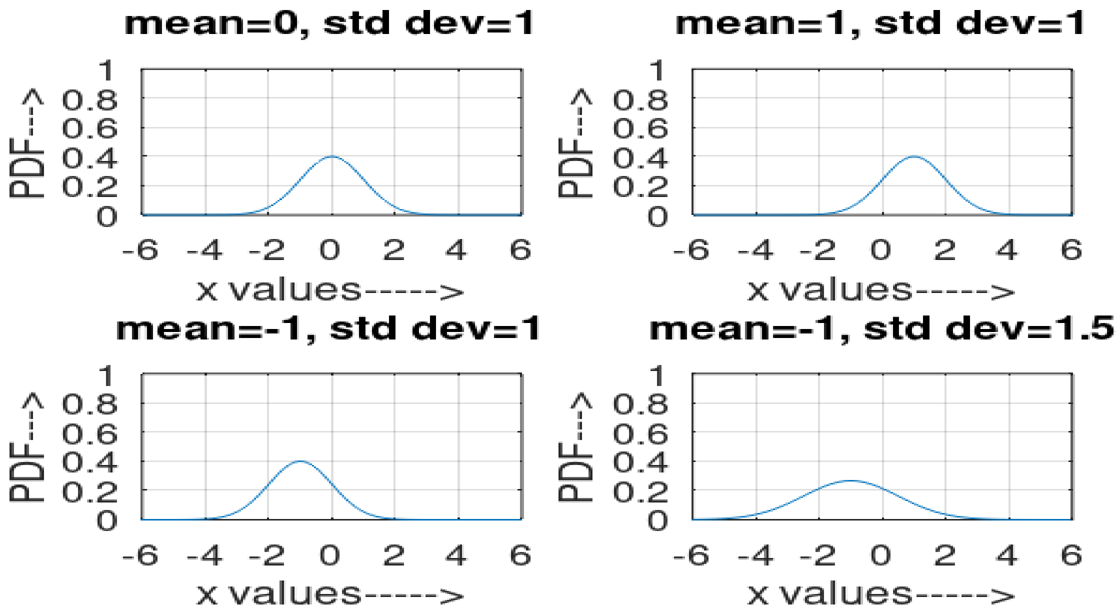
Processes: - Gaussian PDF

```
clc;

clear;

close all;

printf("Name: Jay Kotwal\n");

printf("Roll No: 32137\n");

printf("Batch: L6\n");

pkg load statistics;

 m = 0;

 sd = 1;

 x=-6:0.1:6;

 y=normpdf(x,m,sd);

 figure(1)

 subplot(2,2,1)

 plot(x,y)

 axis([-6 6 0 1])

 xlabel('x values----->');

 ylabel('PDF--->');

 title('CASE-1: mean=0, std dev=1')

 grid on;

 m = 1;

 sd = 1;

 x=-6:0.1:6;

 y=normpdf(x,m,sd);

 subplot(2,2,2)

 plot(x,y)

 axis([-6 6 0 1])

 xlabel('x values----->');

 ylabel('PDF--->');

 title('CASE-2: mean=1, std dev=1')

 grid on;
```

```
m = -1;

sd = 1;

x=-6:0.1:6;

y=normpdf(x,m,sd);

subplot(2,2,3)

plot(x,y)

axis([-6 6 0 1])

xlabel('x values----->');

ylabel('PDF--->');

title('CASE-3: mean=-1, std dev=1')

grid on;

m = -1;

sd = 1.5;

x=-6:0.1:6;

y=normpdf(x,m,sd);

subplot(2,2,4)

plot(x,y)

axis([-6 6 0 1])

xlabel('x values----->');

ylabel('PDF--->');

title('CASE-4: mean=-1, std dev=1.5')
```

```
grid on;
```

