

Index of Pajek and R Commands

Draw screen

- [Draw] Change the class number of vertices, 44, 390–1
- [Draw] Draw screen, 18–20
- [Draw] Export, 25, 404–11
- [Draw] Export > 2D >
 - > Bitmap, 26, 404–5
 - > EPS/PS, 26–7, 405
 - > JPEG, 26, 404–5
 - > SVG, 26–7, 406–8
 - > Current and all Subsequent, 407
 - > General, 406
 - > Labels/Arcs/Edges, 406
 - > Line Values
 - > Classes, 407
 - > Nested Classes, 131–2, 407
 - > Options, 407
 - > Partition, 406–7
 - > Classes, 406–7
 - > Classes with semi-lines, 406–7
 - > Nested Classes, 406–7
 - > VOSviewer, 408–9
- [Draw] Export > 3D
 - > Kinemages
 - > Current and all Subsequent, 410–11
 - > MDL MOLfile, 410
 - > VRML, 409
 - > X3D, 138–9
- [Draw] Export > Append to Pajek Project File
 - > Append, 407–8
 - > Select File, 407–8
- [Draw] Export > Options
 - > Arc Color, 417
 - > Arc Width, 417
 - > Arrow Position, 417
 - > Arrow Size, 417
 - > Bckg. Color 1, 419–20
 - > Bckg. Color 2, 419–20
 - > Bckg. Color 3, 419–20
 - > Bezier Curves
 - > Angle1, 418
 - > Angle2, 418
 - > Straight Lines, 418
 - > Velocity1, 418
 - > Velocity2, 418
 - > Border Color, 412–14, 420
 - > Border Radius, 420
 - > Border Width, 412–14, 420
 - > Bottom frame on the right, 420
 - > Edge Color, 417
 - > Edge Width, 417
 - > EPS, SVG: Lines finished at Vertex Border, 418–19
 - > EPS, SVG, X3D, VRML Size of Vertices, 418–19
 - > EPS Border, 420
 - > EPS: Use RGB colors instead of CMYK, 418–19
 - > Export options overwrite Shapes file, 415
 - > Font Size, 417
 - > Interior Color, 412–14
 - > Label Color, 417
 - > Label Position (on line), 417–18
 - > Label Position (polar)
 - > Angle, 418
 - > Radius, 418
 - > Middle frame on the right, 419–20
 - > Pattern, 417

- [Draw] Export > Options (cont.)
 - > Shape, 412–14
 - > Shape Angle, 412–14
 - > Shapes file, 415
 - > SVG
 - > Opacity of Vertices, Lines, 418–19
 - > Tooltips: Vertices, Lines, Clusters, 418–19
 - > Vertices 3D Effect Linear, Radial, 418–19
 - > SVG Gradient, 419–20
 - > Symbol Size, 415–16
 - > Top frame on the left, 412–16
 - > Top frame on the right, 418–19
 - > X3D, VRML Width of Lines, 418–19
 - > x/y Ratio, 412–14
- [Draw] FishEye
 - > Cartesian, 58–9, 302
 - > Exit, 58–9
 - > Factor, 58–9
 - > Polar, 58–9, 302
- [Draw] GraphOnly, 23
- [Draw] Info
 - > All Properties, 24–5
 - > Closest Vertices, 24–5
 - > Correlation (Layout, Geodesics)*, 25
- [Draw] Layers
 - > Averaging x Coordinate, 273–4, 302
 - > In y Direction, 198, 273–4
 - > In z Direction, 137
 - > Optimize Layers in x Direction, 198–9, 273–4
 - > Type of Layout, 137
 - > 3D, 137
- [Draw] Layout > Circular > using Partition, 45
- [Draw] Layout > Energy, 20–1
 - > Fruchterman-Reingold, 21–2
 - > 2D, 21–2
 - > 3D, 21–2, 138–9, 409
 - > Factor, 21
 - > Kamada-Kawai
 - > Fix First and Last Vertex, 21
 - > Fix One Vertex in the Middle, 21
 - > Fix Selected Vertices, 45
 - > Free, 21, 42
 - > Separate Components, 21, 131
 - > Starting Positions, 20–1
 - > Circular, 20–1
 - > Given xy, 20–1
 - > Given z, 20–1
 - > Random, 20–1
- [Draw] Layout > Pivot MDS > Random Pivots> 2D, 3D, 22, 409
- [Draw] Layout > VOS Mapping > 2D, 3D, 22, 409
- [Draw] Move
 - > Circles, 23, 42
 - > Fix, 23
 - > Radius, 23
 - > y, 199
 - > Grid, 23
- [Draw] Next, 23
- [Draw] Options, 23–4
 - > Colors
 - > Arcs > Relation Number, 19–20
 - > Edges > Relation Number, 19–20
 - > Partition Colors > for Vertices, 42
 - > Relation Colors, 19–20
 - > Use Third Partition for Symbol Color, 44
 - > Layout, 23–4
 - > Real xy Proportions, 60
 - > Lines > Mark Lines
 - > No, 20
 - > with Labels, 20
 - > with Values, 20, 51
 - > Mark Vertices Using, 23–4
 - > Clusters of Second Partition, 43–4
 - > Cluster Symbols of Second Partition, 44, 415–16
 - > Labels Centered, 23–4
 - > Labels as Tooltips, 23–4
 - > Mark Cluster Only, 284
 - > Vector Values, 58
 - > Previous/Next
 - > Apply to, 23, 111–12, 407, 410–11
 - > Optimize Layouts, 111–12
 - > Scrollbar On/Off, 137
 - > Size
 - > of Symbols, 44
 - > of Vertices, 57
 - > Size > of Vertices, 57–8, 183
 - > Symbols for Partition Clusters
 - > Change, 44
 - > Transform, 45
 - > Fit Area, 60
 - > Fit Area > max(x), max(y), max(z), 45
 - > Rotate 2D, 199, 260
 - > Values of Lines > Similarities, 106, 182–3
 - [Draw] Previous, 23
 - [Draw] Redraw, 23

