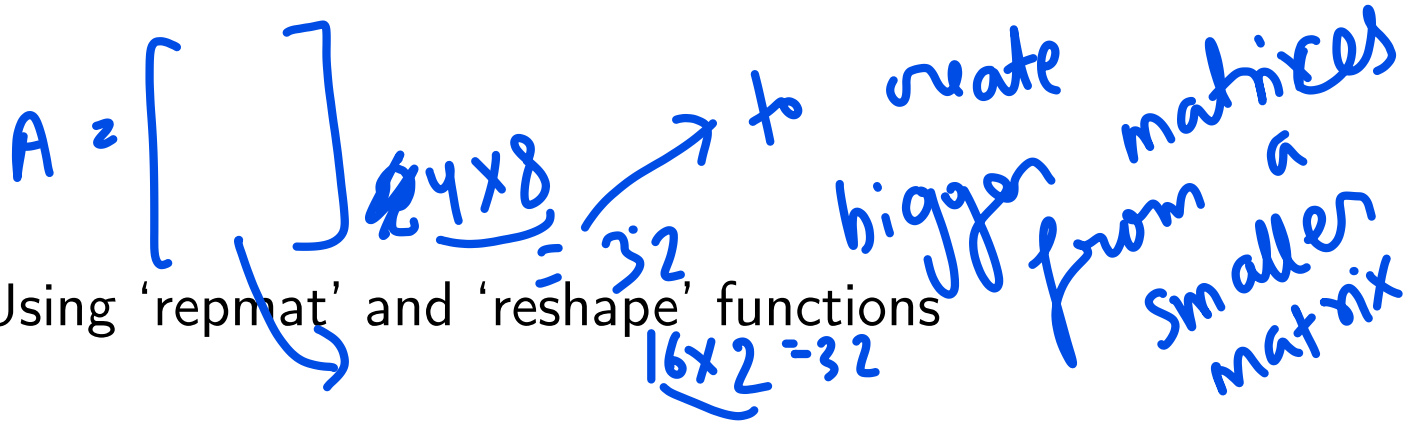
- Diagonal matrix: use function 'diag'



Special matrices (contd.)

