EECS225B–Spring 2020 — PROBLEM SET 02

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1 Project 5.4

1.1 a

aMean4e.m | project5_4_e.m

```
1   function f_hat = aMean4e(g, m, n)
2   g = double(g);
3   f = zeros(m, n);
4   for i = 1:m
5       for j = 1:n
6           f(i, j) = 1/(m * n);
7       end
8   end
9   f_hat = conv2(g, f);
```

1.2 b

+1 | project5_4_e.m | geoMean4e.m | project5_4_f.m

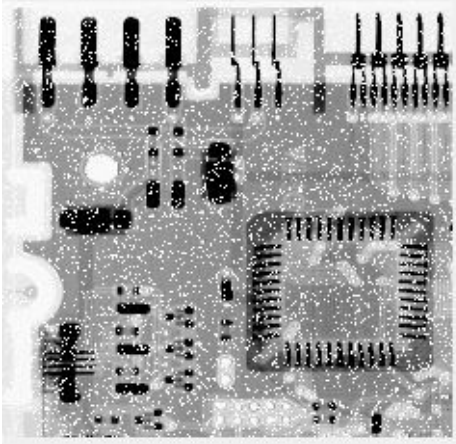
```
1   function f_hat = geoMean4e(g, m, n)
2   g = double(g);
3   [M, N] = size(g);
4   f = ones(m, n);
5   for i = 1:M
6       for j = 1:N
7           g(i, j) = log(g(i, j));
8       end
9   end
10  f_hat = conv2(g, f);
11  for i = 1:M
12      for j = 1:N
13          f_hat(i, j) = exp(f_hat(i, j)) ^(1/(m * n));
14      end
15  end
```

1.3 c

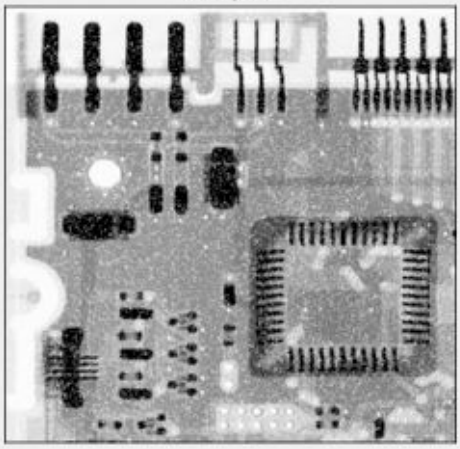
+1 project5_4_f.m | harMean4e.m | project5_4_c.m

```
1   function f_hat = harMean4e(g, m, n)
2   g = double(g);
3   [M, N] = size(g);
4   f = ones(m, n);
5   for i = 1:M
6       for j = 1:N
7           g(i, j) = m * n * g(i, j);
8       end
9   end
10  f_hat = conv2(g, f);
```

input



output



1.4 d

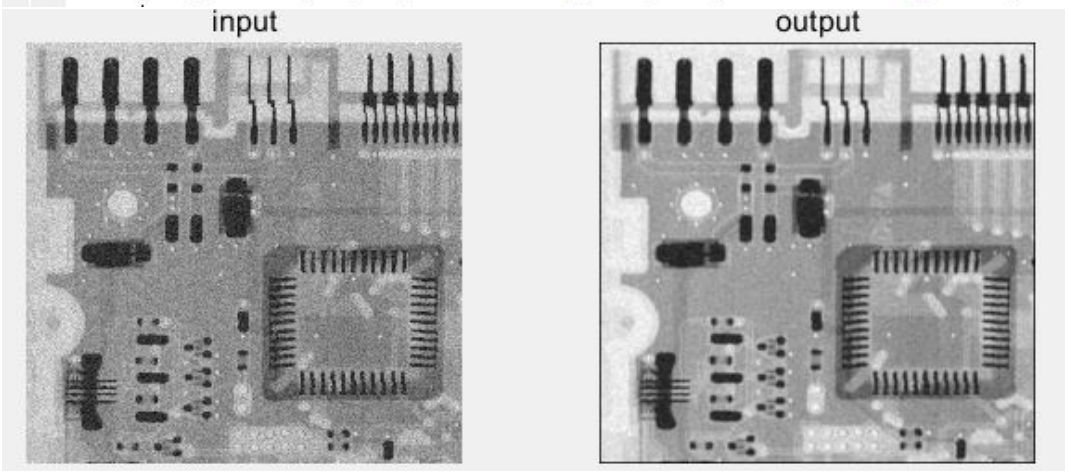
project5_4_c.m | ctharMean4e.m

```
function f_hat = ctharMean4e(g,
    g = double(g);
    f = ones(m, n);
    g1 = g.^(q + 1);
    f1 = conv2(g1, f);
    g2 = g.^q;
    f2 = conv2(g2, f);
    f_hat = f1 ./ f2;
```

