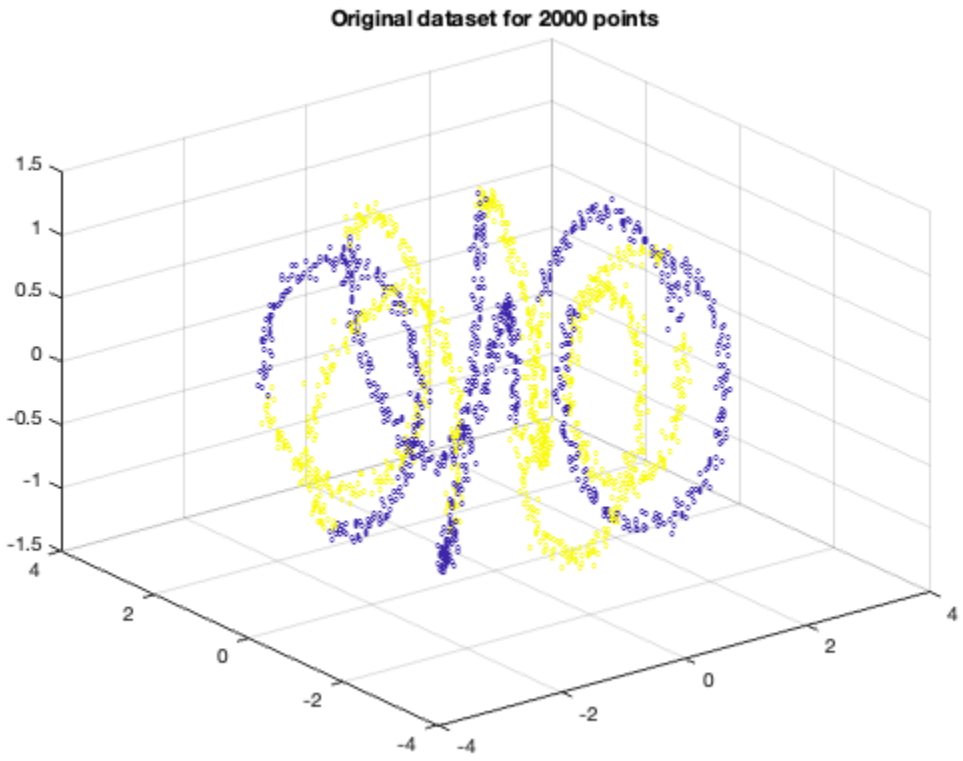
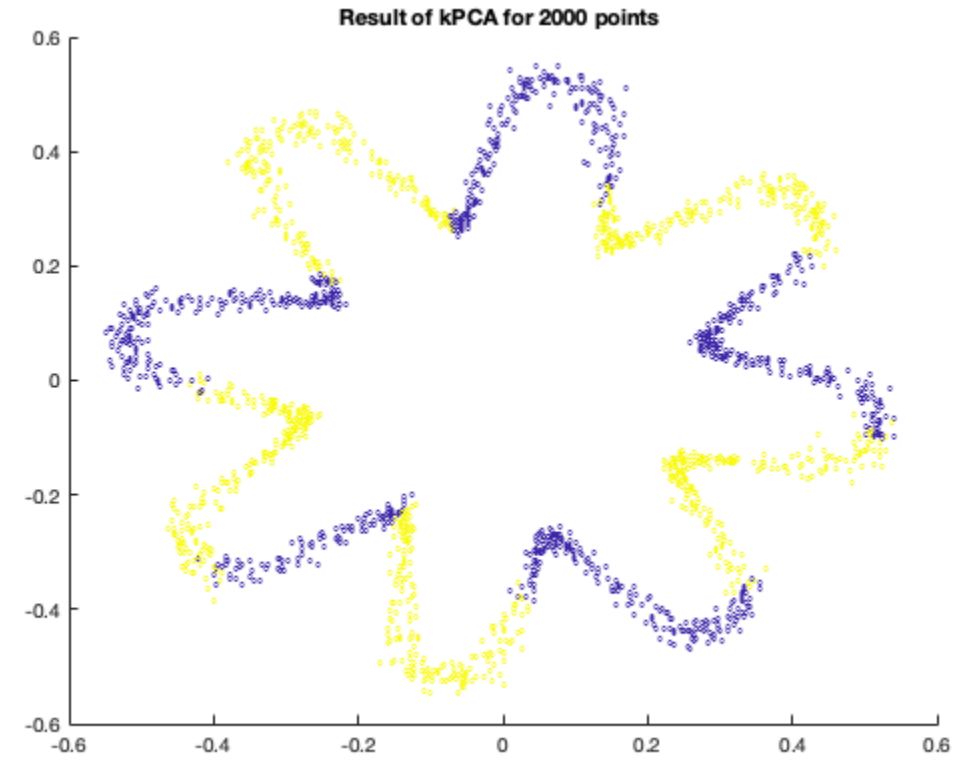
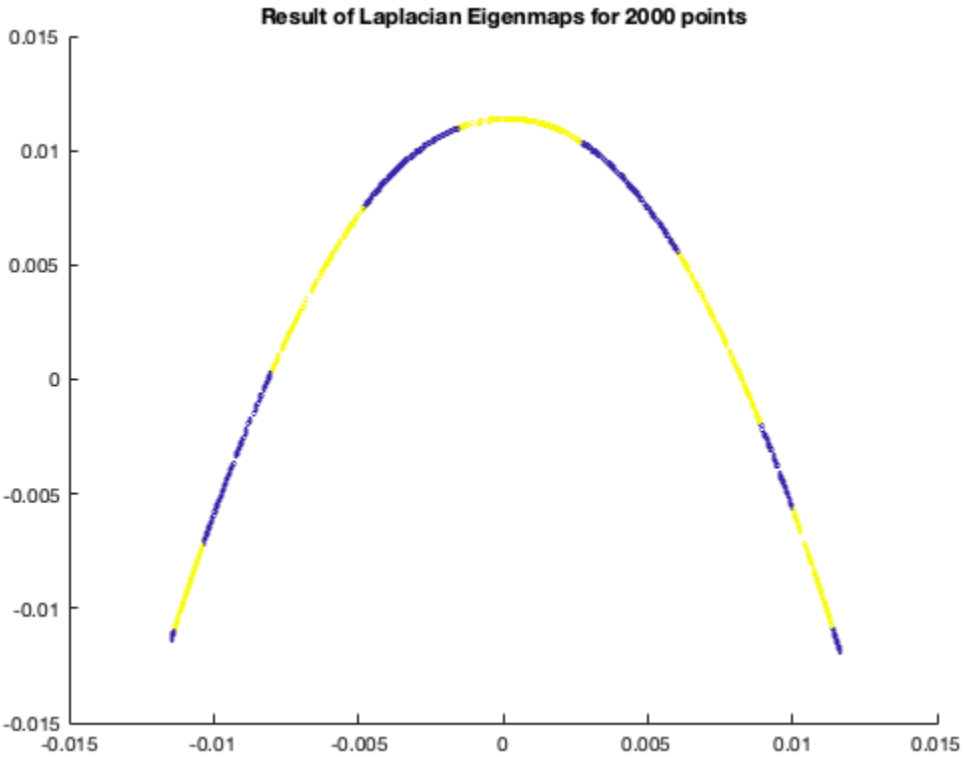
```
clear;
clc;
close all;
tic;
[X, labels] = generate_data('helix', 2000);
    figure, scatter3(X(:,1), X(:,2), X(:,3), 5, labels); title('Original
dataset for 2000 points'), drawnow
    no_dims = round(intrinsic_dim(X, 'MLE'));
    disp(['MLE estimate of intrinsic dimensionality: ' num2str(no_dims)]);
    [mappedX, ~] = compute_mapping(X, 'KernelPCA', no_dims);
    figure, scatter(mappedX(:,1), mappedX(:,2), 5, labels); title('Result of
kPCA for 2000 points ');
    [mappedX, mapping] = compute_mapping(X, 'Laplacian', no_dims, 7);
    figure, scatter(mappedX(:,1), mappedX(:,2), 5,
labels(mapping.conn_comp)); title('Result of Laplacian Eigenmaps for 2000
points'); drawnow
toc;

tic;
[X, labels] = generate_data('helix', 20000);
    figure, scatter3(X(:,1), X(:,2), X(:,3), 5, labels); title('Original
dataset for 20,000 points'), drawnow
    no_dims = round(intrinsic_dim(X, 'MLE'));
    disp(['MLE estimate of intrinsic dimensionality: ' num2str(no_dims)]);
    [mappedX, ~] = compute_mapping(X, 'KernelPCA', no_dims);
    figure, scatter(mappedX(:,1), mappedX(:,2), 5, labels); title('Result of
kPCA for 20,000 points');
    [mappedX, mapping] = compute_mapping(X, 'Laplacian', no_dims, 7);
    figure, scatter(mappedX(:,1), mappedX(:,2), 5,
labels(mapping.conn_comp)); title('Result of Laplacian Eigenmaps for 20,000
points'); drawnow
toc;
```

