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SPPP

: تصاویر ابر طیفی - پیش پردازش - استخراج ویژگی - طبقه بندی - فیلتر پایین گذر - الگوریتم

Projection Pursuit

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Hughes

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Landgrebe Jimenez .

Projection Pursuit
Landgrebe Hsieh .

(PP)

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Shahshahani

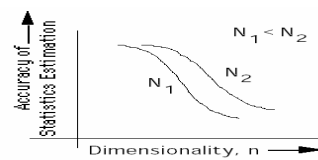
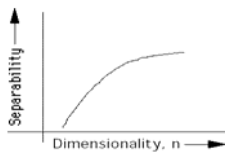
PP

Hughes

Hoffbeck

Friedman

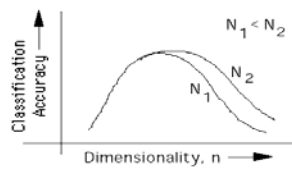
(LPF)



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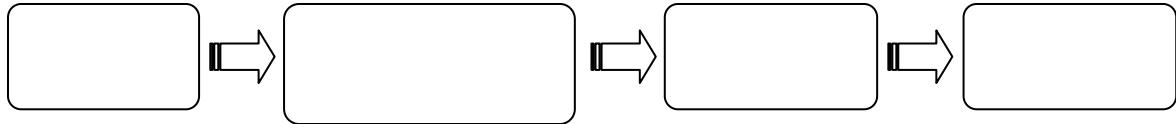
(N)



Hughes :()

[](Hughes)

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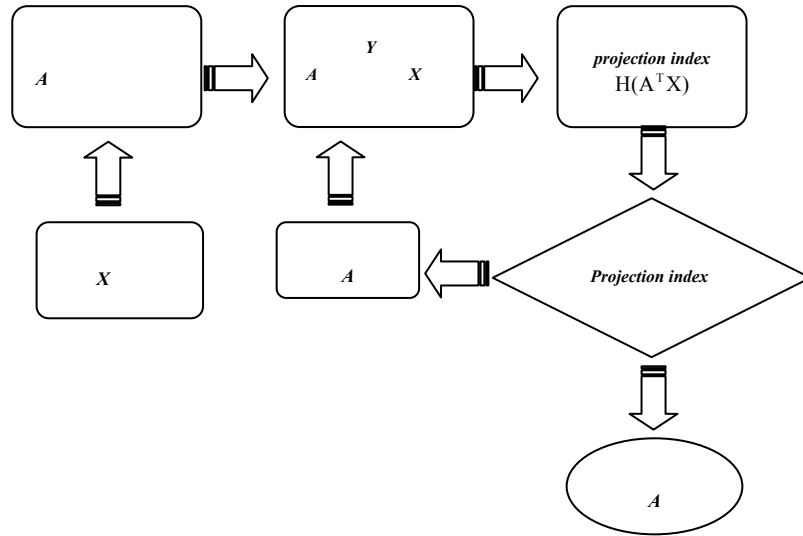


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 H(A^TX)
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 Hughes
Projection index
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 Hughes

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Projection Pursuit
 Projection Pursuit
 Friedman
 . [] Tukey
 PP () Landgrebe Jimenez
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 D_{xM} ()
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 Bhattacharyya
 Projection
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Bhattacharyya
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 j i Chernoff
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$$Y = A^T X \quad ()$$

MxN Y



. Projection Pursuit

$$B_{ij} = -\ln_{\int} \sqrt{P(x|\omega_j)P(x|\omega_i)} dx \quad ()$$

$$P(x|\omega_j) \quad P(x|\omega_i)$$

Bhattacharyya []
PP Projection

Bhattacharyya

PP (Bhattacharyya)
(PPP)

$$B_{ij} = \frac{1}{8}(M_i - M_j)^2 \left[\frac{\sum_j + \sum_i}{2} \right]^{-1} (M_i - M_j) + \frac{1}{2} \ln \left| \frac{\frac{1}{2}(\sum_j + \sum_i)}{\sqrt{\sum_j \|\sum_i\|}} \right| \quad ()$$

$$\sum_j \quad \sum_i$$

Bhattacharyya B_{ij}

$$Y = A^T X$$

Bhattacharyya

Bhattacharyya

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Bhattacharyya []