Index of Pajek and R Commands

441

- [Draw] Spin, 137
- [Draw] ZoomOut, 23
- Edit Hierarchy screen**
 - [Editing Hierarchy] Editing Hierarchy Screen, 329
 - > Change Type, 330
 - > Show Subtree, 329–30
- Edit Network screen**
 - [Editing Network] Editing Network Screen, 28–9
 - [Editing Network] Newline, 28–9
- Edit Partition screen**
 - [Editing Partition] Editing Partition Screen, 39–41
- Main screen**
 - [Main] Cluster
 - > Create Complete Cluster, 326
 - > Create Empty Cluster, 210, 284
 - [Main] Draw > Network, 11
 - [Main] Draw > Network + Create Null Partition, 44
 - [Main] Draw > Network + First Partition, 42
 - [Main] Draw > Network + First Partition + First Vector, 57, 131
 - [Main] Draw > Network + First Vector + Second Vector, 57–8
 - [Main] File > Hierarchy > View/Edit, 89–90, 177, 284–5
 - [Main] File > Ini File
 - > Load, 412
 - > Save, 412
 - [Main] File > Network
 - > Dispose, 376–7
 - > Export as Matrix to EPS
 - > Options, 320–1
 - > Original, 320
 - > Using Permutation + Partition, 320–1, 330
 - > Read, 11–12, 387–9
 - > Save, 25, 30, 77–8, 391
 - > View/Edit, 28–9, 390
 - [Main] File > Pajek Project File, 39–41
 - [Main] File > Partition
 - > Dispose, 376–7
 - > Read, 39
 - > Save, 39, 391
 - > View/Edit, 39–41, 228–9, 284, 390–1
- [Main] File > Vector, 55
 - > Dispose, 376–7
 - > Read, 11–12, 59–60
 - > Save, 391
 - > View/Edit, 157, 237, 391, 398
- [Main] Hierarchy drop-down menu, 89–90
- [Main] Hierarchy
 - > Extract Cluster, 285
 - > Make Partition, 330
- [Main] Info > Memory, 376–7
- [Main] Info > Show Report Window, 16–17
- [Main] Macro
 - > Add Message, 208
 - > Play, 208, 278, 288
 - > Record, 208
 - > Repeat Last Command, 375, 376
 - > Fix (First) Partition, 376
 - > Fix (Second) Partition, 376
- [Main] Main Screen, 11–12
- [Main] Network drop-down menu, 11, 319
- [Main] Network > 2-Mode Network
 - > 2-Mode to 1-Mode, 125–6
 - > Columns, 125–6
 - > Include Loops, 126
 - > Multiple Lines, 126
 - > Rows, 125–6
 - > Partition into 2 Modes, 121
- [Main] Network > Acyclic Network
 - > Create (Sub)Network > Main Paths
 - > Global Search > Key-Route, 295
 - > Global Search > Standard, 295, 298–300
 - > Global Search > Through Vertices in Cluster, 298–300
 - > Local Search > Backward, 300
 - > Local Search > Forward, 298
 - > Local Search > Key-Route, 300
 - > Local Search > Through Vertices in Cluster, 298
- > Create Partition > Depth Partition
 - > Acyclic, 259
 - > Genealogical, 273–4
- > Create Weighted Network + Vector
 - > Traversal Weights, 296, 298
 - > Normalization of Weights, 297
 - > Info, 284, 285
 - > Transform > Preprint Transformation, 303
- [Main] Network > Create Hierarchy
 - > Clustering*, 329
 - > Symmetric-Acyclic, 259

- [Main] Network > Create New Network
 - > Empty Network, 285, 389
 - > SubNetwork with Paths
 - > All Shortest Paths between Two Vertices, 156–7, 275
 - > Info on Diameter, 361
 - > Transform
 - > 1-Mode to 2-Mode, 278
 - > Arcs → Edges > All, 15, 77–8, 88, 207, 215–16, 275
 - > Arcs → Edges > Bidirected only, 260
 - > Edges → Arcs, 14, 155
 - > Line Values, 274–5
 - > Remove
 - > all Edges, 275, 277
 - > Lines with Value > lower than, 50, 52, 301–2
 - > Lines with Value > within interval, 112
 - > Loops, 155, 259, 302–3
 - > Multiple Lines, 155, 275, 372
 - > Transpose > 1-Mode, 228–9
 - > with Bi-Connected Components stored as Relation Numbers, 176–7, 284–5
- [Main] Network > Create Partition
 - > Blockmodeling*
 - > Optimize Partition, 335
 - > Random Start, 337–8, 341–2
 - > Restricted Options, 335
 - > Short Report, 335
 - > Communities
 - > Louvain Method, 133
 - > VOS Clustering, 133
 - > Components
 - > Strong, 83, 86, 254, 260, 302–3
 - > Weak, 83, 301–2, 360
 - > Degree, 155
 - > All, 78, 361
 - > Input, 78, 127, 228
 - > Output, 78, 277
 - > Islands
 - > Generate Network with Islands, 131
 - > Line Weights, 129–31
 - > k-Core
 - > All, 86, 296
 - > Input, 86
 - > Output, 86
 - > k-Neighbours, 155–6, 276
 - > All, 183–4
- [Main] Network > Create Random Network
 - > Bernoulli/Poisson, 362
 - > Extended Model, 372
 - > Scale Free, 371
 - > Adding > Free, 372
 - > Directed, 371
 - > Small World, 365–6
 - > Total No. of Arcs, 362
 - > Vertices Output Degree, 203, 362
- [Main] Network > Create Vector
 - > Centrality
 - > Betweenness, 159, 215–16
 - > Closeness, 157–8
 - > Degree, 155
 - > All, 370
 - > Input, 210
 - > Hubs-Authorities, 161
 - > Proximity Prestige > Input, 234, 237
 - > Clustering Coefficients > CC1, 184, 361, 365, 376
 - > Distribution of Distances*, 157, 365
 - > Get Coordinate, 60, 137–8
 - > Structural Holes, 182
- [Main] Network > Info
 - > Degree Assortativity, 163
 - > General, 16, 41–2, 77, 78, 183–4, 187, 260–1, 300
 - > Line → Rank of its Value, 300
 - > Line Values, 126, 297–8
 - > Triadic Census, 252
- [Main] Network > Multiple Relations Network
 - > Change Relation Number – Label, 278
 - > Extract Relation(s) into Separate Network(s), 12–14, 278
 - > Info, 17
- [Main] Network > Multiple Relations Network > Extract Relation(s) into Separate Network(s), 12–14
- [Main] Network > Signed Network > Create Partition > Doreian–Mrvar Method*, 106–9
- [Main] Network > Temporal Network > Generate in Time, 111, 407–8
- [Main] Networks drop-down menu, 12

