Index

2-universal, 184
4-way independence, 191

Affinity matrix, 229
Algorithm
    greedy k-clustering, 215
    k-means, 211
    singular value decomposition, 51
Almost surely, 253
Anchor Term, 317
Aperiodic, 77
Arithmetic mean, 417

Bad pair, 257
Bayes rule, 428
Bayesian, 338
Bayesian network, 338
Belief Network, 338
belief propagation, 337
Bernoulli trials, 425
Best fit, 40
Bigoh, 406
Binomial distribution, 248
    approximated by Poisson, 426
boosting, 158
Branching process, 272

Cartesian coordinates, 17
Cauchy-Schwartz inequality, 414, 416
Central Limit Theorem, 423
Characteristic equation, 437
Characteristic function, 455
Chebyshev's inequality, 13
Chernoff bounds, 430
Clustering, 208
    k-center criterion, 215
    k-means, 211
    Sparse Cuts, 229
CNF
    CNF-sat, 279
Cohesion, 232
Combining expert advice, 162
Commute time, 104
Conditional probability, 421
Conductance, 97
Coordinates
    Cartesian, 17
    polar, 17
Coupon collector problem, 107
Cumulative distribution function, 420
Current
    probabilistic interpretation, 100
Cycles, 266
    emergence, 265
    number of, 265

Data streams
    counting frequent elements, 187
    frequency moments, 182
    frequent element, 188
    majority element, 187
    number of distinct elements, 183
    number of occurrences of an element, 186
    second moment, 189
Degree distribution, 248
    power law, 248
Depth first search, 261
Diagonalizable, 438
Diameter of a graph, 256, 268
Diameter two, 266
dilation, 385
Disappearance of isolated vertices, 266
Discovery time, 102
Distance
    total variation, 82
Distribution
    vertex degree, 246
Document ranking, 62

Effective resistance, 105
Eigenvalue, 437

Eigenvector, 54, 437
Electrical network, 97
Erdös Rényi, 245
Error correcting codes, 190
Escape probability, 101
Euler's constant, 108
Event, 420
Expected degree
    vertex, 245
Expected value, 421
Exponential generating function, 454
Extinct families
    size, 276
Extinction probability, 272, 274

Finite fields, 457
First moment method, 254
Fourier transform, 370, 455
Frequency domain, 371

G(n,p), 245
Gamma function, 18
Gamma function , 415
Gaussian, 23, 424, 456
    fitting to data, 29
    tail, 419
Gaussians
    sparating, 27
General tail bounds, 433
Generating function, 272
    component size, 288
    for sum of two variables, 272
Generating functions, 451
Generating points in the unit ball, 22
Geometric mean, 417
Giant component, 246, 253, 259, 261, 266
Gibbs sampling, 84
Graph
    connecntivity, 265
    resistance, 108
Graphical model, 337
Greedy
    k-clustering, 215
Growth models, 286
    with preferential attachment, 293
    without preferential attachment, 287

Hölder's inequality, 414, 416
Haar wavelet, 386
Harmonic function, 98
Hash function
    universal, 184
Heavy tail, 248
Hidden Markov model, 332
Hitting time, 102, 114

Immortality probability, 274
Incoherent, 368, 371
Increasing property, 253, 270
    unsatisfiability, 279
Independence
    limited way, 190
Independent, 421
Indicator random variable, 257
    of triangle, 251
Indicator variable, 422
Ising model, 352
Isolated vertices, 259, 266
    number of, 259

Jensen's inequality, 418
Johnson-Lindenstrauss lemma, 25, 26

k-clustering, 215
k-means clustering algorithm, 211
Kernel methods, 228
Kirchhoff's law, 99
Kleinberg, 295

Lagrange, 456
Laplacian, 70
Law of large numbers, 12, 14
Learning, 129
Linearity of expectation, 251, 421
Lloyd's algorithm, 211
Local algorithm, 295
Long-term probabilities, 80

m-fold, 270

Markov chain, 77
  state, 82
Markov Chain Monte Carlo, 78
Markov random field, 340
Markov's inequality, 13
Matrix
  multiplication
    by sampling, 193
  diagonalizable, 438
  similar, 437
Maximum cut problem, 63
Maximum likelihood estimation, 429
Maximum likelihood estimator, 29
Maximum principle, 98
MCMC, 78
Mean value theorem, 457
Median, 423
Metropolis-Hastings algorithm, 83
Mixing time, 80
Model
  random graph, 245
Molloy Reed, 285
Moment generating function, 455
Mutually independent, 421

Nearest neighbor problem, 27
Nonuniform Random Graphs, 284
Normalized conductance, 80, 89
Number of triangles in $G(n, p)$, 251

Ohm's law, 99
Orthonormal, 445

Page rank, 113
  personalized , 116
Persistent, 77
Phase transition, 253
  CNF-sat, 279
  nonfinite components, 291
Poisson distribution, 426
Polar coordinates, 17
Polynomial interpolation, 190
Positive semidefinite, 451
Power iteration, 62
Power law distribution, 248
Power method, 51
Power-law distribution, 284
Prüfer, 459
Principle component analysis, 56
Probability density function, 420
Probability distribution function, 420
Psuedo random, 191
Pure-literal heuristic, 280

Queue, 281
  arrival rate, 281

Radon, 152
Random graph, 245
Random projection, 25
  theorem, 25
Random variable, 420
Random walk
  Eucleadean space, 109
  in three dimensions, 110
  in two dimensions, 110
  on lattice, 109
  undirected graph, 102
  web, 112
Rapid Mixing, 82
Real spectral theorem, 439
Replication, 270
Resistance, 97, 108
  efffective, 101
Restart, 113
  value, 113
Return time, 113

Sample space, 420
Sampling
  length squared, 194
Satisfying assignments
  expected number of, 280
Scale function, 386
Scale vector, 386
Second moment method, 251, 254
Sharp threshold, 253
Similar matrices, 437

Singular value decomposition, 40
Singular vector, 42
    first, 43
    left, 45
    right, 45
    second, 43
Six-degrees separation, 295
Sketch
    matrix, 197
Sketches
    documents, 201
Small world, 294
Smallest-clause heuristic, 280
Spam, 115
Spectral clustering, 216
Sperner's lemma, 459
Stanley Milgram, 294
State, 82
Stirling approximation, 414
Streaming model, 181
Symmetric matrices, 439

Tail bounds, 430, 433
Tail of Gaussian, 419
Taylor series, 409
Threshold, 252
    CNF-sat, 277
    diameter $O(\ln n)$, 269
    disappearance of isolated vertices, 259
    emergence of cycles, 265
    emergence of diameter two, 256
    giant component plus isolated vertices, 267
Time domain, 371
Total variation distance, 82
Trace, 448
Triangle inequality, 414
Triangles, 250

Union bound, 422
Unit-clause heuristic, 280
Unitary matrix, 445
Unsatisfiability, 279

Variance, 422
variational method, 413
VC-dimension, 148
    convex polygons, 151
    finite sets, 153
    half spaces, 151
    intervals, 151
    pairs of intervals, 151
    rectangles, 151
    spheres, 152
Viterbi algorithm, 334
Voltage
    probabilistic interpretation, 99

Wavelet, 385
World Wide Web, 112

Young's inequality, 414, 416