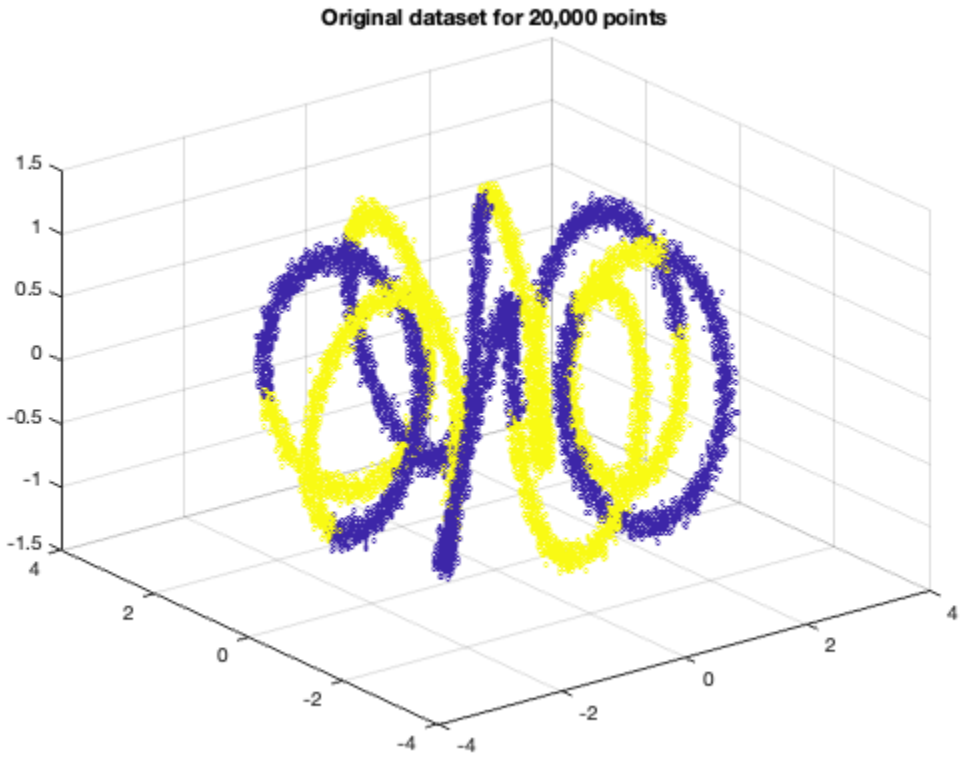
```
   Welcome to the Matlab Toolbox for Dimensionality Reduction, version 0.8b
(18-April-2012).
      You are free to modify or redistribute this code (for non-commercial
purposes), as long as a reference
      to the original author (Laurens van der Maaten, Delft University of
Technology) is retained.
      For more information, please visit http://homepage.tudelft.nl/19j49

MLE estimate of intrinsic dimensionality: 2
Computing kernel matrix...
Eigenanalysis of kernel matrix...
Computing final embedding...
Constructing neighborhood graph...
Computing weight matrices...
Constructing Eigenmaps...
Warning: Ignoring issym field in the options structure since the first input
is
not a function handle.
Elapsed time is 7.879875 seconds.
```

