

Index

- (1-r)-cohesive set, 128
- acceptance threshold, 13
- access model, *See also* linear access model, 196–7
- acquaintance immunization, 98
- adjacency matrix, 28
- affiliating referral search, 221–3
- algorithmic betweenness, *See* betweenness algorithmic
- ancestor (of a node), 72
- assortativeness, 54, 223
 - in scale-free networks, 72–4
- average degree of neighboring node, 45
- average delay, *See* delay
- balance condition in stochastic processes, 265
- Barabási and Albert model, *See* scale-free networks
- Bethe lattice, 134, 139, 140
- betweenness
 - algorithmic, 179
 - topological, 35
- betweenness space, 184
- binomial degree distribution, 31
- binomial model, 37
- Cayley trees, 139–140
- centrality of node, *See also* betweenness, 182, 192
- citation networks, 2
- clique, 125, 127
- closure (in networks), *See also* clustering, 17, 34
- clustering coefficient, 33
 - in binomial model, 42–3, 54
 - in general random networks, 53–4
 - in regular lattice networks, 56
 - in scale-free networks, 71–2
 - in small-world networks, 57–9
- clustering, generalized, 249
- coauthorship networks, 6
- cohesiveness, 34
 - in binomial model, 43
 - in diffusion models with structured networks, 124–5
- complexity in networks, 20–1
 - and incentives, 254–5
- component, *See also* giant component, 32
- component size, 32
 - of operational nodes in SI model, 79, 81–3
- configuration model, 43–4
- conformity index, 135–8, 141–2
- congestion in search, 174
- connectedness, 37–8
- connections model, *See also* symmetric connections model, 196–7
- connectivity, 30
- coordination game embedded in social networks, 196–8, 205–9, 211–4, 237–43
- critical spreading rate, 92, 121–2
- cure, 84, 87
- cure policy, 98–101

292 **Index**

- degree correlation, *See also* assortativeness, 44, 102
- degree (of a node), 30
 - maximum, 158
- degree distribution, 31
 - of neighboring nodes, 44
 - of second neighbors, 45
- delay in search, 156–7, 159, 164, 178–9
- descendant (of a node), 72
- design of networks, optimal, 183–7
- diameter, 33
 - in the binomial model, 39, 47
 - in general random networks, 46
 - in lattice networks, 55
 - in scale-free networks, 71
- diffusion, 9, 23, 76–7
 - resilience of, 111–12
- diffusion and growth in networks, 250–4
- diffusion policy, 95
- diffusion wave, 77, 147
- distance, 32–3
- distance, average network, 33
 - in binomial model, 39
 - in general random networks, 46
 - in regular lattice networks, 55
 - in small-world networks, 58–9, 62–4
- email networks, 7
- epidemics, 75–6
- epidemiology, 75
- error tolerance, 83
- excess degree distribution of neighboring nodes, 49
- food webs, 4
- generating functions, 48–53, 259–260
 - for probability mixtures, 261–2
 - for sums of random variables, 261–2
 - self-consistency criterion for, 48
- geometric degree distribution, 31–32, 67
- giant cascade (diffusion wave), *See* giant component
- giant component, *See also* component, 32
 - in Binomial model, 40–3
 - in diffusion model with neighborhood effects, 111–8
 - in general random networks, 46–7, 52–3
 - in structured networks, 106–8
- Gibbs measure, 134, 140, 263, 265–6
 - and reversibility, *See also* balance condition, 265
- global diffusion wave (cascade), *See* diffusion wave
- GNR, *See* growing networks with redirection
- group recruitment and networks, 15
- growing networks with redirection (GNR), 219
- growth in networks, 65
- Hamilton cycle, 36n5
- hierarchic backbone, networks with a, 187–94
- hierarchic structures, 169–74
- hierarchical trees, *See* hierarchic structures
- homogenous mixing hypothesis, 88, 119
- homophyly in network formation, 171
- hysteresis in network evolution, 232, 235, 241
- immunization, 95–8
 - acquaintance, 98
 - targeted, 97
- index of social conformity, *See* conformity index
- infection, 77
- informal insurance and networks, 15–16
- informational networks, 2
- innovation, persistent, 145–54
- interfirm partnerships and networks, 17–18
- internode degree correlation, *See* degree correlation
- Ising model, 132, 238, 263
 - mean-field solution, 268
- jump process, *See also* jump rates, 272
- jump rates, 228, 239
- labor markets and networks, 11–13
- LAM, *See* linear access model
- lattice networks, 29, 55
- LCD, *See* linearized chord diagram

