

LAB PRACTICAL 1: MATLAB INTRODUCTION



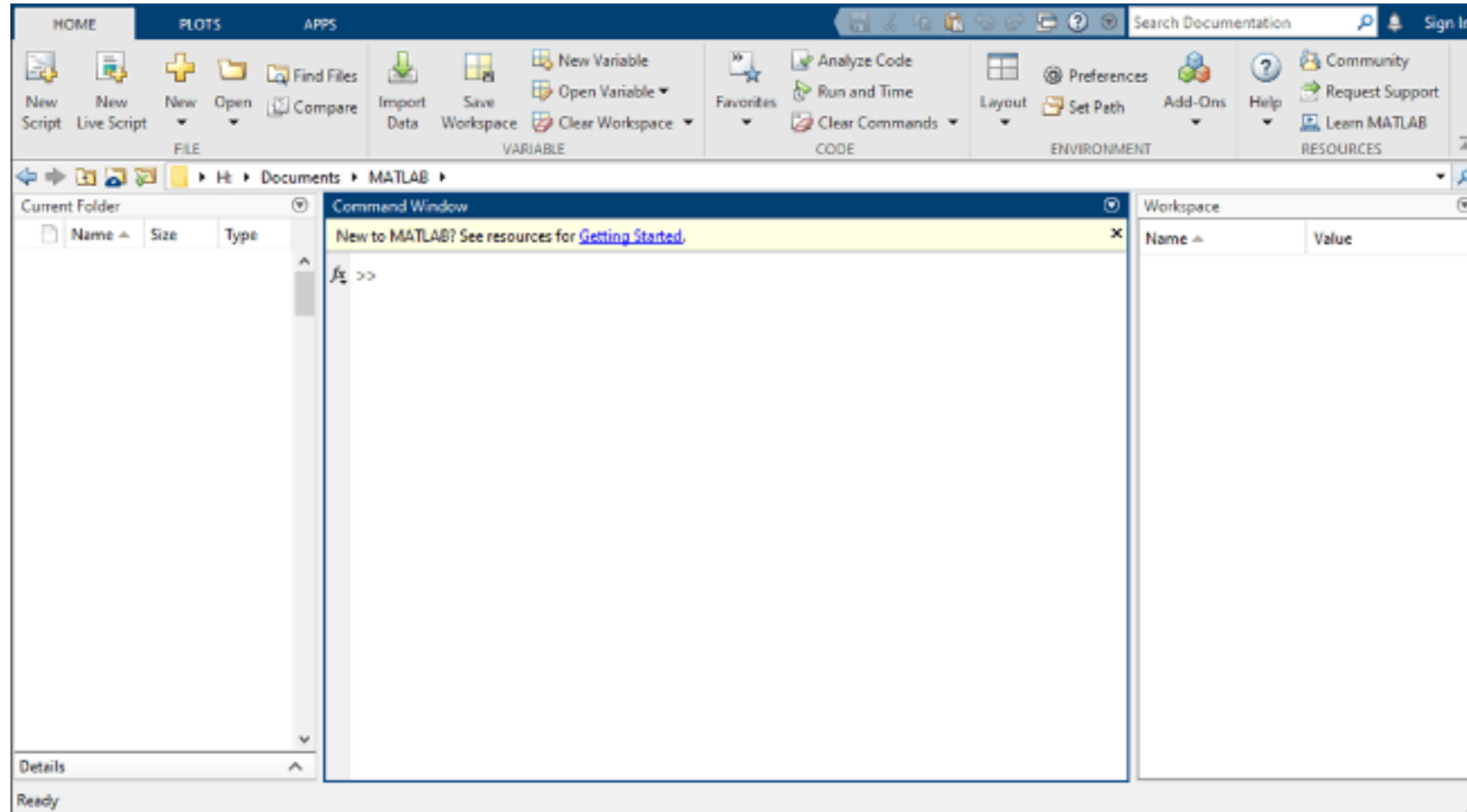
PUSL3123 AI and Machine Learning

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Desktop Basics



The desktop includes these panels:

- **Current Folder** — Access your files.
- **Command Window** — Enter commands at the command line, indicated by the prompt (>>).
- **Workspace** — Explore data that you create or import from files.

Matrices and Arrays

clear all;

% Array Creation

A = [2 100 4 11]; % Row vector

B = [2, 0, 5 ,1];

% 3*3 matrix

C= [4 3 1; 3 3 2; 9 1 0];

% Create a matrix is to use a function

Zero = zeros(3,1);

Ones = ones(3,2);

% Matrix and Array Operations

OP=A+3;

% transpose a matrix

OP1=OP';

% Concatenation, joining arrays to make larger ones

Newarray=[A, B];

% returns an n-by-n matrix with equal row and column sums

Col_Row_Equal = magic(4);

Calling Functions

% Calling Functions

```
Max_Col=max(Col_Row_Equal);
```

% returns the maximum elements of an array.

```
Min_FirstCol=min(Col_Row_Equal(:,1));
```

% returns the maximum element of first column.

```
Min_FirstRow=min(Col_Row_Equal(1,:));
```