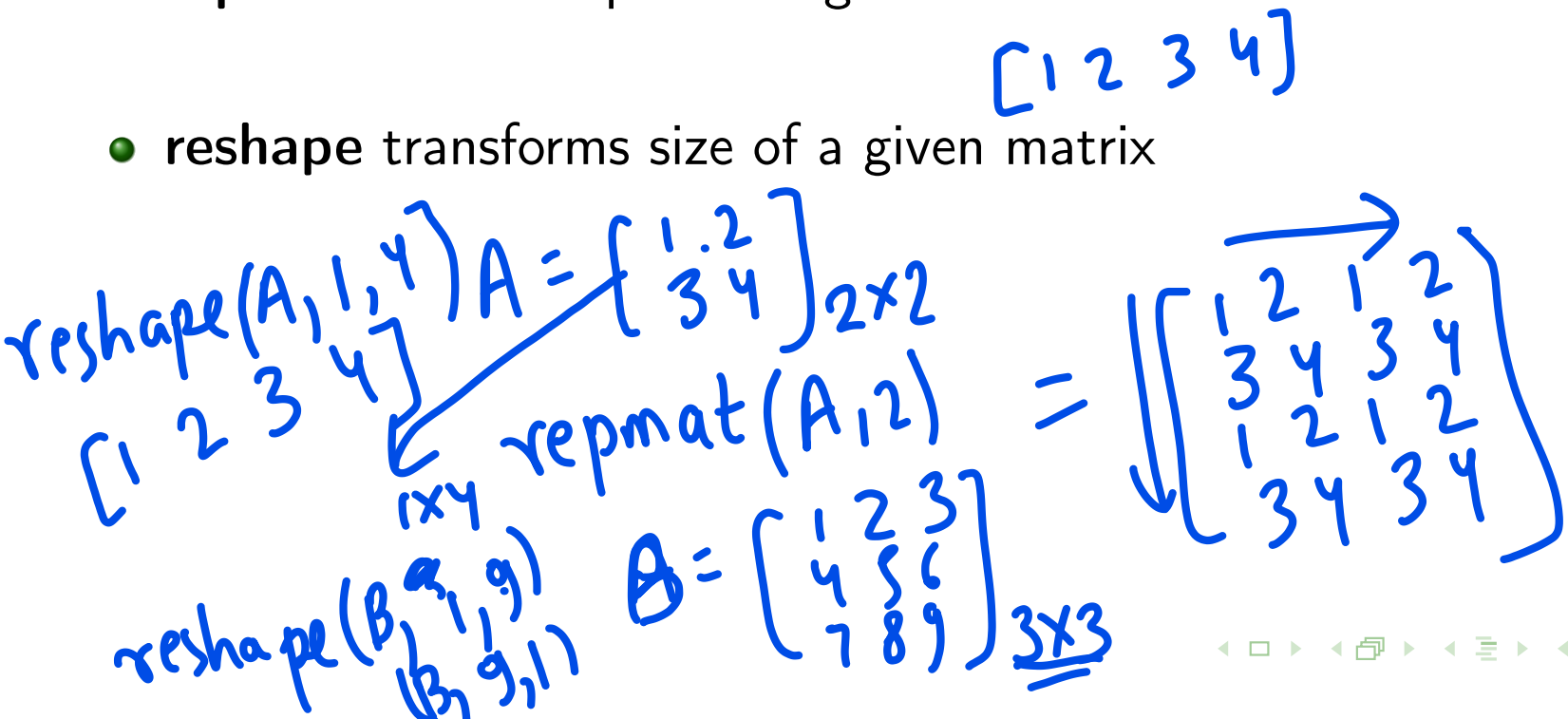
Demo

Special matrices (contd.)



Using 'repmat' and 'reshape' functions

- **repmat** creates copies of a given matrix
- **reshape** transforms size of a given matrix



Special matrices (contd.)

Demo

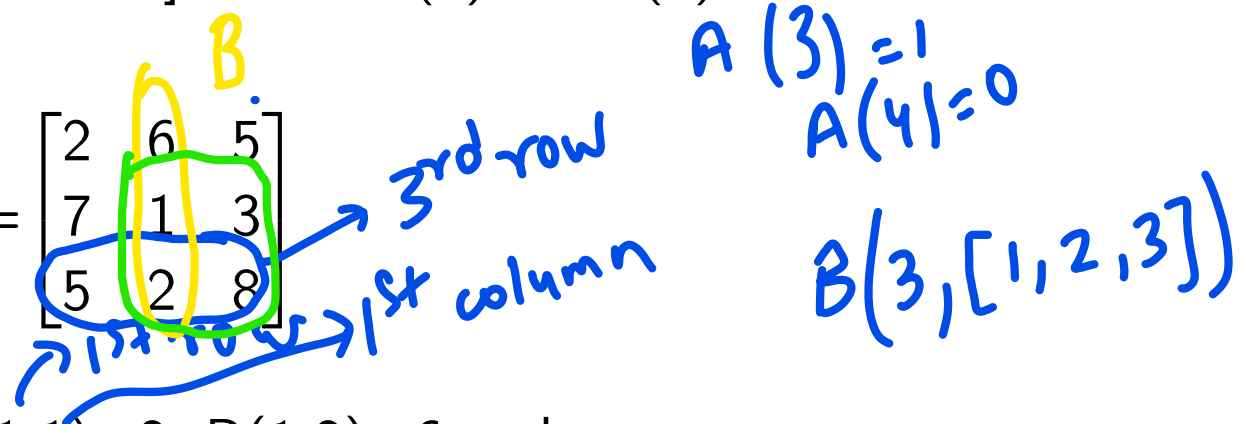
Array indexing

Array indexing means extracting elements of array.

Examples:

- Let A=[5 3 1 0]. Then A(1)=5, A(2)=3 and so on.
- If Let B= $\begin{bmatrix} 2 & 6 & 5 \\ 7 & 1 & 3 \\ 5 & 2 & 8 \end{bmatrix}$

  Then B(1,1)=2, B(1,2)=6 and so on.



Array indexing (contd.)

- Use colon operator to extract a row or column.

  Example: B(3,:) = [5 2 8] (extracts the third row of B)

  3rd row

  all columns

- You can also extract arrays from arrays!

