Least Squares Problems

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$$\begin{bmatrix} 1 & t_i \end{bmatrix}$$

$$\begin{bmatrix} \beta_0 & \beta_1 \end{bmatrix}^T$$

$$\begin{bmatrix} 1 & t_i & t_i^2 \end{bmatrix}$$

$$\begin{bmatrix} \beta_0 & \beta_1 & \beta_2 \end{bmatrix}^T$$

$$\begin{bmatrix} 1 & t_i & \sin(2\pi t_i) & \cos(2\pi t_i) \end{bmatrix}$$

$$\begin{bmatrix} \beta_0 & \beta_1 & \beta_2 & \beta_3 \end{bmatrix}^T$$

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% MA339 Project: Least-Squares Problems
% Lewis Collum

% I did this using Octave instead of Matlab.
% Matlab was not installing properly on my OS (Arch Linux).
% It should still run fine, but if it doesn't that's the reason why.

fprintf("Step 2:\n");

t = [0, 2, 3, 5, 7, 8, 10];
y = [0, 6, 2, 1, 5, 3, 9];

x = polyfit(t, y, 1);
beta0 = x(2)
beta1 = x(1)
fit = x(1) + x(2)*t;

figure
plot(t, y, '*b', t, fit, '-r')
legend('data','fit')
xlabel('t')
ylabel('y')
title('least-squares line for student number data')
uiwait


fprintf("\nStep 3:\n");
[time, temp] = set_temps;

fprintf("Linear -------------\n");
x1 = polyfit(time, temp, 1);
beta10 = x1(2)
beta11 = x1(1)
fit1 = beta10 + beta11*time;

fprintf("Quadratic ----------\n");
x2 = polyfit(time, temp, 2);
beta20 = x2(3)
beta21 = x2(2)
beta22 = x2(1)
fit2 = beta20 + beta21*time + beta22*time.^2;
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fprintf("Linear+Cycle -------\n");
A3 = [ones(size(time)) time sin(2*pi*time) cos(2*pi*time)];
x3 = A3\temp;
beta30 = x3(1)
beta31 = x3(2)
beta32 = x3(3)
beta33 = x3(4)

plot(time, temp, '-b', time, fit1, '-r', time, fit2, '-g')
uiwait



format longG
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