Index of Pajek and R Commands

443

- [Main] Networks > Cross-Intersection >
 - First, 14
- [Main] Networks > Fragment (First in Second), 88–9, 90
 - > Check relation numbers, 286
 - > Check values of lines, 286
 - > Find, 285
 - > Induced, 285
- [Main] Networks > Multiply Networks, 278
- [Main] Networks > Union of Vertices, 60
- [Main] Operations drop-down menu, Ch2
- [Main] Operations > Network + Cluster
 - > Dissimilarity* > Network-based
 - > d1 > All, 326–7
 - > Options > Report Matrix, 326–7
 - > Extract SubNetwork, 285
 - > Brokerage Roles, 188–9
 - > Extract > SubNetworks Induced by Each Selected Cluster Separately, 135
 - > Extract > SubNetwork Induced by Union of Selected Clusters, 47, 86, 131, 134, 183–4, 287–8, 302, 325–6, 335
 - > Info > E-I Index, 134
 - > Shrink Network, 50, 52, 255, 302–3
 - > Transform
 - > Direction, 209–10
 - > Lower → Higher, 302
 - > Remove Lines
 - > Between Clusters, 187, 260–1
 - > Inside Clusters, 53
- [Main] Operations > Network +
 - Permutation
 - > Reorder Network, 321
- [Main] Operations > Network + Vector
 - > +Cluster
 - > Diffusion Partition, 210
 - > Info > Assortativity, 163–4
 - > Neighbours > Sum
 - > All, 207–8
 - > Input, 207–8
 - > Output, 207–8
 - > Transform > Put Coordinate, 60
- [Main] Operations > Partition +
 - Permutation
 - > Reorder Partition, 321
- [Main] Operations > Vector + Partition
 - > Extract Subvector, 59, 131, 288
 - > Shrink Vector, 59
- [Main] Options > Blockmodel – Shrink, 50–1
- [Main] Options > Read–Write
 - > 0/0, 208
 - > Bipartite Pgraph, 283–4
 - > GEDCOM – Pgraph, 273, 283–4
 - > Ignore Missing Values in menu Vector and Vectors, 216, 376
 - > Max. vertices to draw, 400
 - > Ore: Different relations for male and female links, 273, 274–5
 - > Pgraph + labels, 283–4
 - > Threshold, 393–4
- [Main] Partition drop-down menu, 39
- [Main] Partition, 45
 - > Binarize Partition, 207, 287–8
 - > Copy to Vector, 56, 231
 - > Count, Min–Max Vector, 361
 - > Create Constant Partition, 44, 390
 - > Create Random Partition > 1-Mode, 106
 - > Info, 41–2, 78, 90, 188–9, 203, 215, 233, 276, 277, 286–7, 361
 - > Make Cluster
 - > Vertices from selected Clusters, 210, 326
 - > Make Network
 - > Random Network, 362
 - > Make Permutation, 320
- [Main] Partitions drop-down menu, 45
- [Main] Partitions, 45
 - > Add (First + Second), 287–8
 - > Expand Partition
 - > First according to Second (Shrink), 260
 - > Extract SubPartition (Second from First), 48, 90–1, 127, 131, 133–4, 277, 302
 - > Info, 62–3
 - > Cramer’s V, Rajski, Adjusted Rand Index, 62–3, 133–4, 287, 337
 - > Spearman Rank, 230, 237–8, 240–1
 - > Make Random Network, 362
- [Main] Permutation drop-down menu, 320
- [Main] Tools > Excel, 138
- [Main] Tools > Export to Delimited File, 138
- [Main] Tools > R
 - > Locate R, 137–8
 - > Send to R

444

Index of Pajek and R Commands

- [Main] Tools > R (*cont.*)
 - > All Vectors, 137–8
 - > Current Vector, 370
- [Main] Vector drop-down menu, 55
- [Main] Vector > Create Constant Vector, 391, 398
- [Main] Vector > Info, 55, 57, 183, 215–16, 237, 273, 288, 376
- [Main] Vector > Make Partition
 - > by Intervals, 56–7
 - > First Threshold and Step, 56–7, 237–8, 240–1
 - > Selected Thresholds, 286
- > Copy to Partition by Truncating (Abs), 56, 137, 176–7, 188–9
- [Main] Vector > Transform
 - > Multiply by, 183
 - > Normalize > Max, 57–8
- [Main] Vectors drop-down menu, 207–8
- [Main] Vectors
 - > Divide (First/Second), 207–8, 210
 - > Info, 231
- PajekXXL and Pajek3XL Main screen**
- [Main] Tools > Pajek
 - > Locate Pajek, 402
 - > Send Network to Pajek > + Add Vertex Labels from File(s), 402
- Report screen**
- [Report] File > Empty Report, 377
- R Commands**
- R: {igraph} power.law.fit(), 370–1
- R: Edit
 - > Run all, 370
 - > Run line or selection, 370–1
- R: File > Open Script, 370

Subject Index

Note: Italicized page numbers with f's or t's refer to figures or tables.