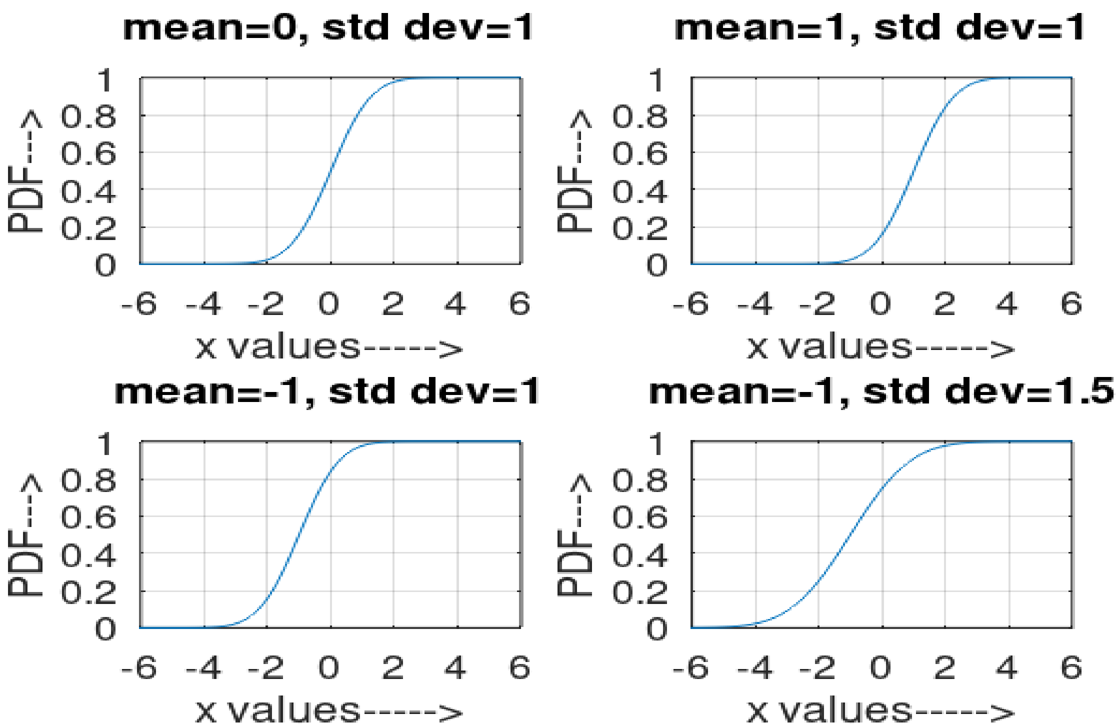


Processes: - Gaussian CDF

```
clc;
clear all;
close all;
pkg load statistics;
 m = 0;
 sd = 1;
 x=-6:0.1:6;
 y=normcdf(x,m,sd);
 figure(1)
 subplot(2,2,1)
 plot(x,y)
 axis([-6 6 0 1])
 xlabel('x values----->');
 ylabel('PDF--->');
 title('mean=0, std dev=1')
 grid on;
 m = 1;
 sd = 1;
```

```
x=-6:0.1:6;
y=normcdf(x,m,sd);
subplot(2,2,2)
plot(x,y)
axis([-6 6 0 1])
xlabel('x values----->');
ylabel('PDF--->');
title('mean=1, std dev=1')
grid on;
m = -1;
sd = 1;
x=-6:0.1:6;
y=normcdf(x,m,sd);
subplot(2,2,3)
plot(x,y)
axis([-6 6 0 1])
xlabel('x values----->');
ylabel('PDF--->');
title('mean=-1, std dev=1')
grid on;
m = -1;
sd = 1.5;
x=-6:0.1:6;
y=normcdf(x,m,sd);
subplot(2,2,4)
plot(x,y)
axis([-6 6 0 1])
xlabel('x values----->');
ylabel('PDF--->');
title('mean=-1, std dev=1.5')
```

grid on;

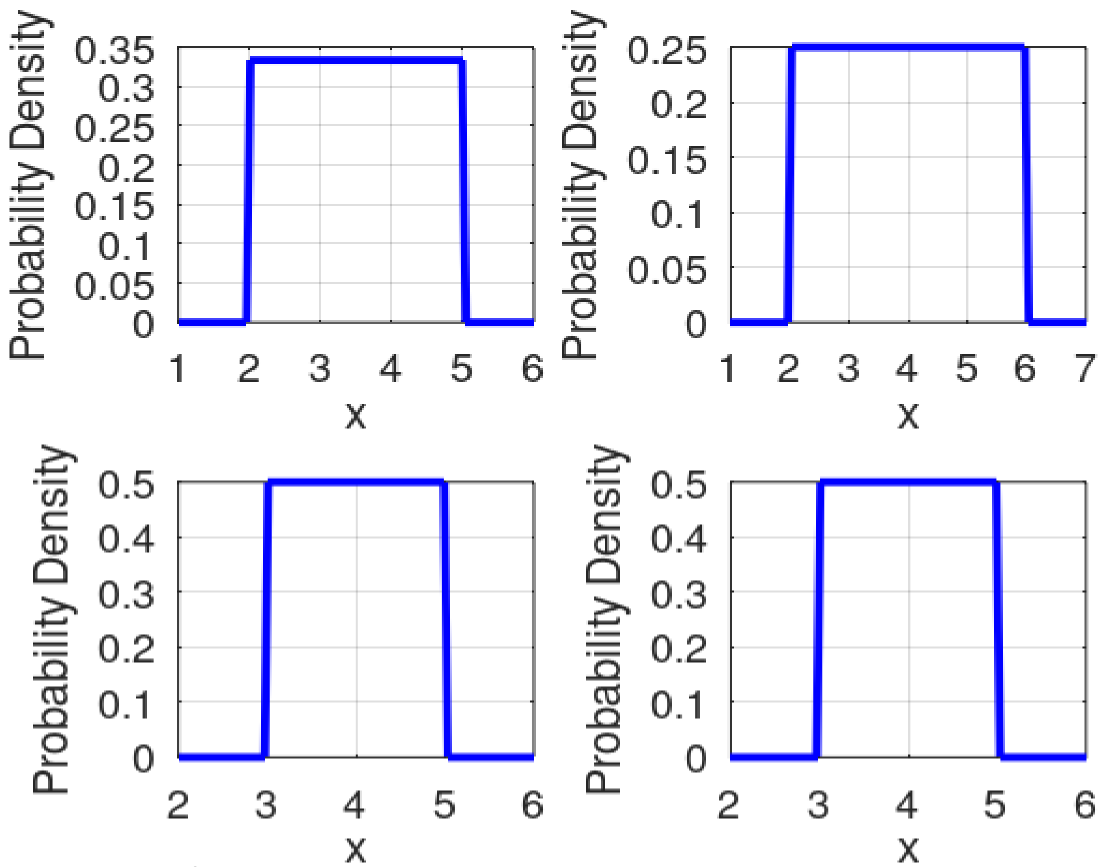


Processes: - Uniform PDF

```
a = 2;

b = 5;

x = linspace(a-1, b+1, 100);

pdf_vals = unifpdf(x, a, b);

subplot(2,2,1)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

a = 2;

b = 6;

x = linspace(a-1, b+1, 100);

pdf_vals = unifpdf(x, a, b);

subplot(2,2,2)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');
```

```
grid on;

a = 3;

b = 5;

x = linspace(a-1, b+1, 100);

pdf_vals = unifpdf(x, a, b);

subplot(2,2,3)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

a = 3;

b = 5;

x = linspace(a-1, b+1, 100);

pdf_vals = unifpdf(x, a, b);

subplot(2,2,4)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');
```

