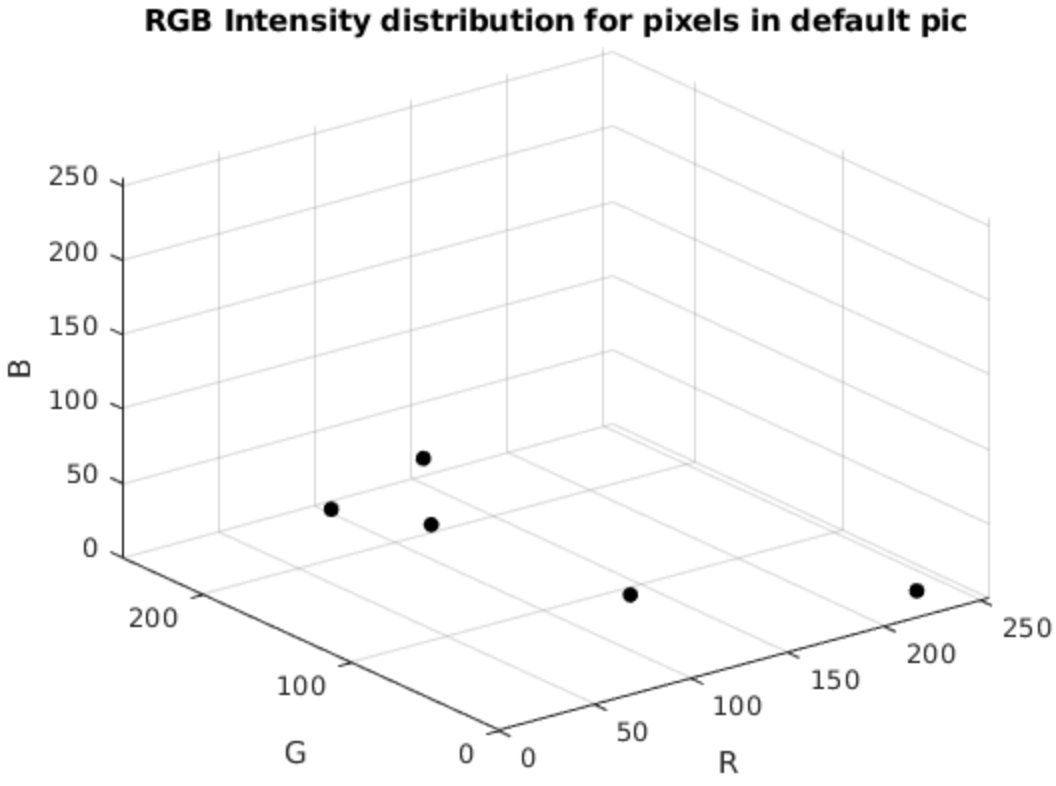
Table of Contents

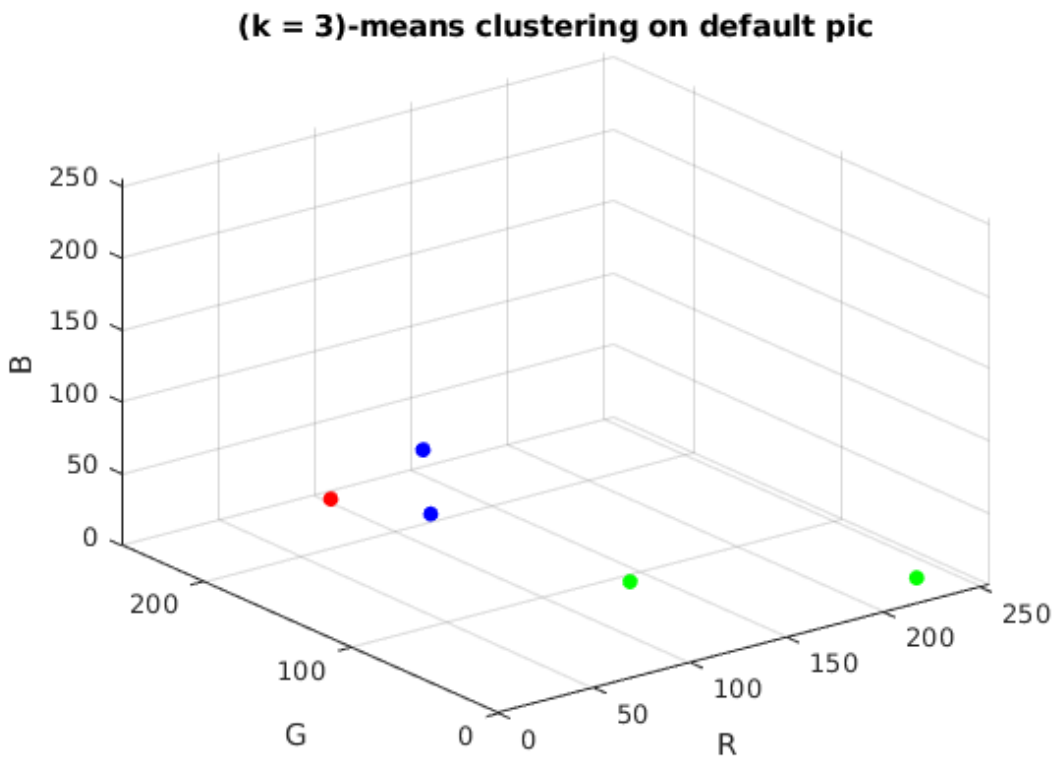
Part 1 1
Part 2 4
Part 1 4
Part 3 6
Part 1 6

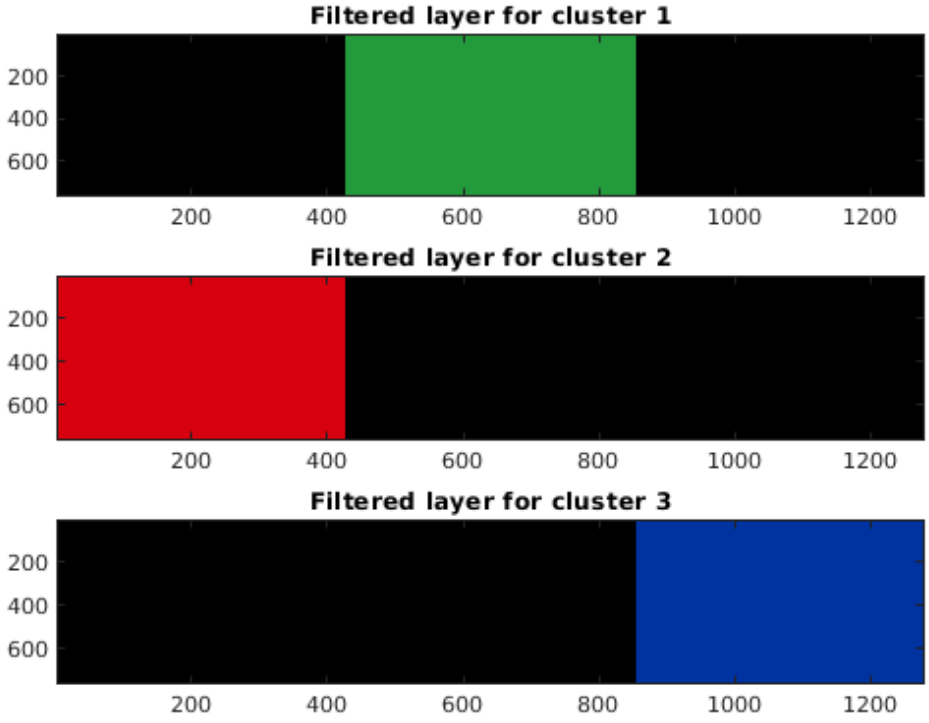
Part 1

```
close all; clear all; clc;

A = imread('default_rgb_reference.tif');
B = double(A);

r = B(:,:,1);
r_flat = reshape(r, [], 1);
g = B(:,:,2);
g_flat = reshape(g, [], 1);
b = B(:,:,3);
b_flat = reshape(b, [], 1);

figure();
plot3(r_flat, g_flat, b_flat, 'k.','MarkerSize', 20);
title('RGB Intensity distribution for pixels in default pic');
xlabel('R');
ylabel('G');
zlabel('B');
axis([0, 255, 0, 255, 0, 255]);
grid on;
hold off;

k = 3;
X = [r_flat, g_flat, b_flat];
[idx, cent] = kmeans(X, k, 'Replicates', 10);

figure();
cluster_data = struct('cluster',{}, 'rgb_data', {});
col = {'red', 'green', 'blue'};
for clust_num = 1:k
    cluster_data(clust_num).cluster = clust_num;
    rgb_data_temp = X(find(idx == clust_num),:);
    cluster_data(clust_num).rgb_data = [find(idx == clust_num),
 rgb_data_temp];
    plot3(rgb_data_temp(:,1), rgb_data_temp(:,2),
 rgb_data_temp(:,3),...
        '.', 'Color', string(col(clust_num)), 'MarkerSize', 20);
    hold on;
end
title(sprintf('(k = %d)-means clustering on default pic', k));
```

```
xlabel('R');
ylabel('G');
zlabel('B');
axis([0, 255, 0, 255, 0, 255]);
grid on;
hold off;
clear clust_num;

figure();

for clust_num = 1:k
    im_data = NaN(size(A));
    r_layer = im_data(:,:,1);
    g_layer = im_data(:,:,2);
    b_layer = im_data(:,:,3);

    clust_idx = cluster_data(clust_num).rgb_data(:,1);
    r_layer(clust_idx) = r_flat(clust_idx);
    g_layer(clust_idx) = g_flat(clust_idx);
    b_layer(clust_idx) = b_flat(clust_idx);

    im_data = cat(3, r_layer, g_layer, b_layer);
    subplot(k, 1, clust_num);
    image(uint8(im_data));
    title(sprintf('Filtered layer for cluster %d',clust_num));
end
```