- Acrobat Distiller, 405
active network, 11
actors, 5
 defined, 427t
 input domain, 232
 participation rate, 122
 threshold of, 206
 in two-mode networks, 121
acyclic networks, 253–5, 284, 289, 293, 427t
Adamic, L. A., 355–7, 381
adjacency matrix, 317, 427t
adjacent vertices, 427t
Adjusted Rand Index (ARI), 63, 133–4, 287, 337
Adobe Illustrator, 408
adoption categories, 204, 427t
adoption rate, 202–3, 215, 427t
adoption time, 198
affective relations, 99
affiliation matrix, 317, 427t
affiliations, 119–40
 brokerage roles and, 184–9
 communities, 132–5
 islands, 127–32
 one-mode networks, 121–7
 overview, 119–20
 partitions, 127
 three-dimensional, 135–9
 two-mode networks, 121–7
aggregate constraints, 182, 183, 427t. *See also* dyadic constraint
Albert, R., 366, 382
Aldenderfer, Mark S., 348
alpha, 366, 369, 371, 381
Anatomy of Scottish Capital, The (Scott and Hughes), 121
ancestors, 276
 closest common, 273
 pedigree, 273
angle, 418
arc, 7, 9–10, 155, 362
 bidirectional, 7, 155
 colors, 417
 defined, 427t
 head of, 7
 tail of, 7
 traversal weight, 293–4
articulation points, 173, 176–7, 427t
assortative mixing, 162
assortativity, 73, 162–4, 428
assortativity coefficient, 162, 163–4, 428
asymmetric dyads, 247, 428
Attiro data, 73–5, 76, 78, 83, 88, 226–7
attribute, 428
attribution, 101
automatic drawing, 20–2
average degree, 76, 78
BabelPad, 392
background colors, 419–20
backward local main path search, 294, 300
balance model, 248, 428
balance theory, 99–102. *See also* structural balance
 clusterability, 103–9

- balance theory (*cont.*)
 - development in time, 109–13
 - structural balance, 103–9
- balanced (semi-) cycle, 428
- balanced network, 101, 102
- balanced signed graph, 101, 428
- balance-theoretic models, 250*t*
- Barabási, A.L., 366, 382
- Barabási-Albert model, 366, 367, 372
- Batagelj, Vladimir, 265, 307, 348, 382
- Bernoulli random graph, 358–60, 362
- betweenness, 155–6
- betweenness centrality, 159, 428. *See also* centrality
- betweenness centralization, 159, 428
- bi-components, 82–3, 172–7, 284–5, 428.
 - See also* components
 - defined, 173–4
- bidirectional arc, 7, 14, 155, 186
- bipartite network. *See* two-mode networks
- bipartite parentage graph, 283–4
- birth cohorts, 287*t*
- bitmap, 26, 404–5
- Blashfield, Roger K., 348
- block, 331
 - complete, 332, 339–40
 - defined, 428
 - null, 332, 339–40
 - regular, 339–40, 434
- blockmodel, 332–3, 342*f*, 428
- blockmodeling, 50–1, 333–8
 - defined, 428
 - generalized, 341, 342
 - matrices, 316–21
 - overview, 315
 - permutation, 316–21
 - steps in, 333–4
- blogs, 355–7, 373–5
- Blondel, V. D., 142
- blood marriages, 280, 428. *See also* nonblood relinking; structural relinking
- blood relations, 271
- Bollobás, B., 382
- Bonacich, Phil, 167
- Boorman, S. A., 348
- border color, 420
- Borgatti, Stephen, 142
- Bornschier, Volker, 66
- boundary specification, 6
- Brandes, U., 33, 382
- Breiger, Ronald L., 141, 348
- bridge
 - bi-components and, 172–7
 - defined, 173, 428
 - ego-networks, 177–84
 - finding in hierarchy of bi-components, 177
 - overview, 170
- brokerage role, 184–9. *See also* coordinator role; gatekeeper; itinerant broker; liaison
 - defined, 185, 428
 - in strike network, 186–7
 - types of, 185–6
- Brothers Keeper, 306
- Burt, Ronald S., 193, 241
- calculation, in social network analysis, 15–17
- Carlson, R.O., 219
- Carrington, P.J., 220
- Cartwright, Dorwin, 116
- cell (of a matrix), 428
- centrality
 - betweenness, 159
 - closeness, 154
 - ego-centered approach to, 149
 - eigenvector, 160–2
 - network, 289–90
 - number of neighbors and, 151
- centrality literature data, 289–90, 291–2, 297*t*, 302, 303*f*
- centralization, 149
 - betweenness, 159
 - closeness, 154
 - degree, 152, 155
 - eigenvector, 161
- Cerinšek, M., 307
- Chime, 410
- chi-square statistic, 252
- Church of Jesus Christ of Latter-Day Saints, 306
- circles, 45
- citation, 291–304
 - analysis, 291
 - networks, 291–2, 296
- Clifford, Roy A., 96, 241
- Clip format, 405
- cliques, 86–91, 191–2
 - defined, 428
 - overlapping, 88
- closeness centrality, 154, 157–8, 428. *See also* centrality

Subject Index

447

- closeness centralization, 154, 429
- closest common ancestor, 273
- clusterability, 102, 248
 - detecting, 103–9
- clusterability model, 429
- clusterable (semi-) cycle, 429
- clusterable signed graph, 429
- clustering, 361
 - clustering coefficients, 184, 359, 361, 365, 376, 429
 - clusters, 102, 187, 284, 326, 329
 - creating, 326
 - ranked, 248–9
 - Unicode symbols, 415–16
 - vertices, 326
- cohesion concept, 292–3
- cohesive subgroups, 73–93
 - cliques, 86–91
 - components of, 79–83
 - cores of, 83–6
 - degree of, 75–9
 - density of, 75–9
 - example of (Attiro neighborhood in Costa Rica), 73–5
 - family–friendship groupings, 73–5
 - overview, 73
- Coleman, James S., 219, 241
- colors, names of, 413*t*
- column (matrix), 316
- Commodity Trade Statistics*, 37
- communication network, 150–1
 - betweenness in, 158–60
 - distance, 151–8
 - of striking employees, 171*f*
- communities, 132–5, 429
- community detection, 429
- complete block, 332, 339–40
- complete dyads, 246
- complete network, 429
- components, 79–83, 429
 - bi-components, 82–3
 - giant, 359, 360
 - strong, 81–3
 - weak, 81–3
- conditional uniform random graph models, 359–60
- connected network, 21, 22, 80
- connectedness, 80
- constraints
 - aggregate, 182, 183, 427*t*
 - dyadic, 180–1, 430
- contagion, 200–3
- contextual view, 429
- continuous property, 53–4
- continuous-time Markov process models, 355
- contours, 82–3, 176–7
- coordinates, 53–60
- coordinator role, 185–6, 189, 429. *See also* brokerage role; gatekeeper; itinerant broker; liaison
- CorelDRAW, 406
- core-periphery structure, 325–6, 331, 333–4
- cores, 83–6
- correlation, 229–31
- correlation coefficients, 229
 - Pearson's, 230
 - Spearman, 229–30
- Cortona VRML Client, 409
- Cramer's V, Rajski, Adjusted Rand Index, 63, 133–4, 287, 337
- createpajek.exe, 391
- critical mass, 211–16, 429
- critical path method, 295
- cross-sectional networks, 111
- cut-vertex, 173, 429
- cycle, 101, 429
- data collection techniques, 27
 - free recall, 27
 - paired comparison, 27
 - ranking, 27
 - roster, 27
 - unrestricted choices, 27
- data objects, 9
- Davis, J. A., 116
- De Nooy, Wouter, 266
- De Solla Price, D., 367, 382
- De Solla Price's model, 367–8, 371
- Degenne, Alain, 167, 193, 348
- degree, 429
 - degree assortativity, 162, 163
 - degree centrality, 429
 - degree centralization, 152, 155, 429
 - degree sequence, 361, 429
 - degrees of network, 75–9
- dendrogram, 324*f*, 324–5, 429. *See also* hierarchical clustering
- density, 429
- descendants, 276
- diffusion
 - adoption rate, 202–3
 - from central and marginal vertex, 202*f*