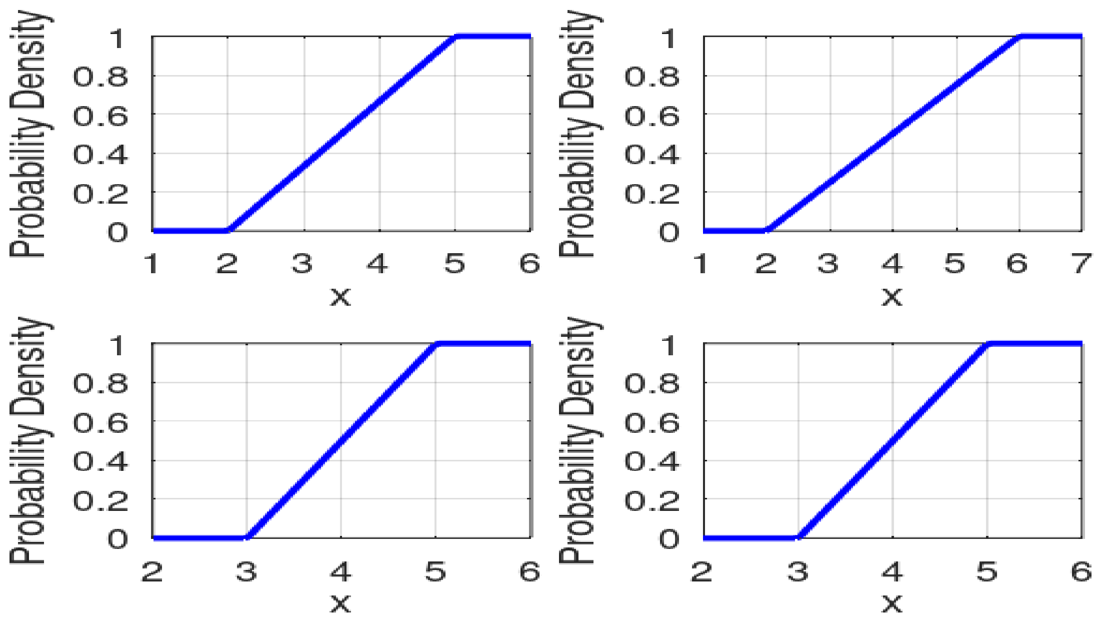
```
grid on;
```



Processes: - Uniform CDF

```
a = 2;

b = 5;

x = linspace(a-1, b+1, 100);

pdf_vals = unifcdf(x, a, b);

subplot(2,2,1)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

a = 2;

b = 6;

x = linspace(a-1, b+1, 100);

pdf_vals = unifcdf(x, a, b);

subplot(2,2,2)
```

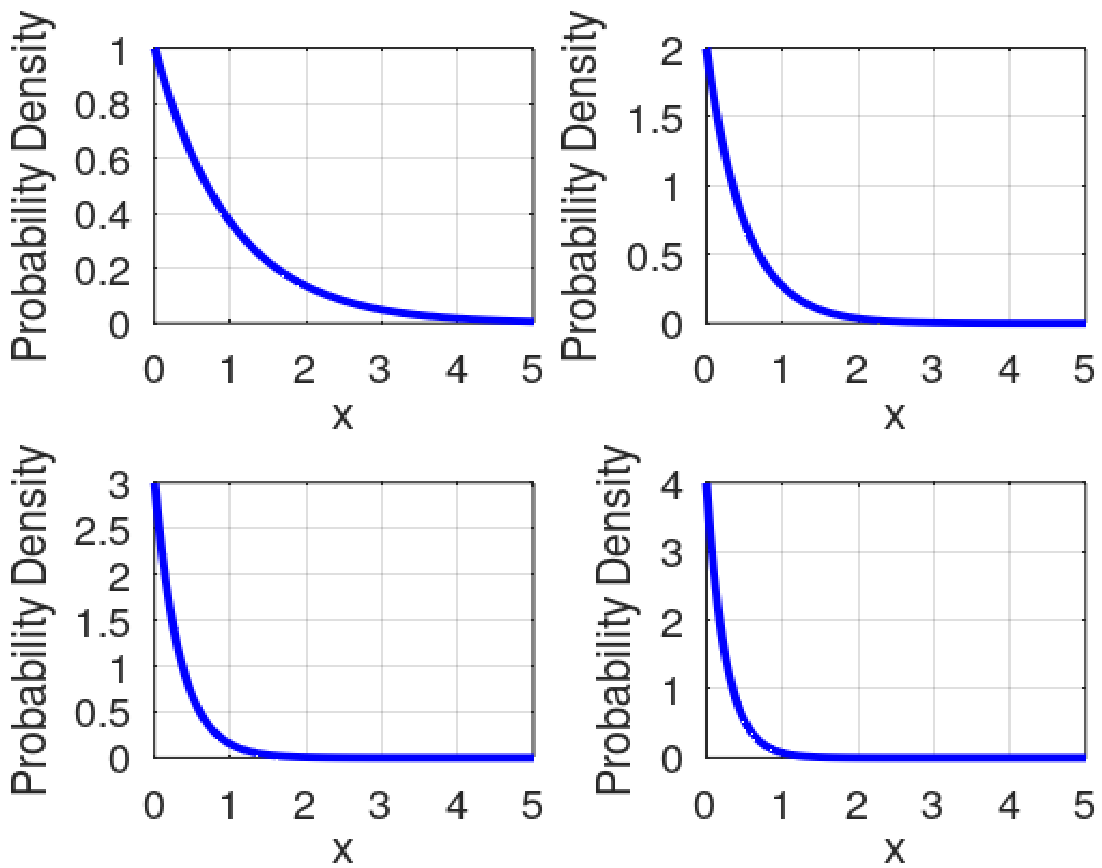
```
plot(x, pdf_vals, 'b-', 'LineWidth', 2);
xlabel('x');
ylabel('Probability Density');
grid on;
a = 3;
b = 5;
x = linspace(a-1, b+1, 100);
pdf_vals = unifcdf(x, a, b);
subplot(2,2,3)
plot(x, pdf_vals, 'b-', 'LineWidth', 2);
xlabel('x');
ylabel('Probability Density');
grid on;
a = 3;
b = 5;
x = linspace(a-1, b+1, 100);
pdf_vals = unifcdf(x, a, b);
subplot(2,2,4)
plot(x, pdf_vals, 'b-', 'LineWidth', 2);
xlabel('x');
ylabel('Probability Density');
grid on;
```



