

# 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'

Demo

## Special matrices (contd.)

Using 'repmat' and 'reshape' functions

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

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)

- You can also extract arrays from arrays!

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



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  $\sin x$  vs  $x$ '

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')
```

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

# Arithmetic operations with arrays (contd.)

- Transpose of a matrix

**Example:**

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

## Demo



# Arithmetic operations with arrays (contd.)

Arithmetic functions can also take arrays as input.

**Example:**

$x = [1 \ 2 \ 3 \ 4 \ 5]$

$\text{factorial}(x) = [1 \ 2 \ 6 \ 24 \ 120]$

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'

Demo

# End of Lecture 4

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