- diffusion (*cont.*)
 - by contacts, 201*f*
 - contagion, 200–3
 - critical mass, 211–16
 - curve, 201*f*, 200–1
 - exposure, 204–10
 - modern math diffusion data, 197–8
 - overview, 197
 - thresholds, 204–10
- diffusion curve, 430
- dining-table partners data, 4*f*, 4–5, 6, 7–8, 9, 11–12, 15
- directed graph (digraph), 7, 8, 430
- disassortativity, 162
- dissimilarity, 324*t*, 326–7
- distance, 430
 - distance distribution, 157
- divide et impera* (divide-and-rule) strategy, 178
- domain, 231–5, 430
 - input, 232
 - restricted input, 233
- Doreian, Patrick, 115, 116, 265, 307, 348
- Doreian–Mrvar Method, 106, 111–12
- Dutch literary criticism data, 265
- dyad, 245–6, 253, 430
 - asymmetric, 247, 428
 - complete, 246
 - null, 247
 - symmetric, 247, 250*t*
- dyadic constraint, 180–1, 430. *See also* aggregate constraints
- edge, 7, 155, 417, 430
- ego-centered approach, 178, 430
- egocentric density, 182, 183–4, 430
- ego-networks, 177–84
 - defined, 430
 - density of, 182
 - dyadic constraint, 180
 - proportional strength of ties, 180
- eigenvector centrality, 160–2, 430. *See also* centrality
- eigenvector centralization, 161, 430
- Encapsulated PostScript, 405–6, 412–18, 420
- endogamy, 279, 430
- equivalence, 322–31
 - class, 322
 - defined, 430
 - regular, 338–43, 434
 - structural, 323–4, 435
- Erdős, P., 358, 381
- Erdős–Rényi random graph model, 358, 362
- error matrix, 340*f*
- error scores, 105, 111–12, 112*t*
- events, 121, 430
 - size of, 122, 435
- Everett, Martin, 142
- Excel, 138
- exponential random graph models (ERGM), 355
- exposure, 204–10, 430
- Extensible 3D (X3D), 409–10
- External-Internal Index, 132–3, 135, 430
- family of child or orientation (FAMC), 271, 431
- family of spouse or procreation (FAMS), 271, 431
- family trees, 270–8
- family-friendship groupings, 73–5
- Faulkner, Robert R., 142
- Faust, Katherine, 32, 96, 115, 142, 167, 241, 265, 348
- Fennema, Meindert, 142
- Ferligoj, Anuška, 265, 266, 348
- Fernandez, Roberto M., 193
- first-order inflection point, 212
- FishEye* mode, 58–9, 431
- fixed choices, 27
- Flament, Claude, 265, 298–300, 302
- Flux Player, 410
- flying teams data, 115
- forest, 431
- Forsé, Michel, 167, 193, 348
- forward local main path, 294
- fragments, 88–9, 286
- free choices, 27
- free recall method, 27
- Freeman, Linton, 32, 167, 289, 298–300, 302, 307
- Fruchterman–Reingold, 21–2, 138–9
- Galesburg drug study data, 219, 237–8, 240–1
- Garfield, Eugene, 307, 381
- gatekeeper, 185–6, 431. *See also* brokerage role; coordinator role; itinerant broker; liaison
- GDP per capita, 53–4, 55, 56, 57, 61
- Gecko package, 423

