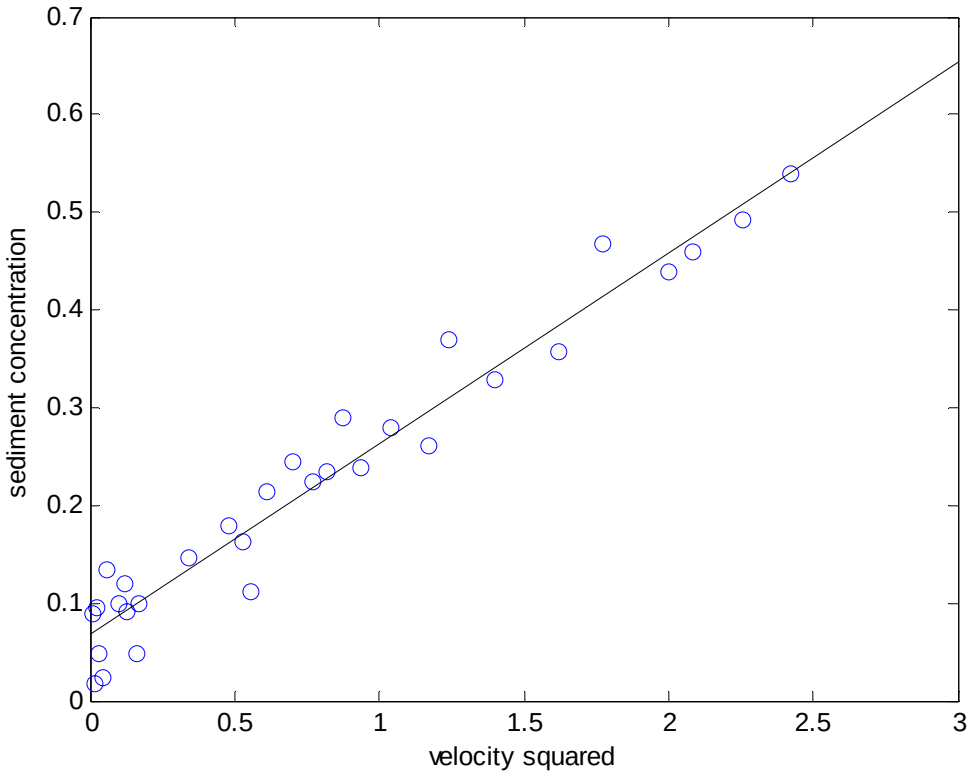
CIEG 675
Homework #6 Due **Tuesday October 25, 2007**

In a m-file do the following and verify it works by copy and pasting into the command window or running your m-file.

1) Load the data file called regr.mat from my web page. It contains two variables u and c (synthetic) that represent velocity and sediment concentration data respectively. There is some work that suggests the concentration should be related to the velocity squared. Do an analysis and tell me what you think. Also, determine the root-mean-square error between the data and the theorized linear fit.

```
%% prob 1  %%

%% first make fake data
u=-1.5:0.1:1.5;
u=u+rand(size(u))/5;
c=0.2*u.^2+rand(size(u))/7;
save regr u c
%%%% this was done for you


load regr

p=polyfit(u.^2,c,1);  % find the polyfit slope
rsq=(p(1)*std(u.^2)/std(c))^2;  % r^2 correlation coefficient

cfit=polyval(p,u.^2);  % the polyfitted values of c assuming a linear fit

rmse= sqrt(mean( (cfit-c).^2));  % the root-mean square error.

plot(u.^2,c,'o');
hold on
xl=[0 3]; % x coords of a fitted line
yl=polyval(p,xl);
plot(xl,yl,'k');
xlabel('velocity squared');
ylabel('sediment concentration');
```

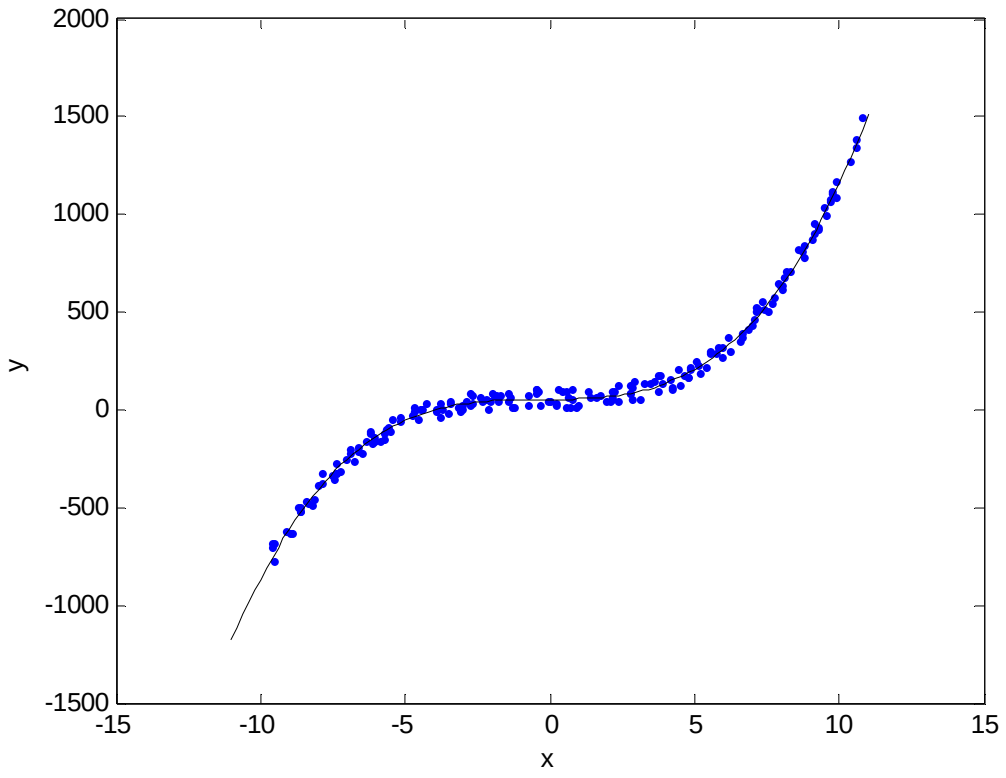


The rmse is 0.0328. small given range of data. R^2 is 0.95 which is quite high for this data meaning they are well correlated.

