CIE 327-Project

S.P. Analyzer Report

Mohamed Zayed Ahmed
201800760

Input generation:

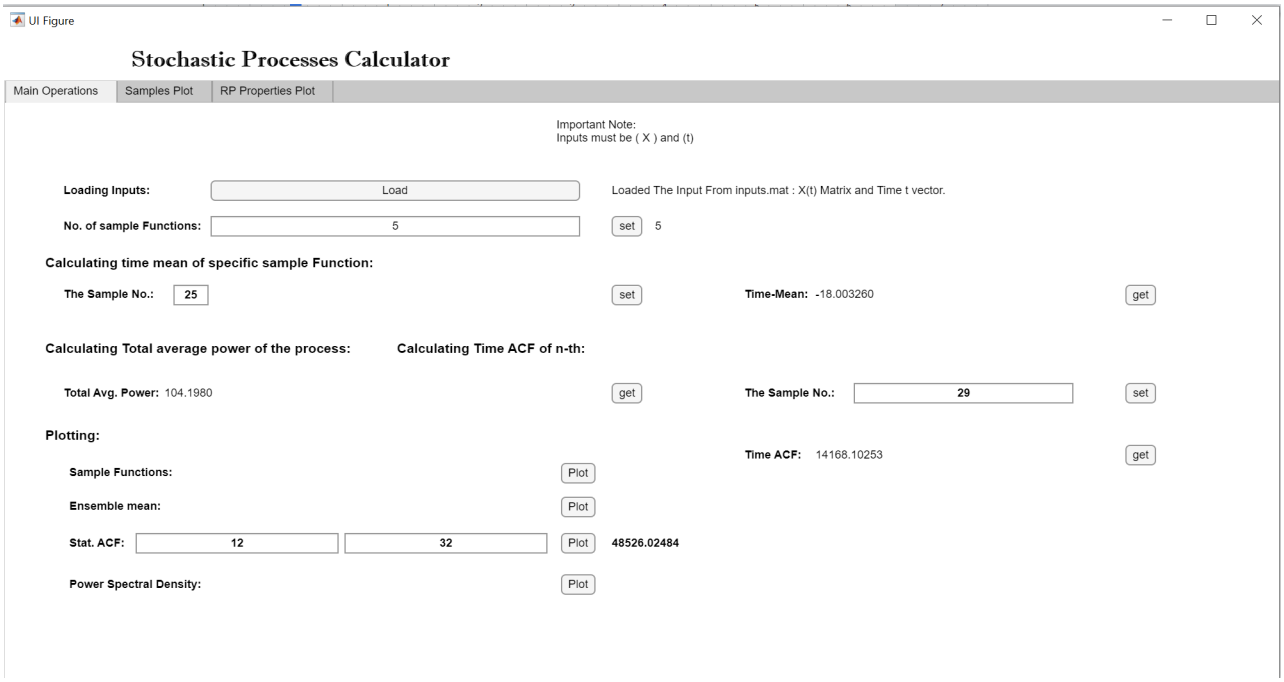
```
% %
% Mohamed Zayed Ahmed (201800760)
%part 1:
%First Test Case
clear;clc;
theta = unifrnd(0,2*pi,1000);
omega_c = 3/4*pi;A = 4;
t = (-10:0.01:4.99);
for i =1:1000
X = (A*sin((omega_c *t)+theta(i,:).'))+(0.5*A*cos((2*omega_c *t)+(theta(i,:).'/3)));
end

save('Yinputs.mat','X','t');
```

The input to the project is a .mat file containing a matrix (X) :The ensemble Matrix, and the time vector (t). They are saved by the built in mat function save. The uppove image shows a test case saving. Any input must be saved to a .mat file containing the ensemble matrix (X) and time vector (T).

Using The SPCalc:

After Generating the *.mat file containing the X(ensemble matrix) and the time vector(t). Open the GUI app SPCalc. Then load the .mat file using the load button.

