

Index

- A-A design, 91
- A-B-A design, 91, 149
- absolute nothingness, 375
- abstraction, 364
- acausality, 365, 369
- Allais paradox, 153
- amplitude, 23, 64, 182, 346
- amplitude amplification, 280
- annihilation operator, 241
- anticommutator, 216
- averaging model, 138
- awareness
 - conventional, 376
 - enlightened, 377, 379
 - of, 380, 381
 - that, 381
 - universal, 376
- axioms of rational decision theory, 153
- balance heuristic, 354
- basho*, 378
 - absolute nothingness, 379
 - being, 381
 - relative nothingness, 380
- basho* of being
 - awareness that, 382
 - relation with cognitive representation, 381
- basho* of relative nothingness
 - awareness of, 382
- basis, 34, 35, 40, 60
- basis vectors, 34, 249
- Bayes factor, 160, 196
- Bayesian cognition, 247
- Bayesian information criterion (BIC), 168
- Bayesian model comparison, 159, 196
- Bayesian network, 345, 396
- Bayesian probability, 10
- Bayesian sampler, 139
- belief modal operator, 326, 397
- beliefs, 297, 298, 323, 397
 - grammatical parsing, 326
 - incompatibility of, 327
 - nonseparable cognitive state, 327
- Bell inequality, 69, 201, 389
- Bell state, 69, 320
 - nonseparability, 320
- Bell–CHSH inequalities, 287, 299, 303, 308, 325, 328
- bistability, 357
- bistable model, 357
 - causality, 359, 360
 - Linda problem, 358
- bistable perception, 235
- bistable probability, 357
- bit, 249
- Boolean algebra, 12
- borderline contradictions, 143
- Born rule, 28
- bra [notation], 61

- C-not gate, 254
- canonical anticommutator (CAR), 241
- categorization decision task, 117, 162
- category membership, 141
- Cauchy–Schwartz inequality, 77
- causal constraint, 288
- causal Markov condition, 345, 360, 369
- causal relations, 345
- causality, 308, 309
- chi-square test, 231
- classical reasoning, 143
- Clauser–Horn–Shimony–Holt (CHSH) inequality, 7
- cognitive architecture, 17
- cognitive realism, 297, 298, 308, 309
- cognitivist hypothesis, 378
- coherent state, 213
- collapse, 4, 18, 32, 198
- column matrix, 61, 64
- commutative, 24, 106, 132, 142
- commutator, 215
- compatible, 6, 24, 30
- complementarity, 5
- complementary memory model (QCM), 171
- completeness, 31, 66
- complex conjugate, 44, 188
- complex number, 43
- computational mind, 383
- conditions of possible experience, 295, 298, 303, 304, 360
 - application of, 308
 - failure of, 300
 - polytope, 299
- conjunction error, 99, 130
- conjunction fallacy, 358
- conjunction of concepts, 141
- connectionist network, 255
- consciousness, 391
- context by default, 24
- context sensitivity, 295, 309
- contextuality, 6, 7, 205, 285, 294, 308, 309, 325, 326, 367, 368, 388
 - ambiguous phrases, 327, 328
 - cognitive implications, 294
 - corpus-based, 328, 329
 - cyclic systems of random variables, 290
 - definition of, 295
 - experimental conditions for, 304
 - lexical semantics, 330
 - relation with causality, 308, 309
 - relation with entanglement, 289
 - relation with indeterminacy, 309
- contextuality by default, 290, 325, 328, 329
- contexts, 290
- equation, 293
- implications for modelling, 294
- random variables, 290
- relation with no-disturbance, 293
- contextuality principle, 323
 - contextuality by direct influence, 324
 - noncontextuality, 324
 - proper contextuality, 325
- control qubit, 254
- controlled-U gate, 17, 86, 248, 264
- coordinate, 64
- coordinate representation, 60
- corner inequality, 124
- creation operator, 241
- cross product, 251
- cyclic system, 329
- decohere, 390
- decoherence, 213
- density matrix, 81, 145, 214
- dependent joint distribution, 69
- determinacy, 365, 367, 368, 397
 - definition of, 365
 - law of the excluded middle, 374
- diagonal matrix, 28
- diffusion rate, 186
- dimension, 49, 61
- direct influence, 293, 295, 325, 328, 329
- direct sum, 143
- directed acyclic graph, 345
- disjunction effect, 110, 154
- disjunction error, 104, 130, 133
- disjunction of concepts, 141