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Bhattacharyya

A a_i

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Projection
(SPPP)

$$[\quad] \quad Y \quad \text{Projection}$$

$$\text{SPPP} \quad ()$$

$$A \quad)$$

$$[\quad] \quad (\quad .A \quad :$$

$$\begin{bmatrix} a_{1,1} & 0 & & 0 & 0 \\ \vdots & \vdots & & \vdots & \vdots \\ a_{1,n_1} & 0 & & \vdots & \vdots \\ 0 & a_{2,1} & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & a_{2,n_2} & & \vdots & \vdots \\ \vdots & 0 & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & & a_{g-1,1} & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & & a_{g-1,n_{g-1}} & a_{g,1} \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & & 0 & a_{g,n_g} \end{bmatrix}$$

SPPP | Bhattacharyya

Bhattacharyya

$$j \quad i \quad X(i,j) \quad [\quad]$$

$$Y(i,j)$$

$$: [\quad] \quad (A \quad)$$

$$Y(i,j) = \frac{1}{W} \sum_{(k,l) \in W} X(i+k, j+l), \quad ()$$

$$X(i, k, j, l), \quad W$$

$$(k,l) \in W \quad g$$

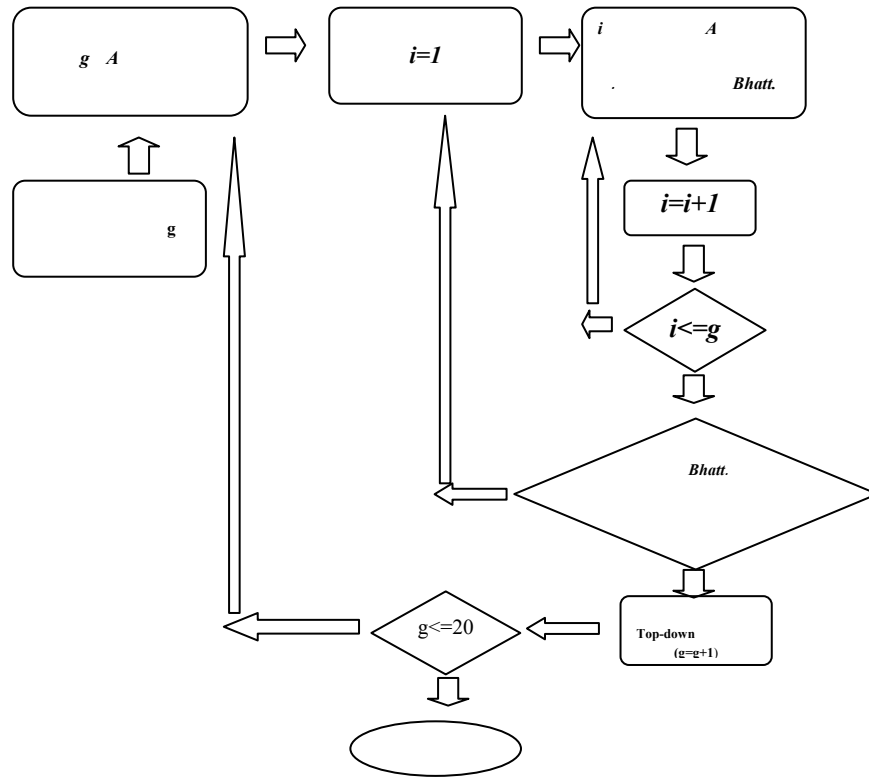
$$Y \quad N(MX, \Sigma_X)$$

(Bhattacharyya) Projection

$$\Sigma_Y = \frac{1}{W} \Sigma_X \quad ()$$

$$M_Y = M_X \quad ()$$

Bhattacharyya



.SPPP :

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Bhattacharyya

Bhattacharyya

TM

$$B_x = B_{1x} + B_{2x} \quad ()$$

$$B_{1x} = \frac{1}{8} (M_{1x} - M_{2x})^T \left[\frac{\sum_{1x} + \sum_{2x}}{2} \right]^{-1} (M_{1x} - M_{2x}) \quad ()$$

$$B_{2x} = \frac{1}{2} Ln \frac{\frac{1}{2} [\sum_{1x} + \sum_{2x}]}{\sqrt{|\sum_{1x}| |\sum_{2x}|}} \quad ()$$

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(w)

: Bhattacharyya

$$B_y = B_{1y} + B_{2y} = w B_{1x} + B_{2x} \quad ()$$

Bhattacharyya

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AVIRIS

Indian's Indian Pine

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AVIRIS

corn, corn-notill, soybean-clean, soybean-notill,
 wood, grass/pasture-mowed, corn-min,
 grass/pasture, grass/trees hay-windrowe.

