
Homework 8, ME3215 Spring 2022

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Curve fitting part 2: linear & polynomial regression, overdetermined system

HW8_2 Linear regression

```
clear;clc;close all

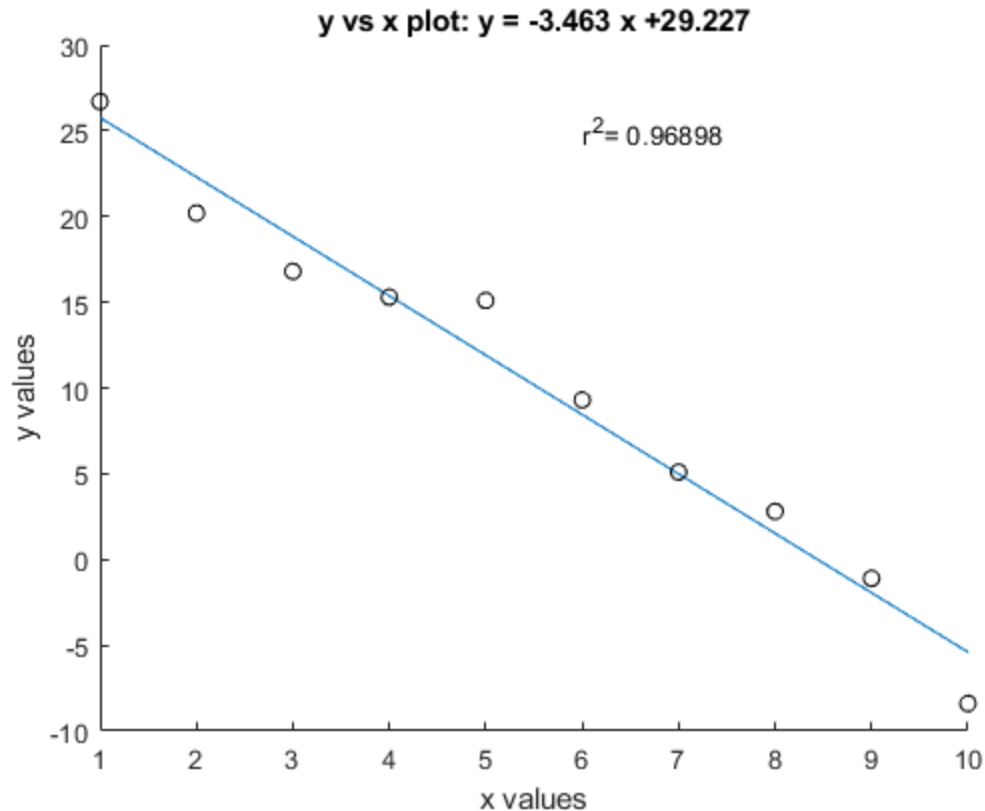
x=[1:10];
y= [26.7 20.2 16.8 15.3 15.1 9.3 5.1 2.8 -1.1 -8.4];
%(y = a1x + a0)
a=polyfit(x,y,1);
a1=a(1); %slope
a0=a(2); %intercept

function handle for the line

f1=@(x)a1*x+a0;
r=rsquaredF(f1,x,y);
%plot this line & the data points
figure
hold on
fplot(f1,[1 10])
plot(x,y,'ko')
text(6,25,['r^2= ' num2str(r)])
str1=sprintf('y vs x plot: y = %4.3f x %+4.3f',a1,a0);
title(str1)
xlabel('x values')
ylabel('y values')

fprintf('For x = 7.2, the value of y = %5.4f\n', f1(7.2))

For x = 7.2, the value of y = 4.2928
```



