

Index

- Aaron, 86, 87
Abelson, R. P., 223
Aeschylus, 226
Aikin, Jim, 311, 339
Alberti bass, 45, 54, 144, 147, 173
Alice (ALgorithmically Integrated Composing Environment), 343–344
Ames, Charles, 11. *See also* Cybernetic Composer
Analysis, xi, 96, 98, 127, 129, 141, 147–151, 155, 177, 271, 279, 289, 312, 335, 338, 341, 342, 447
artificial intelligence and, 323
continuity and, 107
harmony and, 128
Schenker and, 250
SPEAC and, 130–136, 144, 343
structure and, 127–128, 164
texture and, 128
Antecedent, 46, 131, 133, 201. *See also* SPEAC
Aristotle, 226
Armstrong, Louis, 11
Ars combinatoria, 11, 196, 197, 205, 218
Artificial composition, 195, 206–208
Artificial creation, 201
Artificial creativity, 288, 318, 323–330, 335
Artificial evolution, 286
Artificial intelligence (AI), viii, 33, 36, 107, 109, 280, 323–330
Association nets, 323, 325–327, 329, 344

Babbitt, Milton, 280
Bach, C. P. E., 5
Bach, J. S., viii, 3, 11, 37, 43, 51–52, 53, 54–55, 57–59, 69, 81, 86, 185, 212, 221–235, 237–262, 283, 290, 291, 298, 300, 313, 315, 319, 320, 339, 340, 443
B minor Mass, 254
cantatas, 434
chorales, 13, 21, 55, 93–106, 108, 131, 136, 151
fugues, 108, 129, 228, 430
inventions, 67, 200, 201, 208, 227, 228, 237–262, 273, 275–276, 297, 315, 316–317, 395–396, 504
Orgelbüchlein, 229, 232
Passacaglia BSV 582, 222–223
St. John Passion, 58
St. Matthew Passion, 58, 224, 225, 229, 232, 284
Sinfonia BWV 787, 227, 228
Well-Tempered Clavier, 45–46, 68, 224, 238, 254, 469–470
Baker, Nicholson, 289
Backpropagation, 11, 325
BackTalk, 325–326, 329
Bartók, Béla, viii, 312, 337, 550
Basso continuo, 3, 434

Beethoven, Ludwig van, viii, 41, 222, 295, 313, 320, 337, 338, 467–471, 491
Berggren, Ulf, 11, 206, 207
Berlin, Irving, 60
Berlioz, Hector, 331
Bernstein, Leonard, 61, 62–63
Bharucha, Jamsheed, 272–273
Blues, 8, 9, 10, 212, 214
Boethius, 188, 189
Brahms, Johannes, 38, 41, 295, 312, 337, 470, 512
Brenner, Charles, 70
Bruckner, Anton, 516
Bruner, Jerome, 344, 345
Buxtehude, Dietrich, 223, 230

Cage, John, 88, 294, 301
Callegari, Antonio, 5
Canon, 129, 224, 229
Carroll, Lewis, 319–320
Character, 105, 107–108, 112, 114, 147, 151, 154, 155, 156, 157, 166, 171
databases and, 144
Chess, 34–36, 66, 344–345. *See also* Deep Blue; Kasparov, Garry
Chopin, Frédéric, viii, 3, 13, 37, 53–54, 58, 66, 69, 76, 80, 84, 88, 232, 294, 298, 299, 301, 302, 304–305, 340
ballades, 59, 294–295
études, 42, 232, 233
mazurkas, 13, 21, 38, 67, 190, 112, 113, 295, 297, 299, 300, 335–337, 495, 500
nocturnes, 45, 53, 504–505, 512
waltzes, 66
CHORAL, 212. *See also* Ebcioglu, Kemal
Clarification, 147–150, 153, 154, 160
Codex Seraphinianus, 303
Cognitivism, 195
Cohen, Harold, 86, 87
Collision detection, 283, 287
Computer composing programs
Alice, 343–344
CHORAL, 212
Counterpoint Solver, 11
Cybernetic Composer, 11
Flavors Band, 11
Improvisor, 11
Push Button Bach, 11
SARA, 183
Consequent, 46, 131, 133. *See also* SPEAC
Continuous flow, 270
Controllers, 48, 84, 111–112, 177, 178, 179, 310
Copernicus, Nicholas, 188
Cope, Mary Jane, 51, 73, 297
Correspondent, 266

