

## Index

- affine transformation, 16, 379
- AIC, 246
- AICc, 247, 327
- AICm, 327
- AICr, 328
- Akaike's Information Criterion, 246, 326
- aliasing, 132
- all-possible-subsets, 250
- analysis distribution, 472, 473
- asymptotic relative efficiency (A.R.E.), 80
- autocorrelation function, 98, 104
- autocovariance function, 97
- autoregressive models, 109
  
- basis set, 165
- Bayes' Theorem, 472
- Bayesian Information Criterion, 247
- bias–variance trade off, 240
- BIC, 247
- bivariate normal distribution, 22
- Bonferroni procedure, 262
- Bonferroni's inequality, 262
- bootstrap, 64
  
- canonical correlation, 345
- Central Limit Theorem, 22, 179
- chain rule, 326
- change point, 265
- chi-squared distribution, 25
- climate, definition of, 101
- coefficient of determination, 195
- collinear, 165
- column vector, 159
- conditional distribution, 16
- confidence interval
  - bootstrap, 64
  - correlation coefficient, 59
  - difference in means, 53
  - interpretation, 55
  - variance ratio, 63
  
- conformable, 166
- confounding variable, 222
- coplanar, 165
- Corrected AIC, 247
- correlation coefficient, 15
- correlation test, 47
- covariance, 14
- covariance inflation, 502
- covariance localization, 503
- cross validation, 247, 248
  
- degrees of freedom, 27
- delta method, 462
- detection and attribution, 226
- determinant, 178
- diagonal matrix, 167
- Discrete Fourier Transform, 129
- discriminant ratio, 374
  
- Eckart–Young–Mirsky Theorem, 285
- effective degeneracy, 287
- eigenvalue, 176
  - degenerate, 176
- eigenvector, 176
- Empirical Orthogonal Function (EOF), 276, 284
- ensemble, 101
- Ensemble Adjustment Kalman Filter (EAKF), 497
- ensemble collapse, 499
- Ensemble Square Root Filter (EnSRF), 495
- Ensemble Transform Kalman Filter (ETKF), 494
- ENSO, definition of, 337
- entropy, 325
- Error-in-Variables model, 228, 282
- estimation
  - annual cycle, 202
  - trend, 201
- exchangeable, 71
- expectation, 11
- Extremal Types Theorem, 458

524

F-test, 44  
 false discovery rate, 310  
 familywise error rate, 259  
 field significance, 298  
 Fisher's Z transformation, 61  
 Fixed-X, 327  
 forced variability, 226  
 forward selection, 251  
 Fréchet distribution, 456  
 Frobenius norm, 275

general linear hypothesis, 233  
 generalized eigenvalue problem, 511  
 Generalized Extreme Value distribution, 457  
 generalized least squares, 225  
 Gumbel distribution, 456

Hadamard product, 504  
 hat matrix, 198, 212  
 histogram, 2  
 Hotelling's statistic, 398  
 Hotelling's T-squared statistic, 181  
 Hotelling's T-squared Test, 179  
 hypothesis test  
   correlation test, 47  
   F-test, 44  
   multivariate, 156  
   non-parametric, 69  
   *t*-test, 33, 43

independence, 16  
 information criterion, 325  
 inner product, 160  
 innovation vector, 499  
 intercept, 205  
 internal variability, 226

joint probability density, 13

Kalman Filter Update Equations, 477, 490  
 Kronecker delta, 168  
 Kurskal-Wallis test, 81

likelihood, 472  
 LIM; Linear Inverse Model, 314, 320  
 line fit, 205  
 linear independence, 164  
 Livezey–Chen Field Significance Test, 303

Mallows' Cp, 246  
 marginal distribution, 14  
 maximum likelihood method, 459  
 mean, 4  
 median, 5  
 Method of Least Squares, 188  
 method of moments, 459  
 Monte Carlo, 23, 303, 375

*Index*

multiple correlation, 195  
 multiple regression, 187  
 multivariate normal distribution, 178  
 multivariate regression, 314  
 multivariate *t*-test, 179  
 Mutual Information Criterion (MIC), 329  
 Mutual Information Criterion, MIC, 331

Niño3.4 index  
   autocorrelation function, 98, 119  
   teleconnection with US temperature, 299, 341  
   time series, 2  
 norm, 159  
 normal equations, 190  
 North Atlantic Oscillation, 464  
 Nyquist frequency, 132

orthogonal  
   transformation, 170  
 orthogonal regression, 282  
 orthonormal, 160  
 outer product, 168  
 over-determined, 188  
 overfitting, 243

Parseval's identity, 133  
 partial correlation, 221  
 partial regression, 216  
 PC time series, 276, 284  
 percentile, 6  
 periodogram, 135  
 permutation test, 304  
 population, 8  
 positive definite, 174  
 positive semi-definite, 174  
 posterior distribution, 472, 473  
 predictable component analysis (PrCA), 418  
 predictand, 187  
 predictive information, 412  
 predictor, 187  
 principal component, 275  
 prior distribution, 472  
 projection matrix, 212, 241  
 proper score, 325

quadratic form, 174

R-squared, 195  
 Random-X, 327  
 rank, 72  
   of a matrix, 165  
   ties, 73  
 Rayleigh quotient, 373  
 regression maps, 332  
 return level, 449  
 return period, 449  
 robust, 73

- scaling factors, 227  
scatterplot, 3  
Schur product, 504  
Schur product theorem, 504  
Schwartz Information Criterion, 247  
secular component, 200  
sequential processing, 477  
serially correlated, 96  
SIC, 247  
signal-to-noise EOFs, 435  
Singular Value Decomposition, 283  
slope, 205  
spatial dependence, 264  
Spearman's rank correlation coefficient, 85  
stability postulate, 455  
standard deviation, 7  
standard error, 19  
standardized normal distribution, 21  
standardized variable, 13  
stationary, 102  
stepwise regression, 253  
stochastic dominance, 79  
stochastic process, 94  
SVD, 283  
*t*-test, 33, 43  
teleconnection, 337  
total least squares, 228  
trace, 177  
training sample, 244, 247  
transpose, 167  
under-determined, 188  
unforced variability, 226  
union-intersection test, 380  
univariate multiple regression, 187, 317  
univariate regression, 187, 317  
validation sample, 244, 247  
variance, 7, 12  
variational data assimilation, 485  
Weibull distribution, 456  
white noise, 104