HW8_3: Sinusoidal model for daily temps

```
clear all;clc;close all

%Lubbock TX September 15, 2015
t=(0:2:24)'; % column
T=[71.1 69.1 66.0 69.1 73.0 79.0 86.0 93.0 96.1 93.9 91.0 82.9
  82.0]'; %column
w0=2*pi/24; %angular frequency

%Part a, simple sinusoidal model,
%T = c1 + c2 cos(w0 t) + c3 sin(w0 t)
Z=[ones(size(t)) cos(w0*t) sin(w0*t)];
c=Z\T;
y1 = @(t)c(1) + c(2)*cos(w0*t) + c(3)*sin(w0*t);
r1=rsquaredF(y1,t,T);
fprintf('The r^2 value for model(a) is %.6f\n', r1)

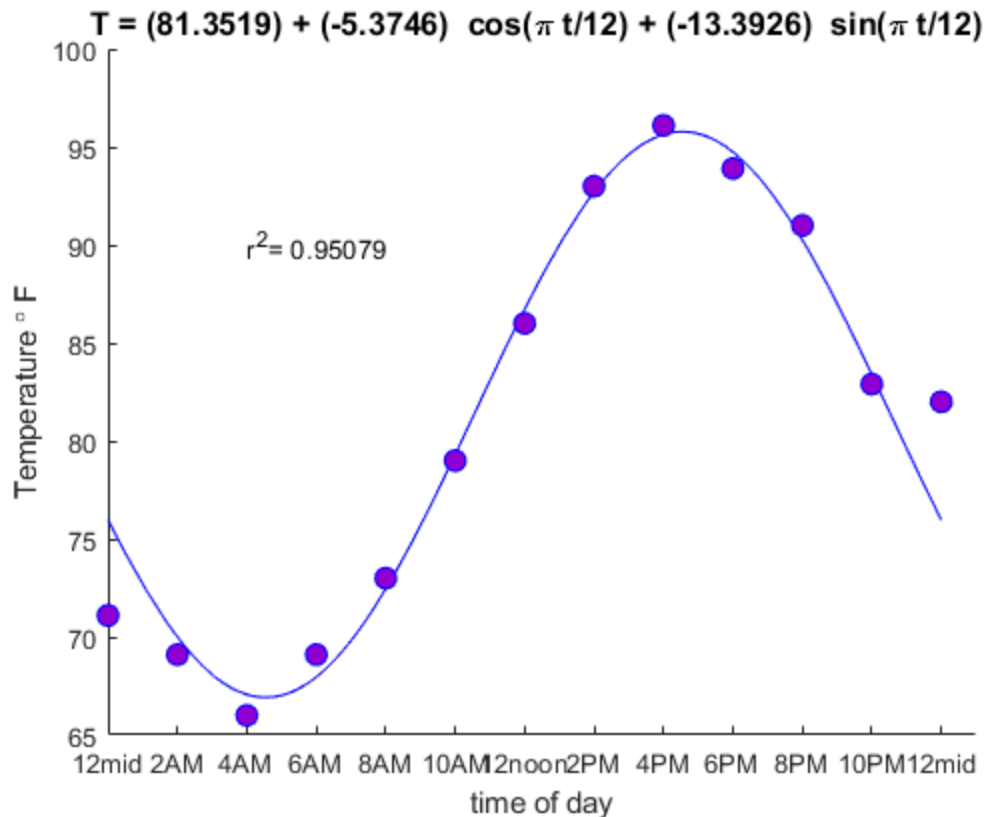
figure
%Includes some fancy stuff :)
hold on
fplot(y1,[0 24],'b')
plot(t,T,'bo','MarkerFaceColor',[148/255 0 211/255],'MarkerSize',8)
xlabel('time of day')
ylabel('Temperature \circ F')
```

```

set(gca, 'XTick', (0:2:24), 'XTickLabel',
{'12mid', '2AM', '4AM', '6AM', '8AM', '10AM', '12noon', '2PM', '4PM', '6PM', '8PM', '10PM'})
str=[sprintf('T = (%5.4f) + (%5.4f) ', c(1), c(2)) ' cos(\pi t/12) '
    sprintf(' + (%5.4f) ', c(3)) ' sin(\pi t/12) '];
title(str, 'FontSize', 12)
text(4, 90, ['r^2 = ' num2str(r1)])