1.5 e

aMean4e.m | project5_4_e.m | +

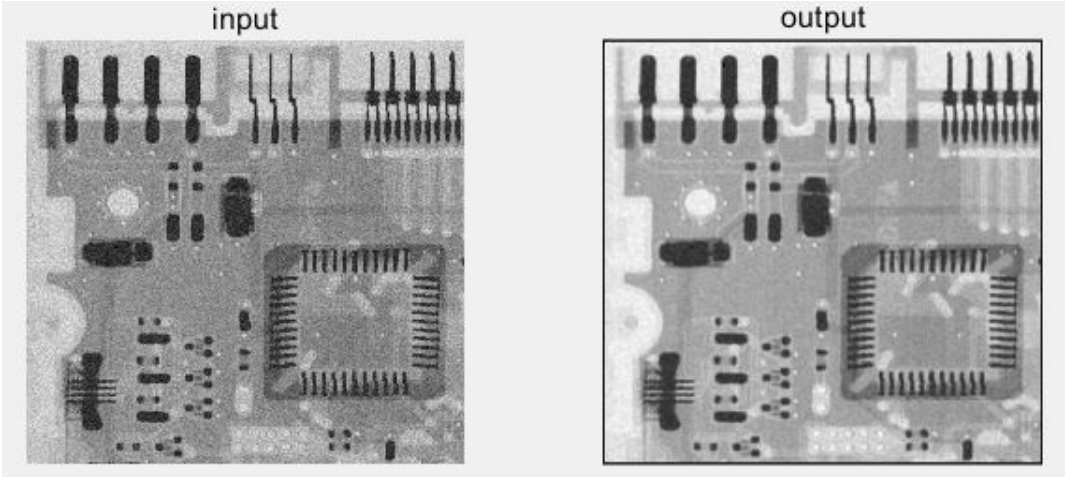
```
img = imread('circuitboard-gaussian.tif');
subplot(1,2,1);imshow(img,[]);title('input');
f_hat = aMean4e(img, 3, 3);
subplot(1,2,2);imshow(f_hat,[]);title('output');
```



1.6 f

project5_4_e.m | geoMean4e.m | project5_4_f.m

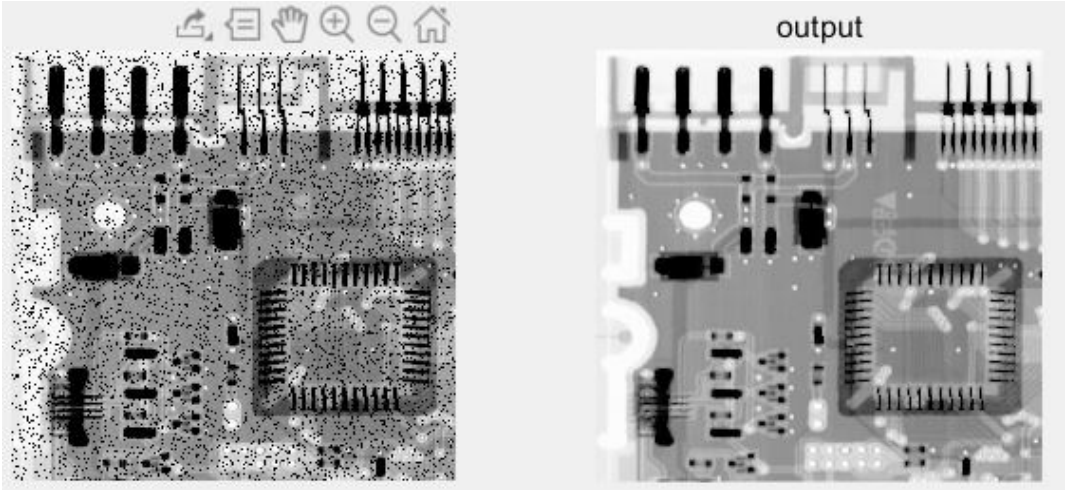
```
1 —    img = imread('circuitboard-gaussian.tif');
2 —    subplot(1, 2, 1);imshow(img, []);title('input');
3 —    f_hat = geoMean4e(img, 3, 3);
4 —    subplot(1, 2, 2);imshow(f_hat, []);title('output');
```