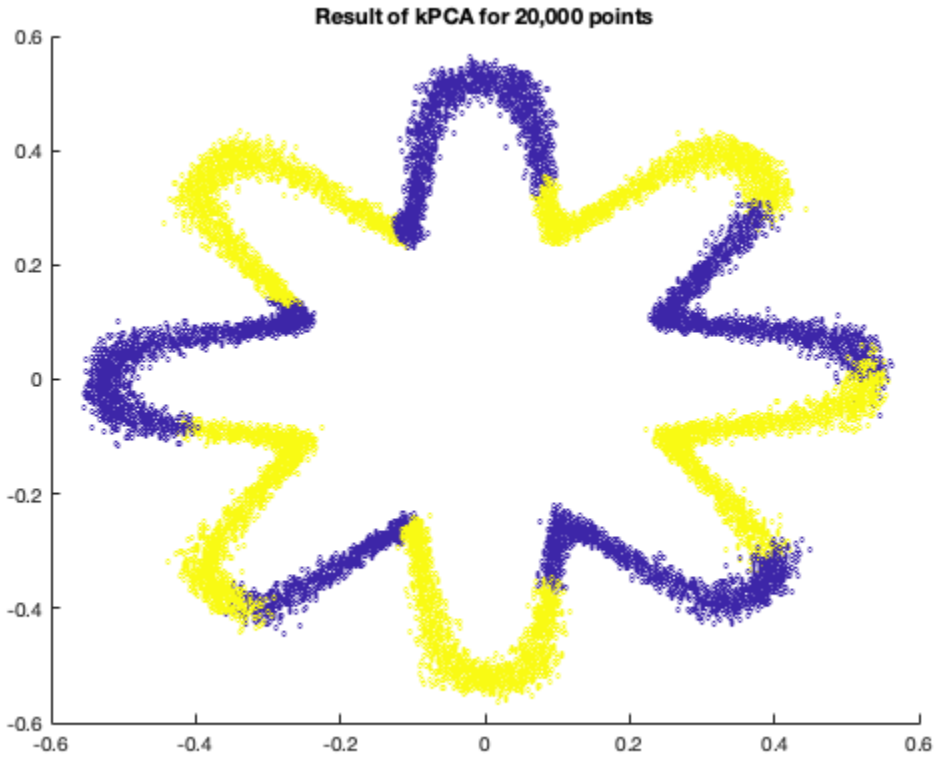
```
MLE estimate of intrinsic dimensionality: 3
Computing kernel matrix...
Eigenanalysis of kernel matrix...
Computing final embedding...
Constructing neighborhood graph...
Computing weight matrices...
Constructing Eigenmaps...
Warning: Ignoring issym field in the options structure since the first input
is
not a function handle.
Elapsed time is 2467.298131 seconds.
```

