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CEE 103 HW#6 Scripts

%CEE103 Homework #6

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%Problem 1a

clear all; close all; clc;

x=[0,1.1,2.5,3.3,4];

y=[3.2,1.5,-0.9,0.3,2.5];

Minverse=(1/52.94)\*[34.35,-10.9;-10.9,5];

b=[0;0];

for i=1:5

b=b+[y(i);x(i)\*y(i)];

end

a=Minverse\*b;

p=a(1)+a(2)\*x;

error=zeros(1,5);

for i=1:5

error(i)=y(i)-p(i);

end

E2=0.5\*(sum(error.^2));

After running the script, E2=4.7092

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%Problem 1b

clear all; close all; clc;

x=[0,1.1,2.5,3.3,4];

y=[3.2,1.5,-0.9,0.3,2.5];

Minverse=[0.9041 -0.7737 0.1428;-0.7746 1.3624 -0.3186;0.1433 -0.3197 0.0803];

b=[0;0;0];

for i=1:5

b=b+[y(i);x(i)\*y(i);(x(i)^2)\*y(i)];

end

a=Minverse\*b;

p=a(1)+a(2)\*x+a(3)\*x.^2;

error=zeros(1,5);

for i=1:5

error(i)=y(i)-p(i);

end

E2=0.5\*(sum(error.^2));

After running the script, E2=0.7120

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%Problem 1c

clear all; close all; clc;

x=[0,1.1,2.5,3.3,4];

y=[3.2,1.5,-0.9,0.3,2.5];

Minverse=[0.0842 -0.1240 0.1980;-0.1240 0.5616 -0.3127;0.1980 -0.3127 0.7745];

b=[0;0;0];

for i=1:5

b=b+[y(i)\*x(i);y(i)\*sin(2\*x(i));y(i)\*cos(x(i))];

end

a=Minverse\*b;

p=a(1)\*x+a(2)\*sin(2\*x)+a(3)\*cos(x);

error=zeros(1,5);

for i=1:5

error(i)=y(i)-p(i);

end

E2=0.5\*(sum(error.^2));

After running the script, E2=0.8257

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%Problem 2

clear all; close all; clc;

global x y X

x=[1;2;3;4;5;6;7;8;9;10;11;12;13;14;15]; %Data points

y=[1.3;1.9;1.5;2.9;2.4;3.7;3.1;4.2;3.4;4.3;3.5;4.1;3.2;3.7;2.6]; %Given values

X=1:0.005:15; %Variables

s = [1.01:0.02:8 9:0.25:40];

vidObj = VideoWriter('Movie\_b.mp4');

vidObj.Quality = 100;

vidObj.FrameRate = 50;

open(vidObj);

for i = 1:length(s)

disp(i)

%------------------------------------------------------

%[f1,N1] = HW6\_MLSa(s(i),X,y,x); % Function you need to write

[f1,N1] = HW6\_MLSb(s(i),X,y,x);

%------------------------------------------------------

h = figure(1);box on;grid on;

plot(x,y,'ro','linewidth',2); hold on;

plot(X,f1,'b','linewidth',2); hold on;

plot(x,N1,'linewidth',2); hold off;

ylabel('P1(x)','FontWeight','bold','FontSize',12);

xlabel('x','FontWeight','bold','FontSize',12);

set(gca,'FontWeight','bold','fontsize',15);grid on;

axis([0 x(end) -0.5 5]);

set(h, 'Position', [100, 100, 1100, 700]);

drawnow

writeVideo(vidObj, getframe(gca));

end

close(gcf)

close(vidObj);

function [ f1,N1 ] = HW6\_MLSa( s,X,y,x )

%Creates the moving least squares for part a

P=zeros(1,length(X));

for j=1:length(X)

M=zeros(2,2);

for k=1:length(x)

z=abs(X(j)-x(k))/s;

M=M+(Weight(z)\*[1 x(k);x(k) x(k)^2]);

end

Minv=inv(M);

Basisfunc=zeros(1,length(x));

p=zeros(1,length(X));

for k=1:length(x)

z=abs(X(j)-x(k))/s;

Basisfunc(k)=(Weight(z)\*[1,X(j)]\*Minv\*[1;x(k)]);

p(k)=Basisfunc(k)\*y(k);

end

P(j)=sum(p);

end

f1=P.';

N1=Basisfunc.';

end

function [ f1,N1 ] = HW6\_MLSb( s,X,y,x )

%Creates the moving least squares for part b

P=zeros(1,length(X));

for j=1:length(X)

M=zeros(3,3);

for k=1:length(x)

z=abs(X(j)-x(k))/s;

M=M+(Weight(z)\*[1 x(k) x(k)^2;x(k) x(k)^2 x(k)^3;x(k)^2 x(k)^3 x(k)^4]);

end

Minv=inv(M);

Basisfunc=zeros(1,length(x));

p=zeros(1,length(X));

for k=1:length(x)

z=abs(X(j)-x(k))/s;

Basisfunc(k)=(Weight(z)\*[1,X(j),X(j)^2]\*Minv\*[1;x(k);x(k)^2]);

p(k)=Basisfunc(k)\*y(k);

end

P(j)=sum(p);

end

f1=P.';

N1=Basisfunc.';

end

function [ phi ] = Weight( z )

%Weight Function for problem 2

if z<=0.5

phi=(2/3)-(4\*z^2)+(4\*z^3);

elseif z<=1.0

phi=(4/3)-4\*z+(4\*z^2)-((4/3)\*z^3);

else

phi=0;

end

end