Index

293

- linear access model (LAM), 199
- linearized chord diagram (LCD), 71
- linkage correlation, *See also* clustering coefficient, 53
- Little's Law, 181n15
- magnetization, *See also* conformity index, 264
- maximum degree, *See* degree, 158
- mean-field theory, 268–274
 - master equations in, 272–4
- meeting partners in action model (MPA), 220
- metastable configurations, 270
- MPA, *See* meeting partners in action model
- multilateral convention, 248
- multiscale networks, 193
- Nash Equilibrium, 200n5
 - strict, 200
- neighborhood, 29
- neighborhood effects, 109–10
- neighboring nodes, 44
- networks
 - definition and representation of, 28–9
 - connected, 31
 - core-periphery, 193–4
 - directed, 28
 - directed wheel, 201
 - exponential, 67
 - local-team, 193–4
 - random, 30, 193–4
 - random interdivisional, 193–5
 - structured, 101–8
 - scale-free, 31
 - undirected, 28
- network formation, game-theoretic models of, 195–215
- network formation and social coordination, 205–9, 211–4, 237–43
- neural networks, 4
- nonaffiliating referral search, 219
- one-sided link creation, 199
- operational component, 79
- organizations and networks, 18–19
- organizational depth, 190
- organizational distance, 189
- pairwise stable configuration (PSC), 205–6
- pairwise stable network (PSN), 202–3
- peer effects and networks, 16
- PD, *See* prisoners dilemma embedded in social networks
- phase transition
 - first-order, 234, 241, 267, 270
 - second-order, 267, 271–2
- plasticity of networks, 245
- play in networks, 23, 236–254
- Poisson degree distribution, 31
- Poisson random networks, 36
- polarization in networks, 187
- Potts model, 25, 132, 144, 238
- power law, 32, 70, 148
- preferential attachment, *See also* meeting partners in action, 65
- prevalence of infection, 87
- prisoner's dilemma embedded in social networks
 - one-shot (PD), 244–6
 - repeated (RPD), 246–250
- problem solving in networks, 175–6, 178
- processing burden and congestion, 180
- propensity (of a node towards adoption or adjustment), 110
- protocol (for search in networks), 163
 - decentralized, 166–7, 176
 - gradient, 167, 171
- PSC, *See* pairwise stable configuration
- pseudoglobal knowledge, 191
- PSN, *See* pairwise stable network
- random configuration, 44
- random networks (general formulation), 43
- random nets, 36
 - biased, 37
- random trees, *See also* tree networks, 139
- reach of diffusion wave, 77
- reflexive links, 29
- robustness in networks, 9, 83–4
- routing procedure, *See* protocol
- RPD, *See* prisoners dilemma, repeated

294 **Index**

- scale-free networks, 32, 64
 - growth and, 65–7
 - preferential attachment and, 65–70
 - SI epidemics in, 82
- SCM, *See* symmetric connections model
- search, 9, 23, 155
 - global, 227
 - network-based, 215
- search protocol, *See* protocol
- searchability, 162
- self-consistent field theory, *See* mean field theory
- SI, *See* susceptible-infected model
- SIR, *See* susceptible-infected-recovered model
- small worlds, 3–4, 7, 54–5
 - and experiments, 7–8
- sociogram, 5
- spreading condition, 46
- static equilibrium, 199–209
- strong ties, 12, 34
- structured networks, 101–8
- surfing the network, 223–6
- susceptible agents, 118
- susceptible-infected model (SI), 76
 - under targeted attack, 83–4
 - with malfunctioning nodes, 77–83
- susceptible-infected-recovered model (SIR), 75, 84–6
- susceptible-infected-susceptible model (SIS), 75, 87–95
 - in regular networks, 88–90
 - in random networks, 90–95
 - in scale-free networks, 93–95
- symmetric connections model (SCM), 196–7, 202
- targeted attack, 83
- technological diffusion and networks, 13–14
- threshold function, 38
- trade, trust, and networks, 17–18
- transportations networks, 1
- tree networks, 29, 40, 47, 71, 125–6
- two-sided link creation, 198
- volatility of links, 215–6, 227
- Watts and Strogatz model, *See* small worlds
- wave, *See* diffusion wave
- weak ties, 12, 34