Index

angle	expected value, 58
between vectors, 37	kurtosis, 73, 157
artificial neural network, 145	exploratory projection pursuit, see projection pursuit
blind source separation, 5	face recognition, 10
	factor analysis, 9, 129, 133
central limit theorem, 56	fMRI, see functional magnetic resonance imaging
informal definition, 55	functional magnetic resonance imaging
central moment, 58, 131	independent component analysis, 141
color magnetic resonance images, 143	
column	gaussian distribution, 55
number, convention, 42	definition, 56
column vector, 23	gaussian pdf
complexity, 14	signal mixture, 71
and predictability, 112	gradient ascent, 119
Kolmogorov, 112	Hessian matrix, 126
complexity conjecture, 111	multivariate, 122
complexity pursuit, 112	second order methods, 126
gradient ascent, 173	univariate, 120
software, 184	Gram-Schmidt orthogonalisation, 75, 130, 157, 163
correlation, 62	
and independence, 61	Hessian matrix, 126
and statistical independence, 63	histogram, 51
covariance, 62, 131	probability density, 53
covariance matrix, 131	probability density function, 53
cumulative density function, 57	
	ICA, see independent component analysi
determinant, 95	independence, see statistical independence
dot product, 37, 152	independent component analysis
dual set, 105	and blind source separation, 5
,	applications, 139
EEG, see electroencephalogram	cdf-matching, 86, 93
eigenimage, 179	color magnetic resonance images, 143
eigensequence, 179	electroencephalogram, 140
eigenvalue, 130, 180	functional magnetic resonance imaging, 141
eigenvector, 130, 180	gradient ascent, 165
definition, 131	infomax and MLE, 103
electroencephalogram	MatLab code, 169
independent component analysis, 140	maximum likelihood estimation, 99
entropy, 83, 86	resources, 183
as surprise, 87	software, 183
definition, 89	spatial, 108
differential, 89	spatiotemporal, 109
evaluating, 89	speech, 139
joint, 83, 93	temporal, 106
maximum, 89	infomax, 84
multivariate, 93	infomax ICA, 83
relative, 93	inner product, 37, 152
ERP, see electroencephalogram	geometry, 38
expectation, 58	orthogonal projection, 39
. /	O 1 J ,

192 Index

invertible function, 84	orthogonal projection, 24 inner product, 39
Jacobian, 101	outer product, 167
multivariate definition, 95	outer product, 107
	montial danisystisms 124
univariate definition, 92	partial derivative, 124
Jacobian matrix, 95	perception, 8
joint pdfs, 61	stereo disparity, 145
joint probability, 81	platykurtotic, 72
	predictability
Kolmogorov complexity, 112, 113	and complexity, 112
Kullback-Leibler divergence, 72, 93	definition, 113
kurtosis	principal component analysis, 9, 17, 129, 157, 179
definition, 60	of speech, 131
expected value, 73, 157	reducing sensor noise, 76
non-normality, 73	probability
	joint, 81
leptokurtotic, 72	of independent events, 79
likelihood function, 102	probability density, 53
linear transformation, 31, 155	probability density function, 53
log likelihood function, 102	gaussian, 55
.,	joint, 61, 81
marginal pdfs, 61	marginal, 61, 81
matrix, 153	speech, 80
covariance, 131	projection pursuit, 71
linear transformation, 155	and ICA, 75
mixing, 42	MatLab code, 158
•	software, 184
size, convention, 42	software, 164
unmixing, 41	#OVV
maximum entropy, 88, 89	row
maximum entropy pdf, 57	number, convention, 42
maximum likelihood estimate, 102, 103	row vector, 23
maximum likelihood estimation	1
and ICA, 99	scalar product, 37, 152
mesokurtotic, 72	scalar variable, 21
mixing coefficients, 21, 25, 26	second order methods
mixing signals, 13	BFGS, 126
MLE, see maximum likelihood estimation	conjugate gradients, 126
moment	signal mixture
central, 58	gaussian, 71
numerical evaluation, 60	signal mixtures, 5, 13
moments of pdf, 58	number, 17
mutual information, 84, 99	singular value, 180
	singular value decomposition, 157, 179
natural gradient, 127	skewness
normal distribution, 55	definition, 59
normality, 13	source signals, 5, 13
number	number, 17, 110, 182
source signals, 17, 110, 182	spatial ICA, 108
G,,,	spatiotemporal ICA, 109

Index 193

```
speech
  independent component analysis, 139
sphering, 157
standard deviation, 59
statistical independence, 13
  and correlation, 63
  and joint pdfs, 61
  definition, 61
  ICA, 79
  of joint and marginal pdfs, 79
stereo disparity, 145
sub-gaussian, 72
super-gaussian, 72
temporal ICA, 106
transpose
  matrix, 156
  vector, 153
transpose operator, 23
unmixing
  general strategy, 14
unmixing coefficients, 21, 27
unmixing matrix
  non-square, 17, 110, 182
variance, 59
vector, 23, 151
  angle, 152
  basis, 179
  column, 23, 36
  dual, 105
  inner product, 37
  length, 34
  matrix multiplication, 154
  multiplication, 152
  orientation, 34
  outer product, 167
  resultant, 124, 151
  row, 23, 36
  subtraction, 152
  sum, 124, 151
  transpose, 36, 153
vector variable, 23
weight vector, 34
whitening, 157
```