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%This code to apply LDA (Linear Discriminant Analysis)

% This example deals with 2 classes
c1=[1 2;2 3;3 3;4 5;5 5] % the first class 5 observations
c2=[1 0;2 1;3 1;3 2;5 3;6 5] % the second class 6 observations

% Number of observations of each class
n1=size(c1,1)
n2=size(c2,1)

%Mean of each class
mu1=mean(c1)
mu2=mean(c2)

% Average of the mean of all classes
mu=(mu1+mu2)/2

% Center the data (data-mean)
d1=c1-repmat(mu1,size(c1,1),1)
d2=c2-repmat(mu2,size(c2,1),1)

% Calculate the within class variance (SW)
s1=d1'*d1
s2=d2'*d2

sw=s1+s2
invsw=inv(sw)

% in case of two classes only use v
% v=invsw*(mu1-mu2)'

% if more than 2 classes calculate between class variance (SB)
sb1=n1*(mu1-mu)'*(mu1-mu)
sb2=n2*(mu2-mu)'*(mu2-mu)
SB =sb1+sb2
v=invsw*SB

% find eigen values and eigen vectors of the (v)
[vec,eval]=eig(v)

% Sort eigen vectors according to eigen values (descending order) and
% neglect eigen vectors according to small eigen values
v=vec(greater(eval))
% or use all the eigen vectors

% project the data of the first and second class respectively
y2=c2*v
y1=c1*v

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