Non Linear Feature Transform

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Fernando P.D.R

X

For Iris Data Set Feature Space x

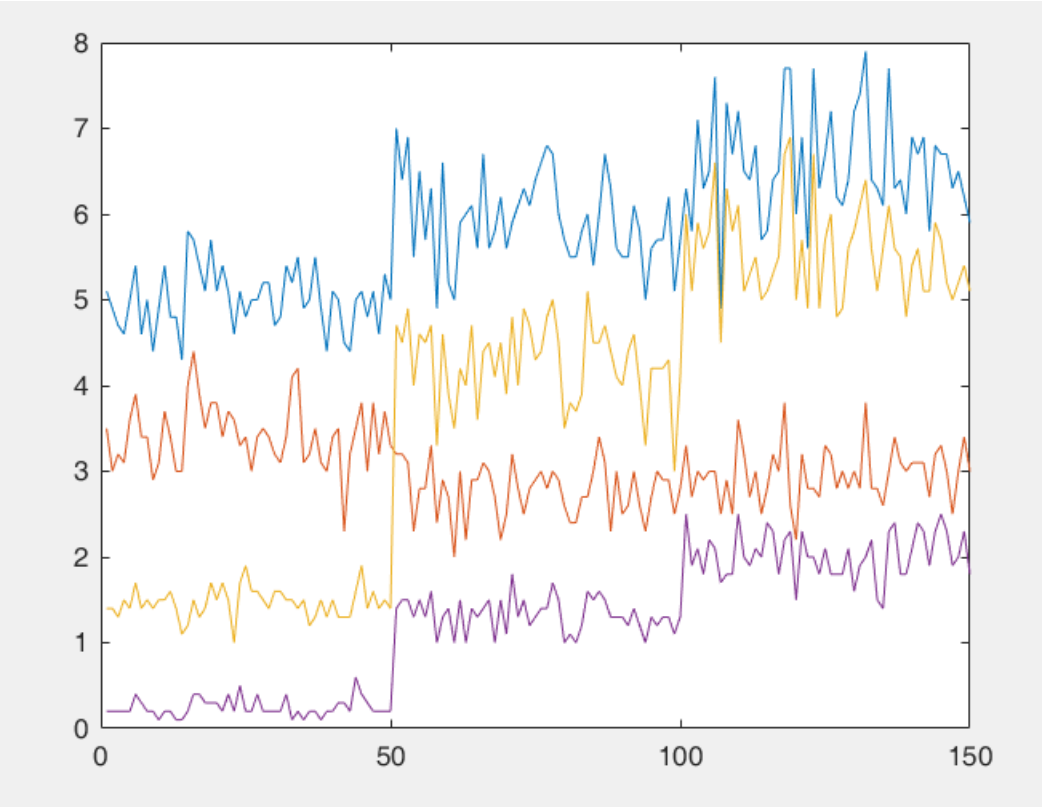

Figure 1 : Feature Space x

PCA for x

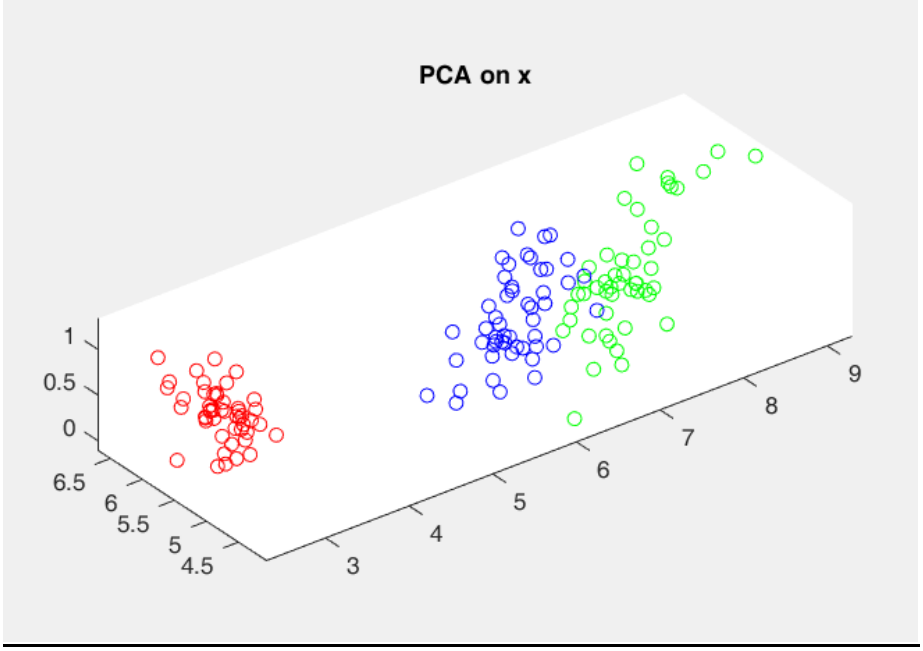

Figure 2: PCA for Space x

