

# CAMBRIDGE ANNUAL TEMPERATURE ANALYSIS

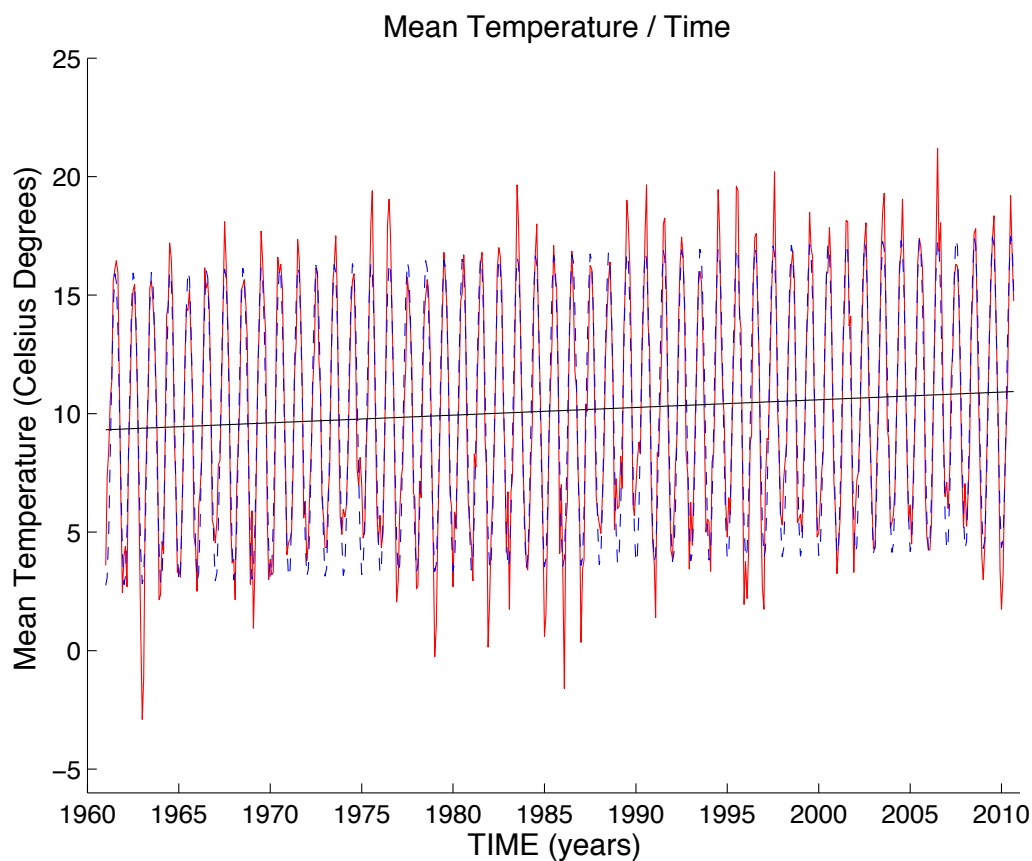
## MATLAB ASSIGNMENT 2 REPORT

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By analysing the values given in the file “cambridge.dat”, I obtained the following graph(**Figure 1**) and histogram(**Figure 2**) :