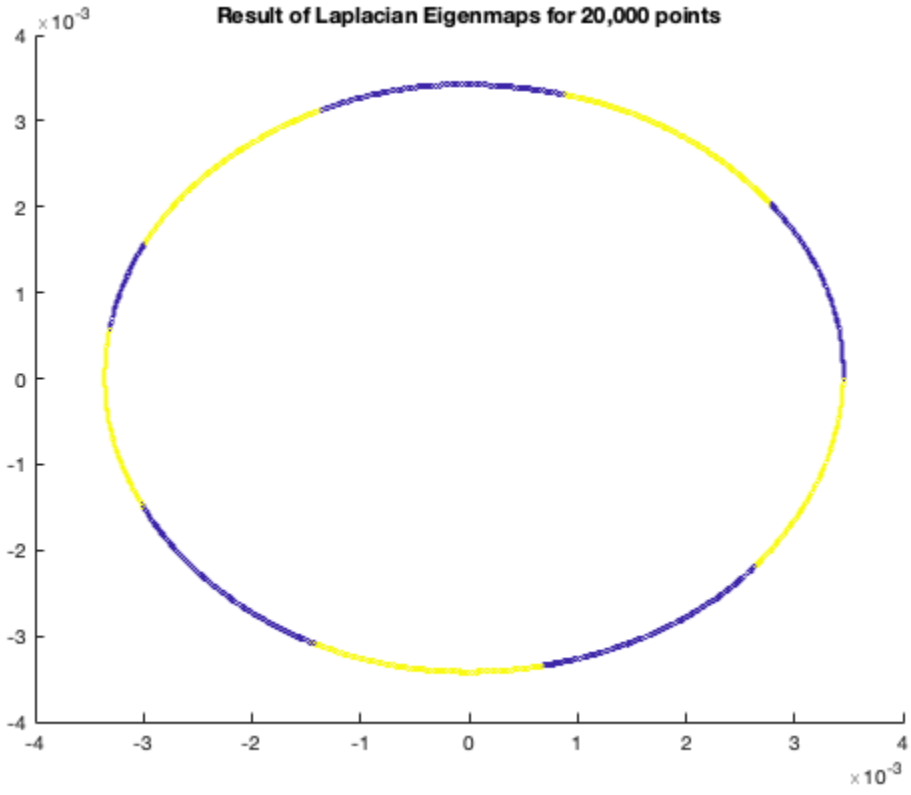



Result of kPCA for 2000 points
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.6
-0.4
-0.2
0
0.2
0.4
0.6


Result of Laplacian Eigenmaps for 2000 points
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.015
-0.01
-0.005
0
0.005
0.01
0.015


Original dataset for 20,000 points
1.5
1
0.5
0
-0.5
-1
-1.5
4
2
0
-2
-4
-4
-2
0
2
4


Result of kPCA for 20,000 points
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.6
-0.4
-0.2
0
0.2
0.4
0.6



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