% returns the maximum element of row.

```
Mat_Size=size(Col_Row_Equal)
```

% returns a row vector whose elements are the lengths of the corresponding dimensions of matrix

```
mean_dataset=mean(A);
```

% let's create a new vector to implement Variance and standard_deviation

```
vector=[2, 1.8, 1.5 ,1.9];
```

```
Variance=var(Vector);
```

```
standard_deviation=std(Vector);
```

```
x = [0 2 9 2 5 8 7 3 1 9 4 3 5 8 10 0 1 2 9 5 10];
```

```
hist(x)
```

```
nbins = 5;
```

```
hist(x,nbins)
```

Plot in Matlab

```
clear all;
```

```
clc
```

```
close all
```

```
x = linspace(0,2*pi); % returns a row vector of 100 evenly spaced points
```

```
y = sin(x)
```

```
% label the axes and add a title.
```

```
xlabel("x")
```

```
ylabel("sin(x)")
```

```
title("Plot of the Sine Function")
```

```
plot(x,y,"r--")
```

```
% Retains plots in the current axes so that new plots added to the axes do not delete existing plots
```

```
hold on
```

```
y2 = cos(x);
```

```
plot(x,y2,"b--")
```

```
hold off
```

Multiple Plots

- clear all;
close all
% Create tiled chart layout
t = tiledlayout(2,2);
title(t,"Trigonometric Functions")
x = linspace(0,30);
% Create axes in tiled chart layout
nexttile
plot(x,sin(x))
title("Sine")
nexttile
plot(x,cos(x))
title("Cosine")
nexttile
plot(x,tan(x))
title("Tangent")
nexttile
plot(x,sec(x))
title("Secant")

Uniform probability distribution

- Use the Matlab **rand** function to generate a 1xn dimensional matrix samples drawn from a uniform distribution (use '**help** rand' to find more about the '**rand**' function)
- From what range does rand draw samples?
- Select a suitable number of samples
- Display the size of the array
- Plot the data against sample number using the plot command.
- Use the histogram command and plot a histogram of the distribution
- Ensure you put suitable labels on the plot axes and add a title, etc.
- Experiment with different numbers of samples and bins

Uniform probability distribution

Typical results are shown below in Fig. 1.

