

Index

a

access time, *see* hitting time
acyclic graph 78
adjacency matrix adjacent 84
Akaike information criterion (AIC) 5
anonymous
– broadcast 178
– dynamic networks 176, 178, 182
Apple products 49
Audit TFTP Get Filename 70

b

bargaining game 113
Bayesian approach 13
Bayesian information criterion 23
benchmark model 18
Bernoulli random variable 60
BFS search 57
binary decisions/decision fusion 139
bipartite graph 80, 89
bootstrap procedure 16
bootstrap resampling algorithm 17
Breadth-first search (BFS) 53
Brunner Munzel test 25

c

causal influence 180
chemical reaction networks (CRNs) 176
classical (frequentest) approach 142
classical model selection approach 5
clique number 80
coarse-graining method 232
coclique number 80
common neighbors 33
communication 178
– network 174, 175, 212
– synchronous message passing 178
complete graph 80

complex networks
– definition 219
– vs. power graphs 228
computational network analysis 1
concordance function 53
concurrent progress, *see* maximum outgoing influence (moi)
confluent drawing 219
connected graphs 78
consensus 175
constant-state nodes 176
constrained optimization approach 94
contagion, in interbank networks, *see* interbank network
co-occurrence network 221
coordinated consensus 175
cospectral graph 87
counting, dynamic networks 176, 177, 180, 182, 196
covariance matrix 15
cut-edge of graph 79
cut-set matrix 86

d

data snooping 2
DBLP dataset
– SSC 45
– TESC 63
decayed hitting time 31
– complexity 40
– definition 36
– iterative approximation 37–39
– sampling algorithm 39–40
degree and diffusion matrix 85
degree of vertex 77, 78
delay-tolerant networks 173
de-noising method 232
detection probability 142

directed graph 76
 DPS Magic Number DoS 70
 dynamic diameter 180
 dynamic graph 174, 177
 – alternating matchings 197
 – definition 203
 – Soifer's 202
 dynamic networks
 – all-to-all token dissemination 175, 177, 180
 – anonymous 176, 182
 – with broadcast 186–188
 – causal influence 180
 – consensus 175
 – counting 175–177, 180, 182
 – counting upper bound 179
 – dynamic graph 174, 177
 – higher dynamicity 195–196
 – leader node 178
 – motivation-state of the art 173
 – naming 176, 177, 182
 – with one-to-each 178, 188–195
 – population protocol (PP) model 176
 – static networks with broadcast 183–186
 – synchronous, *see* synchronous dynamic networks
 – uniformity 176
 – unknown 176, 177, 182

e
 eccentricity 79, 184
 edge-connectivity of graph edge 79
 edge reduction and relative edge reduction 223–225
 empirical studies
 – DBLP dataset 45
 – DHT approximation 45–47
 – synthetic events 47–49
 – TaoBao dataset 45
 – twitter dataset 45
 endogenous interbank networks
 – asset and fund optimisation 112, 113
 – banks book 115
 – bargaining game 113, 117–118
 – funding sources 113, 116–117
 – interbank assets optimisation 115–116
 – interest rate 113
 – investment risk 112
 – model assumption 111–112
 – optimal funding structure 113
 – price adjustments 118
 – sequential optimisation process 111
 – structure of 123–127
 EVE 50

f
 fairness assumption 189
 false alarm probability 142
 family wise error rate (FWE) 7
 fastest edge reappearance 198
 feed forward neural network model 2–4
 financial intermediaries 97
 fire sales of illiquid portfolio 108–109
 flooding time 180
 Florida Food Chain Network 233
 F-type statistics 19

g
 game cards 50
 Gaussian distribution 63
 geometric distribution 43
 global sampling 61
 gossip 177, 180
 graph clustering 32
 graph density 66
 graph isomorphism 77
 graph matrices 83
 – adjacency matrix 84
 – cut-set matrix 86
 – degree and diffusion 85
 – incidence matrix 84
 – Laplace matrix 85–86
 – path matrix 86
 graph mining 32
 graph theory
 – clique and coclique 80
 – connectivity 79
 – directed and undirected 76
 – regular graph 80
 – tree 80
 gScore 31
 – framework 44
 – synthetic events 47

h
 hidden layer size selection 14–15
 – real data application 23–26
 – reality check approach 15–19
 – superior predictive ability approach test 19–23
 hitting time 33, 36
 Hoeffding's inequality 41
 holistic proximity measures 35
 HTTP Auth TooLong 70
 hypothesis testing 7