Subject Index

449

- GEDCOM (genealogical data format), 271, 273, 274–5, 277, 283–4, 306, 388
- genealogical generation, 272, 431
- genealogy, 269–70
 - family trees, 270–8
 - social research, 278–88
- generalized blockmodeling, 341, 342, 431
- generalized random graph models, 359–60
- generation jump, 273, 288, 431
- geodesic, 153–4, 157f, 156–7, 275–6, 431
- GhostScript, 405
- GhostView, 405
- giant component, 359, 360. *See also* components
- Gilbert, E. N., 382
- Gil-Mendieta, Jorge, 348
- Glance, N., 355–7
- global main path, 431
 - key-route, 295
 - standard, 295, 298–300
- global main path methods, 295
- global view, 431
- Gondola family tree, 270–3, 274f
- Gornik, Miha, 421
- Gould, Roger V., 193
- Granovetter, Mark, 193, 219
- graph, 7, 9–10, 431
 - directed (digraph), 7, 8, 430
 - Ore, 272f, 272, 274–5, 276, 280f, 433
 - parentage (P-graph), 282f, 281–3, 434
 - signed, 100, 101, 102, 428, 429, 435
 - simple, 435
 - undirected, 7, 8, 436
- graph drawing esthetics, 18
- graph theory, 6
- Guillaume, J.-L., 142
- Hage, Per, 115
- Harary, Frank, 115, 116
- head (of an arc), 7
- Heider, Fritz, 99, 101, 116
- hierarchical clustering, 324, 328f, 329f, 431
- hierarchical clusters model, 249, 431
- hierarchy, 89–90, 431
- hi-tech unionization data, 192–3
- Hlebec, Valentina, 266
- Holland, Paul W., 265, 382
- Hollywood composers data, 141
- homophily, 73, 432
- Hughes, Michael, 121, 142
- Hummon, Norman P., 307
- image matrix, 332, 340f, 432
- immediacy index, 291, 432
- impact factor, 291, 432
- incident, 432
- indegree, 227–9, 432
- independence, 76
- induced subnetwork, 46–8, 89, 432
- Inkscape, 406, 408
- innovativeness, 206
- input domain, 231–5
- Instant Player, 410
- Institute for Scientific Information (ISI), 291
- interactive innovation, 213
- interlocking directorates, 120–1, 399–400
- intermarriage, 279
- islands, 130f, 127–32
 - defined, 432
 - landscape of, 138f
 - in three dimensions, 136f
- Isle of Man genealogical data, 306
- isomorphic network, 318, 432
- itinerant broker, 185–6, 187, 432. *See also* brokerage role; gatekeeper; liaison
- Johnsen, Eugene C., 265
- joint stock companies, 120–1
- Jorion, Paul, 306
- JPEG, 26, 404–5
- Kadushin, Charles, 141
- Kalish, Y., 382
- Kamada, T., 33
- Kamada-Kawai, 21, 25, 42, 45, 90–1, 106, 131
- Katz, Elihu, 219, 241
- Katz, L., 382
- Kawai, S., 33
- k-connected component, 432
- k-core, 83, 296, 432
- key-route global main path, 295
- key-route local main path search, 294–5, 300
- key-routes, 432
- Kick, E., 66
- Kincaid, D. Lawrence, 166, 167
- Kinemages, 410–11
- KiNG, 411
- k-Neighbors, 155, 276
- Knoke, David, 241
- Kolaczyk, E. D., 381
- Korea family planning data, 166

- Krackhardt, David, 193
- Kramberger, A., 266
- labels, 415
- landscape, 136*f*, 138*f*, 137–8
- LaTex, 405
- Lefebvre, E., 142
- Leinhardt, Samuel, 265, 382
- Leonard, Olen E., 96, 241
- liaison, 185–6, 187, 432. *See also* brokerage role; coordinator role; gatekeeper; itinerant broker
- Lin, Nan, 193, 241
- line (network), 7, 45. *See also* arc; edge; loop
 - defined, 432
 - labels, 417–18
 - removing, 50
- line multiplicity, 124, 126
- line values, 8, 126
 - similarities, 182–3
- line-network, 152*f*, 151–2
- Liu, J. S., 307
- local clustering coefficient, 361. *See also* clustering coefficients
- local main path methods, 295, 300, 432
- local view, 432
- longitudinal networks, 109–11
- Loomis, Charles P., 96, 241
- loop, 7, 432
- Louvain method, 132, 133
- Lu, L. Y. Y., 307
- Luce, R. D., 96
- Lusher, D., 382
- macros, 208, 288
- Mage, 410–11
- Mahnken, Irmgard, 306
- main path, 294
 - analysis, 292–3
 - backward local, 294, 300
 - component, 296, 303*f*, 433
 - defined, 432
 - forward local, 294
 - global, 295
 - key-route local, 294–5
 - local, 295
 - as multirelational network, 301
- manipulation, in social network analysis, 12–15
- manual drawing, 22–5
- marriages, 269–70
 - blood, 280
- family trees and, 270–8
- intermarriage, 279
- multiple, 283
- nonblood relinking, 280
- polygamy, 283
- remarriages, 276, 280–1, 283
- structural relinking and, 280–1
- Massey, J. G., 167
- matriilineal lines, 286
- matrix, 316–21, 433
 - adjacency, 317, 427*t*
 - affiliation, 427*t*
 - cell, 428
 - column, 316
 - error, 340*f*
 - image, 332, 340*f*, 432
 - row, 316
- matrix format, 388, 393–4
- matrix multiplication, 277
- M-clusters model, 249
- MDL file, 342–3
- MDL MOL, 410–11
- Menzel, Herbert, 219, 241
- Mexican political elite data, 347
- Michael, Judd H., 167, 193
- Microsoft Access, 395, 398
- Microsoft Word, 398, 405
- Milgram, Stanley, 32
- missing values, 376
- modern math diffusion data, 197–8
 - adopters, 211–12
 - adoption rate and acceleration, 211–12
 - early adopters, 204
 - exposure of vertices, 204–5
 - threshold, 206
- modularity, 132, 433
- Monte Carlo simulation, 373–7
- Morales, Julio O., 96, 241
- Moreno, J. L., 3, 32, 115
- Mrvar, A., 115, 116
- multiple lines, 7–8, 372, 433
- multiple relations network, 9, 433
- multiplex network, 433
- multiplicity, 433
- neighbor, 433
- nested subnetwork, 433
- network, 6–8, 45
 - active, 11
 - acyclic, 253–5, 284, 289
 - centrality, 289–90
 - combining, 60
 - complete, 429