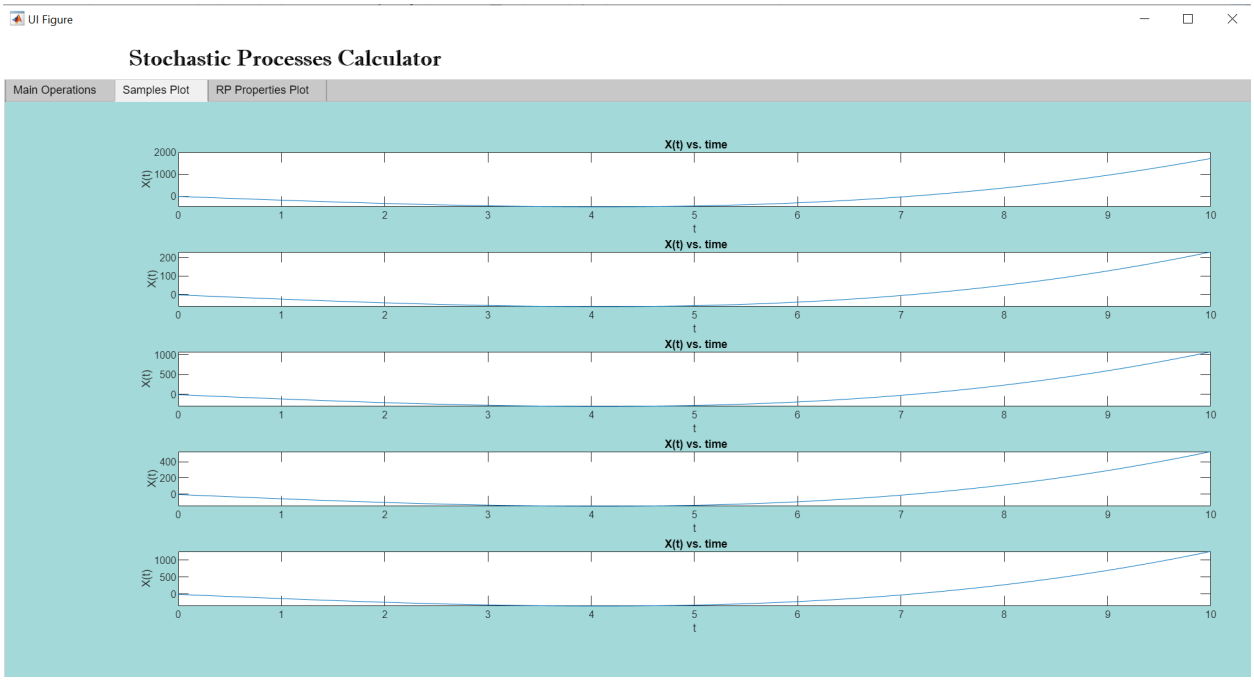


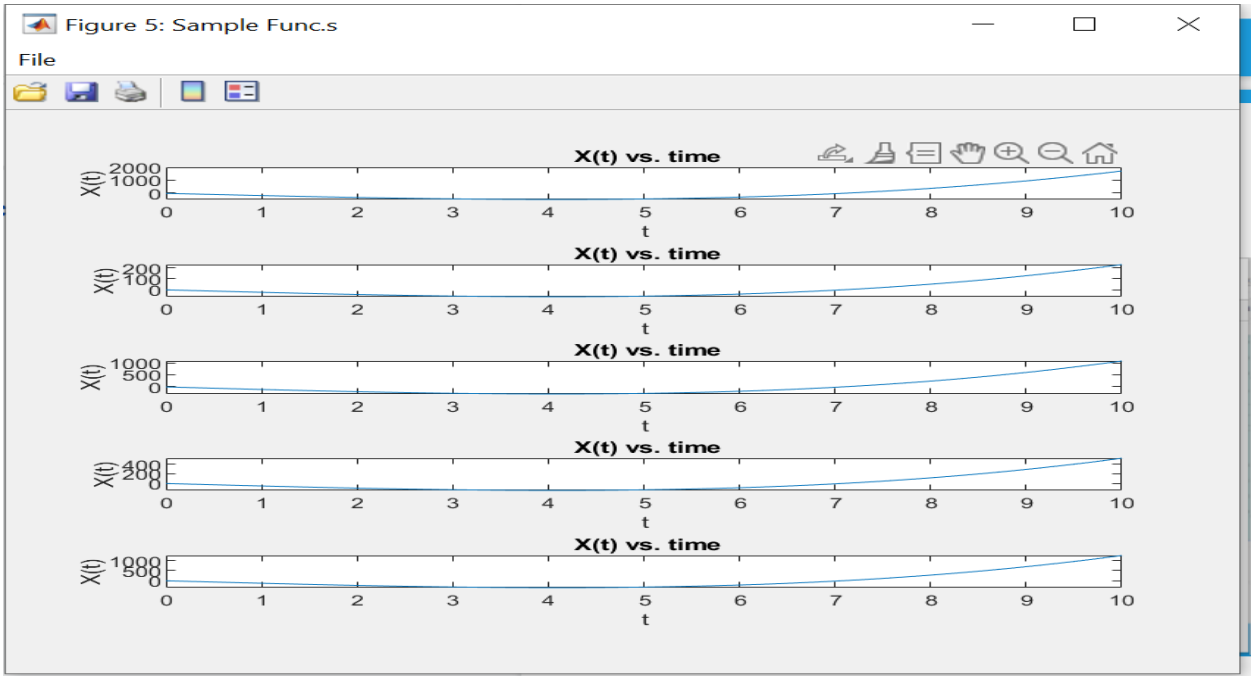
The loading label changes from wait for loading to Loaded message. Then use the functionalities of the calculator. Zero values in the Edit Fields must be changed to an acceptable value.