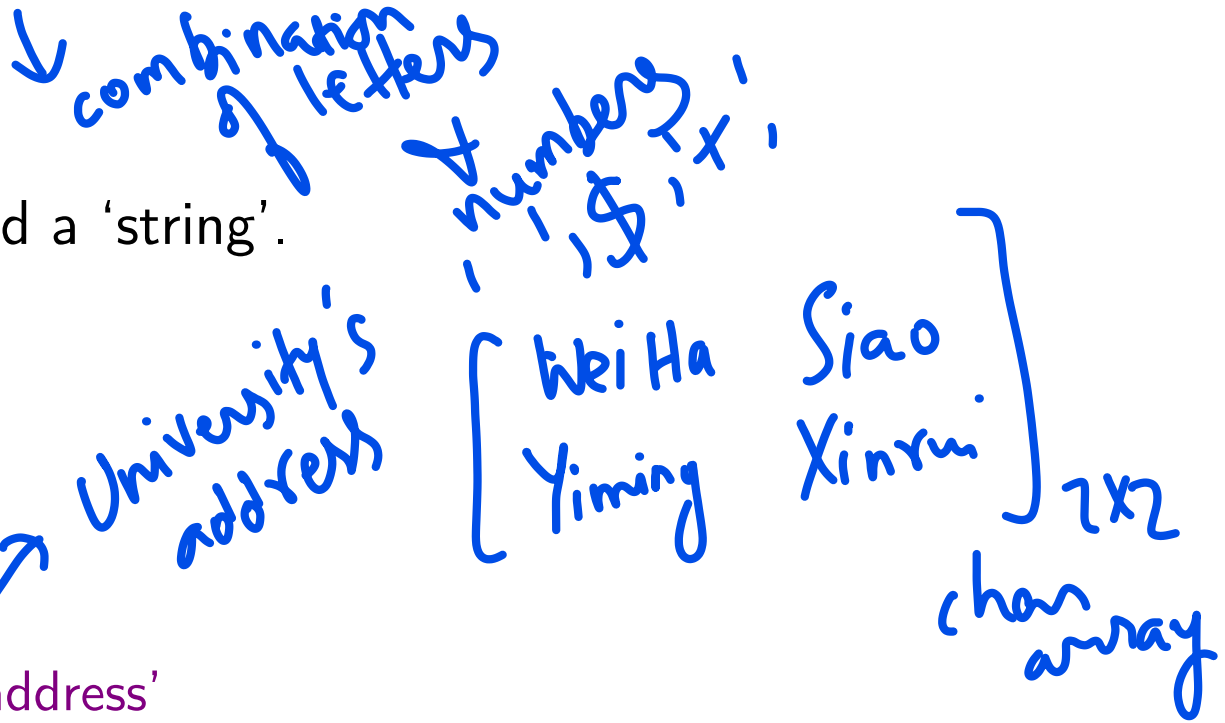
  Example: B([2,3],[2,3]) = extracts the array $\begin{bmatrix} 1 & 3 \\ 2 & 8 \end{bmatrix}$.

Array indexing (contd.)

Demo

Char Arrays

- Char Arrays store alphanumeric characters such as numbers and letters.
- 1-D char array is called a 'string'.
- **Examples of string:**
  1. name ='Wei Hao'
  2. a = 'University''s address'
  3. title = 'plot of sinx vs x'



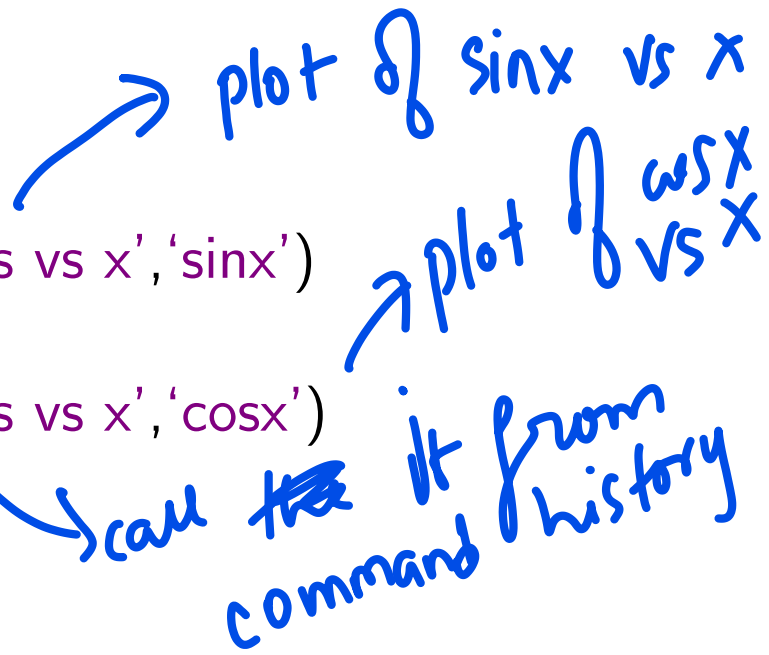
Char Arrays (contd.)

Demo

Char Arrays (contd.)

Char arrays can also be made using **sprintf** function.