Subject Index

451

- creating, 28
- cross-sectional, 111
- defined, 433
- degree centralization of, 152
- degree sequence of, 361
- diameter of, 361
- editing, 28–9
- extracting, 46–7
- extracting subnetwork from, 46–7
- extracting vector values from, 59
- line-network, 151–2
- longitudinal, 109–11
- manipulation of, 12–15
- motifs, 375, 433
- multiple relations, 9, 433
- multiplex, 433
- one-mode, 121–7, 433
- optimal layout of, 18
- parts of, 8
- reduction of, 45–53
 - contextual view, 51–3
 - global view, 48–51
 - local view, 46–8
- relations, 8
- shrinking, 48, 255, 435
- star-network, 151, 152*f*, 154
- strongly connected, 80–1
- symmetrizing, 77–8, 436
- transposed, 436
- two-mode, 121–7, 436
- unconnected directed, 79*f*
- valued, 124, 436
- weakly connected, 80–1
- network data formats, 387–9
- network format, 388
- network growth models, 366
- Newman, M. E., 167, 381, 382
- NoClip* export, 405
- nonblood relinking, 280, 433. *See also* blood marriages; structural, relinking
- Norman, Robert Z., 116
- NotePad++, 392
- null block, 332, 339–40
- null dyads, 247, 433
- one-mode networks, 121–7, 433
- optimization technique, 105, 433
- Ore graph, 272*f*, 272, 274–5, 276, 280*f*, 433
- outdegree, 433
- paired comparison, 27
- Pajek
 - automatic drawing methods, 22
 - blockmodeling commands in, 335–8
 - coordinate system of, 136*f*
 - creating network files for, 389–400
 - helper software, 391
 - within Pajek, 389–91
 - relational database, 394–400
 - word processor, 392–4
 - data objects, 9
 - dialog box, 14*f*
 - Draw screen, 18–20, 25, 54–5, 136–9, 425–6
 - export formats, 404–11
 - bitmap, 404–5
 - Encapsulated PostScript, 405–6
 - Extensible 3D (X3D), 409–10
 - JPEG, 404–5
 - Kinemages, 410–11
 - MDL MOL, 410–11
 - Scalable Vector Graphics, 406–8
 - VOSviewer, 408–9
 - VRML, 409–10
 - installing, 387
 - limitations of, 400
 - Mac OS X, installing on, 421–3
 - Main screen, 11–12, 424
 - menu structure in, 13*f*
 - names of colors in, 413*t*
 - network data formats, 387–9
 - Options screen, 411*f*
 - project file, 39–41
 - Report screen, 16–17, 77
 - scrollbar, 137
 - shortcut key combinations, 424–6
 - updates of, 402–3
- Pajek3XL, 387, 400–2
- PajekToSvgAnim.exe, 407–8
- PajekXXL, 387, 400–2
- parentage graph (P-graph), 282*f*, 281–3, 434
- partial order, 258, 433
- participation rate, 434
- partitions, 38–45, 90–1, 286–7
 - affiliation, 127
 - binarized, 287–8
 - creating, 44
 - cross-tabulation of, 61–3
 - defined, 433
 - definition of, 38
 - dimensions of, 430
 - editing, 39

- partitions (*cont.*)
 - exporting, 398–9
 - optimizing, 335
 - order of class numbers in, 39
 - removing, 376–7
 - saving, 39
 - as storage of discrete characteristics of vertices, 38
 - translating vectors into, 56
- path, 80, 153, 434
- patrilineal genealogy, 270–8
- patrilineal lines, 286
- Pattison, P., 382
- Pearson’s correlation coefficient, 230
- pedigree, 276, 434
- permutation, 316–21, 434
- Perry, A., 96
- Personal Ancestral File, 306
- Pfeffer, Jürgen, 391
- Ph.D. students in computer science data, 306
- Pich, Ch., 33
- Pivot MDS, 22
- Poisson distribution, 359
- polarization, 112
- polygamy, 280, 283
- popularity of vertex, 227–9, 434
- position, 434
- PostScript format, 320–1, 327, 405
- POVRay, 409–10
- Powell, J.H., 382
- power-law distributions, 367
- preferential attachment models, 366–72
- preprint transformation, 434
- preprints, 303
- prestige
 - correlation, 229–31
 - domains, 231–5
 - overview, 225–6
 - proximity, 235–8
 - social, 225
- prevalence, 434
- probability distribution, 354–5, 359–60
- proportional strength, 180, 434
- proximity prestige, 235–8, 434
- Qiew, 409
- R (software), 137–8, 370
- radius, 418
- Ragusan nobility data, 269–70, 279, 283
- random graph models
- Bernoulli, 358–60, 362
- classic uniform models, 358–62
- Erdős-Rényi, 358
- Monte Carlo simulation, 373–7
- overview, 353–5
- Poisson, 359
- preferential attachment models, 366–72
- small-world models, 362–6
- ranked clusters, 248–9, 434
- ranked structure (blockmodel), 340–1
- ranking, 27
 - acyclic networks, 253–5
 - overview, 244–5
 - triadic analysis, 245–53
- ray-tracing, 409–10
- reachable, 434
- Read, K., 115
- receiver (head of arc), 7
- regular block, 339–40, 434
- regular equivalence, 338–43, 434
- relational database, 394–400
- relaxed balanced, 106
- relinking index, 282, 284–5, 434
- relocation techniques, 20–1
- remarriages, 276, 280–1, 283
- Rényi, A., 358, 381
- representative role, 434
- resolution parameter, 133
- restricted domain, 435
- restricted input domain, 233
- rewiring, 364, 372, 373–5
- Riordan, O., 382
- Roberts, F. S., 116
- Robins, G., 382
- Rogers, Everett M., 167, 219
- rotation, 137
- row (matrix), 316
- Sabidussi, G., 167, 298–300
- Sampson, Samuel F., 103, 115
- Sampson monastery data, 103
 - clusters, 103–9
 - structural balance, 103–9
- San Juan Sur data, 96, 226–7, 237
- sawmill communication data, 150–1, 155, 157, 159, 272
- Scalable Vector Graphics (SVG), 406–8, 412–19
- Schijf, Huibert, 142
- Schmidt, Samuel, 348
- Schweitzer, Thomas, 306
- Scientometrics data, 381