1.7 g

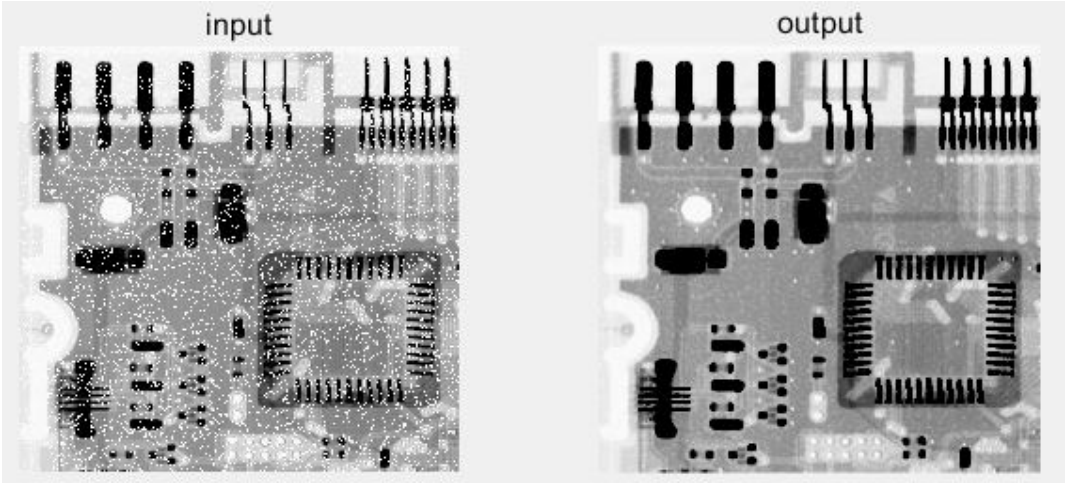
project5_4_c.m | ctharMean4e.m | project5_4_g.m

```
1 —    img = imread('circuitboard-pepper.tif');
2 —    subplot(1, 2, 1);imshow(img, []);title('input');
3 —    f_hat = ctharMean4e(img, 3, 3, -1.5);
4 —    subplot(1, 2, 2);imshow(f_hat, []);title('output');
```



1.8 h

```
+1  ctharMean4e.m | project5_4_g.m | project5_4_h.m
1 —  img = imread('circuitboard-salt.tif');
2 —  subplot(1,2,1);imshow(img,[]);title('input');
3 —  f_hat = ctharMean4e(img, 3, 3, 1.5);
4 —  subplot(1,2,2);imshow(f_hat,[]);title('output');
```



2 Project 5.5

2.1 a

gsnfil.m medianFilter4e.m +

```
function f_hat = gsnfil(A, k , fun)
f_hat = nlfilter(A, k, fun);
```

2.2 b

project5_5_e.m minFilter4e.m +

```
function f_hat = minFilter4e(g, m, n)
fun = @(x)min(x(:));
f_hat = nlfilter(g, [m, n], fun);
```

2.3 c

project5_5_e.m maxFilter4e.m minFilter4e.m

```
function f_hat = maxFilter4e(g, m, n)
fun = @(x)max(x(:));
f_hat = nlfilter(g, [m, n], fun);
```

2.4 d

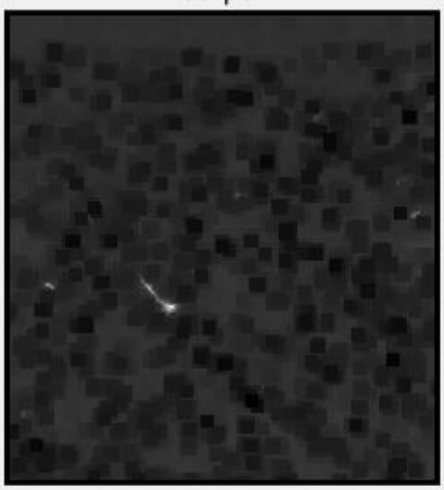
medianFilter4e.m project5_5_f.m +

```
function f_hat = medianFilter4e(g, m, n)
fun = @(x) median(x(:));
f_hat = nlfilter(g, [m, n], fun);
```

2.5 e

project5_5_e.m | maxFilter4e.m | minFilter4e.m

```
1 —    img = imread('hubble.tif');
2 —    img = double(img);
3 —    subplot(1,2,1);imshow(img,[]);title('input');
4 —    f_hat = minFilter4e(img, 15, 15);
5 —    subplot(1,2,2);imshow(f_hat,[]);title('output');
```



2.6 f

medianFilter4e.m | project5_5_f.m

```
1 —    img = imread('circuitboard-saltandpep.tif');
2 —    subplot(2,2,1);imshow(img,[]);title('a');
3 —    img = medianFilter4e(img, 3, 3);
4 —    subplot(2,2,2);imshow(img,[]);title('b');
5 —    img = medianFilter4e(img, 3, 3);
6 —    subplot(2,2,3);imshow(img,[]);title('c');
7 —    img = medianFilter4e(img, 3, 3);
8 —    subplot(2,2,4);imshow(img,[]);title('d');
```