Processes: - Exponential PDF

```
lambda = 1;

x = linspace(0, 5, 100);

pdf_vals = exppdf(x, 1/lambda);

subplot(2,2,1)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

lambda = 2;

x = linspace(0, 5, 100);

pdf_vals = exppdf(x, 1/lambda);

subplot(2,2,2)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

lambda = 3;

x = linspace(0, 5, 100);
```

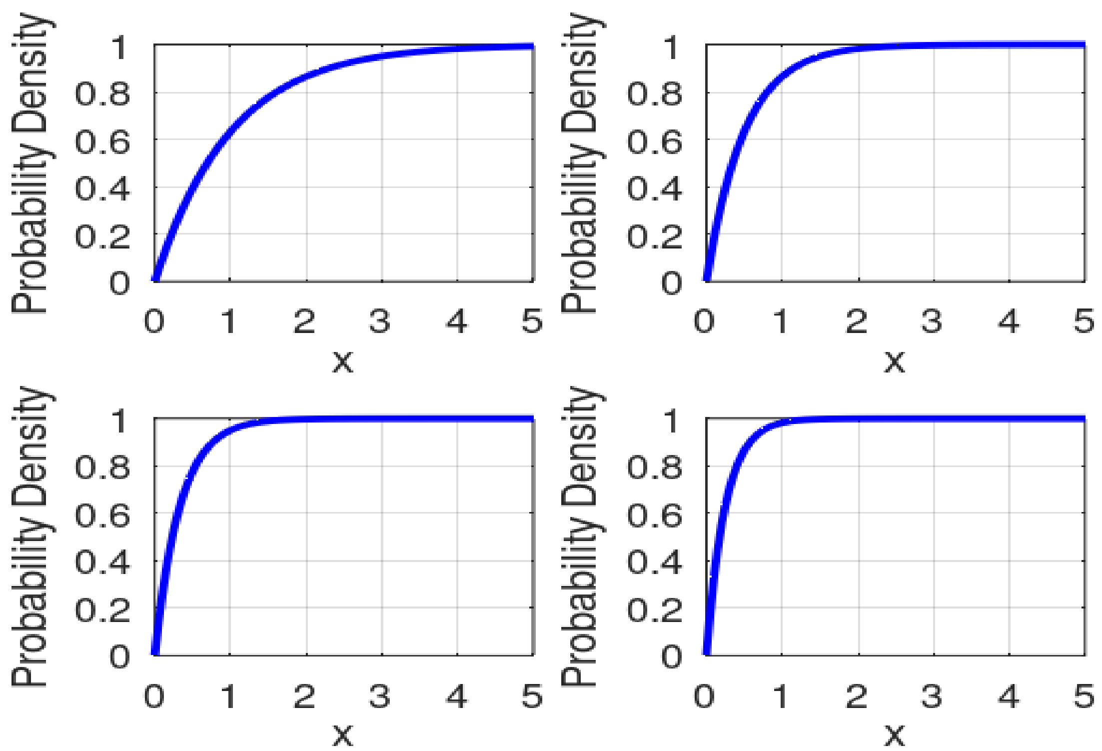
```
pdf_vals = exppdf(x, 1/lambda);

subplot(2,2,3)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

lambda = 4;

x = linspace(0, 5, 100);

pdf_vals = exppdf(x, 1/lambda);

subplot(2,2,4)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;
```



Processes: - Exponential CDF

```
lambda = 1;

x = linspace(0, 5, 100);

pdf_vals = expcdf(x, 1/lambda);

subplot(2,2,1)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

lambda = 2;

x = linspace(0, 5, 100);

pdf_vals = expcdf(x, 1/lambda);

subplot(2,2,2)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

lambda = 3;

x = linspace(0, 5, 100);

pdf_vals = expcdf(x, 1/lambda);

subplot(2,2,3)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');

ylabel('Probability Density');

grid on;

lambda = 4;

x = linspace(0, 5, 100);

pdf_vals = expcdf(x, 1/lambda);

subplot(2,2,4)

plot(x, pdf_vals, 'b-', 'LineWidth', 2);

xlabel('x');
```

