adjacency list, 4 matrix, 3, 5, 9, 11, 19, 58, 157, 163, 167, 310 affinity, 21 agent-based models, 86, 181 anatomical connectivity, 280 assortative, 14, 44, 129, 147 mixing, 13 weighted, 21 authorities and hubs, 170 avalanche, 256 adaptive defense, 263	coevolution, 238, 291 communities, 4, 145, 158, 238, 239 compartmental models, 182, 219 complex systems, 24, 47, 72, 76, 92, 215, 265 component, 5, 142, 304, 306 connected, 5, 118, 120, 134 directed graph, 6 giant, 6, 51, 122, 124, 126, 264 giant in, 7 giant out, 7 giant strongly connected, 7 giant weakly connected, 6
Axelrod model, 232, 239	computer network, 243 congestion, 246
Barabási-Albert model, 64, 132, 156, 157, 179, 196,	threshold, 249
228, 234, 258, 261	connectance, 4, 142, 283
basic reproductive number, 182, 187	connectome, 280
betweenness centrality, 9, 13, 117, 132, 146, 172, 247,	consensus, 225, 239
249, 260	time to, 226
algorithm, 10	cooperator, 236, 240
average, 12	copy model, 68
distribution, 12, 41, 252	correlations, 43, 72, 73
edge, 10, 146	matrix, 129, 194, 308
local, 179	crawler, 166
random walk, 249	critical
biological networks, 32	behavior, 114
Boltzmann weight, 96	exponent, 98, 103, 123, 154
Boltzmann–Gibbs distribution, 80	immunization, 209
Boolean network, 274	load, 258
bounded confidence, 217	phenomena, 49, 96
brain, 279	point, 93, 94, 97, 125, 203, 265
	temperature, 94, 95, 97, 100, 106
cascade model, 286	cut-off, 16, 40, 41, 108, 128, 130, 204, 282, 300
citation network, 169	cycle, 5, 52
CiteRank, 169	
cliques, 4, 16, 211	damage, 116, 261
bipartite, 4, 170	measure, 117
closeness centrality, 9	random, 117, 208
clustering coefficient, 10, 17, 37, 52, 53, 55, 56, 66,	targeted, 117, 208
300	threshold, 126, 130
weighted, 20	defector, 236, 240
clustering spectrum, 17, 44, 45, 54	degree, 7, 9, 62, 117, 161
weighted, 20	average, 12, 38, 51, 55, 58, 126, 298

average nearest neighbors, 15, 21, 44, 54, 73, 195 classes, 15, 17, 62, 105, 111, 155, 161, 167, 190, 192, 201, 223, 228, 298 correlations, 14, 44, 72, 73, 193, 206 distribution, 12, 18, 37, 51, 53–55, 62, 66, 104, 119, 127, 161, 164, 282, 285, 298, 303, 306 fluctuations, 39, 41, 49, 51, 106, 115, 127, 155, 190, 203, 207, 231, 301 maximal, 16 delivery time, 172, 174, 175, 178 density, 4 detailed balance, 80, 87, 109	Hamiltonian, 60, 80, 95, 96, 102 heavy tails, 16, 37, 38, 41, 49, 70, 118, 127, 208, 300 heterogeneity parameter, 41, 108, 125, 127, 155, 192, 193, 305 hidden variables, 54 HOT model, 71 hub, 13, 18, 35, 37, 106, 108, 114, 118, 119, 127, 131, 143, 147, 156, 165, 170, 177, 192, 211, 224, 228, 234, 251, 258, 276 avoidance, 251 hyperlink, 32, 69, 166 Hyperlink-Induced Topic Search, 170
degree, 298 diameter, 8, 143, 178, 211, 300 diffusion processes, 161, 180 rate, 161, 214 disassortative, 14, 44, 73, 129, 147 mixing, 14 weighted, 21 disparity, 21, 273 distance, 7, 35, 52, 55, 97, 101, 173, 227, 300 effective, 176, 253 Euclidean, 71 geographical, 175 weighted, 22 dynamical processes, 77	ignorant, 218 immunization, 189, 207 acquaintance, 210 targeted, 208 threshold, 189, 207, 209 uniform, 189, 207 in-degree, 9, 39, 167, 274, 306 average, 12 distribution, 12, 69, 270 infected, 218 infectious, 182 information spreading, 218 Internet, 29, 36, 71, 264 traffic, 243 Ising model, 95, 101, 104
eccentricity, 8 ecosystem, 282 edge, 2 directed, 3 efficiency, 119, 224, 261 emergent phenomena, 47, 64, 75, 92, 97,	Kuramoto model, 151  Laplacian, 138, 141, 144, 163, 310, 311 latent, 182 load, 224 Lette, Voltagra, 287
246, 265 epidemic forecast, 212 models, 180, 195, 204 threshold, 182, 187, 193, 199, 202, 221 Erdős–Rényi model, 18, 36, 50, 88, 119, 126, 142, 157, 164, 178, 196, 300 extremal theory, 300	Lotka–Volterra, 287  Markovian, 87, 161, 213 master equation, 61, 78, 163 projection, 62, 82 master stability function, 139 mean-field, 82, 95, 99, 111, 144, 153, 161, 167, 183, 206, 228, 233 metabolic
fiber bundle model, 258 finite size effects, 41, 128, 204, 209 firing and pulse, 148 fitness, 54, 67 food web, 33, 282 stability, 288 fractal, 49, 244 functional connectivity, 281	flux, 272 network, 268, 271 metapopulation models, 28, 212 equation, 214 transport operator, 214 Milgram's experiment, 171 model validation, 74 Monte Carlo simulations, 59, 86, 95, 177, 179, 195, 209, 223, 234 motifs, 4, 28, 270, 285
gene regulatory network, 274 generating functions, 124, 303 genetic regulatory network, 268 graph complete, 2, 8 directed, 3, 29, 32, 306 sparse, 4 undirected, 2, 30	neighbors, 2 network bipartite, 26 directed, 167 equilibrium statistical mechanics, 58 evolving, 60 growing, 62, 75

