

Index

Symbols

- 1D-based BID 12
 - 2D biometric images 7
 - 2D image matrix-based LDA 274
 - 2D transform 300
 - 2D-based BID 12
 - 2D-Gaussian filter 228
 - 2D-KLT 300, 302
 - 2DPCA 293
 - 3-D face geometric shapes 7
 - 3D geometric data 7
- A**
- AFIS technology 5
 - algebraic features 80, 223
 - algorithm 56
 - AMD (see assembled matrix distance)
 - ANN 65
 - Appearance-Based BID 12
 - artefacts 1
 - assembled matrix distance (AMD) 287, 314
 - assembled matrix distance metric 295
 - ATM (see automated teller machine)
 - automated teller machine (ATM) 5
 - axes 240

B

- banking 5
 - Bayes classifier 56
 - BDPCA (see bi-directional PCA)
 - BDPCA + LDA 287, 304
 - BDPCA-AMD 324
 - behavioral characteristics 1
 - between-class scatter matrix 51, 332
 - bi-directional PCA (BDPCA) 287, 303
 - BID (see biometric image discrimination)
 - biometric applications 339
 - biometric image discrimination (BID) 1, 7, 222
 - biometric technologies 1
 - biometrics 2
 - business intelligence 5
- C**
- canonical variate. 52
 - CCD camera 197
 - CCD-based palmprint capture device 81
 - centralized data fusion 330
 - CKFD (see complete KFD algorithm)
 - classical PCA 290
 - classifier 104
 - CLDA (see combined LDA algorithm)

- coefficients 46
- color image representation 339
- combined LDA algorithm (CLDA) 168
- complete KFD algorithm (CKFD) 237
- complex discriminator 329
- complex fisherfaces 343
- complex linear projection analysis 332
- complex PCA 11, 333
- complex principle component analysis (CPCA) 333
- compression mapping principle 160
- compression speed 265
- computation requirement 265
- computer systems 5
- computer vision 21
- correlation-based 2
- covariance matrix 23, 332
- CPCA (see complex principle component analysis)

- D**
- data fusion 11, 329
- DCT (see discrete cosine transform)
- decision fusion 330
- DEM (see dual eigenspaces method)
- determinant of a matrix 23
- digital camera 3
- direct LDA (DLDA) 170, 196, 220, 290
- discrete cosine transform (DCT) 205
- discriminant function 43
- discriminant vectors 317
- discriminant waveletface method 211
- discrimination technologies 7
- distance metric 299
- distributed data fusion 330
- DLDA (see direct LDA)
- DTW (see dynamic time warping)
- dual eigenfaces 11
- dual eigenspaces method (DEM) 222
- dynamic thresholding 66
- dynamic time warping (DTW) 125

- E**
- ear biometrics 109
- ear-based recognition 112
- EFM 193

- eigenanalysis 100
- eigenears 110
- eigenface 11, 66, 319
- eigenpalm 90
- eigenvalues 22
- eigenvectors 22
- eigenvoice 113
- elastic bunch graph matching 22
- EM algorithm 65
- Euclidean distance 87
- Euclidian space 333
- expectations 23
- extrapolation 74
- eye wear 75

- F**
- face covariance matrix 22
- face recognition 66, 112
- face space 22, 223
- face-based recognition 112
- face-scan technology 3
- facial detail 291
- facial expression 67, 291
- facial feature extraction 304
- facial features 1
- false accept rate (FAR) 85
- false reject rate (FRR) 85
- FAR (see false accept rate)
- feasible solution space 240
- feature combination 330
- feature extraction-based 330
- feature fusion 329
- feature matrix 260
- feature parallel fusion 348
- feature selection-based 330
- feature space 22, 57
- feature vector 121
- FERET 110, 289, 323
- finger-scan 2
- fingerprint matching 1
- finite-dimensional Hilbert space 237
- Fisher criterion 81, 239
- Fisher LDA 156
- Fisher linear discriminant 50
- Fisher linear discriminant analysis 7
- Fisher vector 141

- Fisherfaces 68, 318
 Fisherpalm 80
 FLD 66
 Foley-Sammon discriminant vectors 141
 Fourier transform 9
 fraud 5
 Frobenius distance 297, 314
 Frobenius norm 261, 263, 284, 297
 FRR (see false reject rate)
 fusion 250
 fuzzy methods 49
- G**
- gait 1, 95
 gaits 1
 gallery 265
 Gaussian 56
 Gaussian mixture model (GMM) 113
 Gaussian pyramid 85
 Gaussian-Hermite moment 121
 genuine matching 85
 gestures 1
 glasses recognition 78
 GMM (see Gaussian mixture model)
 Gram matrix 34
 Gram-Schmidt orthonormalization procedure 56
 grayscale face image 339
- H**
- half total error rate 85
 hand geometry 1
 Hermite matrices 333
 hidden Markov model (HMM) 125
 Hilbert space 237
 Hilbert-Schmidt theorem 241
 histogram equalization 66
 HMM (see hidden Markov model)
 holistic PCA 300
 HSI (see hue, saturation and intensity)
 HSV (see hue, saturation and intensity value)
 hue, saturation and intensity (HSI) 340
 hue, saturation and intensity value (HSV) 340
 hybrid neural methods 11
- hyperplane 42
- I**
- ICA (see independent component analysis)
 identimat 2
 identity scheme 5
 identity verification 4
 ILDA (see improved LDA)
 illumination 340
 image between-class 259, 276
 image covariance matrix 259
 image pattern 264
 image preprocessing 119
 image processing toolbox 85
 image total scatter matrices 259
 image translation 2
 image within-class 259, 276
 IMPCA method 259
 IMPCA-based image reconstruction 260
 improved LDA (ILDA) 187, 195
 independent component analysis (ICA) 10, 289
 infinite-dimensional Hilbert space 239
 information fusion 330
 input space 38
 interpolation 74
 iris 2, 4, 118
 iris recognition 118
 iris scan 4
 irregular discriminant information 236
 isomorphic mapping 162
- K**
- K-L (see Karhunen-Loeve)
 Karhunen-Loeve (K-L) 11, 38, 82
 kernel discriminant analysis 57
 kernel Fisher discriminant (KFD) 7, 235
 kernel function 58
 kernel matrix 34
 kernel PCA 34
 kernel principal component analysis (KPCA) 7
 KFD (see kernel Fisher discriminant)
 KPCA (see kernel principal component analysis)

