Contents


```
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% MATH 3890
% Machine Problem 11
% 06 April 2021

clc; clear; close all
```

Read Grid Points

```
[npts, x, y] = readxy;
```

Franke's function

```
f = @(x, y) franke2(x, y);
z = f(x, y);
```

Radial basic function

```
rbf = @(eps, r) exp(-(eps*r).^2);
```

Prompt for eps

```
eps = input('Enter the value of eps: ');
```

Compute coefficients

```
[c, M] = scatrbf(x, y, z, eps, rbf);
```

Compute difference between RBF interpolant and f

```
% Evaluate the RBF interpolant and Franke's function on a grid
ng = 71;
xmin = min(x); xmax = max(x); ymin = min(y); ymax = max(y);
xg = linspace(xmin,xmax,ng); yg = linspace(ymin,ymax,ng);
interp_value = zeros(ng, ng);
```

```
exact_value = zeros(ng, ng);
for i = 1:ng
    for j = 1:ng
        interp_value(i, j) = 0;
        for k = 1:length(c)
            r = sqrt((xg(i) - x(k))^2 + (yg(j) - y(k))^2);
            interp_value(i, j) = interp_value(i, j) + c(k)*rbf(eps, r);
            exact_value(i, j) = franke2(xg(i), yg(j));
        end
    end
end

% Compute difference
err = exact_value - interp_value;
err = reshape(err, ng*ng, 1);
```

Plot the interpolant

```
figure; surfl(xg',yg',interp_value'); colormap(copper);
```

Print max and RMS errors

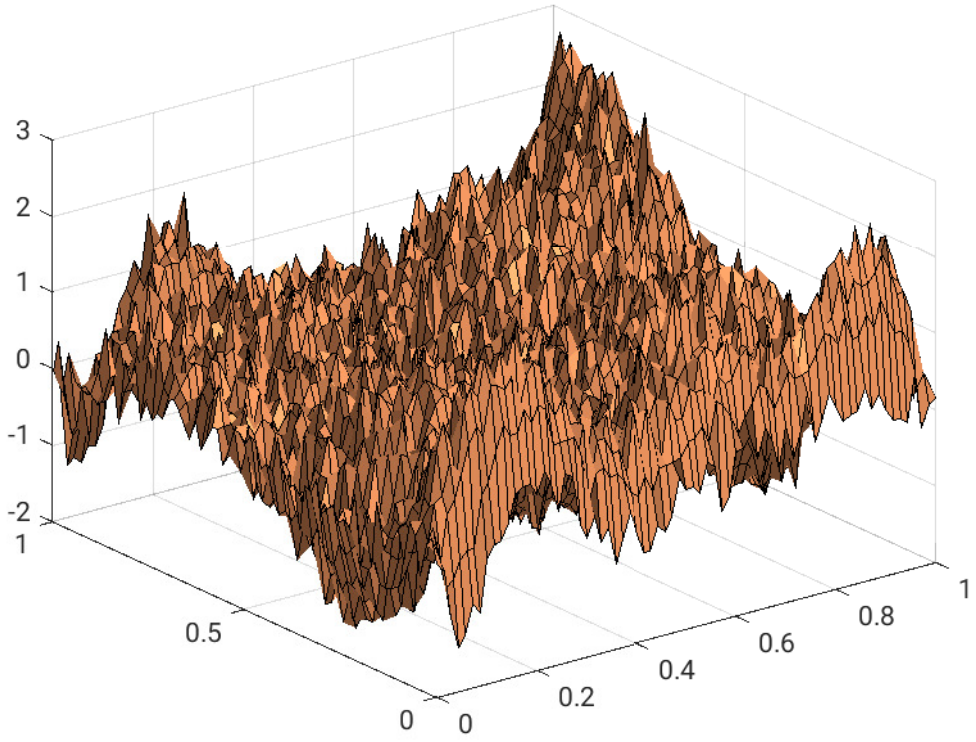
```
fprintf('Maximum error: %5.2e,   RMS = %5.2e\n', norm(err,inf),erms(err))
```