(k = 3)-means clustering on default pic
B
G
R
250
200
150
100
50
0
200
100
0
0
50
100
150
200
250


Filtered layer for cluster 1
Filtered layer for cluster 2
Filtered layer for cluster 3
200
400
600
200
400
600
800
1000
1200

Part 2

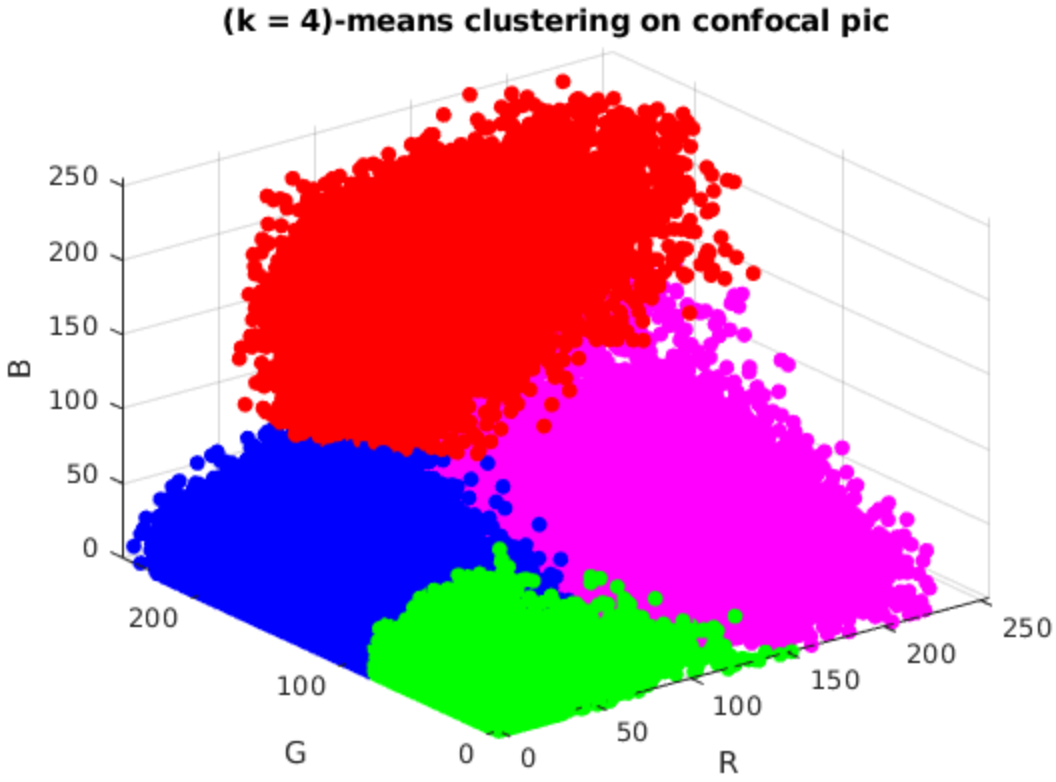
```
close all; clear all; clc;
```

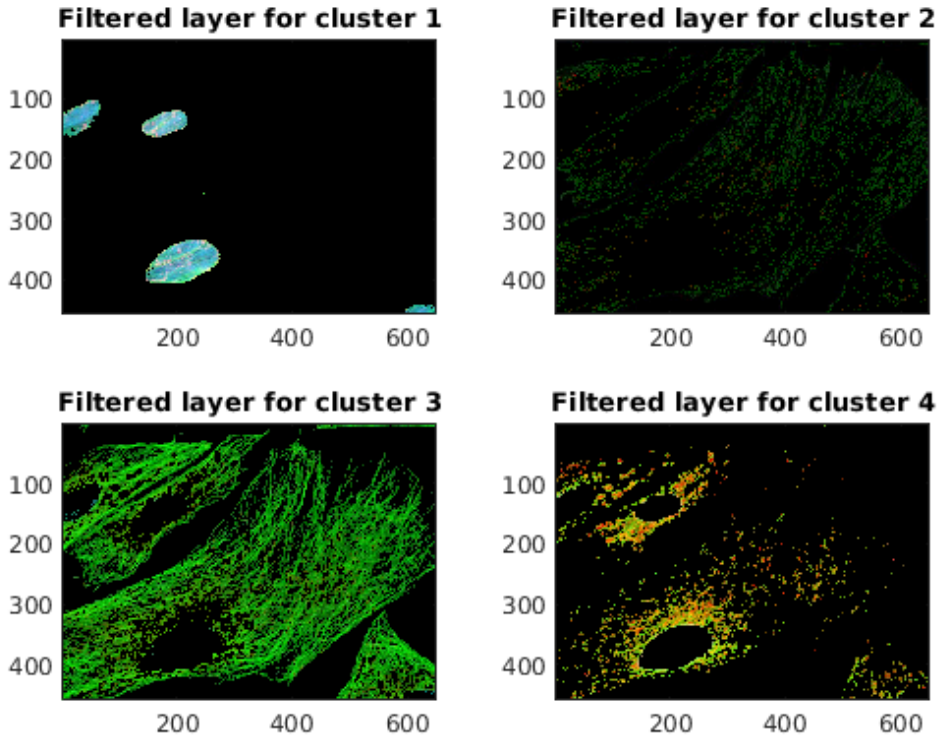
Part 1

```
A = imread('confocal_image01.tif');
B = double(A);

r = B(:,:,1);
r_flat = reshape(r, [], 1);
g = B(:,:,2);
g_flat = reshape(g, [], 1);
b = B(:,:,3);
b_flat = reshape(b, [], 1);

k = 4;
X = [r_flat, g_flat, b_flat];
[idx, cent] = kmeans(X, k, 'Replicates', 50);

figure();
cluster_data = struct('cluster',{}, 'rgb_data', {});
col = {'red', 'green', 'blue', 'magenta', 'cyan'};
for clust_num = 1:k
    cluster_data(clust_num).cluster = clust_num;
    rgb_data_temp = X(find(idx == clust_num),:);
    cluster_data(clust_num).rgb_data = [find(idx == clust_num),
 rgb_data_temp];
    plot3(rgb_data_temp(:,1), rgb_data_temp(:,2),
 rgb_data_temp(:,3),...
        '.', 'Color', string(col(clust_num)), 'MarkerSize', 20);
    hold on;
end
title(sprintf('(k = %d)-means clustering on confocal pic', k));
xlabel('R');
ylabel('G');
zlabel('B');
axis([0, 255, 0, 255, 0, 255]);
grid on;
hold off;
clear clust_num;

figure();

for clust_num = 1:k
    im_data = NaN(size(A));
    r_layer = im_data(:,:,1);
    g_layer = im_data(:,:,2);
    b_layer = im_data(:,:,3);

    clust_idx = cluster_data(clust_num).rgb_data(:,1);
    r_layer(clust_idx) = r_flat(clust_idx);
```

```
    g_layer(clust_idx) = g_flat(clust_idx);
    b_layer(clust_idx) = b_flat(clust_idx);

    im_data = cat(3, r_layer, g_layer, b_layer);
    subplot(round(k/2), 2, clust_num);
    image(uint8(im_data));
    title(sprintf('Filtered layer for cluster %d',clust_num));
end

disp(sprintf('(k = %d) - clusters needed', k))
```