- Counterpoint Solver, 11. *See also* Schottstaedt, William
- Crumb, George, 311
- Cybernetic Composer, 11. *See also* Ames, Charles
- Darwin, Charles, 270, 285, 344
- Database, vii, viii, xi, 49, 70, 86, 89, 92, 93–96, 98, 102, 105, 109, 114, 123–126, 127, 129, 136, 137, 141–148, 150, 151, 153, 155, 162, 172, 175, 183, 297, 299, 300, 302, 303, 310, 311, 312, 314–316, 319, 324, 330, 332, 334, 340, 341, 391
- Alice and, 343–344
- first themes and, 156–160
- the interface and, 177, 178, 181
- Sorcerer and, 342
- De Kooning, Willem, 65
- Deep Blue, 34–36, 40, 344–345. *See also* Chess; Kasparov, Garry
- De institutione musica*, 188
- Degree of realized expectation (DRE), 267, 269, 273, 275, 278, 281
- Destination, 94, 96, 98, 105, 108, 112, 134, 151, 154–156, 157, 158, 160, 162, 164, 169, 172, 173
- DeVries, Peter, 289
- Dies Irae*, 331
- Dobrian, Christopher, 86
- Earmarks, 33, 112, 114–122, 127, 137, 143, 151, 162, 318, 332, 342
- Ebcioğlu, Kemal, 11, 212. *See also* CHORAL
- ECHO, 287. *See also* Holland, John
- Edelman, Gerald, 270
- Edison, Thomas, 188
- Emotivism*, 195
- Eumerdification*, 291
- Euler, Leonhard, 233
- Event, 141–143, 150, 153, 154, 177
- Evolutionary simulations
- ECHO, 287
- Evolved Virtual Creatures, 286–288, 318
- Evolved Virtual Creatures, 286–288, 318
- Experiments in Musical Intelligence (Emmy), viiix, 37–38, 39, 41, 43–44, 53, 59, 64, 73, 75, 76, 80, 83–84, 86, 88, 90, 139, 185–186, 187, 206, 208, 210–211, 216, 219, 283, 288, 307, 309, 311, 318–320, 322, 341–345
- accompanying CD and, xi
- algorithmically induced grammars and 57
- analysis and, 151
- artificial intelligence and, 323–331
- Bach and, 221–235, 285
- Bach inventions and, 237–262, 316–317
- clarifying data and, 147–150
- combinatorics and, 196, 218
- computational modeling and, 263–281
- consciousness and 195
- counterpoint and, 226–228, 315
- creation of, 93
- different versions of, 92
- earmarks and, 112–122
- emotion and, 85, 313
- genetics and, 200, 286
- gramelot and, 290
- implications of, 33
- intention and, 334–341
- interface of, 177–183
- keys and, 204–205
- music cognition and, 331–334
- music of, 355–357
- object orientation and, 154–155
- patterns and, 109–125, 153
- performance and, 212–215
- processes and output of, 141–146
- recombination and, 1, 89, 156–175
- semantic meshing and, 46–48
- signatures and, 48–49, 109–112, 201
- simulations and, 310
- soul and, 91
- SPEAC and, 129–137
- structural logic and, 97–102, 127–137, 199
- style identification and, 13–32, 52, 66–69, 215, 312
- syntactic meshing and, 45–46
- templagiarism and, 49–51
- texture and, 105–108
- transposition and, 95–96
- unifications and, 122–125
- variations and, 102–105
- World Anthem and, 314
- Extension, 46, 131, 133. *See also* SPEAC
- Figured bass, 3–4, 6, 8, 227, 230
- Fischer, Bobby, 34, 35
- Flavors Band, 11. *See also* Fry, Christopher
- Fo, Dario, 290
- Foucault, Michel, 291
- Freud, Sigmund, 344
- Fry, Christopher, 11. *See also* Flavors Band
- Fugue, 49, 68, 128, 129, 216, 218, 224, 226, 227, 228, 238, 243, 244, 309, 316, 430
- Fux, Johann Joseph, 11, 227, 230, 316
- Gamow, George, 221, 235
- Gershwin, George, 62–63, 300
- Go, 36
- Gregorian chant, 315
- Handel, George Frederick, 73, 337
- Hart, Lorenz, 43

