

# MATLAB Exercise 2

Exercise 3

CSC872

Pattern Analysis and Machine Intelligence

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1

1

## Platforms

- MATLAB
  - MathWorks: <http://www.mathworks.com/>
  - <http://en.wikipedia.org/wiki/MATLAB>
- MATLAB @ SFSU
  - <https://athelp.sfsu.edu/hc/en-us/articles/360011475074-Getting-MATLAB-for-students>
- MATLAB clones
  - Octave: <http://www.gnu.org/software/octave/>
  - SciLab: <http://www.scilab.org/>
- Various tutorials available online
  - [https://matlabacademy.mathworks.com/?s\\_tid=acb\\_tut](https://matlabacademy.mathworks.com/?s_tid=acb_tut)

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2

2

## Vectors

- Create vector: use brackets
- Transpose
- Colon operator, :, 1:2
- Accessing and Assigning values to elements
- Vector operations: dimensions
- >> size
- >> length
- >> mean
- >> std
- >> sum
- >> sort

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3

3

## Matrix

- Create matrix
- Transpose
- Matrix operator: inv, eig etc.
- Vectorization:  $M(:)$  → example
- Matrix operations: \*, .\* , access
- >> rand, randn
- >> ones
- >> zeros
- >> eye
- >> size, length, max, min, diag

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4

4

## Plotting

- Plot
- Hist
- Mesh
- Surf

doc 

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5

5

## Figure

- >> figure
- >> hold
- >> grid
- >> title
- >> xlabel, ylabel
- >> legend
- >> axis
- >> print/savefig
- >> subplot

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6

6

## Exercise

- Make a random matrix
- Modify the matrix arithmetically
- Create a vector from the matrix
- Sort the vector & plot it in a figure
- Make a plot of tangent curve.
- Make a histogram and display it in a figure
- Save the figure into a file and view it in an imaging software

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7

7

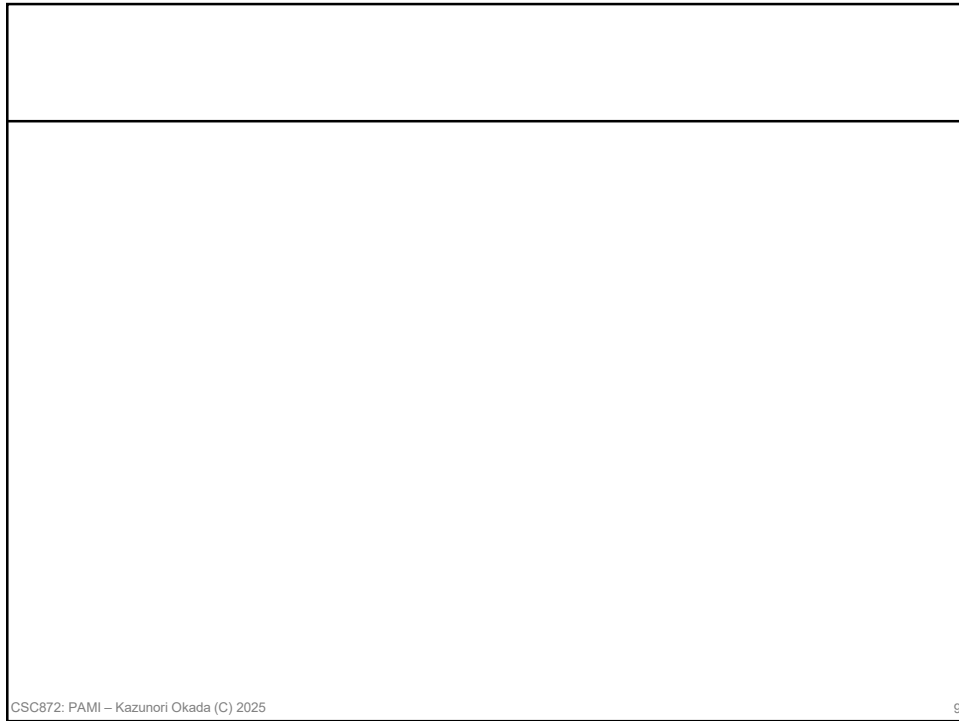
## Useful MATLAB Codes: Matrix Op

- $C = \text{vertcat}(A,B)$  ( $C = [A;B]$ )
- $C = \text{horzcat}(A,B)$  ( $C = [A B]$ )
- $m = \text{mean}(X)$ : a mean vector of input row-sample matrix
- $M = \text{repmat}(m,N,1)$ : create a row matrix with the mean
- $C = \text{cov}(X)$ : covariance matrix of input row-sample matrix
- $[V D] = \text{eig}(C)$  eigen value decomposition

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8

8



## Image Files

- <https://bidal.sfsu.edu/~kazokada/csc872/DATA/9.jpg>
- <https://bidal.sfsu.edu/~kazokada/csc872/DATA/Baboon.bmp>

## Image

- `>> IM = imread(filename)`
- `>> imagesc(IM)`
- `>> imshow(IM)`
- `>> colormap('gray')`
- `>> axis ij, axis equal`
- `>> imresize(IM, factor)`
- `>> imwrite(filename, type)`
- Data types (`whos`)

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11

11

## String

- `>> disp`
- `>> sprintf`

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12

12

## File I/O

- >> dir
- >> fopen, fclose
- >> fprintf, fscanf, fwrite, fread

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13

13

## Loops/Conditions

- Relationship: > < >= <= == ~=
- For loop
- While loop
- break
- If ... elseif ... else ... end

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14

14

## Script & Function

- M-files
- Script
- Function
- Comments
- Path (path, Pathtool)
- Pathtool! ← to open a tool to set path
- >> input

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15

15

## Exercise

- Write a reusable function to
  - Load a color image with specific format from the current directory
  - Display color and bw versions of the same image in a single figure (use subplot)
  - Binarize the image using a user specified threshold
  - Display the result
  - Compute some image statistics (mean, std, etc)
  - Make a plot of the statistics and display it in a figure
  - Save figures in a bitmap image and an eps file.

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16

16