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%Senior Design ECE457 Project Group 9
%Fall 2019
clf;clear all; clc; close all;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%% USER MANIPUTLATION %%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
sdevs = 3; %How many standard deviations?
sets = 100; %How many data sets?
N = 30; %Now many trials in a set?
ambientmin = 30; %Toggle minimum ambient level
ambientmax = 90; %Toggle maximum level
sz = 36; %Size of scatter circles
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

x = [30:0.1:110]; %Setting x axis for 'normpdf' plot
x1 = linspace(30,90,sets);
DataMat = zeros(N,1); %Predefine Data Matrix
TotalData = zeros(N, sets);
number = 0;
amb4 = 0;
AllAveAmb = zeros(1,sets);
AllStdAmb = zeros(1,sets);
AllAveplus3std = zeros(1,sets);

for c = 1:sets
    amb54 = 35+ 25*rand;
    for k=1:N

        amb4 = amb54+amb54*rand/6;%amb54+amb54*rand*rand/8;
        TotalData(k,c) = amb4;

%        AveAmb = mean(TotalData(:,c)); %Calculate Averages
%        StdAmb = std(TotalData(:,c)); %Calculate Standard Deviations



    end

        AveAmb = mean(TotalData(:,c)); %Calculate Averages
        StdAmb = std(TotalData(:,c)); %Calculate Standard Deviations
    AllAveAmb(1,c) = AveAmb;
    AllStdAmb(1,c) = StdAmb;
%    AllAveplus3std(1,c) = AveAmb+sdevs.*StdAmb;
end
%y = sort(AllAveAmb);
%z = sort(AllStdAmb);
AllAveplus3std = AllAveAmb+sdevs.*AllStdAmb;
%TotalData %Print Data Matrix to command window
```

```
%GauAmb = normpdf(x,AveAmb,StdAmb);

%AveAmb = mean(TotalData(:,1)); %Calculate Averages

%StdAmb = std(TotalData(:,1)); %Calculate Standard Deviation


figure(1)
scatter(AllAveAmb, AllStdAmb, sz, 'r') %Ambient

%plot(f,AllAveAmb, AllStdAmb, 'p')
title('Standard Deviation with respect to Average Ambient Level')
xlabel('Ambient Level')
ylabel('Standard Deviation')

figure(2)
hold on
plot(x1,AllAveAmb, 'r')
plot(x1,AllAveplus3std, 'g')
title('Average Ambient Level versus +X std. level per trial')
xlabel('Trial')
ylabel('Ambient Level')
legend({'Ambient','Ambient + X
 std'},'Location','northwest','NumColumns',1)
hold off

    %Gaussian of all ambients
        aveallave = mean(AllAveAmb)
        stdallstd = std(AllAveAmb)
        meanplusXstd = aveallave + sdevs*stdallstd
        GauAmbient = normpdf(x,aveallave,stdallstd);
    %Gaussian of all ambients plus 3 std
        %aveallave3 = mean(AllAveplus3std)
        %stdallstd3 = std(AllAveplus3std)
        %GauAmbient3 = normpdf(x,aveallave3,stdallstd3);

figure(3)
hold on
plot(x,GauAmbient, 'r')
xline(meanplusXstd, 'g')
hold off

%scatter(AllAveplus3std, 'g')
title('Average Ambient Level versus +X std. level per trial')
xlabel('Ambient Level')
ylabel('Probability Distribution')
legend({'Ambient','Average + X
 std'},'Location','northeast','NumColumns',1)