FDA for x

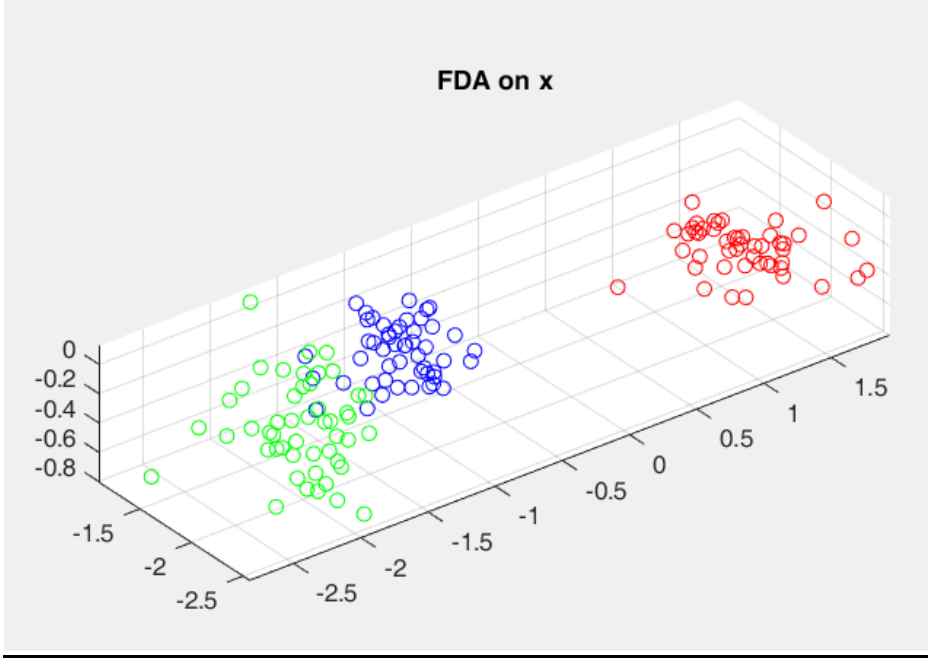

Figure 3 : FDA for x

x^2

For Iris Data Set Feature Space x^2

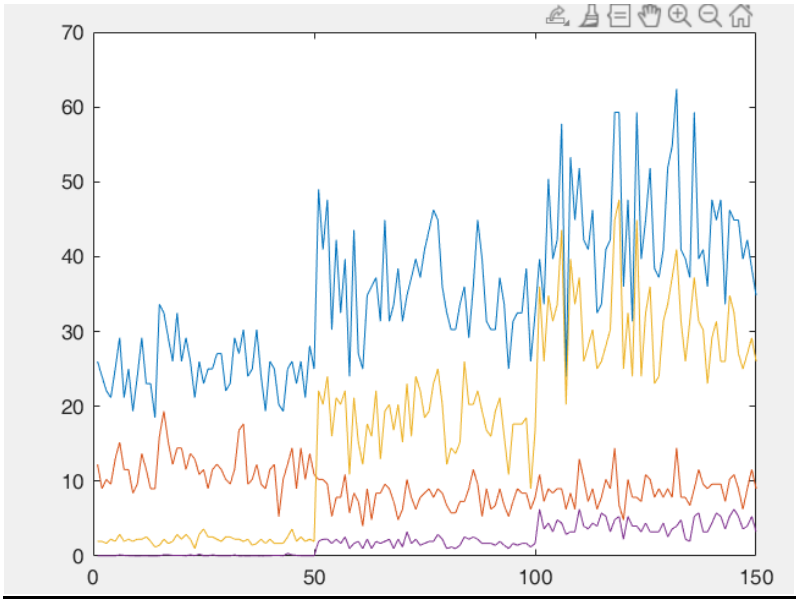

Figure 4 : Feature Space x^2

PCA for x^2

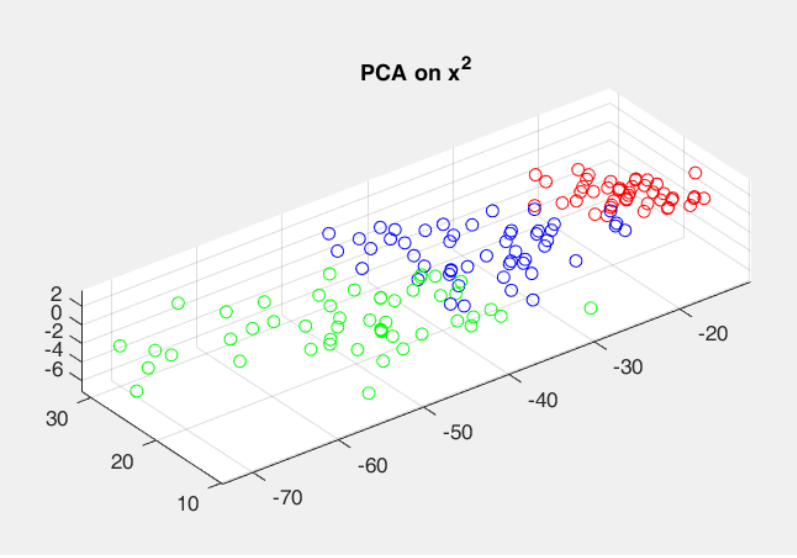

Figure 5 : PCA for x^2

FDA for x^2