- distance axiom of symmetry, 122
- dot motion task, 194
- double conjunction error, 132, 136
- double stochasticity, 183
- dual-process models, 356
- Dutch book, 13, 130
- eigenvalue, 46, 211
- eigenvector, 46, 211
- Einstein–Podolsky–Rosen (EPR)
 - experiment, 286, 288, 289, 325, 327, 328
- Ellsberg paradox, 153
- emerging concept, 142
- enactive cognition, 379
 - phase 1, 381
 - phase 2, 380
- entangled, 8, 25, 144, 158, 250
- entanglement, 69, 287, 288, 387
 - amount of, 320
 - factorizability, 320
 - interpreting text, 320
 - lexical category, 321
- episodic memory, 170
- epistemic, 3, 180, 213
- epistemology, 397
- epsilon-greedy rule, 279
- equilibrium, 201, 212, 244, 390
- exemplar model, 167
- expected utility theory, 153
- experience, 295
- exploration/exploitation properties, 279
- exponential distribution, 228, 239
- extra-list cuing, 316
- fine-tuning, 369
- flow states, 393
- Fock space, 143, 389
- Fourier transformation, 80
- free association, 316
- free association network, 316
 - implicit activation, 316
 - tensor product, 319
- functional magnetic resonance imaging (fMRI), 284
- gamma distribution, 228
- garden path sentence, 321, 339
 - cognitive state, 322, 323
 - word interaction, 322
- Gaussian, 185
- Gaussian process analysis, 201
- generalization test, 198
- generalized quantum episodic memory model, 174
- gist, 170
- Gleason's property, 370
 - relation with fine-tuning, 370
- gradient descent learning, 273
- guppy effect, 285, 319
- Hamiltonian matrix, 46, 98, 157, 164, 184, 187, 243, 276
- Heisenberg equation, 243
- Hermitian, 62, 214
- Hermitian transpose, 44
- heuristic rules, 265
- heuristics, 137, 248
- hidden-state Markov process, 227
- hierarchical Bayesian methods, 175
- Hilbert adjoint, 62
- Hilbert space, 13, 22, 61, 346
- human mental lexicon, 315
- idealization, 364
- idempotency, 28
- idempotent, 63
- identity matrix, 28
- imaginary number i , 45
- impossible experience, 300, 303
- impossible urn, 300, 303
- incompatibility, 303, 308, 326
- incompatible, 6, 24, 33, 76, 106, 144, 387
- inconsistent connectedness, 292
- indeterminacy, 298, 303, 309, 318, 326, 365, 367, 398
 - cognitive properties, 308
 - free association network, 316
 - interpreting text, 315
 - metaphysical, 373
 - polysemy, 315
 - radical, 391