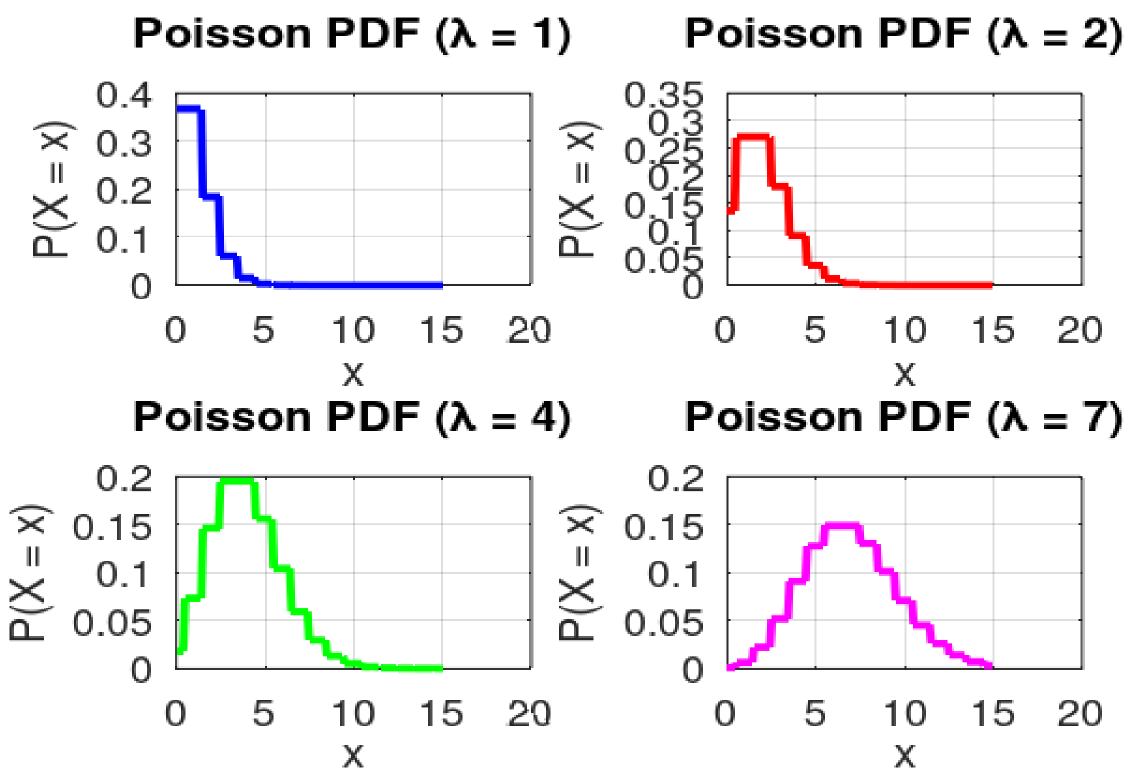
```
ylabel('Probability Density');

grid on;
```



Processes: - Poison's PDF

```
x = 0:0.1:15;

% λ = 1

subplot(2, 2, 1);

y1 = poisspdf(round(x), 1);

plot(x, y1, 'b', 'LineWidth', 2);

title('Poisson PDF (\lambda = 1)');

xlabel('x'); ylabel('P(X = x)'); grid on;

% λ = 2

subplot(2, 2, 2);

y2 = poisspdf(round(x), 2);

plot(x, y2, 'r', 'LineWidth', 2);

title('Poisson PDF (\lambda = 2)');

xlabel('x'); ylabel('P(X = x)'); grid on;

% λ = 4

subplot(2, 2, 3);
```

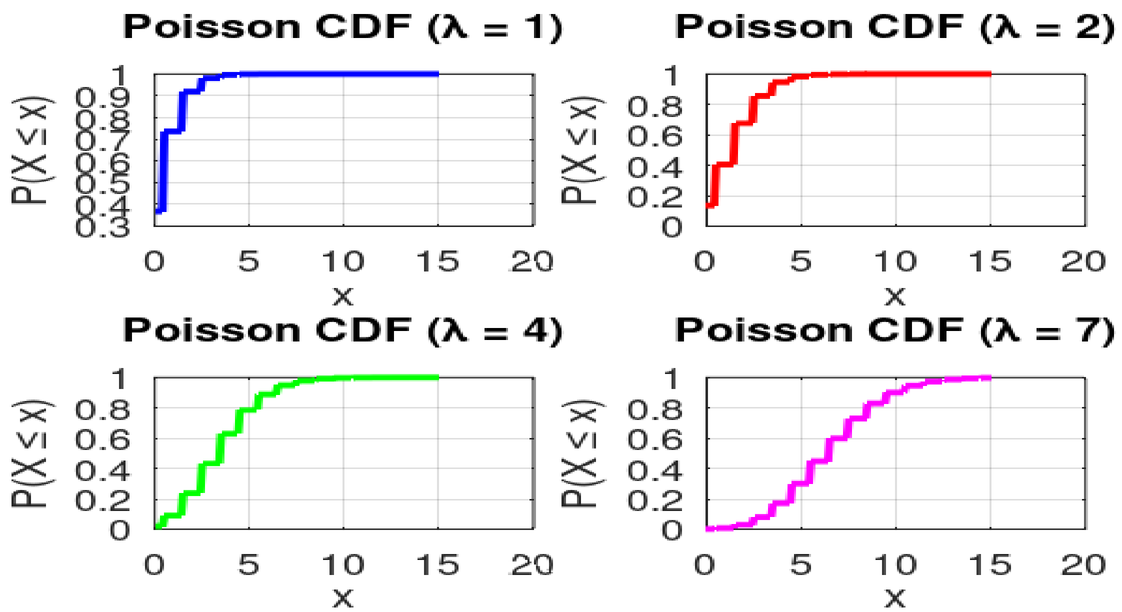
```
y3 = poisspdf(round(x), 4);

plot(x, y3, 'g', 'LineWidth', 2);

title('Poisson PDF (\lambda = 4)');

xlabel('x'); ylabel('P(X = x)'); grid on;

% λ = 7

subplot(2, 2, 4);

y4 = poisspdf(round(x), 7);

plot(x, y4, 'm', 'LineWidth', 2);

title('Poisson PDF (\lambda = 7)');

xlabel('x'); ylabel('P(X = x)'); grid on;
```