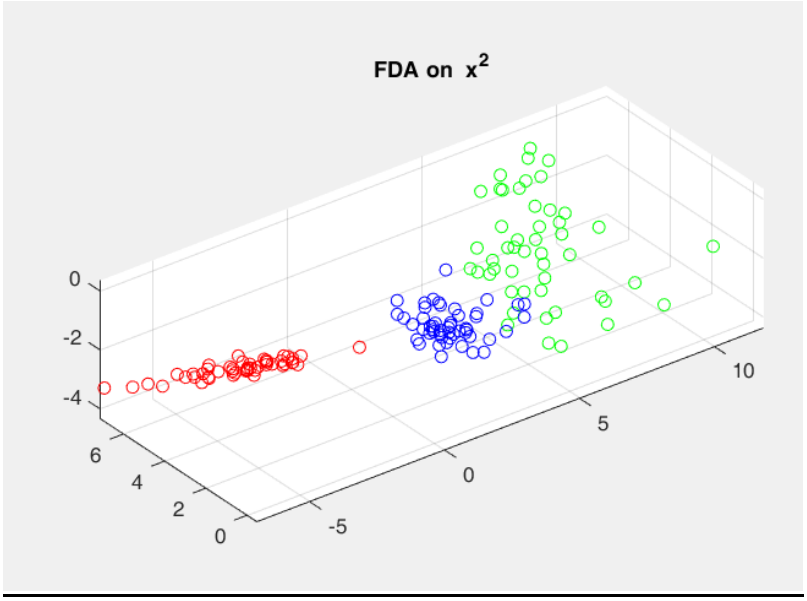

Figure 6 : FDA for x^2

log(x)

For Iris Data Set Feature Space log(x)

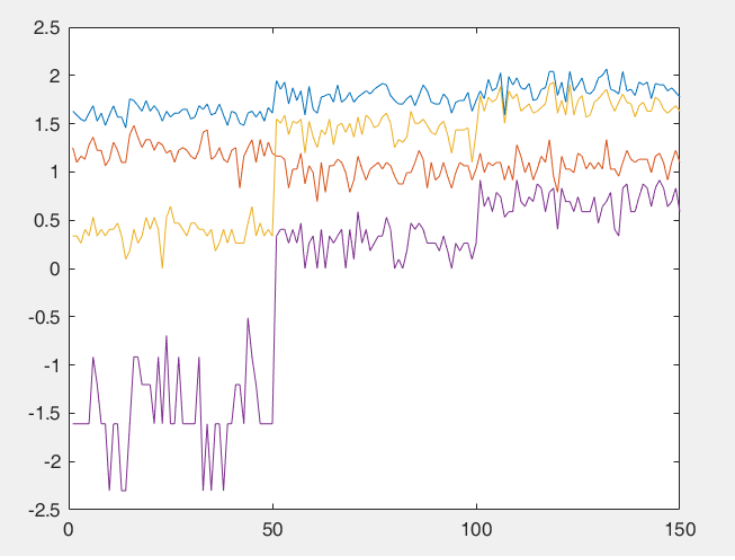

Figure 7 : Feature Space log(x)

PCA for log(x)

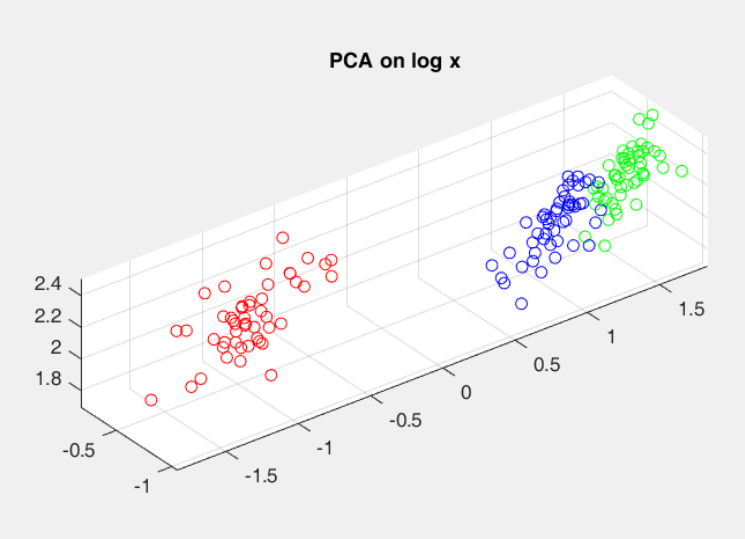

Figure 8 : PCA for log(x)

FDA for log(x)