- indeterminacy (*cont.*)
 - relation with incompatibility, 308
 - spin-half particle, 373
- index term, 331
 - outer product, 332
 - quantum representation, 332
- information environment, 244
- information processing, 247
- information retrieval, 330
- initial state, 48, 185
- inner product, 29, 44, 61
- instruments, 152
- integrated information theory (IIT), 394
- intensity matrix, 183, 185
- interference, 5, 131, 133, 142, 154, 389
- interference effect, 38, 72, 104, 118, 163, 192, 351
- intra-list cuing, 316
- inverse, 62
- inverse document frequency, 332
- item memory task, 174
- Kalman filter, 283
- ket [notation], 61
- Kochen–Specker theorem, 367, 370
 - illustration of, 366
 - language, 325
 - phenomenology, 327
- Kolmogorov axioms, 129
- Kolmogorov equation, 183, 390
- Kripke frames, 397
- Kronecker product, 70, 251
- ladder operator, 240
- law of identity, 375
- law of reciprocity, 71, 149, 183
- law of total probability, 5, 32, 38, 72, 118, 162, 351, 387
- lexical category
 - and context, 323
- lexicographic rule, 248, 265
- Lindblad operator, 16, 216
- linear dynamical system, 211
- linear functional, 62
- linear operator, 62
- log likelihood lack of fit, 239
- logic of nothingness, 375
- logistic (soft max) rule, 279
- Lüder’s rule, 32, 255, 348
- Markov model, 118, 150, 160, 166, 169, 178, 210, 388
- Markov process, 16, 140
- Markov–quantum process, 201
- matrix exponential, 47
- matrix multiplication, 29
- mean, 77
- mean drift rate, 186
- measurement context, 292, 304, 309, 326, 328, 367
 - causal influence, 293
 - causality, 309
 - facial traits, 304
- measurement error, 84, 136
- measurement matrix, 227, 237
- memory over-distribution effect, 170
- Minkowski metric, 124
- mixed density, 214
- momentum basis, 79
- mutually exclusive, 23
- Necker cube, 202, 235
- negation of concepts, 143
- neural network, 247
- no-disturbance condition, 288, 292, 303, 304, 309, 369
 - relation with Bell–CHSH inequalities, 289
 - relation with causality, 289
 - relation with inconsistent connectedness, 292
- no-signalling condition, 286
- nonclassical reasoning, 143
- noncommutative, 24, 132
- noncommutativity, 144
- noncontextuality, 365
- normalization factor, 161, 353
- normalized, 29
- Not gate, 252
- number operator, 242

- observable, 51, 77, 272
- ontic, 3, 181, 214
- open system, 16, 210, 212, 234, 240, 390
- operational realism, 364
- orthogonal, 29, 31, 62
- orthonormal, 62
- orthonormal matrix, 41, 211
- oscillation, 199
- outer product, 30
- over-extension effect, 141

- paradigmatic association, 318, 338
- partial Boolean algebra, 9, 13
- partial trace, 88, 213
- partition, 66
- Pauli matrices, 273
- phase
 - text processing, 321
- phenomenological mind, 383, 391
- physicalism, 363
- poeisis, 378, 379
- polytope, 361
- position basis, 79
- positive operator-valued measurement (POVM), 81, 147, 390
- potential function, 187
- preferential choice task, 199
- priority heuristic, 265
- prisoner's dilemma (PD) game, 111
- probabilistic inference, 346
- probability identities, 137
- probability-plus-noise, 138
- production rules, 247, 253
- projector, 27, 63
- prospect theory, 159
- pure experience, 379, 393
- pure state, 214

- Q learning, 280
- qq equality, 109, 146, 148
- qualia, 391
- quantum AI, 394
- quantum Bayesian network (QBN), 169, 345
- quantum brain, 11
- quantum causality, 396
- quantum computer, 18
- quantum episodic memory model, 170
- quantum field theory, 240
- quantum grammar, 339
 - DisCoCat, 340
 - quantum circuit Born machine (QCBM), 341, 342
 - quantum computing, 340, 342
 - semantic vectors, 339
 - simultaneous perturbation stochastic approximation, 341
- quantum information retrieval, 314, 331
- quantum instrument, 392
- quantum Kripke frames, 398
- quantum language
 - word representation, 314
- quantum language model, 331
 - complex Hilbert space, 336
 - density matrix, 332, 334
 - document matching, 338
 - document ranking, 333, 334
 - machine learning, 334
 - neural network architecture, 335
 - neural network-based, 333
 - smoothing, 333
- quantum linguistics, 315
- quantum machine intelligence, 397
- quantum measurement, 381
- quantum mind hypothesis, 363
- quantum neural network, 274
- quantum noise process, 227, 234
- quantum qualia hypothesis, 382, 391
- quantum rationality, 395
- quantum reinforcement learning, 279
- quantum sampler, 140
- quantum state tomography, 272
- quantum walk, 187, 225
- quantum wave, 18
- quarter law, 161
- qubit, 249
- question order effect, 37, 76, 105, 134, 145