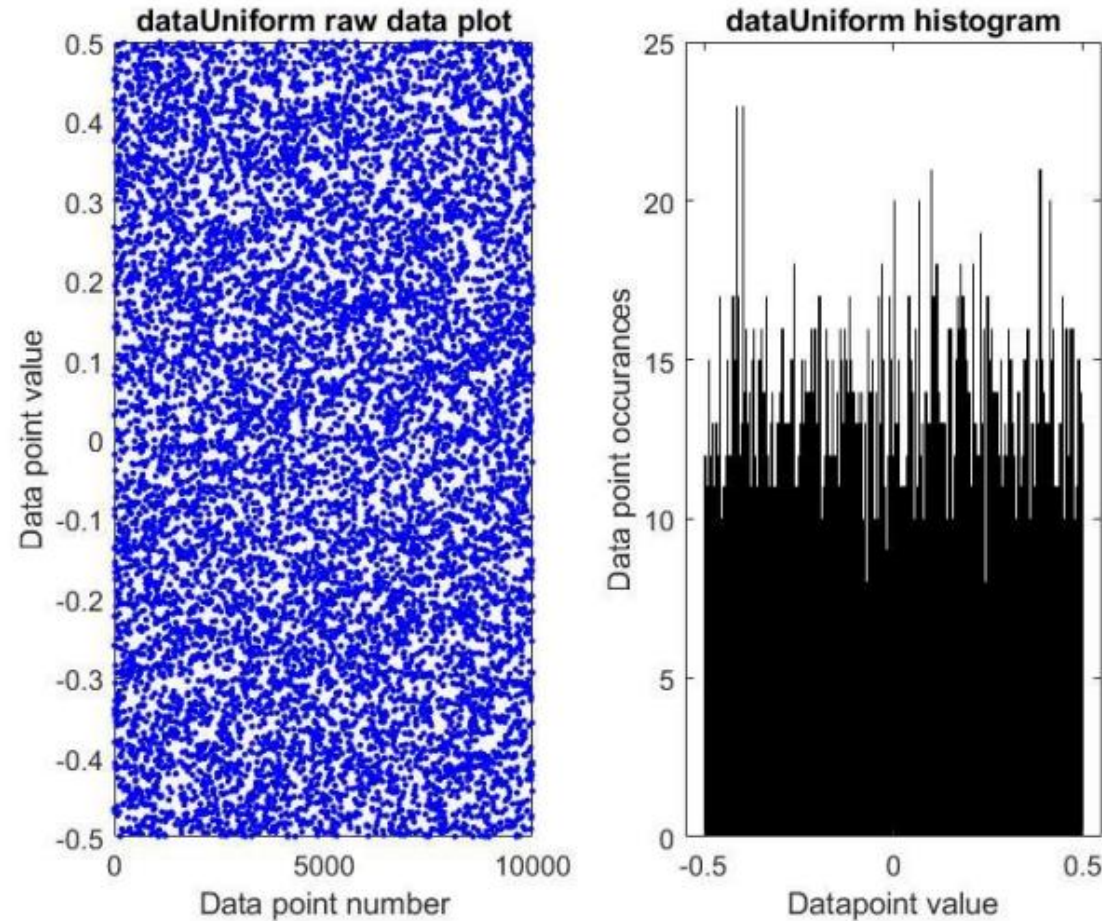


Fig. 1 Sample plot and histogram plot of a uniform distribution

Generate a 2-D distribution

- Call the **randn** function with parameters (2, samples) to generate a 2xn dimensional matrix of samples drawn from a normal distribution
- Select a suitable number of samples
- Display the size of the array.
- Plot the data dimension against each other to get a **2D scatter** plot that should look something like that shown below in **Fig. 3**. (hint: type '**help scatter**' to find out how to use the function)
- What is the mean vector of your dataset?
- Use the **cov** function to compute the **covariance** matrix of your dataset. What is the covariance of your dataset?

Generate a 2-D distribution

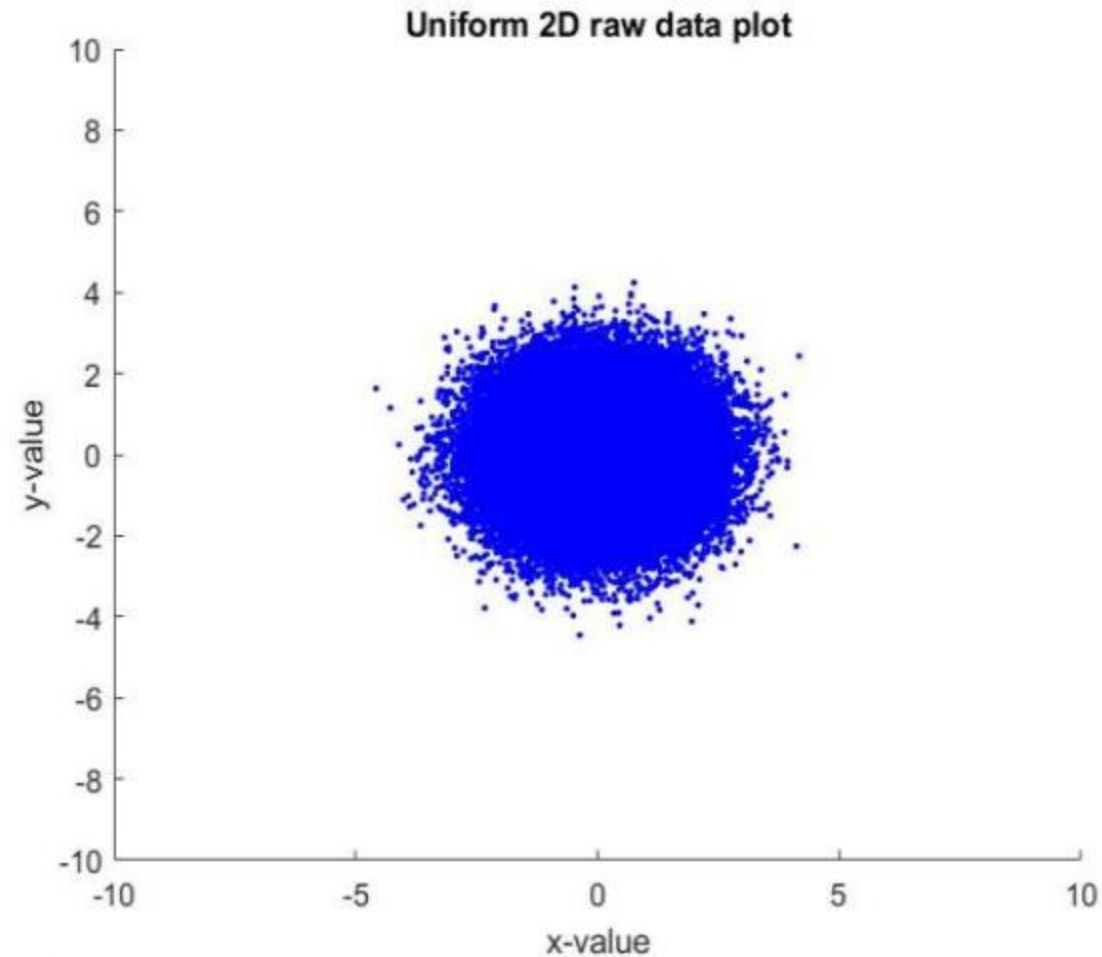


Fig. 3. Plot of the two feature values against each other for all data samples

Reading List

- Types of MATLAB Plots
https://uk.mathworks.com/help/matlab/creating_plots/types-of-matlab-plots.html
- Get Started with MATLAB
<https://uk.mathworks.com/help/matlab/getting-started-with-matlab.html>
- Data Import and Analysis — Functions
https://uk.mathworks.com/help/matlab/referencelist.html?type=function&category=data-import-and-analysis&s_tid=CRUX_topnav