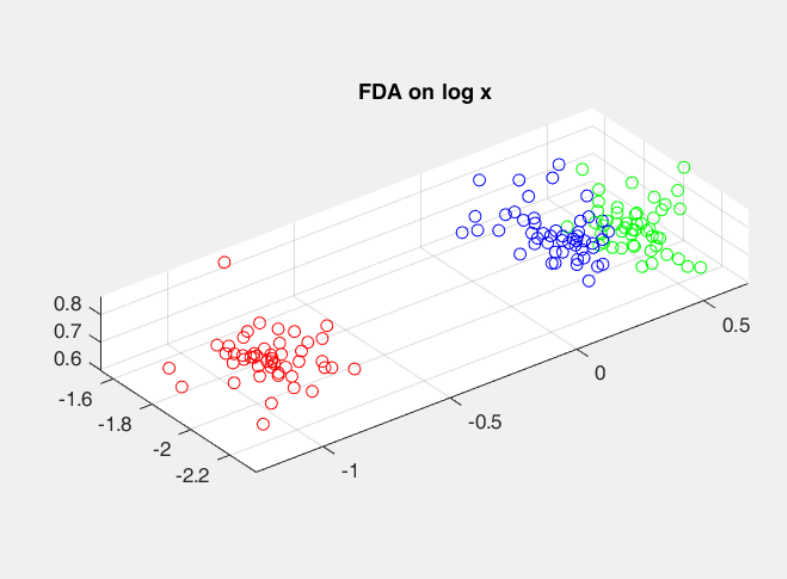

Figure 9 : FDA for log(x)

sinc(x)

For Iris Data Set Feature Space sinc(x)

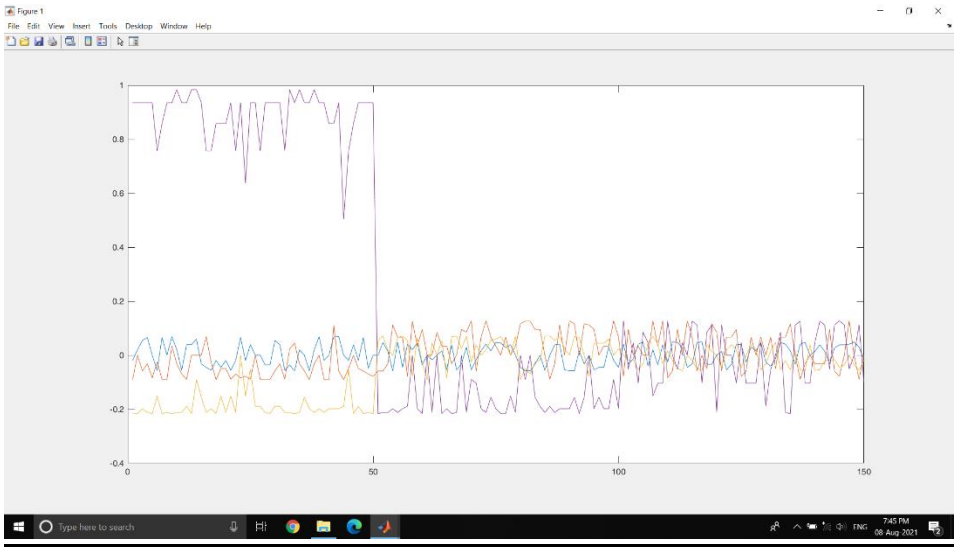

Figure 10 : Feature Space sinc(x)

PCA for sinc(x)

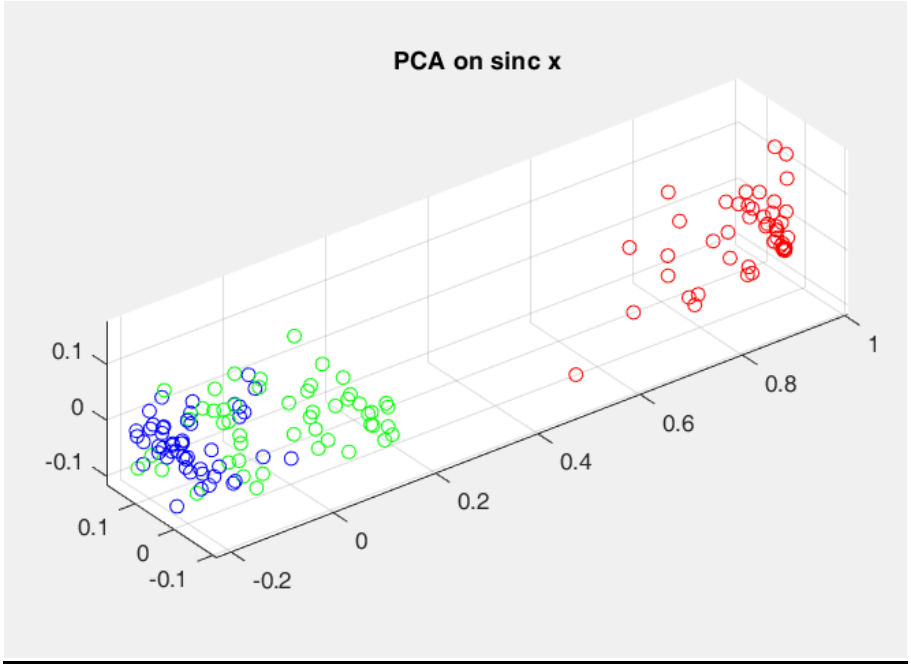

Figure 11 : PCA for sinc(x)

FDA for sinc(x)