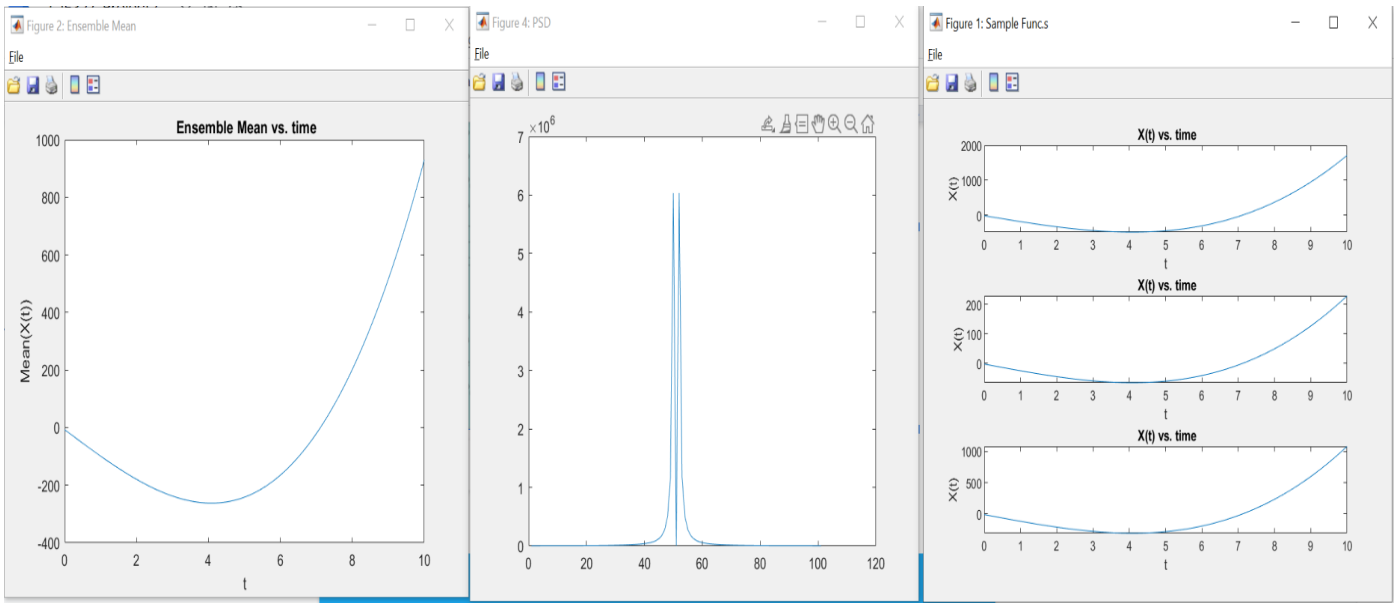
Each Plot is done twice. Once in the specified tab which is either The Sample Function plot tab or the RP Properties Tab and the other plot is in an external separate Figure window.