```

The r^2 value for model(a) is 0.950790



```

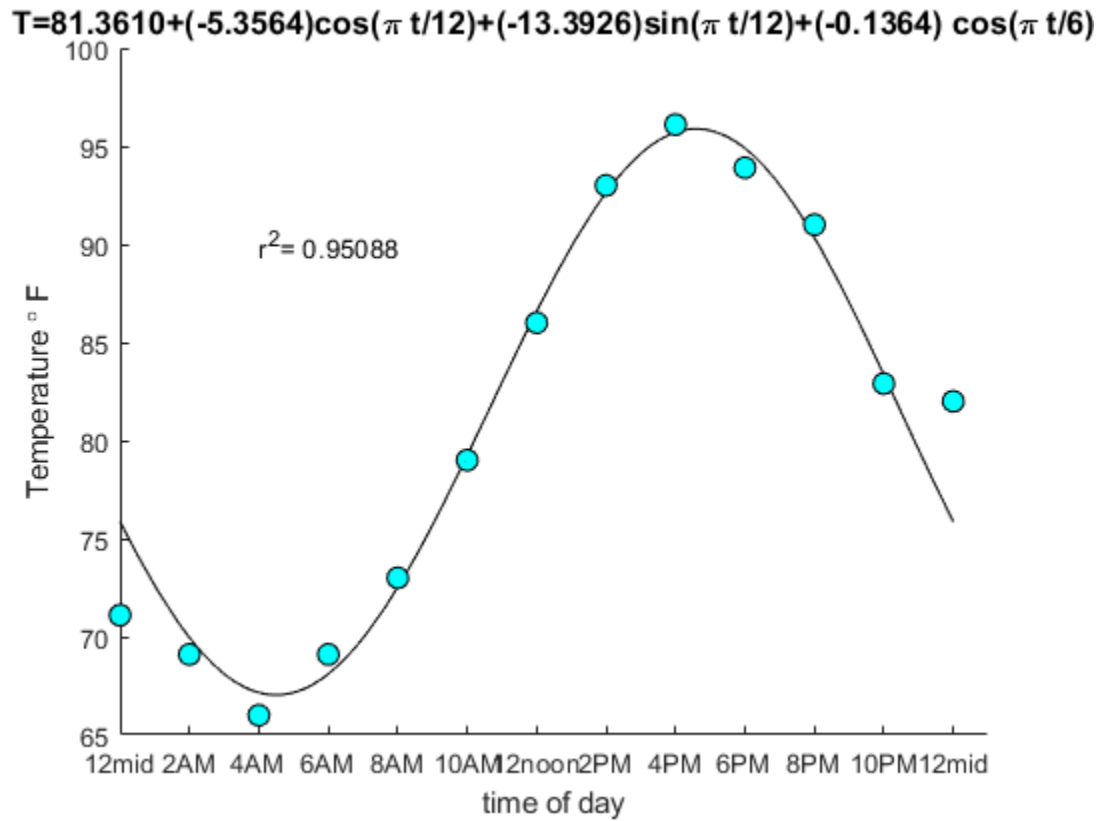
%Part b, complex sinusoidal model
%T = c1 + c2 cos(2pi t) + c3 sin(2pi t) + c4 cos (4pi t)
Z=[ones(size(t)) cos(w0*t) sin(w0*t) cos(2*w0*t) ];
c=Z\T;
y2 = @(t)c(1) + c(2)*cos(w0*t) + c(3)*sin(w0*t)+ c(4)*cos(2*w0*t);
r2=rsquaredF(y2,t,T);
fprintf('The r^2 value for model(b) is %.6f\n', r2)

figure
hold on
fplot(y2,[0 24], 'k')
plot(t,T, 'ko', 'MarkerFaceColor', 'c', 'MarkerSize', 8)
xlabel('time of day')
ylabel('Temperature \circ F')
set(gca, 'XTick', (0:2:24), 'XTickLabel',
{'12mid', '2AM', '4AM', '6AM', '8AM', '10AM', '12noon', '2PM', '4PM', '6PM', '8PM', '10PM'})

```

```
str=[sprintf('T=%5.4f+(%5.4f)',c(1),c(2)) 'cos(\pi t/12)'
    sprintf('+(%5.4f)',c(3)) 'sin(\pi t/12)' sprintf('+(%5.4f)',c(4)) '
    cos(\pi t/6)'];
title(str,'FontSize',12)
text(4,90,['r^2= ' num2str(r2)])
```

The r^2 value for model(b) is 0.950884



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