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```
% Nikhil Jayswal
% MATH 3890
% Machine Problem 12
% 12 April 2021

clc; clear; close all
```

Get Triangulation Data

```
[n, xo, yo, ~, TRI] = readtri;
```

Set up lists

```
[nb, ne, nt, v1o, v2o, v3o, e1o, e2o, e3o, ie1o, ie2o, trilo, triro, ...
    bdy, vadj, eadj, adjstart, tadj, tstart, area, TRI] = trilists(xo, yo, TRI);
```

Set zo

```
zo = sigmoid(xo, yo);
```

Compute coefficients

```
% refine the triangulation
[x,y,v1,v2,v3,e1,e2,e3,ie1,ie2,tril,trir,A] = nmdsps(xo,yo,v1o,v2o,v3o,...
    e1o,e2o,e3o,ie1o,ie2o,trilo,triro);

% coefficients (minimal energy interpolation)
[c,M22,t1,t2] = menps(v1o,v2o,v3o,x,y,zo,v1,v2,v3,e1,e2,e3,ie1,A);
```

Evaluate spline on a grid

```
ng = 71; d = 2;
xmin = min(x); xmax = max(x); ymin = min(y); ymax = max(y);
[xg,yg,g] = valspgrid(d,x,y,v1,v2,v3,e1,e2,e3,ie1,c,ng,xmin,xmax,ymin,ymax);
figure; surfl(xg,yg,g'); colormap(copper); title('Interpolating Spline')
```

Compute the max and RMS errors

```
e = errg(xg,yg,g,@hill);
fprintf('emax = %5.2e, RMS = %5.2e\n',norm(e,inf),erms(e));
```

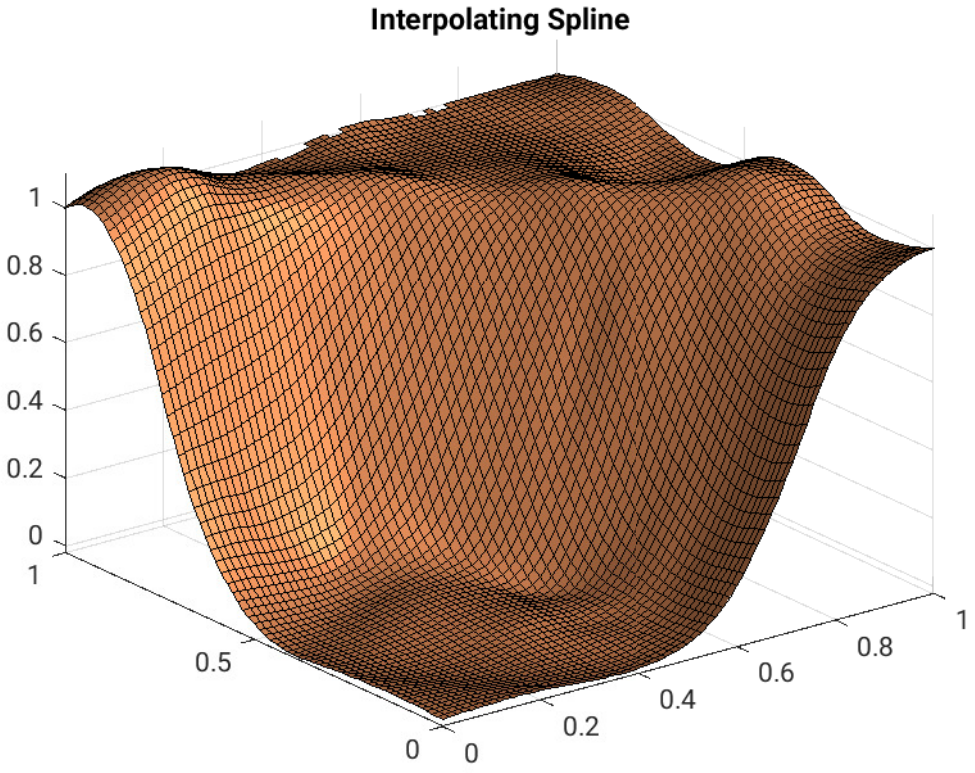
Plot derivative in northeast direction

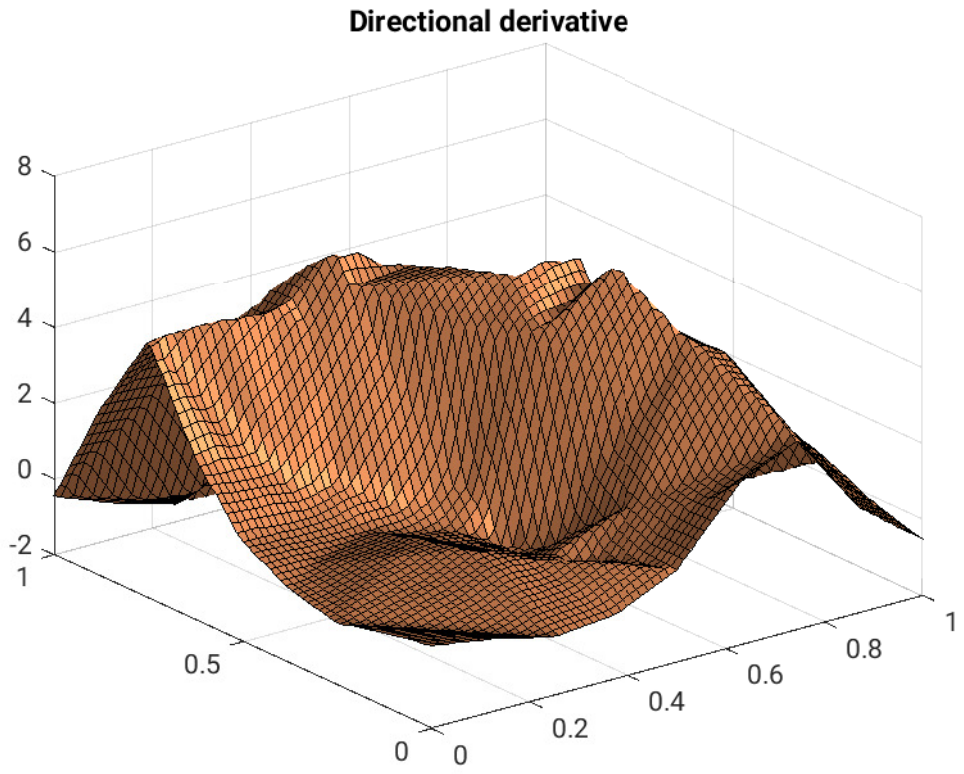
```
% Evaluate the directional derivative on the grid
u = [1,1];
[xg,yg,gu] = valspdergrid(d,x,y,v1,v2,v3,e1,e2,e3,ie1,c,ng,u,...
    xmin,xmax,ymin,ymax);

% Plot the directional derivative
figure; surfl(xg,yg,gu'); colormap(copper); title('Directional derivative')
```

Find and print minimal value of directional derivative on grid

```
fprintf('The minimum value of the directional derivative of the spline = %5.2e\n', min(min(g
```

```
file name for triangulation   'tri36.dat'
emax = 1.10e+00, RMS = 6.49e-01
The minimum value of the directional derivative of the spline = -1.56e+00
```




Directional derivative
8
6
4
2
0
-2
1
0.5
0
0
0.2
0.4
0.6
0.8
1