aveallave =

   51.6594
```

```
stdallstd =

    7.7110


meanplusXstd =

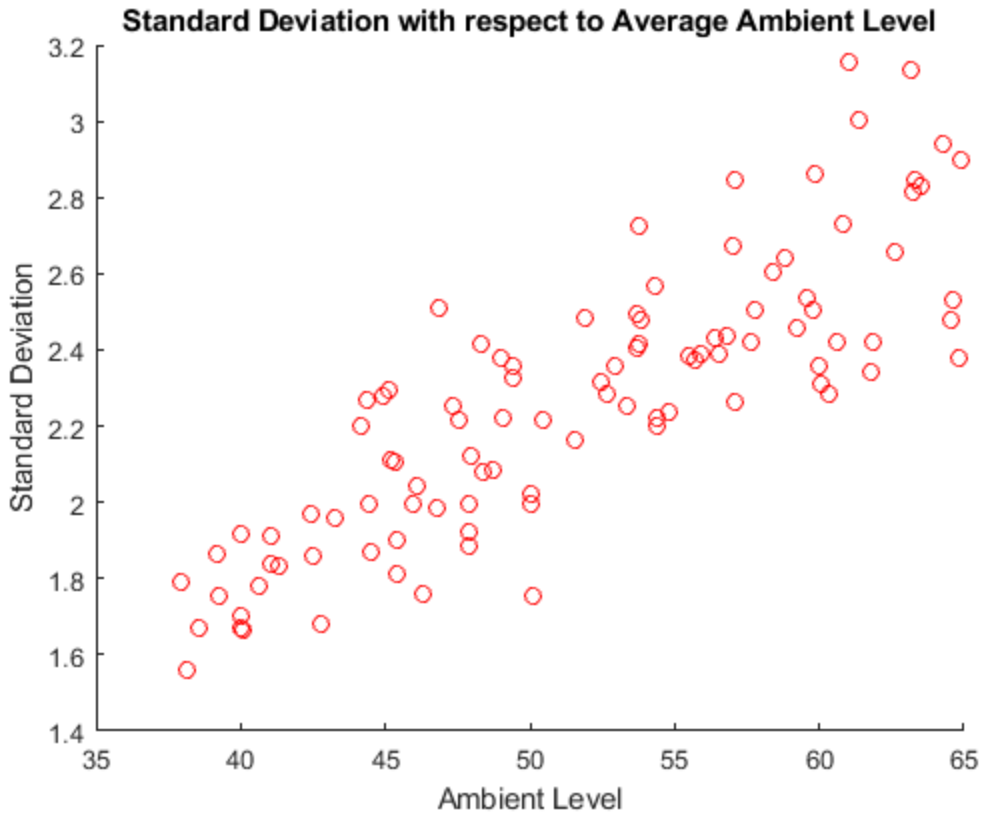
   74.7923

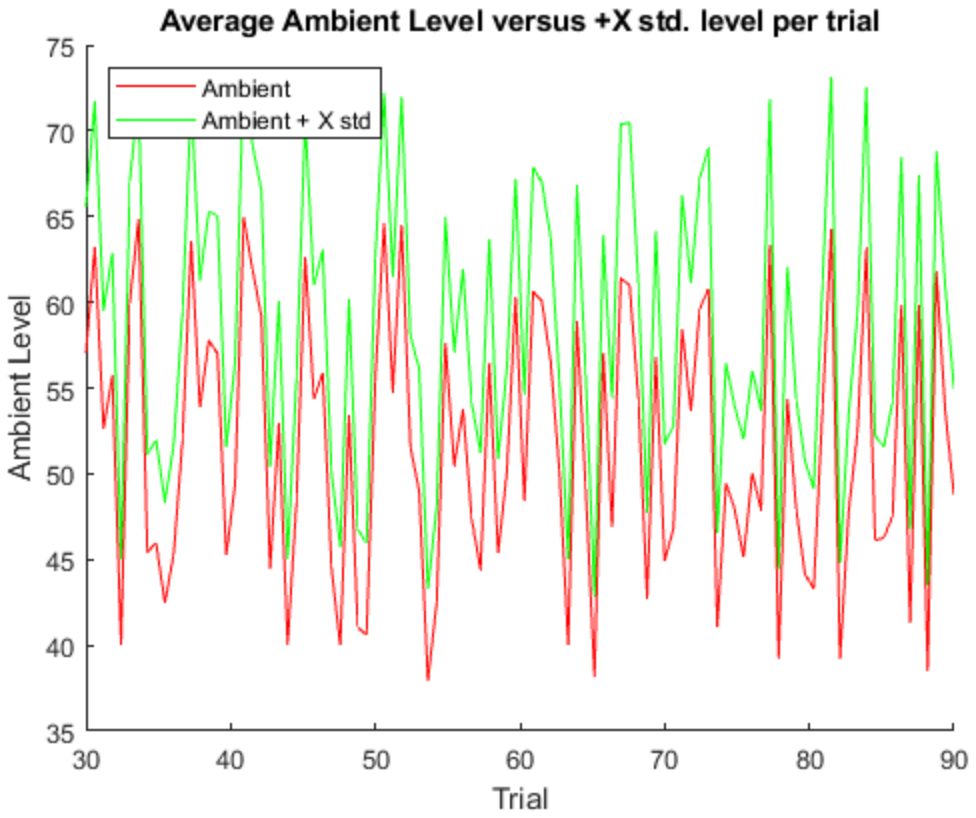

ans =

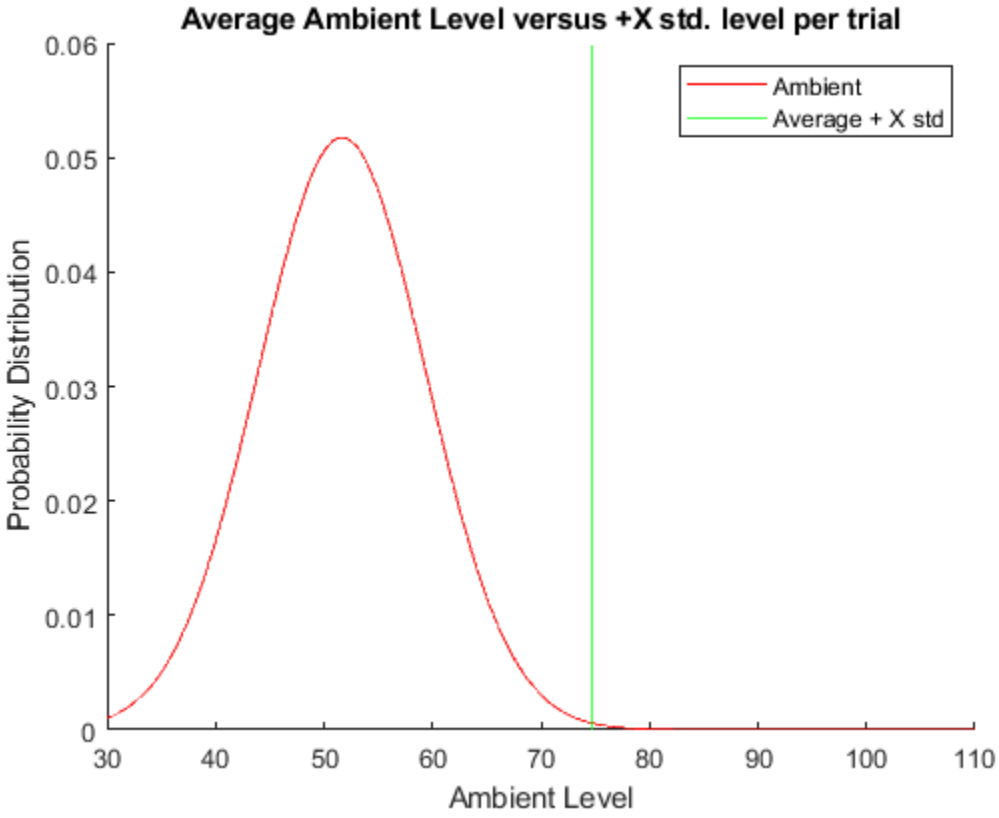
  ConstantLine with properties:

    InterceptAxis: 'x'
            Value: 74.7923
            Color: [0 1 0]
        LineStyle: '-'
        LineWidth: 0.5000
            Label: ''
      DisplayName: ''

  Use GET to show all properties
```




Average Ambient Level versus +X std. level per trial
Ambient
Ambient + X std
Ambient Level
Trial
75
70
65
60
55
50
45
40
35
30
40
50
60
70
80
90


Average Ambient Level versus +X std. level per trial
Ambient
Average + X std
Probability Distribution
Ambient Level
0.06
0.05
0.04
0.03
0.02
0.01
0
30
40
50
60
70
80
90
100
110

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