- Haydn, Franz Joseph, 5, 6, 7, 267, 268
Hearst, Eliot, 34, 35
Hegel, Georg Wilhelm Friedrich, 72–73, 76, 87, 192–193, 194, 205, 208, 216, 291, 312–313
Heidegger, Martin, 291
Hemiola, 267, 512
Hendrix, Jimi, 232
Henrici, 224. *See also* Picander
Hermeneutics, 342
Heyden, Sebaldus, 229
Hidden units, 325
Hierarchy, 46–48, 128, 130, 133, 158, 159, 229, 230, 249, 278, 279, 323, 343, 396
Hiller, Lejaren, 9, 341
Hillis, Danny, 285
Hodgson, Paul, 11. *See also* Improvisor
Holland, John, 287. *See also* ECHO
Hörnle, Dominik, 11
Hucbald, 263, 264, 270, 281
Hypaton, 188
Hypermeter, 258
- Illiac Suite*, 9
Improvisor, 11. *See also* Hodgson, Paul
Incipient, 150, 156
Isaacson, Leonard, 9
- Jackson, Michael, 302
Joplin, Scott, viii, 60, 208, 210, 312, 543–544
- Kasparov, Garry, 35, 40, 344–345. *See also* Chess;
Deep Blue
Kepler, Johannes, 191
Kirnberger, Johann Philipp, 5, 197, 199
Kivy, Peter, 187, 195, 216, 218
Koch, Heinrich Christoph, 192, 199
- Lanier, Jaron, 334–339
Latent ambiguity, 267
Latent surprise, 267, 272
Leibnitz, Gottfried Wilhelm, 196, 197, 199
Lehrer, Tom, 59–61
Lerner, Alan Jay, 61
Lester, Joel, 278
Lewis, George, 86
Lexicon, 94, 150, 151, 154, 155, 156
Liadov, Anatol, 341
Ligeti, György, 229
LISP, vii, 39, 151, 177, 185, 234
Loewe, Frederick, 61
Luther, Martin, 81, 234
- Madonna, 302
Mahler, Alma, 516
- Mahler, Gustav, 53, 75, 86, 320, 470, 516–517, 543
Mandelbrot, Benoit, 221, 223
Mann, Thomas, 516
Markov chains, 9
MATN, 105
Mazlish, Bruce, 344
Menzel, Wolfram, 11
Meson, 188
Meyer, Leonard, 194, 279, 337
MIDI, 141, 143, 145, 177, 183, 206, 391
channel number and, 142
duration and, 142
dynamic and, 142–143
files and, 181
interface and, 177
ontime and, 141
performance and, 182
pitch and, 142
Miller, Glenn, 314
Modulatio, 263, 264
Morehen, John, 204
Moser, David, 56
Mozart, W. A., vii, viii, 5, 11, 38, 44, 54, 76, 108, 109, 111, 112, 114, 121, 122, 143, 144, 147–175, 200, 208, 223, 232, 289, 295, 297, 311–313, 320, 332, 337, 342, 355–377, 443, 447, 468, 544
earmarks and, 114, 115–121, 122
Musikalisches Würfelspiel, 44
piano concertos, 113–114, 300
piano sonatas, 143, 145, 146, 147–175, 206, 355–377, 443, 444, 445–446, 447
signatures and, 109, 110, 11
SPEAC and, 135–136
symphonies, 122
unifications and, 124, 125
Multicomposer database, 469
Musica instrumentalis, 263
Musica mundana, 263
Musikalisches Würfelspiel, vii, 4–6, 7, 44
- Nagel, Thomas, 289
Neural networks, 11, 270, 271, 272, 273, 280, 281, 323, 325
Natural language processing (NLP), 107
Networks. *See also* Backpropagation; Hidden units
association nets, 323, 325–327, 329, 344
neural networks, 11, 270, 271, 272, 273, 280, 281, 323, 325
N-gram frequency, 72, 75, 87, 312
- Object-oriented programming (OOP), 93–94, 148, 154–155, 156