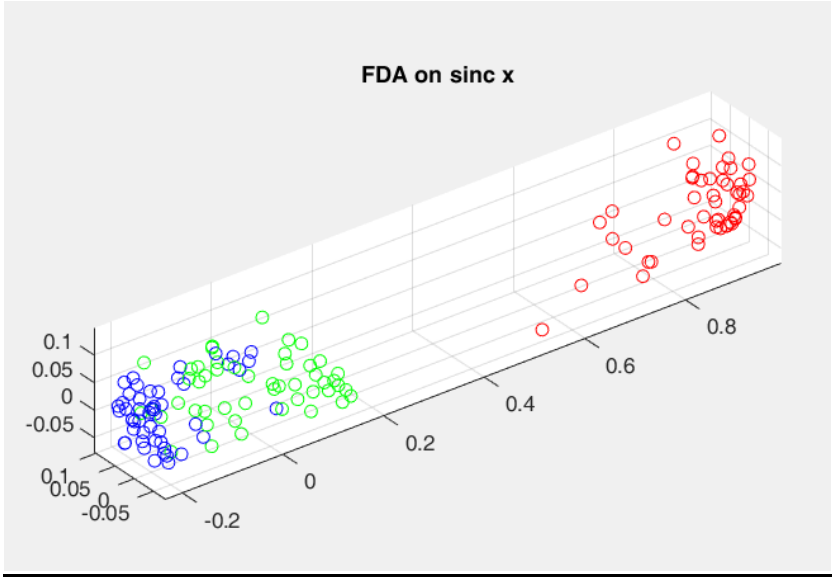

Figure 12 : FDA for sinc(x)

sin(x)

For Iris Data Set Feature Space sin(x)

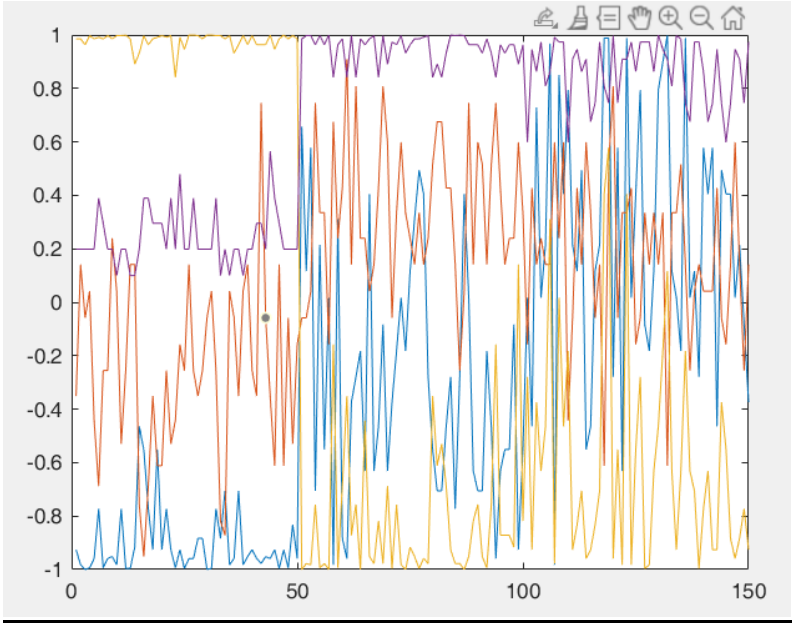

Figure 13 : Feature Space sin(x)

PCA for sin(x)

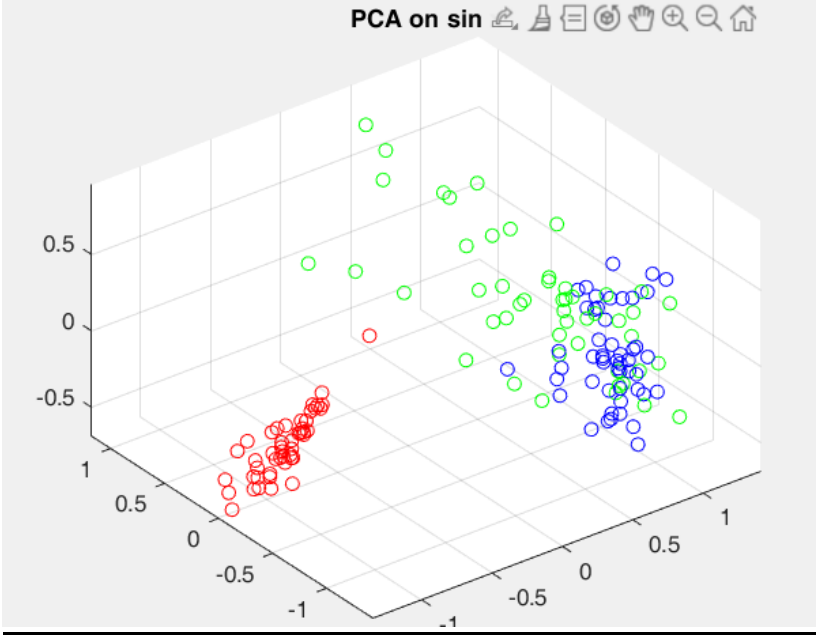

Figure 14 : PCA for sin (x)