Subject Index

453

- Scott, John, 32, 96, 121, 142, 167, 220, 348
 Scottish capital data, 120–1
 islands in network of Scottish firms, 130*f*
 one-mode networks, 121–7
 two-mode networks, 121–7
 Search Path Count, 296
 Search Path Link Count, 296
 Search Path Node Pair, 296
 secondary structural hole, 184–5, 187–8, 435
 second-order inflection of S-curve, 211
 Seidman, S. B., 96
 semicycle, 101, 435
 semipath, 80, 435
 semiwalk, 79–80, 435
 sender (tail of arc), 7
 shortcut key combinations, 424–6
 sibling, 273
 sibling group, 276, 279
 signed graph, 100, 435
 balanced, 101, 428
 clusterability, 102
 clusterable, 429
 signed network, 106
 Simmel, Georg, 119, 141, 178, 193
 simple graph, 435
 sink vertex, 293, 435
 Small World problem, 6
 small-world models, 362–6, 373–5
 Smith, David H. A., 66
 Sneath, Peter, 348
 Snijders, T.A.B., 382
 Snyder, D., 66
 sociability, 147
 social atom, 3
 social capital, 147, 151, 435
 social circles, 119
 social generation, 273, 435
 social network analysis, 5–17, 30
 assembling a social network, 27–30
 estimation techniques in, 6
 main goal of, 5
 manipulation, 12–15
 network definition, 6–8
 statistics and, 61–3
 visualization, 17–27
 automatic drawing, 20–2
 manual drawing, 22–5
 saving a drawing, 25–7
 social prestige, 225
 society, 3
 sociocentered perspective, 149, 435
 sociogram, 4*f*, 3–5
 sociometric choice, 4
 sociometry, 3–5
 Sokal, Robert R., 348
 source vertex, 293, 435
 Spearman's rank correlation, 229–30
 Spencer, J., 382
 spring embedders, 20
 standard global main path, 295, 298–300
 star-network, 151, 152*f*, 154
 betweenness centrality, 159
 defined, 435
 statistical network model, 355, 435
 statistics, 61–3
 Steglich, C. E. G., 382
 strength-of-weak-ties hypothesis, 176
 strike network data, 171–2, 174–5, 186–7
 binary matrix, 320*f*
 communication lines, 316*f*
 coordinator roles in, 188*t*
 matrix, 318*f*
 Strogatz, S.H., 382
 strong component, 435
 strongly connected, 435
 structural balance, 101
 detecting, 103–9
 structural equivalence, 323–4, 435
 structural hole, 178, 182, 436
 secondary, 184–5, 187–8
 structural prestige, 225
 structural property, 39, 436
 structural relinking, 279, 280–1, 282*f*, 436.
 See also blood marriages; nonblood
 relinking
 student government data, 245
 error matrix, 340*f*
 image matrix, 340*f*
 matrix, 339*f*
 subnetwork
 complete, 86–91
 extracting, 431
 induced, 46, 89, 302, 325–6, 335
 nested, 433
 subtree, 329–30
 SVG file, 131–2
 symbiosis, 163
 symbols, 415–16
 symmetric clusters, 256–61
 symmetric dyads, 247, 250*t*
 symmetric-acyclic decomposition, 256–61,
 436

- tab delimited file, 138
- tertus gaudens* strategy, 178, 182
- Textpad, 392
- threshold, 204–10, 436
- threshold category, 436
- threshold lag, 214, 215–16, 436
- ties
 - asymmetric, 245, 258, 260
 - strong, 175, 325–6
 - weak, 170, 175
- transaction networks, 185–6
- transitive triad, 436
- transitivity model, 249, 436
- transposed network, 436
- traversal weight, 293*f*, 293–4, 297*t*, 436
- tree, 282, 436
- Trezzini, Bruno, 66
- triad, 178*f*, 178, 245–53, 436
- triad census, 251*t*, 252*t*, 250–2, 436
- Tusnady, G., 382
- two-mode networks, 121–7, 394, 399–400, 436
- txt2Pajek3.exe, 391
- txt2Pajek.exe, 391
- UCINET DL files, 389
- undirected graph, 7, 8, 436
- Unicode symbols, 415–16
- Unicode UTF-8 with BOM format, 392
- Valente, Tom W., 220
- valued network, 124, 436
- Van de Bunt, G.G., 382
- vector graphics, 26–7
- vectors, 53–60
 - defined, 437
 - drawing, 57–8
 - exporting, 398–9
 - removing, 376–7
 - shrinking, 59
 - size of vertices and, 57
 - translation into partitions, 56
- velocity, 418
- vertex/vertices, 7, 9, 10
 - adjacent, 76
 - attributes of, 39
 - average degree of, 76
 - class numbers, 43–5, 156
 - closeness centrality of, 154
 - colors, 42–3, 156, 156*f*
 - coordinates, 59–60
 - cut-vertex, 173
 - defined, 437
 - degree centrality of, 152–5, 167
 - degree of, 76
 - deleting, 173, 429
 - discrete characteristics of, 38
 - distance between, 153–4
 - distribution of distances between, 157
 - exposure of, 204
 - geodesics between, 157*f*, 156–7
 - indegree of, 76
 - input domain, 232
 - labels, 58, 415
 - labels, editing, 390
 - layout of, 412*f*
 - movement of, 23
 - outdegree of, 76
 - popularity or indegree of, 227–9
 - proximity prestige of, 236
 - shapes of, 412–14, 415
 - sink, 293, 435
 - source, 293, 435
 - symbols, 44
 - threshold of, 208–9
 - traversal weight, 293–4
 - uniting, 60
- Virtual Reality Modeling Language (VRML), 409–10
- visiting ties, 73–5
- visualization, 17–27
 - automatic drawing, 22–5
 - manual drawing, 22–5
 - saving a drawing, 25–7
- VOS Clustering, 132, 133
- VOS Mapping, 22
- VOSviewer, 408–9
- vrml2pov.exe, 410
- walk, 79–80, 437
- Wallerstein, Immanuel, 36, 66
- Wasserman, Stanley, 32, 96, 115, 142, 167, 220, 241, 265, 348, 382
- Watts, D. W., 382
- Watts–Strogatz clustering coefficient, 361, 364. *See also* clustering coefficients
- weakly connected network, 437
- Web of Science, 291
- White, Douglas R., 306
- White, Harrison C., 348
- Wolff, Kurt H., 141
- word processor, 392–4
- WordPad, 392
- world system, 36–8

Subject Index

455

- in South America, 48/*f*
- world trade of manufactures of metal, 39
- world trade data, 39–41, 325–6, 328/*f*, 335, 337–8, 395
- WYSIWYG export, 405
- X3D models, 138–9, 409–10
- XQuartz, 421
- z*-axis, 135
- Zeleny, Leslie D., 115