Processes: - Poison's CDF

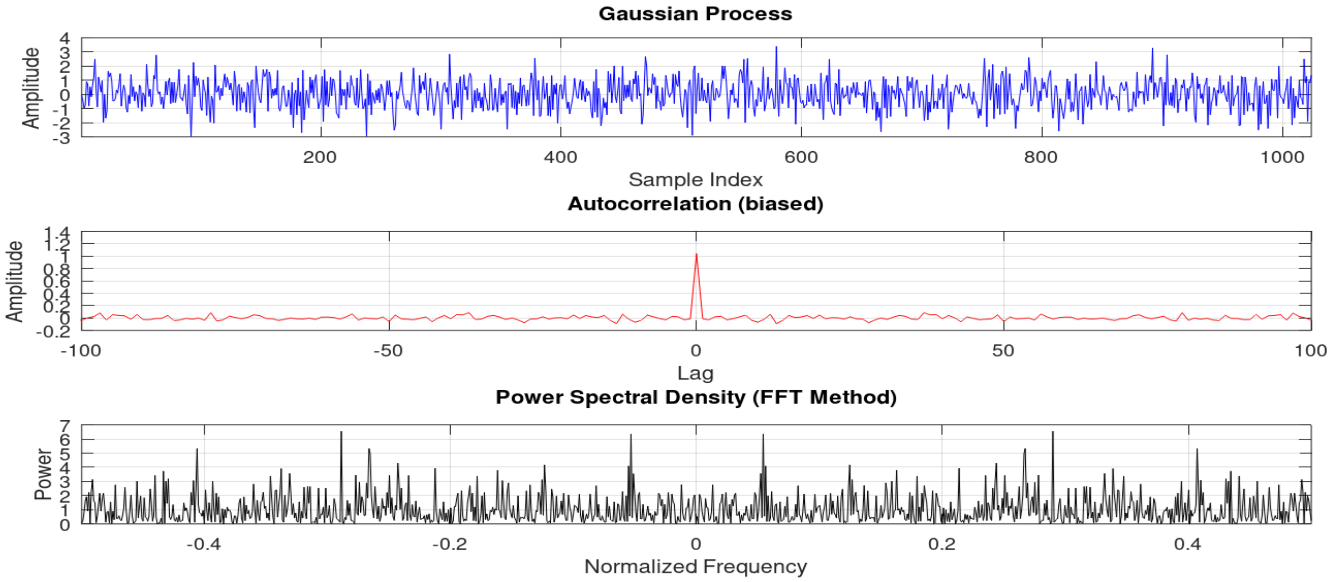
```
% Poisson CDF plots for λ = 1, 2, 4, 7 (no loop)

x = 0:0.1:15;

% λ = 1

subplot(2, 2, 1);

y1 = poisscdf(round(x), 1);

plot(x, y1, 'b', 'LineWidth', 2);
```

```
title('Poisson CDF (\lambda = 1)');

xlabel('x'); ylabel('P(X \leq x)'); grid on;

% λ = 2

subplot(2, 2, 2);

y2 = poisscdf(round(x), 2);

plot(x, y2, 'r', 'LineWidth', 2);

title('Poisson CDF (\lambda = 2)');

xlabel('x'); ylabel('P(X \leq x)'); grid on;

% λ = 4

subplot(2, 2, 3);

y3 = poisscdf(round(x), 4);

plot(x, y3, 'g', 'LineWidth', 2);

title('Poisson CDF (\lambda = 4)');

xlabel('x'); ylabel('P(X \leq x)'); grid on;

% λ = 7

subplot(2, 2, 4);

y4 = poisscdf(round(x), 7);

plot(x, y4, 'm', 'LineWidth', 2);

title('Poisson CDF (\lambda = 7)');

xlabel('x'); ylabel('P(X \leq x)'); grid on;
```