FDA for sin(x)

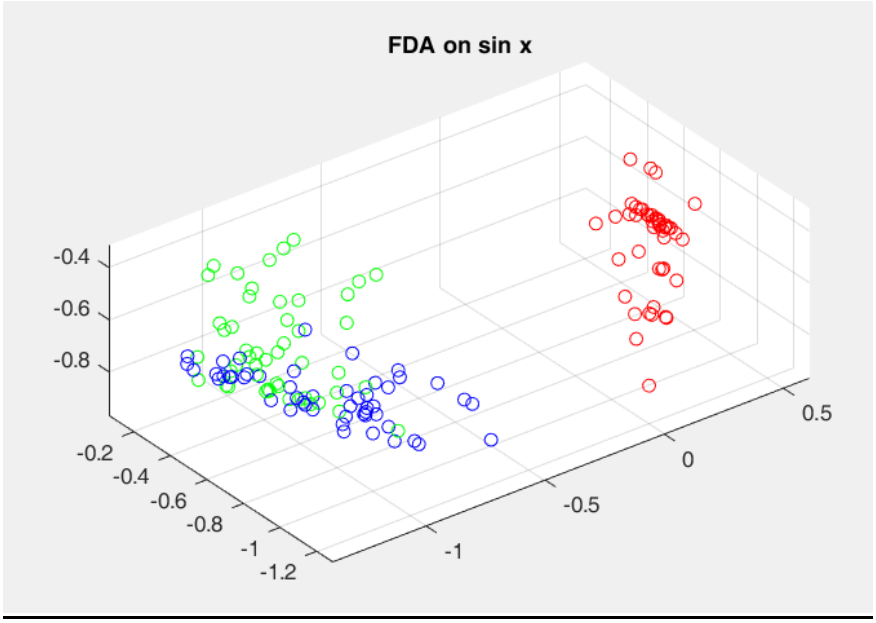

Figure 15 : FDA for sin(x)

tanh(x)

For Iris Data Set Feature Space tanh(x)

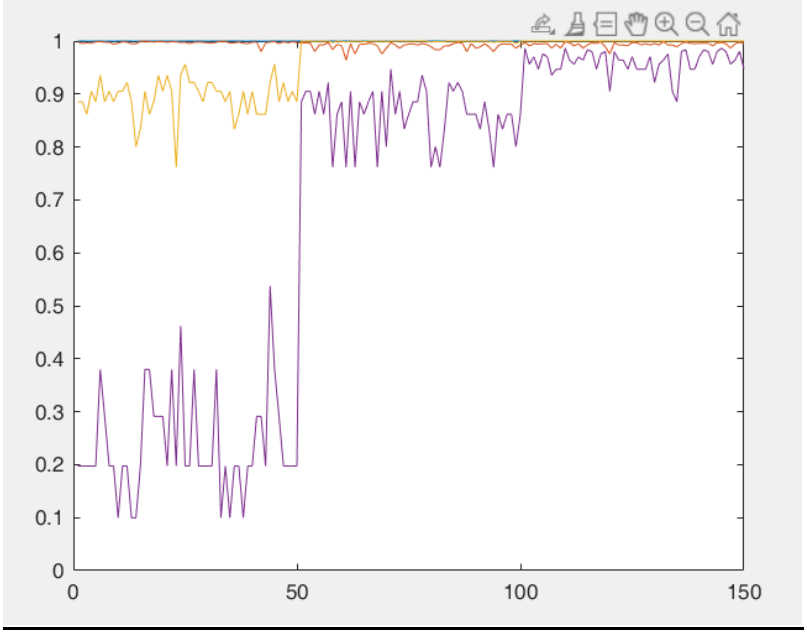

Figure 16 : Feature Space tanh(x)

PCA for tanh(x)

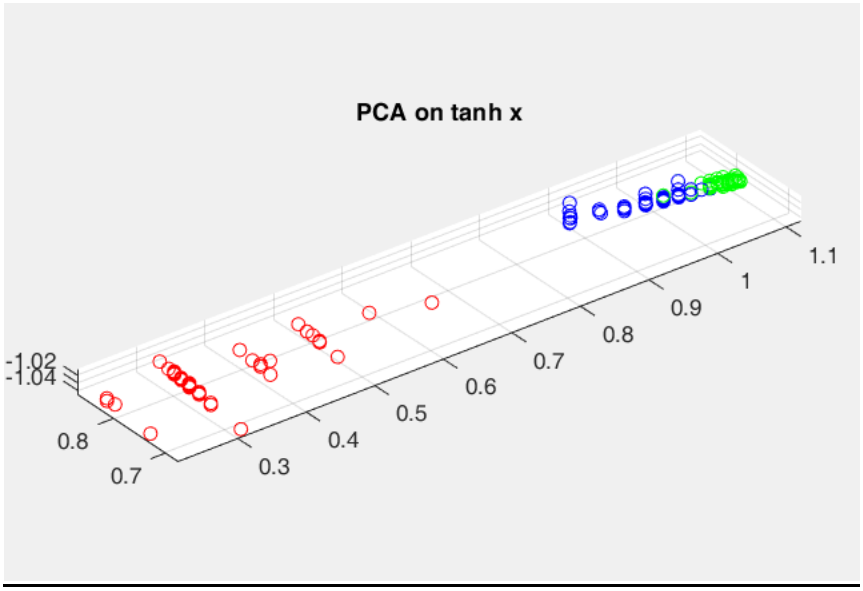

Figure 17 : PCA for tanh(x)