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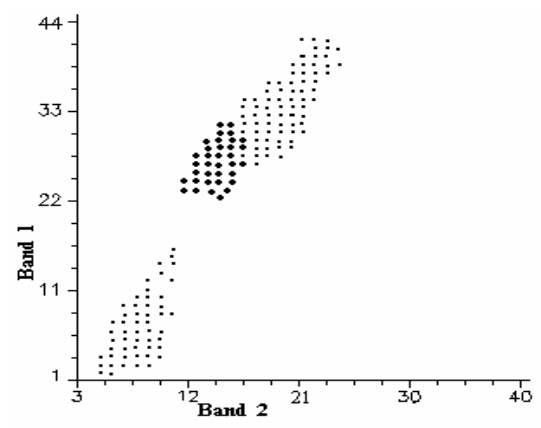
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SPPP

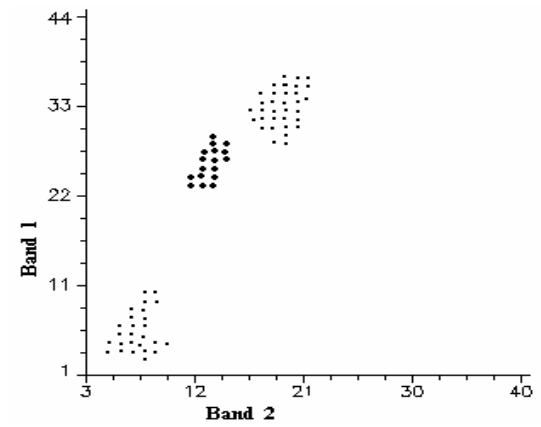
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LPF



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SPPP

Bhattacharyya

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(DAFE)

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Bhattacharyya

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Bhattacharyya

Class Name	Training Samples No. of pixels	Test Samples No. of pixels
grass/pasture-mowed Wood	373	2468
Soybeans-notill	239	1294
Soybeans-clean	197	968
Corn-notill	208	1434
Corn	197	714
Soybeans-clean	205	614
Corn-min	220	836
Grass/pasture	197	497
Grass/trees	217	747
Hay-windrowed	207	489
Total	2260	10061

SPPP

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SPPP

SPPP

SPPP

Bhattacharyya

		Bhattacharyya (MBD)	Bhattacharyya MBD(ΔBI_i)
1	195	0.0188	
5	12 12 24 49 98	0.5069	45%
10	12 12 6 6 6 6 49 49 24 25	1.0290	6%
15	12 6 6 6 6 6 6 49 24 25 12 12 6 6 13	1.3876	8%
20	12 6 6 6 6 6 3 3 24 25 12 12 6 6 13 12 12 6 6 13	1.7644	3%

DBFE DAFE

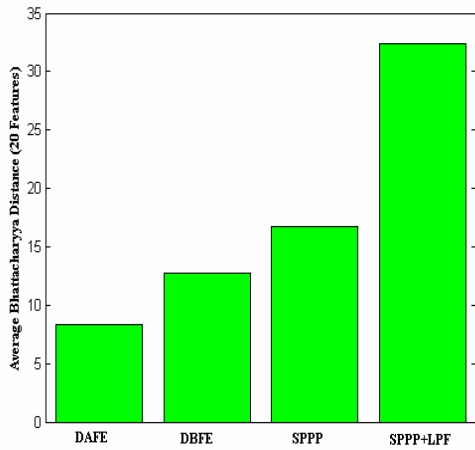
SPPP

SPPP+LPF

SPPP

SPPP

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Bhattacharyya

(SPPP+LPF, DBFE, DAFE)