(k = 4) - clusters needed





Part 3

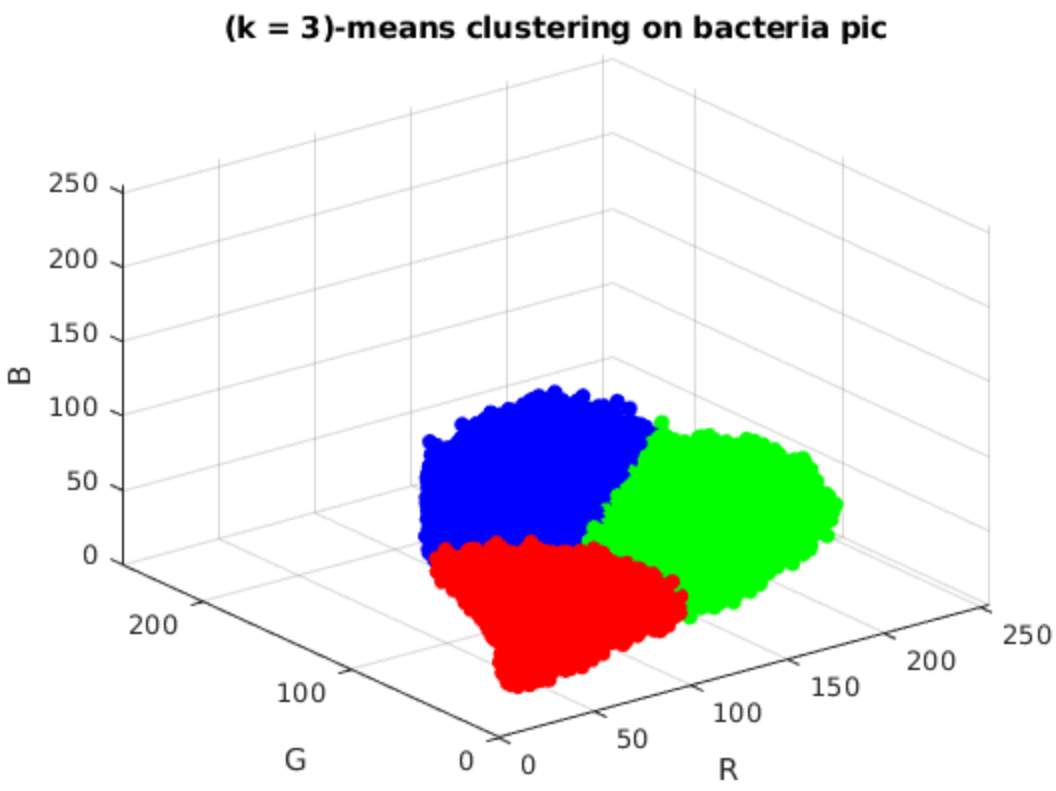
```
close all; clear all; clc;
```

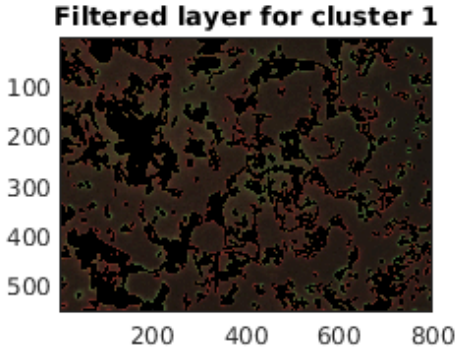
Part 1

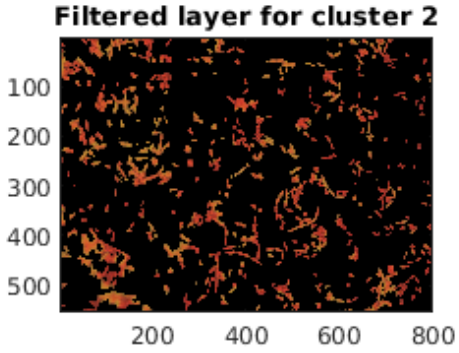
```
A = imread('Bacteria_image01.tif');
B = double(A);

r = B(:,:,1);
r_flat = reshape(r, [], 1);
g = B(:,:,2);
g_flat = reshape(g, [], 1);
b = B(:,:,3);
b_flat = reshape(b, [], 1);

k = 3;
X = [r_flat, g_flat, b_flat];
[idx, cent] = kmeans(X, k, 'Replicates', 50);

figure();
cluster_data = struct('cluster',{}, 'rgb_data', {});
col = {'red', 'green', 'blue', 'magenta', 'cyan'};
for clust_num = 1:k
    cluster_data(clust_num).cluster = clust_num;
    rgb_data_temp = X(find(idx == clust_num),:);
```

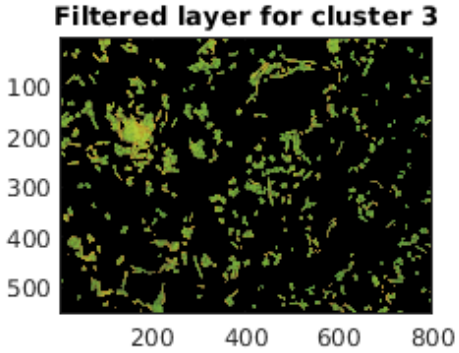
```
    cluster_data(clust_num).rgb_data = [find(idx == clust_num),
 rgb_data_temp];
    plot3(rgb_data_temp(:,1), rgb_data_temp(:,2),
 rgb_data_temp(:,3),...
        '.', 'Color', string(col(clust_num)), 'MarkerSize', 20);
    hold on;
end
title(sprintf('(k = %d)-means clustering on bacteria pic', k));
