## Index

## angle

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

Jacobian, 101
multivariate definition, 95
univariate definition, 92
Jacobian matrix, 95
joint pdfs, 61
joint probability, 81

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