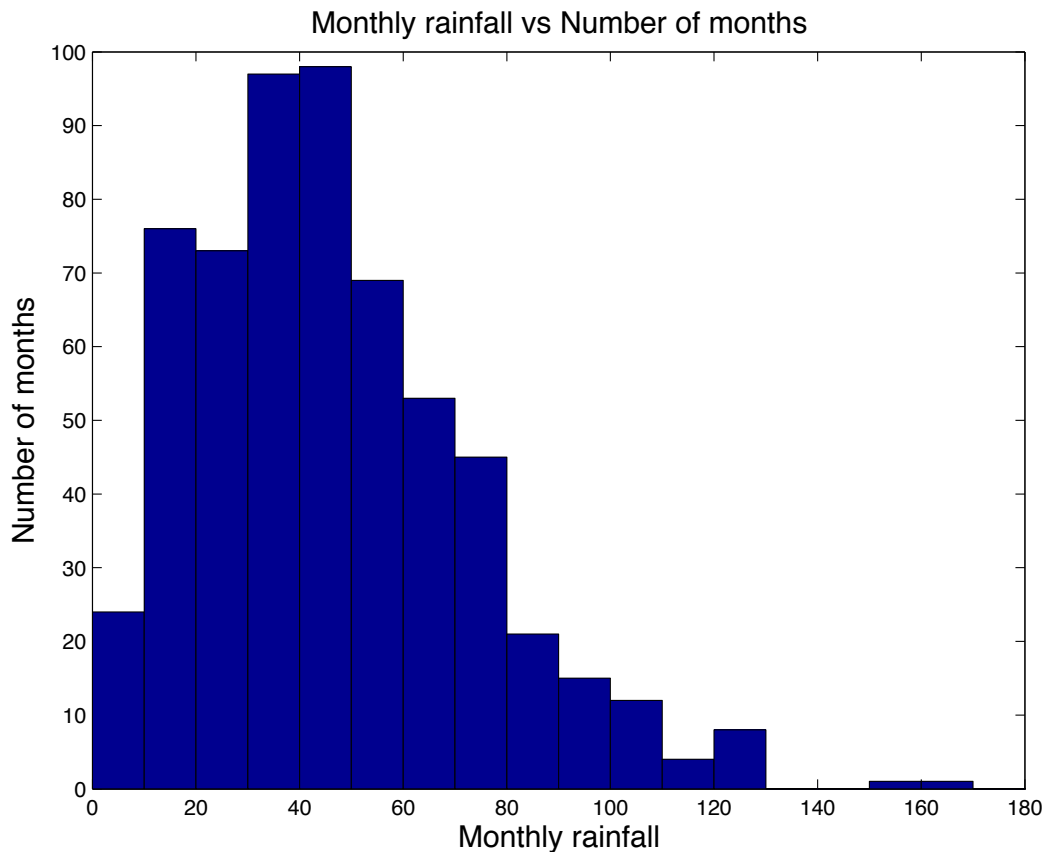
**Figure 1** : Graph showing : - The average temperature / time (in red )  
- The sloping sinusoidal function / time ( in blue )  
- The background function / time ( in black )

The values I chose for  $a0$  are as it follows :  $[6, 1.5, 6, 0.7]$ . Also,  
 $fmin=[9.31813434938865, 0.0324810006327052, -6.65459346045198, 1.40515250381008]$ ,  
calculated using the formula :  $fmin = fminsearch(@fminslope(fmin,time,Mean),a0)$ .

The values for the best fit and the mean line are calculated using the following formulas :

$$yfit = fmin(1) + fmin(2) * (time - 1961) + fmin(3) * \sin(2 * \pi * time + fmin(4))$$

$$MeanLine = fmin(1) + fmin(2) * (time - 1961)$$



*Figure 2 : The histogram*

## **APPENDIX : MATLAB CODE**

### **(1) assignment2.m**

```
% GETTING THE DATA FROM "cambridge.dat"
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```
data=dlmread('cambridge.dat','4,0');
```

```
% PROCESSING THE DATA
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```
year = data(:,1);
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```
month = data(:,2);
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```
time = year + (month - 1)/12;
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```
%GETTING THE MEAN TEMPERATURE
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```

temps = data(:,[3,4]);
Mean = mean(temps,2);

%SETTING a0, CONSIDERING THE VALUES FROM THE Mean/Time GRAPH
a0 = [6, 1.5, 6, 0.7];

% SETTING THE fmin AND yfit
fmin = fminsearch(@(fmin) slopingsine(fmin,time,Mean),a0);
yfit = fmin(1)+fmin(2)*(time-1961)+fmin(3)*sin(2*pi*time+fmin(4));

MeanLine = fmin(1) + fmin(2)*(time-1961);

hold on

%LABELING AND SETTING THE X AND Y AXIS
xlabel(' TIME (years) ', 'FontSize',14);
ylabel(' Mean Temperature (Celsius Degrees)', 'FontSize',14);
title('Mean Temperature / Time', 'FontSize', 14);
xlim([1960,2011]);
ylim([-6,25]);
set(gca, 'FontSize',12);

%PLOTTING THE ACTUAL GRAPHS
plot(time, Mean, '-r');
plot(time,yfit, '--b');
plot(time,MeanLine, 'k');
hold off;

%CREATING THE HISTOGRAM
ydata = data(:,6);
xdata = [5:10:185];
figure;
hist(ydata,xdata);
xlim ([0,180]);
title('Monthly rainfall vs Number of months','fontsize',14);
xlabel('Monthly rainfall','fontsize',14);
ylabel('Number of months','fontsize',14);

(2) slopingsine.m :
function chisq=slopingsine(Xs,time,Mean)
%Computes chi-squared function
chi=Mean-(Xs(1)+Xs(2)*(time-1961)+Xs(3)*sin(2*pi*time+Xs(4)));
chisq= sum (chi.^2);

```