- radical enactivism, 379
 - relation with absolute nothingness, 380
- random utility model, 204
- random variable, 76
- random walk, 186
- rational agency, 395
 - descriptive, 396
 - normative, 395
 - prescriptive, 396
- ray, 34
- realism, 296, 300, 364, 367
 - noncontextual, 365–367
 - relation with contextuality, 366
 - relation with indeterminacy, 298
- reality without realism, 365, 367
 - causality, 366
 - determinacy, 366
 - strong, 366, 374
 - weak, 366
- reciprocity, 101
- reflecting bounds, 186
- Reichenbach's principle, 359, 369
- reinforcement learning, 279
- representativeness, 137
- response time, 210, 223

- sample space, 12, 22
- Schrödinger equation, 16, 184, 243, 390
- self measurement, 19
- self-awareness, 377
- semantic ambiguity, 313
- semantic compositionality, 285, 319, 320, 340
 - entanglement, 320
- semantic space, 313, 339
- semigroup property, 183
- sensitivity to measurement, 4
- separability, 320
- separated state, 250
- similarity heuristic, 354
- soku hi*, 380
 - formal definition of, 375
- soku hi* negation, 375
 - metaphysical incompatibility, 376
 - quantum incompatibility, 375
- source memory task, 170
- span, 34, 61
- spectral decomposition, 46, 211
- speed–accuracy trade-off, 224
- spin-half particle, 371
- squared length, 29
- stable system, 212
- state, 66, 181
- state concept property system, 142
- statistically dependent, 25
- Stern–Gerlach experiment, 50, 91, 149
- stochastic process, 204
- stopping rule, 224, 236
- structural linguistics, 317, 338
- subject–object duality, 376
 - Schrödinger's view, 378
- subjective expected utility theory, 153
- subset, 23
- subspace, 13, 23, 61
- superposition, 3, 16, 214, 225, 240, 249, 388
- sure thing principle, 110, 154
- symmetric matrix, 28, 183, 187
- symmetry, 28
- syntagmatic association, 317, 338
- system plus environment, 84, 152, 213, 390

- take the best, 265
- target qubit, 254
- teleological explanation, 370
 - contextuality of cognitive phenomena, 371
 - fine-tuning, 371
- temporal Bell inequality, 201, 393
- temporal difference, 279
- temporal nonlocality, 393
- tensor product, 68, 125, 143, 240, 250, 319
 - word interaction, 318, 336
- text processing
 - role of beliefs, 323
- theory of mind, 396
- threshold, 224
- Toffoli gate, 258
- total probability, 5

trace, 82, 214	unitary transformation, 63
transition matrix, 182	
transpose, 28	variance, 77
triangle inequality axiom, 124	vector, 60
trust	vector space, 13, 60
and AI, 395	vocabulary, 331
Tsirelson inequality, 8	von Neumann axioms, 129
two-stage gambling experiment, 154	von Neumann equation, 215
uncertainty	wave function, 23, 61, 66
epistemic, 298, 368	word co-occurrence frequency, 321
non-epistemic, 298	word embedding, 334, 338
ontological, 368	complex, 337
uncertainty principle, 11, 43, 77	count-based, 334
under-extension effect, 142	prediction-based, 334
unicity, 6, 204	quantum representation, 334
unitary, 40	word senses, 313
unitary matrix, 98, 182, 252, 273, 388	
unitary operator, 16	Zen Buddhism, 374