Autocorrelation and PSD of Gaussian: -

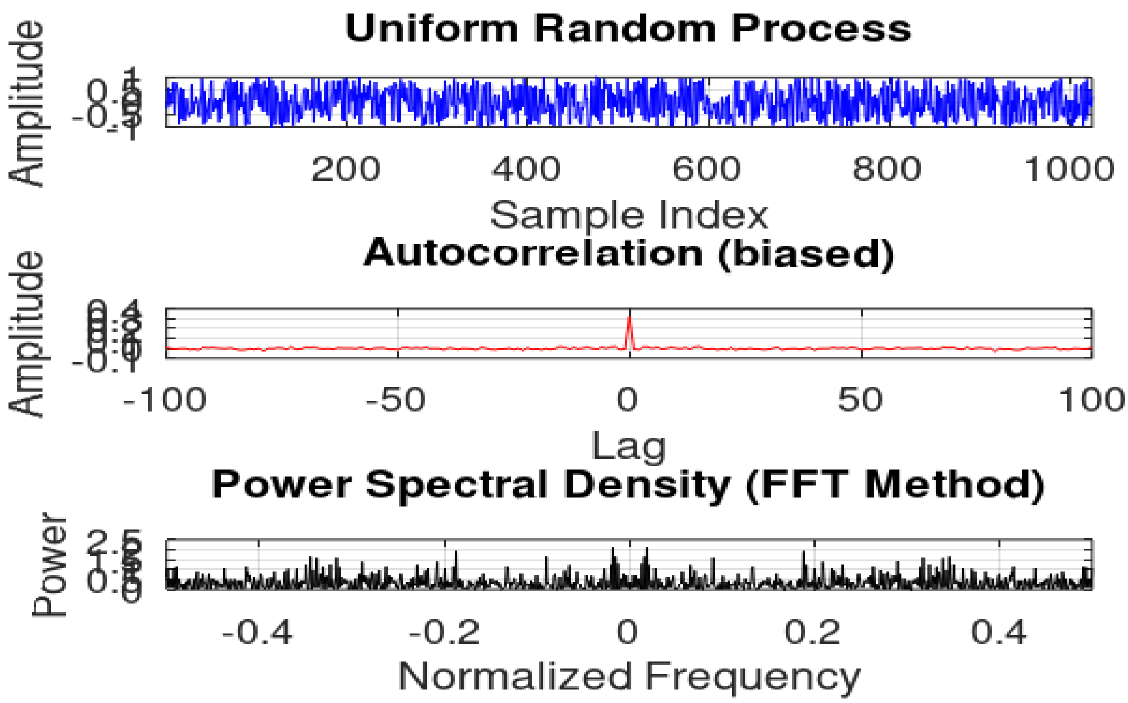
```
% --- Parameters ---

N = 1024;             % Number of samples

mu = 0;               % Mean of Gaussian

sigma = 1;            % Standard deviation

% --- Generate Gaussian Process ---

x = normrnd(mu, sigma, [1, N]);   % Gaussian random sequence

% --- Compute Autocorrelation ---

[Rxx, lags] = xcorr(x, 'biased');  % Biased autocorrelation

% --- Compute PSD using FFT ---

Xf = fftshift(fft(x, N));         % FFT of signal

PSD = abs(Xf).^2 / N;             % Power Spectral Density

f = linspace(-0.5, 0.5, N);       % Normalized frequency axis

% --- Plot using Subplots ---

figure;

subplot(3,1,1);

plot(x);

title('Gaussian Process');

xlabel('Sample');

ylabel('Amplitude');

subplot(3,1,2);

plot(lags, Rxx);

title('Autocorrelation');

xlabel('Lag');

ylabel('Autocorr');

subplot(3,1,3);

plot(f, PSD);

title('Power Spectral Density (PSD)');

xlabel('Normalized Frequency');

ylabel('Power');
```



Autocorrelation and PSD of Uniform: -

```
% --- Parameters ---
N = 1024;          % Number of samples
a = -1;            % Lower bound of uniform distribution
b = 1;             % Upper bound
% --- Generate Uniform Random Process ---
x = a + (b - a) * rand(1, N);   % Uniformly distributed samples
% --- Autocorrelation (biased) ---
[Rxx, lags] = xcorr(x, 'biased');
% --- PSD using FFT ---
Xf = fftshift(fft(x, N));        % FFT centered
PSD = abs(Xf).^2 / N;            % Power Spectral Density
f = linspace(-0.5, 0.5, N);      % Normalized frequency axis
% --- Plotting with subplot ---
figure;
% --- Uniform Process Plot ---
subplot(3,1,1);
plot(1:N, x, 'b');
title('Uniform Random Process');
xlabel('Sample Index');
```

```
ylabel('Amplitude');
grid on;
xlim([1 N]);
% --- Autocorrelation Plot ---
subplot(3,1,2);
plot(lags, Rxx, 'r');
title('Autocorrelation (biased)');
xlabel('Lag');
ylabel('Amplitude');
grid on;
xlim([-100 100]);
% --- PSD Plot ---
subplot(3,1,3);
plot(f, PSD, 'k');
title('Power Spectral Density (FFT Method)');
xlabel('Normalized Frequency');
ylabel('Power');
grid on;
xlim([-0.5 0.5]);
```