Examples:



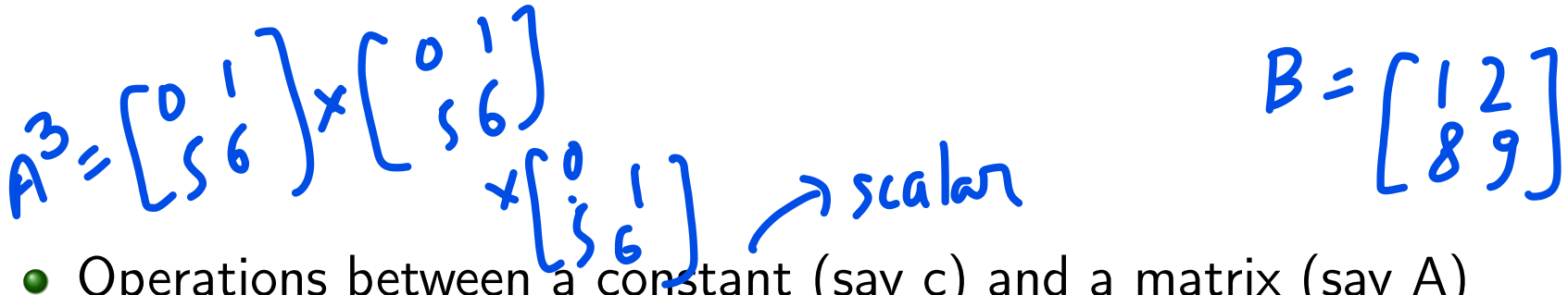

```
title1=sprintf('plot of %s vs x','sinx')

title2=sprintf('plot of %s vs x','cosx')
```

Char Arrays (contd.)

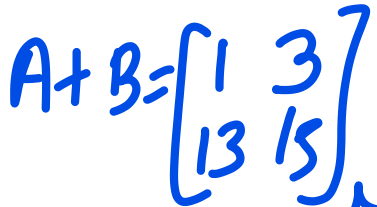
Demo

Arithmetic operations with arrays



- Operations between a constant (say c) and a matrix (say A)

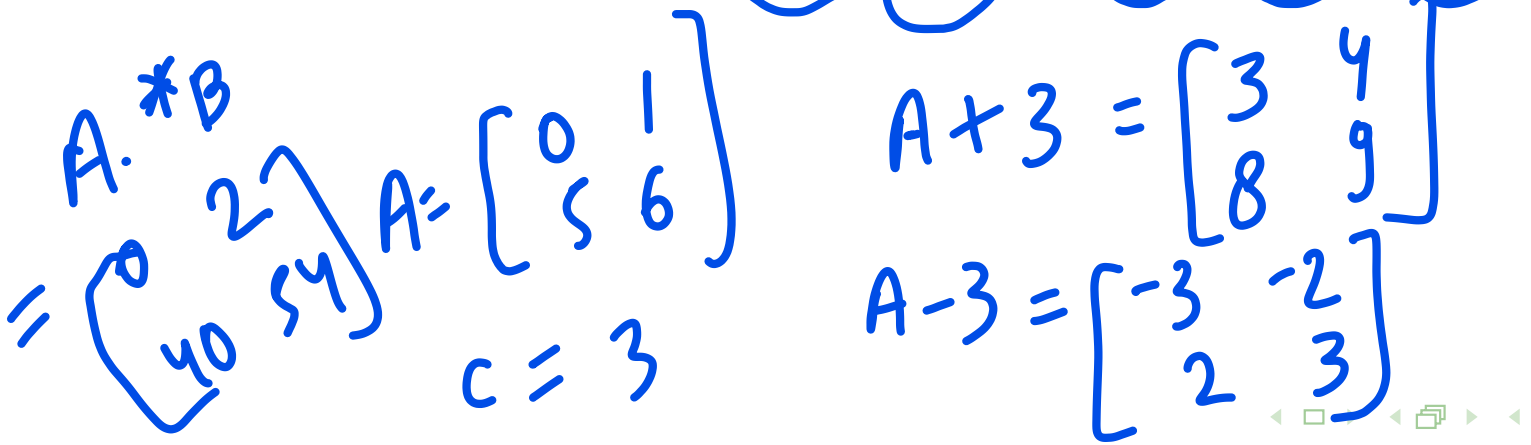
  Examples: A+c, A-c, A*c, A/c, A^c



- Operations between two matrices (say A and B)

  Examples: A+B, A-B, A*B, A/B, A.*B, A./B, A.^B

element by element



Arithmetic operations with arrays (contd.)

eg $Y = \begin{bmatrix} 2 \\ 4 \\ 6 \\ 8 \\ 10 \end{bmatrix}$

- Transpose of a matrix

Example:

If $A = \begin{bmatrix} 2 & 3 \\ 7 & 0 \end{bmatrix}$ then $A' = \begin{bmatrix} 2 & 7 \\ 3 & 0 \end{bmatrix}$

1st row, 2nd row, 1st column, 2nd column

Arithmetic operations with arrays (contd.)