2) The data contained in the file fit.mat (variables x and y) on my web page is thought to be well-suited to a cubic polynomial (x,y). Determine how well the data follows expectations using root mean square error and a plot.

```
%%% prob 2%%%

% make fake data
x=-10:0.1:10;
x=x+rand(size(x));
y=x.^3+rand(size(x))*103 + x.^2 +x +1;
save fit x y
%% this part done for you

clear all
load fit

p=polyfit(x,y,3);  % cubic fit;
```

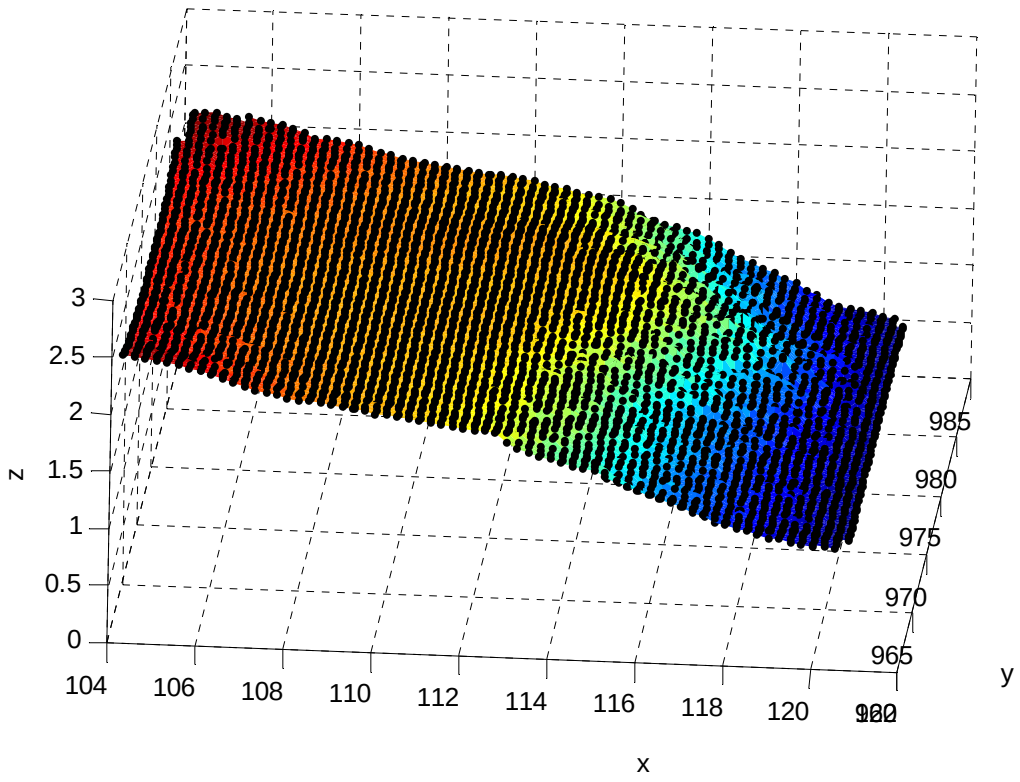
```
yfit=polyval(p,x);  % the polyfitted values of c assuming a linear fit
rmse= sqrt(mean( (yfit-y).^2));  % root mean square error

clf
plot(x,y,'.');
hold on
xl=-11:.2:11;  % for polyfitted curve
yl=polyval(p,xl);  % to make the polyfitted curve
plot(xl,yl,'k');
xlabel('x');
ylabel('y');
```



rmse was 29.31 again seems small compared to scale of data.

3) Load the data file called surface.mat from my web page. It contains variables x (the cross-shore coordinate, y, the alongshore coordinate and z, the elevation) from a beach survey. Perform an interpolation to a uniform grid that encompasses all the data using **griddata**. Plot the results using plot3 (in two lectures we will learn how to make surface maps).

```
%% prob 3 %%
clear all
load surface

% will operate on variables x y z

xmin=floor(min(x(:))); % round down
xmax=ceil(max(x(:)));  % roudn up
xv=xmin:0.25:xmax;  % vector for interpolating;

ymin=floor(min(y(:))); % round down
ymax=ceil(max(y(:)));  % roudn up
yv=ymin:0.25:ymax;  % vector for interpolating;

[X,Y]=meshgrid(xv,yv);  % make a meshgrid of x and y

Zg=griddata(x,y,z,X,Y); % using interp2 and linear

surf(X,Y,Zg);  % will learn about these 2 commands later
shading interp
hold on
plot3(X,Y,Zg,'k.');
xlabel('x');
ylabel('y');
zlabel('z');
```


z
3
2.5
2
1.5
1
0.5
0
104
106
108
110
112
114
116
118
120
x
985
980
975
970
965
y