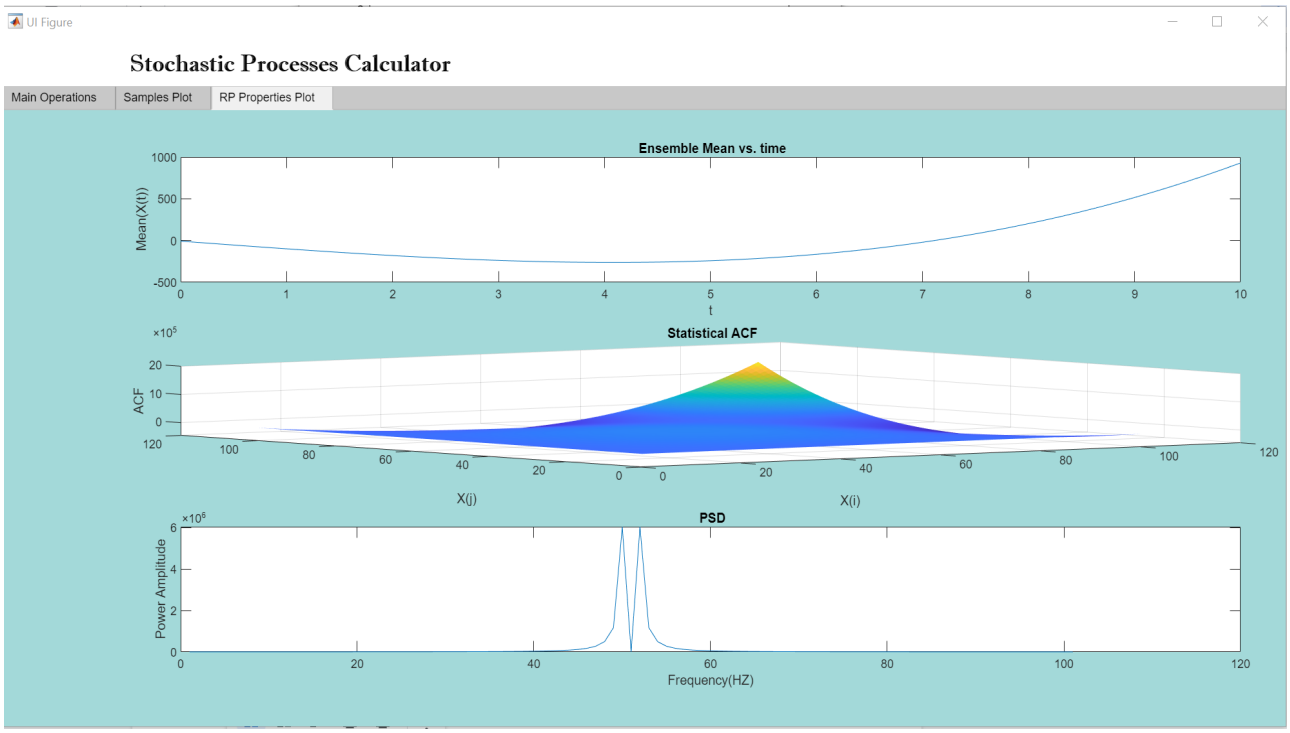
Results for (Sample_Process.mat):

There's very little difference between the 5 samples, as they show the same behavior of declining then re-increasing and ending up at a bigger value than the initial value as if it's an exponential increase.