L

Lambertian surface 68
latent semantic indexing (LSI) 289
Lausanne protocol 4
law enforcement 5
LDA (see linear discriminant analysis) 7, 41, 289
least median of square 98
lighting 72, 290
linear BID 12
linear discriminant analysis (LDA) 7, 11, 41, 158, 222, 289
linear discrimination technique 189
linear machine 44
linear subspace algorithm 69
logical access control 5
low-dimensional image 288
LSI (see latent semantic indexing)

M

M2VTS database 4
MATLAB 196
matrix norm 297
matrix-based BID 12
maximum likelihood eigenspace (MLE) 114
mean values 220
mean vector 23, 246
mean-square error (MSE) 291
memory requirement 265
Mercer kernel 36, 58
minimal mean-square error 264
minimum-distance classifier 224
minor component 126
minutiae-based techniques 2
MLE (see maximum likelihood eigenspace)
modular PCA 294
MSE (see mean-square error)
multi-classifier 330
multi-expert combination strategies 330
multicategory classifiers 44

N

N sample images 67
nearest feature space (NFS) 288

nearest-neighbor (NN) classifier 288
nearest-neighbor (NN) 73, 104, 265
NED (see normalized Euclidean distance)
NFS (see nearest feature space)
NN (see nearest-neighbor)
non-linear BID 12
mon-linear PCA 34
normalized Euclidean distance (NED) 103
null space 290

O

object tracking 329
OCR (see optical character recognition)
ODV (see optimal discriminant vector)
OPS (see original palmprint space)
optical character recognition (OCR) 9
optimal discriminant vector (ODV) 139, 164
original palmprint space (OPS) 81
ORL 171, 200, 215, 289
orthogonal IMLDA (O-IMLDA) 278
orthogonal polynomial functions 121
orthogonality constraints 142
over-fitting problem 288, 291

P

palm-scan technology 3
palmprint 1, 80, 196, 200
palmprint database 200
palmprint identification 80
palmprint recognition 196
parallel feature fusion 330
partial least squares (PLS) 290
pattern recognition 7, 21
PCA (see principal component analysis)
personal computer 3
personal identification number (PIN) 3
physical access 5
PIN (see personal identification number)
PLS (see partial least squares)
polynomial kernel 35
positive semidefinite matrices 24
post-processing 227
preprocessing 329
principal component 126, 260
principal component analysis (PCA) 7, 21, 26, 289

principal curve 38

probe 265

projection axes 240, 264

Q

quadratic discriminant function 46

R

receiver operating characteristic (ROC) 86

recognition 329

recognition rate 220

reconstructed sub-image 260

reconstruction mean-square error 264

regularization 59

retina 2

ROC (see receiver operating characteristic)

S

saturation 340

scalar 260, 280

scale 291

scatter 50

segmentation 126

self-shadowing 68

separable transform 300

serial feature fusion 330

serial fisherfaces 343

signature 1, 126

signature verification 124

signature-scan technology 4

silhouette representation 98

skin pores 1

small sample size (SSS) 8, 236, 290

spatial-temporal correlation 101

speaker identification 113

spectrum magnitude criterion 347

speech recognition systems 2

squared-error criterion function 24

SSS (see small sample size)

support vector 34, 61

SVD theorem 261

SVM 57

symmetry property 329

T

TEM 223

terrorism 6

testing 265

text-dependent 2

text-independent 3

threshold setting 218

tilt 291

total mean vector 54

total scatter matrix 54, 332

traditional linear projection methods 330

training 265

transformation matrix 264

two-directional PCA/LDA approach 287

two-layer classifier 224

U

ULDA (see uncorrelated LDA)

UMIST 289

uncorrelated discriminant vectors 142

uncorrelated IMLDA (U-IMLDA) 278

uncorrelated LDA (ULDA) 334

uncorrelated optimal discrimination vectors (UODV) 139, 142, 192

unitary 300

unitary space 332, 333

unitary transform 300

univariate Gaussian 53

UODV (see uncorrelated optimal discrimination vectors)

V

variance 41

vector 260

vector-based BID 12

vector norm 296

veins 1

voice-scan 2

voiceprints 1

W

wavelet transform 9, 303

weight vector 48

within-class scatter 50, 332

Y

- Yale face database 213
- Yang distance 297, 314
- YOHO speaker verification database 116