Print condition number of M

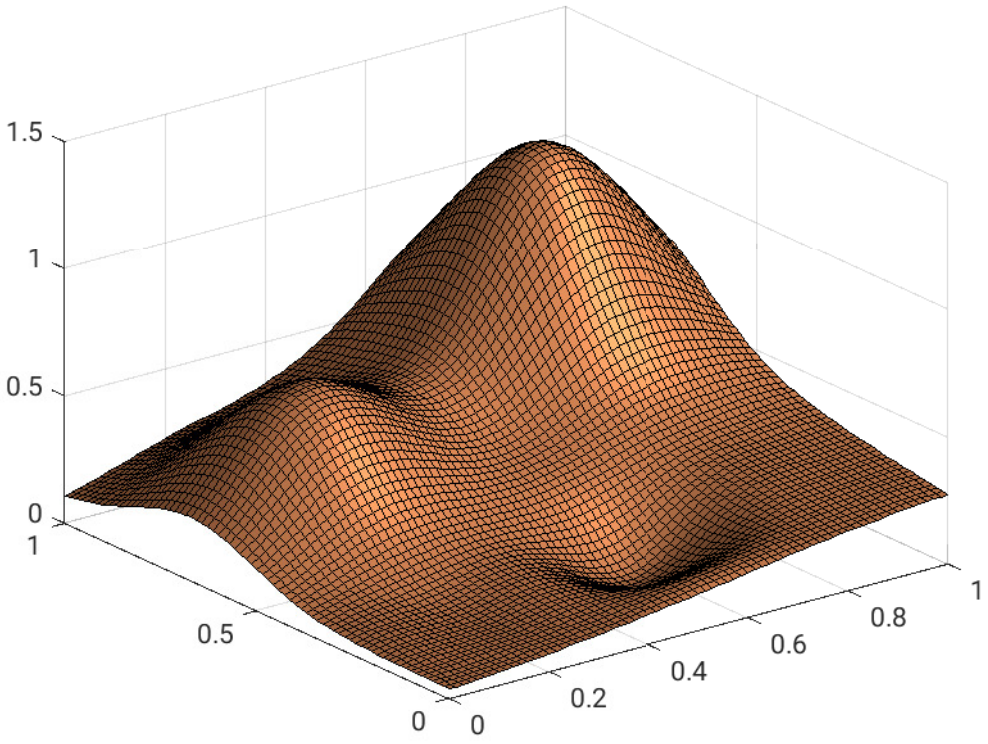
```
fprintf('Condition number of M = %g\n', cond(M))
```

```
file name for points x,y  'gridpts.81'
Enter the value of eps: 1
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =
2.875983e-20.
> In scatrbf (line 20)
In mp11 (line 26)

Maximum error: 2.27e+00,   RMS = 6.03e-01
Condition number of M = 1.05423e+18
```

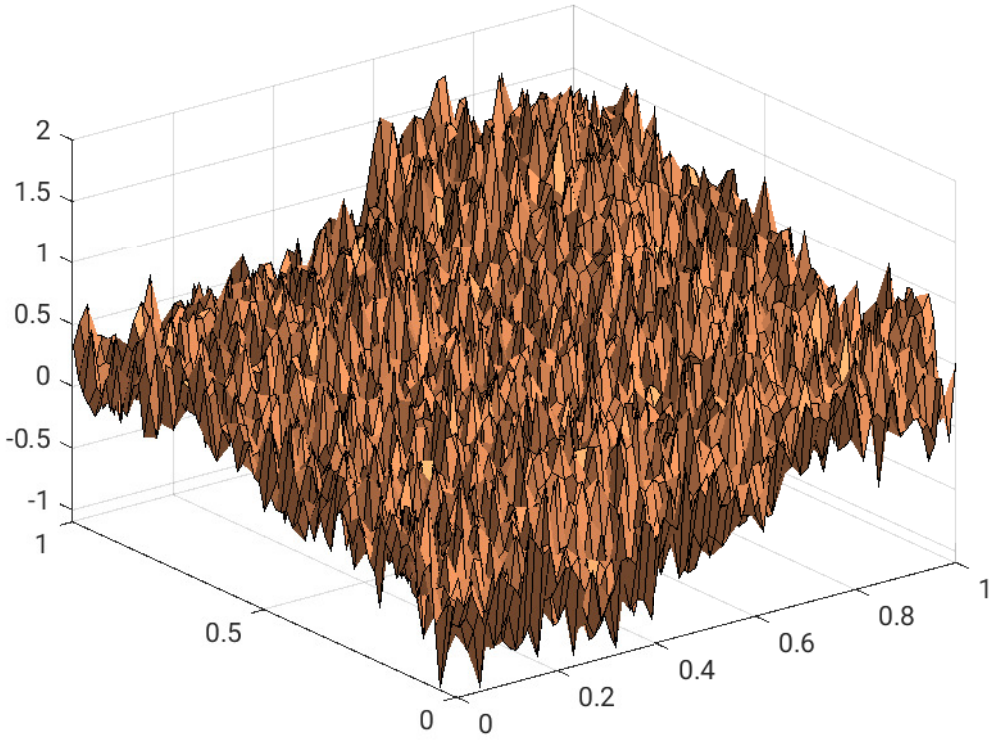


```
file name for points x,y  'gridpts.81'
Enter the value of eps: 4
Maximum error: 2.44e-02,   RMS = 4.76e-03
Condition number of M = 2.03086e+06
```



```
file name for points x,y  'gridpts.289'
Enter the value of eps: 1
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =
3.799617e-21.
> In scatrbf (line 20)
In mp11 (line 26)

Maximum error: 1.17e+00,   RMS = 3.04e-01
Condition number of M = 4.8867e+19
```



```
file name for points x,y  'gridpts.289'
Enter the value of eps: 4
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =
5.431895e-19.
> In scatrbf (line 20)
In mp11 (line 26)

Maximum error: 1.14e-02,   RMS = 9.82e-04
Condition number of M = 4.68226e+18
```