network (cont.)	return probability, 163
heterogeneous, 37, 41, 104, 143, 165, 193, 196,	recovered, 182, 218
223, 228, 234, 237	reliability, 220, 223
	• • • • • • • • • • • • • • • • • • • •
homogeneous, 37, 41, 52, 196	rich-club, 147
maximally random, 16, 18	coefficient, 18
size, 2	routing protocol, 247, 251, 260
uncorrelated, 14, 16, 53, 106, 124, 130, 162, 164,	adaptive, 253
167, 191, 192, 198, 209, 223, 231, 298	*
	degree-biased, 177
weighted, 19, 28, 120, 134, 179, 271	static, 249
neural networks, 279	rumor spreading, 218
niche model, 286	
non-equilibrium, 79, 203, 204, 215, 222, 233	1: 06
non-equinorium, 77, 203, 204, 213, 222, 233	sampling, 86
	biases, 31, 33
opinion formation, 225	network, 34
optimization, 70, 251	scalability, 224
order parameter, 94, 95, 112, 126, 154, 156, 203	•
*	scale-free, 54
out-degree, 9, 167, 277, 306	distribution, 38, 106, 156, 199, 301
average, 12	network, 40, 128, 143, 145, 156, 164, 192, 231,
distribution, 12, 270	276, 282, 301
, , ,	
1 . 25 50 246	property, 244
packet, 35, 78, 246	scaling
PageRank, 166	assumption, 98
paradox of heterogeneity, 143	form, 56, 98, 122, 154, 227, 300
path, 5, 30, 119, 120, 170	scientific collaboration network, 26, 36, 42, 46
Pearson coefficient, 14	search
percolation, 120, 204, 224, 303, 306	broadcast, 172
average cluster size, 122	degree-biased, 177
cluster number distribution, 121	engine, 166, 241
condition, 125	•
	greedy algorithm, 175
generalized random graphs, 124	random walk, 173
infinite dimensional, 124	strategies, 170
inhomogeneous, 134	self-similarity, 41, 244
inverse, 126	shortest path, 9, 35, 132, 171, 173, 211, 247, 251, 253,
threshold, 121	260
transition, 51, 121	length, 7, 12, 52, 53, 56, 67, 71, 119, 172, 300
phase transition, 75, 80, 92, 95, 121, 123, 125, 154,	SI model, 85, 184, 186, 190, 193
203, 222, 233, 246, 248, 265	SIR model, 185, 186, 192, 219, 220
congestion, 248	
	large time limit, 201
phenomenological theory, 112	SIS model, 185, 186, 192
plasticity, 238	large time limit, 198
Poisson distribution, 39, 51, 56, 300	small-world effect, 8, 35, 37, 53, 56, 67, 114, 171,
power law, 54, 123	227, 280
*	
power-law, 38, 73, 98	social networks, 26, 57, 176, 238
behavior, 123	sparse graph, 12
bounded, 41, 300	species, 282
distribution, 64, 106, 174, 177, 199, 301	spreader, 218
predator, 283	spreading rate, 184, 219
preferential attachment, 64	stationary state, 48, 79, 162, 188, 198, 220, 225, 240
rank, 67	stifler, 218
prevalence, 185	strength, 19, 45, 46, 145
prey, 283	distribution, 19, 41
prisoner's dilemma, 235, 240	
	stylized models, 265
protein interaction network, 33, 70, 268	subgraph, 4, 18, 51
	super-spreaders, 189
radius, 8	susceptible, 182, 218
random fuse network, 257	symmetry breaking, 94, 95
random graphs, 6, 36, 50, 124, 298	synchronization, 136, 141, 281
exponential, 58	chaotic systems, 136
generalized, 52, 174, 177, 198, 203, 299	complete, 137
random walk, 160, 245, 247, 251	condition, 141
probability, 162	generalized, 137
probability, 102	generanzeu, 137

path to, 156 periodic systems, 136 phase, 137 time, 150

targeted attacks, 119, 130 temperature, 80, 93 thermodynamic limit, 40, 95, 106, 114, 121, 127, 152, 154, 208, 234, 276 traffic, 10, 28, 120, 172, 241, 242, 247 assignment problem, 243 heterogeneity, 244 measurements, 245 models, 246

models, 246 transition rate, 61, 78, 87, 161, 182, 219 transportation networks, 27, 212, 243 tree, 2, 52 universality, 75, 98, 109, 123, 245, 265

vertices, 2 ordered pairs, 3, 32 unordered pairs, 2 Voter model, 217, 225, 239 link update, 228 reverse, 228 voxel, 281

Watts-Strogatz model, 55, 88, 101, 141, 143, 148, 154, 164, 174, 178, 221, 226, 234, 236 weight, 19, 26, 45, 134, 179, 271 distribution, 19, 41 heterogeneity, 22 worldwide airport network, 28, 36, 42, 46 World Wide Web, 31, 68, 166, 240