i
 importance sampling 58–61
 – TESC EIS 65–66

incidence matrix 84
 independence number 80
 individual sensor's false alarm probability 138
 influence time 196–199
 – incoming 197
 – outgoing 196–197
 instantaneous graphs 178
 interactive visual analysis 233
 interactive visual analytics 231–234
 interbank network
 – data 119
 – endogenous networks 110–118, 123–127
 – literature 99–103
 – models 103–104
 – simulated networks 104–109, 120–123
 – stress testing applications 127–130
 – Systemic Probability Index 109–110
 1-interval connectivity model 177
 intrusion dataset 63
 iterative-alg 40
 iterative approximation 37–39

j

Jaccard's coefficient 33

k

k-d tree indices 56
 Kendall's τ rank correlation measure 32
 Krylov subspace methods 91

l

labeling 179
 Laplace matrix 85–86
 Laptops and tablets 49
 LDAP Auth Failed 70
 leader node 178
 linear model 17
 line graph 81, 90
 local communication windows 177
 local connectivity 79
 loops 76

m

Mabinogi 50
 matrix
 – adjacency 84
 – cut-set 86
 – degree and diffusion matrix 85
 – eigenvalues and eigenvectors 82–83
 – incidence 84
 – Laplace 85–86
 – path 86

 – trace and determinant 81
 maximum cut problem 89
 maximum outgoing influence (moi)
 – definition 199
 – oit unit 199
 Menger's theorem 174
 minimal (consecutive) naming 179
 mining cohesive graph pattern problem 32
 mobility pattern 173
 modular decomposition 77
 moi, *see* maximum outgoing influence (moi)
 Monte Carlo experiment 10, 22
 Monte Carlo sampling method 39
 mother communities, in social network 30
 Motif mining method 232
 multigraph 77
 multiple target localization and diagnostic
 – from binary decisions 158–159
 – from corrected decisions 159–161
 – from energies 158
 – hybrid estimation 160
 – starting values 160
 Multiple testing algorithm 8

n

naming, dynamic networks 176, 177, 182
 naming problem 179
 negative correlation 30
 1-neighborhood event fraction measure 48
 Netscape Enterprise Server software 70
 network coding 175
 network construction 176
 Network Embedded Systems Technology (NEST) project 166–168
 network null model 225
 neural network models
 – Akaike information criterion 5
 – feedforward neural network model 2–4
 – hidden layer size selection 14–15
 – logistic activation function 10
 – model selection in 4–6
 – radially symmetric function 11
 – real data application 12–14
 – relevance measure 6–10
 – Schwarz information criterion (SIC) 5
 – square loss function 10
 – superior predictive ability approach test 19–23
 non linear analysis 1
 nonlinear least squares 22
 non parametric analysis 1
 null hypothesis 54

o

- optimization problem 3
- ordinary decision fusion (ODF) 139
- out-of-sight nodes 56
- Ozone data, neural network 13

p

- pairwise measures 35
- parametric analysis 1
- path matrix 86
- personalized PageRank 33
- PG-similarity 229
- population protocol (PP) model 176
- positive correlation 30
- power edge filtering 232, 233
- power graph
 - algorithm 221
 - analysis 219
 - conditions 222–223
 - definition 221
 - edge reduction and relative edge reduction 223–225
 - extraction 225–227
 - layout 229–231
 - range of 221
 - semantics 222
 - similarity 229
- power grid network 228
- powerset 178
- probability law 2
- pruning strategy 4
- p-value, test 54

q

- quadratic loss function 22
- queue 57

r

- radially symmetric function 11
- randomization technique 33
- random walk and hitting time 35–36
- reality check approach 15–16
 - bootstrap procedure 16
 - covariance matrix 15
 - linear model 16
- reference node sampling
 - algorithms 63
 - BFS search 57
 - complexity analysis 61–62
 - global sampling 61
 - importance 61
- regular graph 80
- RejectSamp 58

