9.913 Pattern Recognition for Machine Vision
Quick Matlab Tutorial
Matlab

Scalar

```matlab
>> a = 10
a =
   10
>> a = 11;
>> a
a =
   11
```
Matlab

Matrix

```
>> a = [11 12 13]
a =
   11   12   13
>> a = [11 12 13; 21 22 23]
>> a
a =
    11   12   13
    21   22   23
>> a(2, 3)
an =
    23
>> a(3)
an =
   12
```

- Row matrix
- Starting another row
- Matrix addressing (1-based)
- With a single index
Matlab

Matrix indexing

```
>> 1:3
ans =
   1   2   3
>> 10:-2:1
ans =
  10   8   6   4   2
>> a(1, 2:3)
ans =
   12   13
>> a(1, 2:3) = 0
a =
   11   0   0
   21   22   23
>> a(:, 2:3) = []
a =
   11
   21
```

- Colon operator
- With a step
- Range addressing
- Setting values
- removing columns
Matlab

Special matrices

```
>> zeros(2, 3)
an =
     0     0     0
     0     0     0

>> ones(2, 3)
an =
     1     1     1
     1     1     1

>> eye(2, 3)
an =
     1     0     0
     0     1     0

>> rand(2, 3)  % uniformly distributed [0,1]
>> randn(2, 3) % normally distributed μ=0, σ=1
```
Matlab

Matrix operations

\[
\begin{align*}
&\text{Addition:} & \quad \text{>> a + b} & \quad - \text{addition} \\
&\text{Matrix multiplication:} & \quad \text{>> a * b} & \quad - \text{matrix multiplication} \\
&\text{Element-wise multiplication:} & \quad \text{>> a .* b} & \quad - \text{element-wise multiplication} \\
&\text{Matrix inverse:} & \quad \text{>> inv(a)} & \quad - \text{matrix inverse} \\
&\text{Matrix power:} & \quad \text{>> a ^ 2} & \quad - \text{matrix power} \\
&\text{Element-wise power:} & \quad \text{>> a .^ b} & \quad - \text{element-wise power} \\
&\text{Division by a scalar:} & \quad \text{>> a / 2} & \quad - \text{division by a scalar} \\
&\text{Element-wise division:} & \quad \text{>> a ./ b} & \quad - \text{element-wise division} \\
&\text{Matrix eigenvalues:} & \quad \text{>> eig(a)} & \quad - \text{matrix eigenvalues}
\end{align*}
\]
Matlab

Scripting

<script_name>.m - script file

Programming:

if a == 1
    <stuff here>
end

for ii = 2:100
    a(ii) = a(ii)+a(ii-1);
end

while a == 10
    <stuff here>
end
Matlab

Functions

File fun.m:

function [a, b] = fun(c, d)
% Everything from here to the empty line will be
% printed if you type “help fun”

a = c + d;
b = a - c;

-----------------------------------------
Matlab

Plotting:

plot(x, y, colspec)

Eg:

>> plot(sin(x))      - default plot against array index
>> plot(x, sin(x), 'r') - red against values of x
>> plot(x, sin(x), 'g.') - green dots
>> image(I)          - plots matrix (0-1) as image
>> imagesc(I)        - plots matrix with scaling to 0-1
>> [a, map] = imread('file.jpg'); - read .jpg image from disk
>> imshow(a, map)     - display the image
Matlab

Useful commands:

help <command> - help about a command
lookfor <string> - find all help containing <string>
diary - log all subsequent commands to file