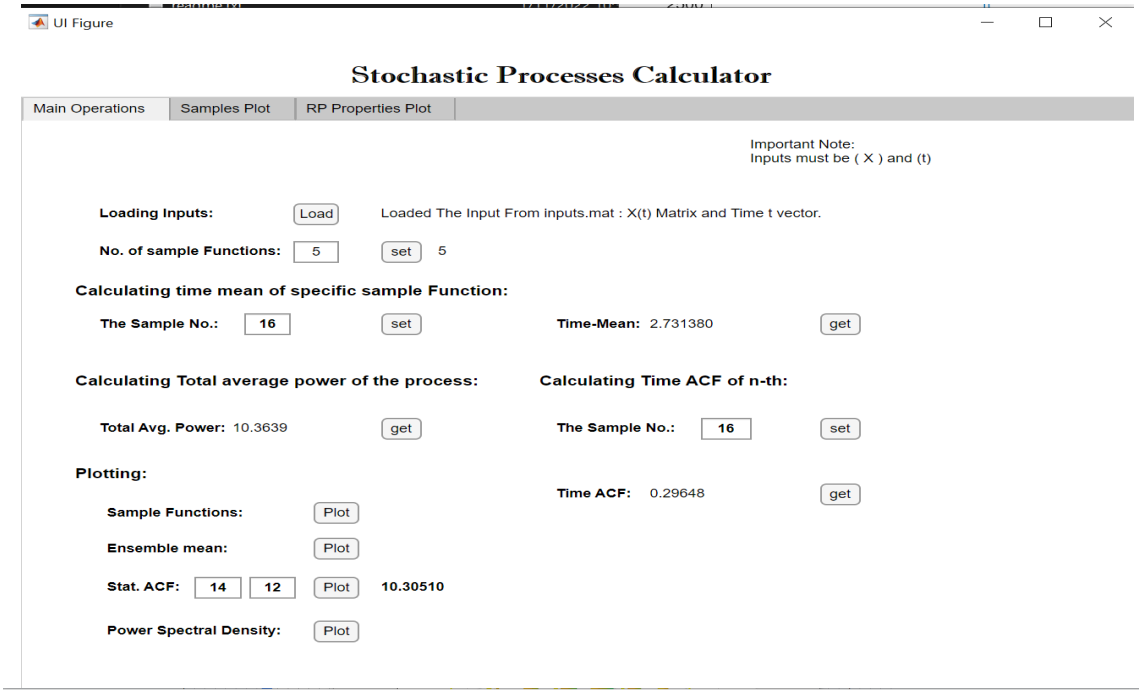


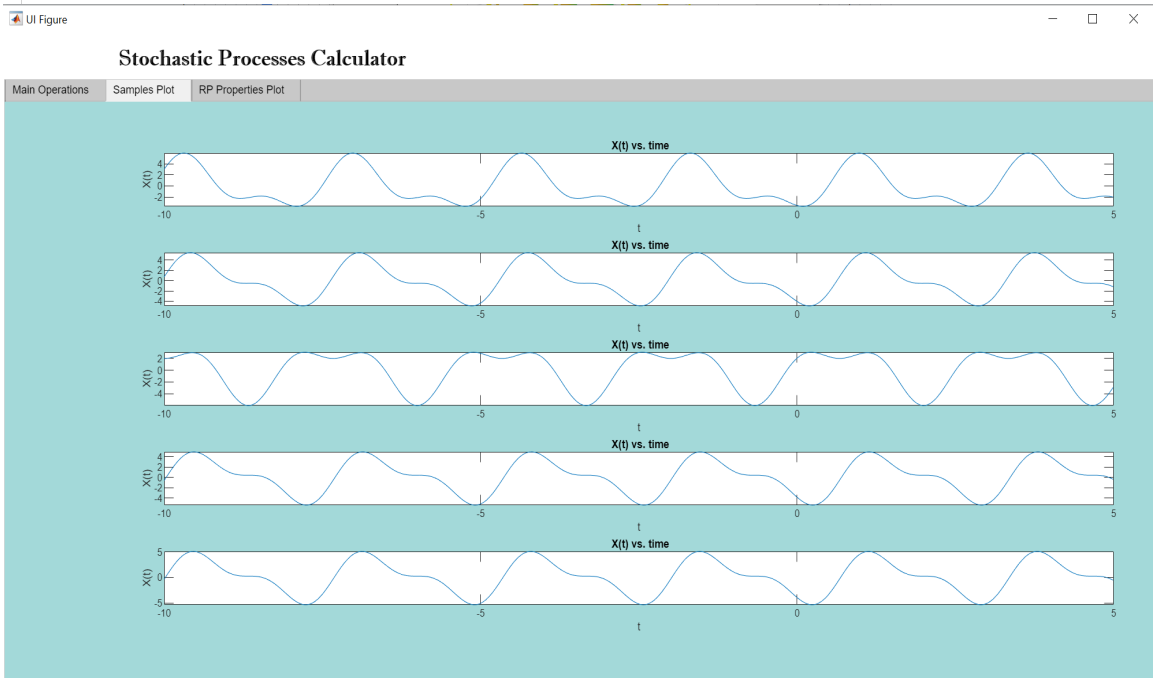


The Ensemble mean shows that the samples aren't so varied from each other because the mean shows the same act of declining then increasing in a semi-exponential behavior. The ACF of the process shows the same behavior as the samples itself as the ACF moving along (i) and (j) is decreasing then approximately exponentially re-increasing till the end of the ACF.

Results for (Generated input of Y funciton):

The file inputs.m generates the input of Y function. Loading the inputs in the application resulted in a periodic function of summation of sin and cos for 1000 thetas. Time ACF not equal ACF and mirroring is present in the PSD graph. The ACF plot has a similar periodic behavior as the source function.





Ensemble mean appears to follow a sinusoidal wave as it was the average of summation of sin and cos functions.