Contents


```
% Nikhil Jayswal
% 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);
```

eps values

```
epslist = 1:7;
```

Construct table

```
tbl = table;
tbl.eps = epslist';

maxerrors = zeros(size(epslist));
rmserrors = zeros(size(epslist));
cnum = zeros(size(epslist));

for m = 1:length(epslist)

    eps = epslist(m);
    % 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);

    % compute errors and condition number
    maxerrors(m) = norm(err, inf);
    rmserrors(m) = erms(err);
    cnum(m) = cond(M);

end

tbl.Max_Error = maxerrors';
tbl.RMS_Error = rmserrors';
tbl.Condition_Number = cnum';

disp(tbl);
```

```
file name for points x,y  'type2.81'
Warning: Matrix is close to singular or badly scaled. Results may be
inaccurate. RCOND =  5.343478e-20.
> In scatrbf (line 20)
In mp11table (line 38)

Warning: Matrix is close to singular or badly scaled. Results may be
inaccurate. RCOND =  2.042598e-19.
> In scatrbf (line 20)
In mp11table (line 38)
```

eps	Max_Error	RMS_Error	Condition_Number
1	0.35122	0.09024	2.1225e+19
2	0.56816	0.032961	9.1895e+17
3	0.07912	0.0044047	5.9527e+14
4	0.02053	0.0016633	6.8198e+10
5	0.0067627	0.00090839	9.8894e+07
6	0.0098039	0.00087769	8.6779e+05
7	0.017651	0.0013248	28614