

```

max_val = 50
num_points = 100000;
radius = 5;

%sphere 1-----
origin = rand(1,3)*max_val;
[point_data_1 X_1 Y_1 Z_1] = generate_sphere(num_points, radius, origin);

point_data_1(:,4) = 1; %hidden classifier

%sphere 2-----
origin = rand(1,3)*max_val;
[point_data_2 X_2 Y_2 Z_2] = generate_sphere(num_points, radius, origin);

point_data_2(:,4) = 2; %hidden classifier

%consolidates the data-----

X = [X_1; X_2];
Y = [Y_1; Y_2];
Z = [Z_1; Z_2];

num_rows = size(X,1);

S = ones(num_rows,1);
C = zeros(num_rows,3);
C = C .+ [.1 .5 .8];

figure, scatter3(X,Y,Z,S,C)

max_X = max(X);
max_Y = max(Y);
max_Z = max(Z);

xlim([0 1.25*max_X]);
ylim([0 1.25*max_Y]);
zlim([0 1.25*max_Z]);

daspect([1 1 1]); %sets the aspect one to one

%=====
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%CLUSTERS THE DATA
%=====
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N = 3;

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dataset = [point_data_1 ; point_data_2];

num_items = size(dataset,1);

scramble = randperm(num_items);
scramble_dataset = dataset(scramble,:); %permutes the dataset

tic;[final_cluster_array] = optimize EMC_cluster(scramble_dataset, N); toc

X = scramble_dataset(:,1);
Y = scramble_dataset(:,2);
Z = scramble_dataset(:,3);

%=====
%=====
%DISPLAYS THE RESULTANT CLUSTERS
%=====
%=====

num_clusters = size(final_cluster_array,2);
total_num_items = size(dataset,1);

C = zeros(total_num_items,3); %used to color the clustered points when displayed

for i = 1 : num_clusters

    cluster_indexes = final_cluster_array{i};

    %assigns a random color to the points in each class
    C(cluster_indexes,1) = rand(); %r
    C(cluster_indexes,2) = rand(); %g
    C(cluster_indexes,3) = rand(); %b

endfor

S = 3*ones(num_items,1);

figure, scatter3(X,Y,Z,S,C)

xlim([0 1.25*max_X]);
ylim([0 1.25*max_Y]);
zlim([0 1.25*max_Z]);

daspect([1 1 1]); %sets the aspect one to one

%=====
%=====

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%TESTS ACCURACY OF CLUSTERING
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num_errors = 0;
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for i = 1 : num_clusters
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temp_indexes = final_cluster_array{i};
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temp_cluster = scramble_dataset(temp_indexes,:);
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class_vector = temp_cluster(:,N+1);
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class = class_vector(1);
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num_errors = sum(class_vector != class);
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endfor
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