xlabel('R');
ylabel('G');
zlabel('B');
axis([0, 255, 0, 255, 0, 255]);
grid on;
hold off;
clear clust_num;

figure();

for clust_num = 1:k
    im_data = NaN(size(A));
    r_layer = im_data(:,:,1);
    g_layer = im_data(:,:,2);
    b_layer = im_data(:,:,3);

    clust_idx = cluster_data(clust_num).rgb_data(:,1);
    r_layer(clust_idx) = r_flat(clust_idx);
    g_layer(clust_idx) = g_flat(clust_idx);
    b_layer(clust_idx) = b_flat(clust_idx);

    im_data = cat(3, r_layer, g_layer, b_layer);
    subplot(round(k/2), 2, clust_num);
    image(uint8(im_data));
    title(sprintf('Filtered layer for cluster %d',clust_num));

end

disp(sprintf('(k = %d) - clusters needed', k))
```

```
(k = 3) - clusters needed
```


(k = 3)-means clustering on bacteria pic
B
G
R
250
200
150
100
50
0
0
50
100
150
200
250


Filtered layer for cluster 1
100
200
300
400
500
200
400
600
800


Filtered layer for cluster 2
100
200
300
400
500
200
400
600
800


Filtered layer for cluster 3
100
200
300
400
500
200
400
600
800

Published with MATLAB® R2021a