FDA for tanh(x)

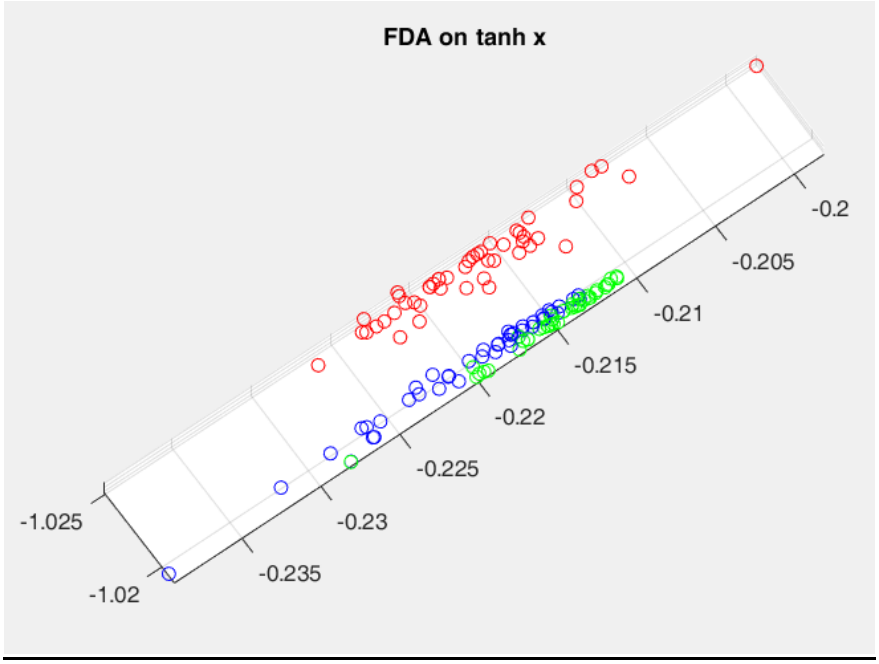

Figure 18 : FDA for tanh(x)

sigmoid(x)

For Iris Data Set Feature Space sigmoid(x)

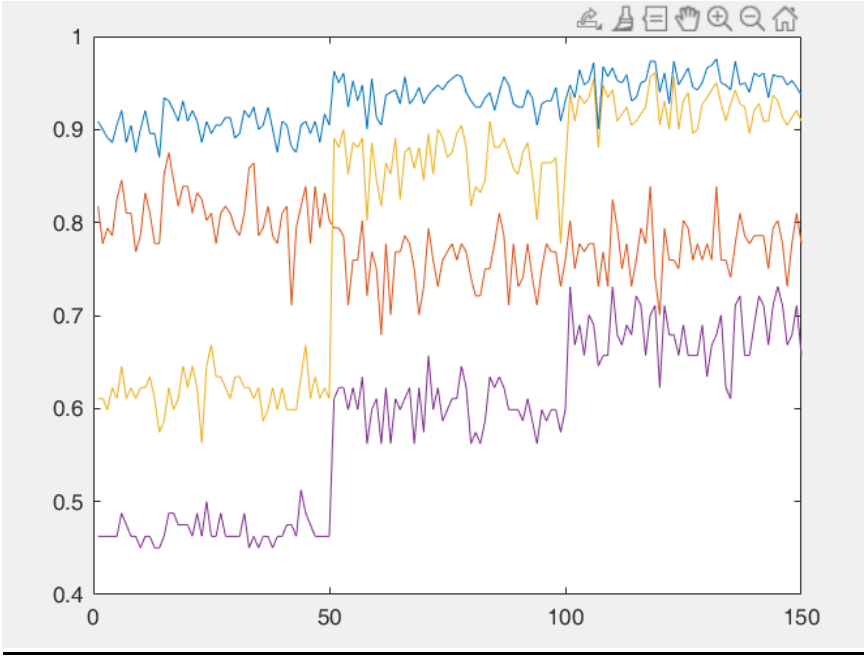

Figure 19 : Feature Space sigmoid(x)

PCA for sigmoid(x)