- relative edge reduction 225, 228
- R-tree indices 56

s

- sampling-alg 40
 - scalability 51
- Schwarz information criterion (SIC) 5
- second limit theorem 55
- self structural correlation (SSC)
 - description 29
 - estimation 42–44
 - novel measure 31
 - problem formulation 34
 - random walk and hitting time 35–36
 - real event 49–50
- semilinearity 176
- sensitivity measures 6
- sigmoidal activation function 3
- simulated interbank network
 - characteristics 104–105
 - contagion mechanism 107–108
 - contagion results 120–123
 - fire sales 108–109
 - interbank network 105–107
 - probability map 105
- simultaneous consensus 175
- single target localization and diagnostics
 - accuracy 155
 - computational cost 157
 - hybrid maximum likelihood estimates 153–154
 - from local vote decision fusion 152–153
 - maximum likelihood estimates 154–155
 - from ordinary decision fusion 151–152
 - robustness to model misspecification 156
 - starting values for localization 155–156
 - from value fusion 150
- Soifer's dynamic graph 202
- South Florida Ecosystem network 227
- spanning line 176
- spanning ring 176
- spanning star 176
- spanning subgraph 77
- spectral graph theory 86
 - bipartite graph 89
 - complete graph 90
 - computational challenges 91
 - cospectral graph 87
 - and graph colouring 91
 - and graph drawing 91
 - line graph 90
 - regular graph 90
 - tree 89
 - and walks 88–89

- square loss function 10
- static network 178
- static networks with broadcast 183–186
- stepM procedure 7
- stress testing applications 127–131
- structural correlations 30
 - pattern mining problem 32
 - self, *see* self structural correlation (SSC)
 - TESC, *see* two-event structural correlation (TESC)
- subsampling procedure 9
- superior predictive ability approach 19–21
- synchronous dynamic graph
 - alternating matchings 197
 - connectivity time 200
 - continuous disconnectivity 201–203
- synchronous dynamic networks 196
 - broadcast 196
 - influence time 196
 - moi, *see* maximum outgoing influence (moi)
 - termination and computation, *see* Termination and computation
- synchronous message passing, *see* communication
- Systemic Probability Index 109–110
- t**
- TaoBao dataset 45
- temporal connectivity conditions 177
- temporal graph 174
- termination and computation
 - communication network 212
 - hear from known 208
 - known upper bound on the oit 205–208
 - optimal termination criterion 203
 - talk to known 211
- termination criteria 177, 182, 196
- ThinkPad 49
- Tibshirani model 22
- time-varying graph 174
- tokens 175
- transaction correlation 68
- transition probability matrix 35
- truncated hitting time (THT) 37
- turing machine (TM) 176
- Twitter dataset
 - SSC 45
 - TESC 63
- two-event structural correlation (TESC)
 - aims 33
 - description 31
 - efficiency and scalability 66–68
 - event simulation methodology 63
 - graph datasets 62–63
 - graph density 66
 - importance sampling 65–66
 - novel measure 31
 - performance comparison 63–65
 - preliminaries and problem formulation 52–53
 - real events 68–70
 - reference node(s) 56
 - reference node sampling 56
 - testing test 54–56
- u**
- undirected graph 34, 76
- unknown, dynamic networks 177, 182
- unweighted graph 34
- upper bound of theorem 205, 206
- v**
- validation 227–228
- value fusion 139
- vertex-connectivity of graph edge 79
- visual analytics 220
- w**
- weighted graph 76
- Wilcoxon rank sum test 25
- wireless sensor networks (WSN)
 - applications of 137, 165–166
 - data collection and fusion
 - ordinary decision fusion 139–140
 - value fusion 139
 - multiple target localization and diagnostic
 - from binary decisions 158–159
 - from corrected decisions 159–160
 - from energies 158
 - hybrid estimation 160
 - starting values 160
 - multiple target tracking 161–165
 - single target localization and diagnostics
 - accuracy 155
 - computational cost 156
 - hybrid maximum likelihood estimates 153–154
 - from local vote decision fusion 152–153
 - maximum likelihood estimates 154–155
 - from ordinary decision fusion 151–152
 - robustness to model misspecification 156
 - starting values for localization 155–156
 - from value fusion 150
 - structure and the design 137, 138
 - target detection
 - accuracy of 142
 - detection performance 148

wireless sensor networks (WSN) (*contd.*)

– – from local vote decision fusion 144–148

– – from ordinary decision fusion 143–144

– – quality of approximation 148

– – radar-based applications 142

– – from value fusion 142–143

worst-case adversary 178

worst-case dynamicity 177

x

XE dynamic networks

– communication 174

y

zooming and network expansion 233–234