Demo

Arithmetic operations with arrays (contd.)

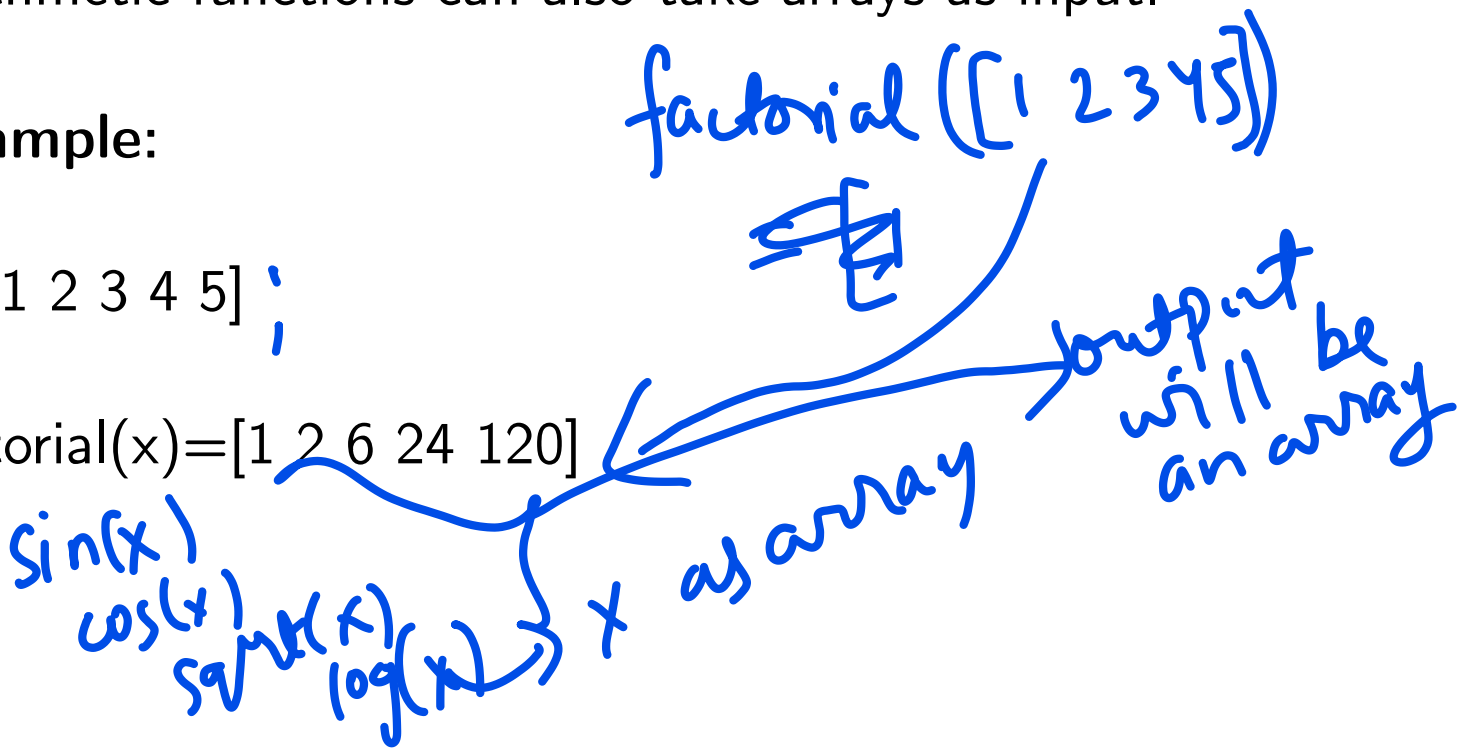
factorial(4) = 4x3x2x1 = 24

Arithmetic functions can also take arrays as input.

Example:

```
x=[1 2 3 4 5];

factorial(x)=[1 2 6 24 120]
```



Arithmetic operations with arrays (contd.)

Demo

Saving and loading variable data

- **save function:** stores variable data in a .mat file

  Command: save 'filename' 'variables to store'

- **load function:** recalls the variable data from a .mat file

  Command: load 'filename'

load myfile.mat

Saving and loading variable data (contd.)

Demo

End of Lecture 4

Please provide your feedback here