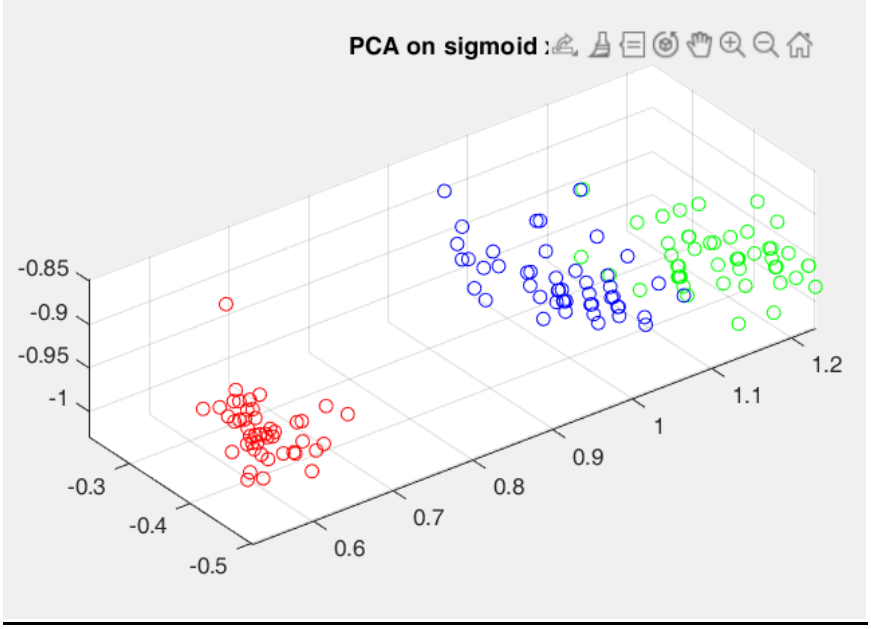

Figure 20 : PCA for sigmoid(x)

FDA for sigmoid(x)

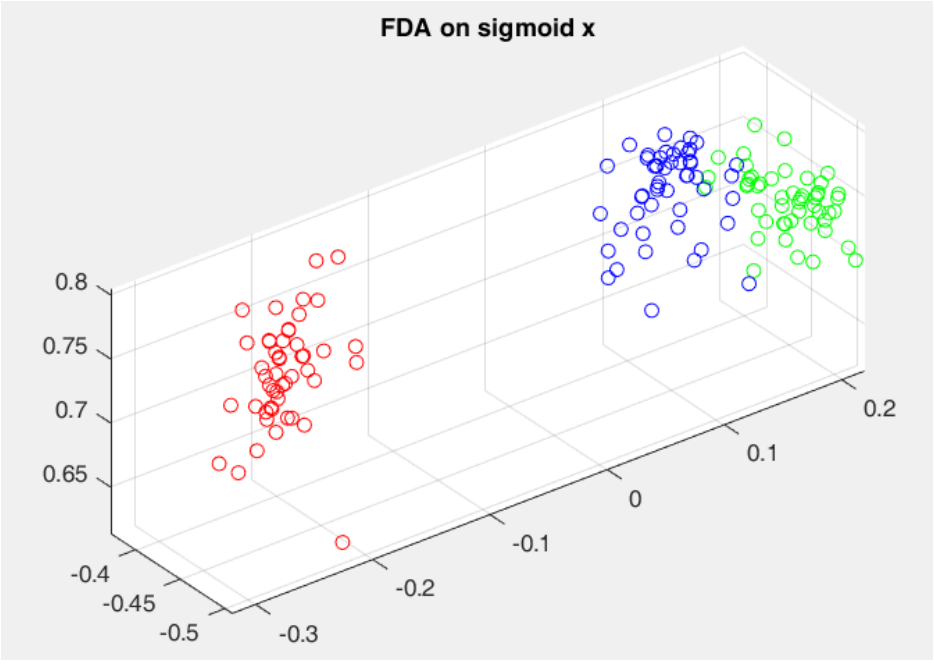

Figure 21 : FDA for sigmoid(x)

Appendix

Non linear feature transform and Principal Componant Analysis

```
i = iris_dataset;

x=sinc(i);
ix0 = 1:50;
ix1 = 51:100;
ix2 = 101:150;

S  =cov(x');


[V,D]   = eigs(S);

Y   = V'*x;

plot3(Y(1,ix0),Y(2,ix0),Y(3,ix0),'ro');hold on;
plot3(Y(1,ix1),Y(2,ix1),Y(3,ix1),'bo');hold on;
plot3(Y(1,ix2),Y(2,ix2),Y(3,ix2),'go');grid on;
title('PCA on tanh x');
axis equal;
```

Non linear feature transform and Fisher Discriminant Analysis

```
i = iris_dataset;

x=i.*i;
ix0 = 1:50;
ix1 = 51:100;
ix2 = 101:150;

m   = mean(x')';
m0  = mean(x(:,ix0)')';
m1  = mean(x(:,ix1)')';
m2  = mean(x(:,ix2)')';
Sb  = (m0-m)*(m0-m)' + (m1-m)*(m1-m)' + (m2-m)*(m2-m)';

S0  = 49*cov(x(:,ix0)');
S1  = 49*cov(x(:,ix1)');
S2  = 49*cov(x(:,ix2)');
Sw  = S0+S1+S2;

[V,D]   = eigs(inv(Sw)*Sb);

Y   = V'*x;


plot3(Y(1,ix0),Y(2,ix0),Y(3,ix0),'ro');hold on;
plot3(Y(1,ix1),Y(2,ix1),Y(3,ix1),'bo');hold on;
plot3(Y(1,ix2),Y(2,ix2),Y(3,ix2),'go');grid on;
title('FDA on  x^2');
axis equal;
```