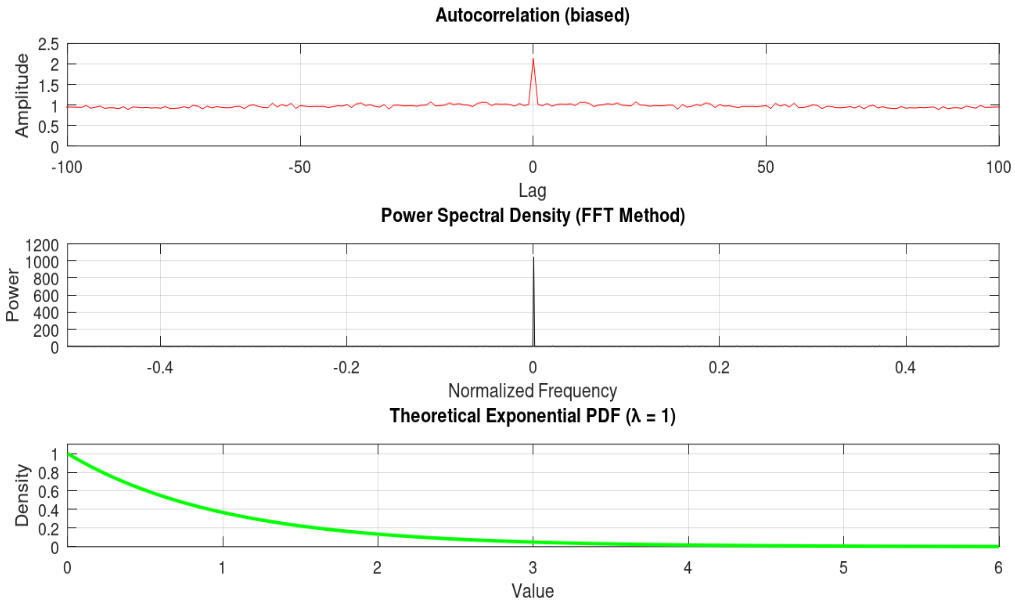


Autocorrelation and PSD of Exponential: -

```
N = 1024;          % Number of samples
lambda = 1;        % Rate parameter (mean = 1/lambda)
x = exprnd(1/lambda, 1, N);    % Exponential samples
[Rxx, lags] = xcorr(x, 'biased');
Xf = fftshift(fft(x, N));
PSD = abs(Xf).^2 / N;
f = linspace(-0.5, 0.5, N);
x_vals = linspace(0, 6/lambda, 200);      % Limit x-axis for visibility
pdf_vals = lambda * exp(-lambda * x_vals);
figure;
subplot(3,1,1);
plot(lags, Rxx, 'r');
title('Autocorrelation (biased)');
xlabel('Lag');
ylabel('Amplitude');
grid on;
xlim([-100 100]);
subplot(3,1,2);
plot(f, PSD, 'k');
title('Power Spectral Density (FFT Method)');
xlabel('Normalized Frequency');
ylabel('Power');
grid on;
xlim([-0.5 0.5]);
subplot(3,1,3);
plot(x_vals, pdf_vals, 'g', 'LineWidth', 2);
title('Theoretical Exponential PDF (λ = 1)');
xlabel('Value');
ylabel('Density');
grid on;
```

xlim([0 6/lambda]);

ylim([0 lambda*1.1]);



Autocorrelation and PSD of Poison's: -

N = 1024;   % Number of samples

lambda = 4;   % Poisson rate (mean and variance)

x = poissrnd(lambda, 1, N);   % Poisson samples

[Rxx, lags] = xcorr(x, 'biased');

Xf = fftshift(fft(x, N));

PSD = abs(Xf).^2 / N;

f = linspace(-0.5, 0.5, N);

k = 0:1:max(x);   % Discrete support

pmf_vals = (lambda.^k .* exp(-lambda)) ./ factorial(k);

figure;

subplot(3,1,1);

plot(lags, Rxx, 'r');

title('Autocorrelation (biased)');

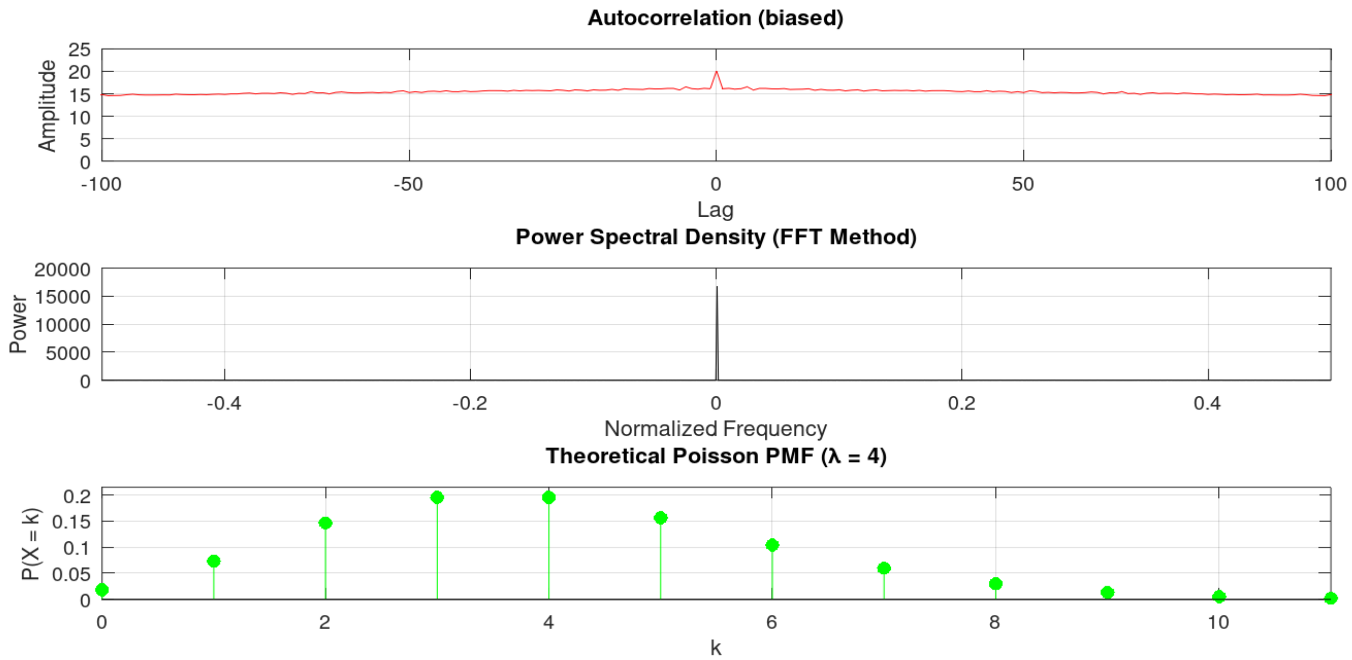
xlabel('Lag');

ylabel('Amplitude');

grid on;

xlim([-100 100]);

```
subplot(3,1,2);
plot(f, PSD, 'k');
title('Power Spectral Density (FFT Method)');
xlabel('Normalized Frequency');
ylabel('Power');
grid on;
xlim([-0.5 0.5]);
subplot(3,1,3);
stem(k, pmf_vals, 'g', 'filled');
title('Theoretical Poisson PMF (λ = 4)');
xlabel('k');
ylabel('P(X = k)');
grid on;
xlim([0 max(k)]);
ylim([0 max(pmf_vals)*1.1]);
```



Command Window

```
Name: Jay Kotwal
Roll No: 32137
Batch: L6
>>
```