SPPP

Bhattacharyya

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Hughes

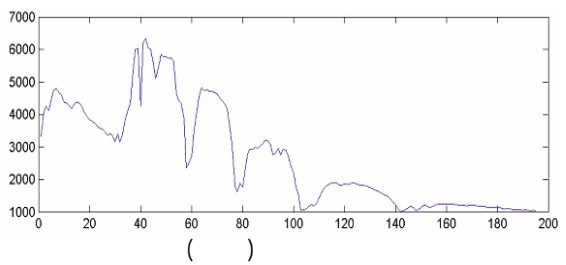
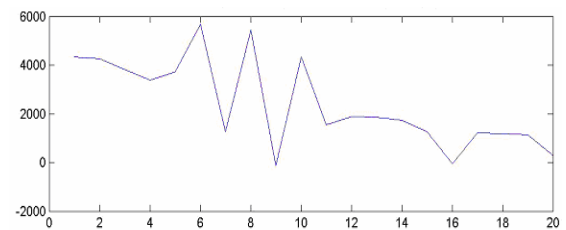
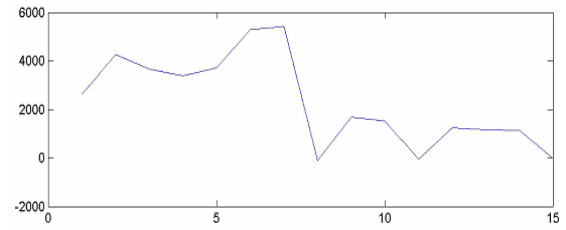
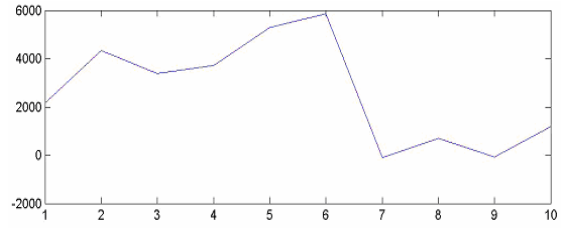
Bhattacharyya

DAFE

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Bhattacharyya

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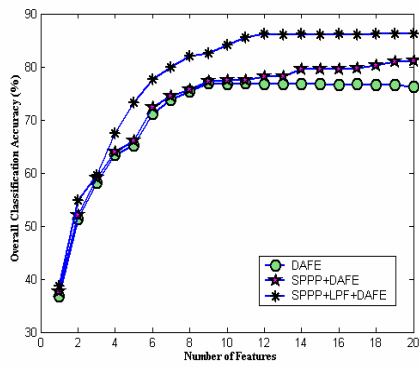
DBFE

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SPPP

DBFE DAFE

SPPP

DBFE DAFE

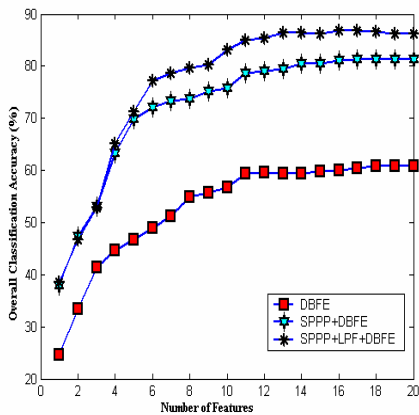
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.(SPPP+LPF+DAFE, SPPP+ DAFE, DAFE)

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SPPP

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	Binary Encoding (SAM)			
	Projection Pursuit	•		
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1 - Training Samples	2 - Hyperspectral	3 - Multispectral
4 - Classifier	5 - Supervised	6 - Un-labeled Samples
7 - Dimensionality Reduction		
8 - Classes Separability Increasing	9 - Projection Pursuit	10 - Feature Extraction
11 - Low Pass Filter-LPF	12 - Principal Component Analysis	
13 - Discriminant Analysis Feature Extraction		
14 - Decision Boundary Feature Extraction		
15 - Orthogonal	16 - Index Function	17 - Exhaustive
18 - Separable	19 - Of Information	20 - Fisher Criterion
21 - Divergence Distance	22 - Parametric Index	
23 - Parametric Projection Pursuit		
24 - Top-Down Binary Decision Tree	25 - Sequential	
26 - Sequential Parametric Projection Pursuit		
27 - Nonsingular Transformation	28 - Invariant	29 - Feature Space
30 - Spectral Mixing	31 - Ground Truth	32 - Corn
33 - Overall accuracy	34 - Spectral Angle Mapper	