- Ornamentation, 13, 21, 112, 144–145, 160, 191, 212, 263
 Orwell, George, 63, 64
- Pachelbel, Wilhelm Hieronymus, 223, 230
 Painting programs: Aaron, 86, 87
 Parker, Charlie, 11
 Pärt, Arvo, 229
 Patterns in music
 earmarks, 33, 112, 114–122, 127, 137, 143, 151, 162, 318, 332, 342
 signatures, 48–49, 50, 51, 61, 83–84, 109–112, 113, 114, 122, 127, 137, 143, 151, 153, 154, 156, 159, 162, 169–171, 172, 173, 174, 175, 178, 179, 200–201, 303
 unifications, 83, 122–125, 127, 129, 137, 151, 156, 329, 342
 Pattern matching, xi, 84, 109–125, 127, 141, 144, 147, 148, 153, 159, 162, 173, 177, 323, 324, 329, 332, 344, 179. *See also* Earmarks; Signatures; Unifications
 Peirce, Charles 331, 332
 Peitgen, Hans Otto, 235
 Picander, 224. *See also* Henrici
 Picasso, Pablo, 82, 92, 285
 Pierson, Kala, 66–67, 81
 Plato, 191, 193
 Poincaré, Henri, 289
 Porter, Cole, 43
 Preparation, 46, 131, 175. *See also* SPEAC
 Presley, Elvis, 302
 Prokofiev, Sergei, viii, 49–50, 74–75, 76, 128–129, 130, 208, 300, 337, 544, 553
Proslabanomenos, 188
 Push Button Bach, 11. *See also* Yavelow, Christopher
 Pushkin, Alexander, 300–301
- Ricci, Pasquale, 5
 Rachmaninoff, Sergei, viii, 183, 208, 331, 333, 527, 543
 Ratner, Leonard, 197
 Recombinancy, xi, 1, 4, 8, 41, 44, 83, 86, 89, 93–96, 98, 102, 121, 129, 141, 147, 158, 171, 173, 183, 206, 309, 332, 341, 344, 395–396, 430, 443, 467–468, 527, 544
 clarification and, 147, 150
 DNA and, 71
 language and, 70–71, 199
 Musikalisches Würfelspiel and, 6
 pattern matching and, 153, 200
 signatures and, 109, 200
 SPEAC and, 129–137, 148
 transformational, 105, 317, 341
- Réti, Rudolph, 309
 Reybrouck, M., 270
 Richter, Peter, 235
 Riepel, Josef, 5
 Rimsky-Korsakov, Nikolai, 341
 Rochberg, George, 342
 Rowell, Lewis, 57–58, 293–295
- Salinger, J. D., 299
 Salzer, Felix, 235
 SARA (Simple Analytic Recombinant Algorithm), 183
 Scarlatti, Domenico, viii, 312, 391, 395, 443
 Schachter, Carl, 235
 Schenker, Heinrich, 131, 200, 230, 235, 250
 Schickele, Peter, 230
 Schoenberg, Arnold, 270, 337, 516
 Schottstaedt, William, 11. *See also* Counterpoint Solver
 Schubert, Franz, viii, 86, 290, 337, 491, 494
 Schweitzer, Albert, 225
 Scope of expectations, 265
 Searle, John, 36, 291
 Segal, Erich, 301
 Serafini, Luigi, 303, 304
 Serialism, 309
 Shakespeare, William, 71, 226, 235, 290, 316, 321, 335
 Shanks, Daniel, 36
 Signatures, 48–49, 50, 51, 61, 83–84, 109–112, 113, 114, 122, 127, 137, 143, 151, 153, 154, 156, 159, 162, 169–171, 172, 173, 174, 175, 178, 179, 200–201, 303
 earmarks and, 112, 114
 performance and, xi
 unifications and, 122, 124–125
 windows and, 178
 Sims, Karl, 286–288, 318
 Singularly projective, 265–266
 Sonata allegro, 200, 206, 208, 443
 Sorcerer, 341–342
 SPEAC, 46–48, 51, 83, 129–137, 144, 148, 151, 157, 226, 303, 304, 310, 318, 329, 331, 343, 344, 544. *See also* Antecedent; Consequent; Extension; Preparation; Statement
 Spitta, Phillip, 224
 Stadler, Maximilian, 5
 Stanislavsky, Constantin, 226
 Statement, 46, 131, 133. *See also* SPEAC
 Stevens, Catherine, 271
 Stochastic, 9, 70
 Strauss, Johann, 271
 Strauss, Richard, 516
 Stravinsky, Igor, 92, 310, 337, 341

- Stretto, 234, 430
Strindberg, Johan August, 226
Susann, Jacqueline, 301
Swift, Jonathan, 196, 197, 198, 199
Synemmenon, 188
- Tchaikovsky, Peter, 321
Templagiarism, 49–50, 83, 129, 291, 329
Terraced dynamics, 222, 391
Texture, 45–48, 105–108, 127, 128, 129, 144, 146,
150, 151, 164, 194, 214, 222–223, 227, 229, 231,
260, 391, 434, 443, 471, 550
Tolstoy, Fyodor, 301
Transformational recombinacy, 33, 105, 106, 112,
142, 156, 172, 183, 309, 317, 341, 512, 527
Turing, Alan, 84–85, 222, 319
Turner, Scott, 331
- Ulam, Stanislaw, 80–81
Unifications, 83, 122–125, 127, 129, 137, 151, 156,
329, 342
- Valéry, Paul, 283
von Bülow, Hans, 516
- Wagner, Richard, 225, 231, 232
Waller, Fats, 42
Walter, Bruno, 516
Webern, Anton von, 516
Williams, Peter, 229
Williams, Tennessee, 316
Whorf, Benjamin, 323–324
Wright, Frank Lloyd, 295
- Xenakis, Iannis, 9, 11, 341
- Yavelow, Christopher, 11, 12. *See also* Push Button
Bach
- Zarlino, Gioseffo, 188, 190