Index

Symbols

2 degree of freedom (DOF) robotic systems 249
3 degree of freedom (DOF) pneumatic device 248

A

abstract data type 71
active queue management (AQM) 271, 280, 281, 282, 283, 284, 285, 286, 287
acute lymphoblastic leukemia (ALL) 99
acute myeloid leukemia (AML) 99
acyclic directed graphs (ADG) 127
Adaptive Virtual Queue (AVQ) 271, 281, 282, 283, 284, 285, 287, 288, 289
additive increase, multiplicative decrease (AIMD) principle 277
Affymetrix oligonucleotide arrays 99
ALC description logic 215
ambiguity 2
artificial evolution 22, 24, 27, 28
artificial intelligence (AI) 23, 92, 127
artificial intelligence in education (AIED) models 128
artificial neural networks (ANN) 72, 73, 77, 78, 80, 81, 82, 83, 84, 85, 87, 88, 92, 176, 177, 178, 179
ASSISTANT decision tree induction system 215
assisted rehabilitation and measurement (ARM) guide 248
asynchronous transfer mode (ATM) 275, 276, 282, 288
available bit rate (ABR) 275
axons 78

B

Bayesian Belief Networks (BBN) 125, 126, 127, 128, 129, 130, 131, 132, 134, 143, 144, 146
Bayesian graphs 130
Bayesian models 126, 127, 129, 136, 142, 144, 146
Bayesian search 130
Bayes' Theorem 127, 128
belief networks 126, 127, 143, 144
biased control loop functions 39
binary trees 24, 29
Blackboard learning management system 112
Bloom filters 281
BLUE AQM algorithm 281, 288
Boltzmann criterion 42, 43
boosting 94
brute force checking 158
buffer 276, 279, 280, 281, 282, 289

C

CAMELS (capital, asset quality, management, earnings, liquidity and sensitivity to market risk) bank ratings systems 196, 197, 202
causal networks 127
causal probabilistic networks 127
CB-MIR systems, concept-based 173
CB-MIR systems, feature-based 173
CB-MIR systems, keyword-based 172
Chaudhry, Nauman A. 2, 5, 6
Chen, Guoqian 4
Chen, Peter P. 2, 3, 5, 6, 7
chromosome 48
Index

classic therapy 248
classification and regression trees (CART) 100
classification tests 220, 242
classification tests, good 214, 217, 218, 220, 221, 230, 236, 237, 239, 242
classification trees 94
colon biopsy samples 99
commensense reasoning processes 214, 241
commensense reasoning rules (CRR) 242
communities, geographical 132
communities, virtual 125, 127, 131, 132, 133, 134, 137, 139, 142, 143, 146, 147
complete test 169
computational intelligence (CI) 282
conceptual modeling 2, 20
concurrency control 153
conditional probability tables (CPT) 136, 146
condition attribute 113, 119, 124
condition class 201
congestion 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 287, 288, 289
congestion control 272, 274, 275, 276, 277, 280, 282, 283, 284, 287, 288
congestion windows (cwnd) 277, 278, 279
conjecture line object 54
conjecture point objects 54
conjecture region object 55
connectionist systems 80
constraint checking 154, 160, 161, 162, 166, 167
constraint simplification by reformulation 162, 165
constraint simplification by update analysis 161, 162
content-based multimedia information retrieval (CB-MIR) 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 187, 188
content-based queries 171
content management system (CMS) 112, 113
continuous passive motion (CPM) 250
tcontrol engineering 40
tcontrol loop protection 39
cost function 48
course selection process 72, 73, 82, 84
course selection system 92
covariance matrix adaptation evolutionary strategy (CMA-ES) 31
crisp data 72, 73
crisp databases 5
crisp entity 5
crisp logic 73, 74
crisp values 5
crossover operation 42

d
Darwinian evolution 22
database consistency 153, 155, 167, 169
database management systems (DBMS) 154, 155, 158
databases 153, 154, 155, 156, 158, 159, 160, 161, 162, 164, 165, 166, 167, 169, 264

databases, knowledge discovery in 104, 105
data fragmentation 169
data mining 104, 194
Daubechies 4 wavelet transform 178
De Caluwe, Rita 3
decision attribute 124
decision class 201, 205
decision support system (DSS) 195
decision tree 104, 107, 108, 123, 124
decision tree analysis 104
decoupled subsystem approach 154
deductive hierarchical database (DHDB) clauses 215
deductive reasoning 214, 215, 216, 218, 235, 236, 237
defuzzification 75, 77, 81
defuzzification, centroid method 75
defuzzification, max-membership method 75
defuzzification, weighted average method 75
delay jitter 279
Delphi technique 143
dendrites 78
determinate spatial objects 50, 51
diffuse large B-cell lymphoma (DLBCL) 99
direct therapy 250, 257, 258, 260, 261, 262
discretisation 193, 194, 195, 197, 198, 209, 213
discriminant analysis 94
distributed community of practice (DCoP) 140
Index

distributed database 153, 169
dominate support 124

E
EDSAC (electronic delay storage automatic calculator) 22
education 127
EDVAC (electronic discrete variable automatic computer) 22
e-learning 106, 112, 122
e-learning database 104
elitism 27, 28, 34
elitism, strong 27
elitism, weak 27
enhanced entity relationship (EER) models 1, 4, 7, 17, 21
entity relationship (ER) models 2, 3, 4, 5, 6
entrepreneurial competencies (EC) module 112
epistasis 24, 29
equivalence classes 201, 213
evaluation block algorithm 41
evaluation block algorithm, initialization stage 41
evaluation block algorithm, warning stage 41
evaluation block algorithm, working stage 41
evolutionary algorithms (EA) 22, 23, 24, 25, 26, 28, 33, 34, 35, 39, 40, 41, 42, 43, 46, 47
evolutionary computation 22, 23, 28, 31, 35
evolutionary programming 23
evolutionary strategies 23, 29, 30, 33, 34
evolutionary time 48
exact object models 50, 52, 54
ExIFO (extension IFO) model 4
explicit congestion notification (ECN) 281, 284, 285, 286, 287, 288, 289
explicit justification 72, 81, 88

F
fault detection methods 40
fault detection methods, process history based 40
fault detection methods, qualitative model-based 40
fault detection methods, quantitative model-based 40
feature selection 194, 195, 196, 197, 199, 201, 213
FERM design methodology 5, 6
financial analysis 194
first in first out (FIFO) 272, 276, 279
first-order logic (FOL) language 214
Fitch’s individual bank strength ratings (FIBR) 194, 196, 197, 199, 200, 202, 203, 205, 206, 209
fitness 23, 24, 25, 26, 27, 31, 32, 33, 35
fitness cases 23, 35
flexion 251, 253, 255, 260, 261
formal concept analysis (FCA) 216, 221, 222
FUSINTER discretisation algorithm 195, 197, 198
fuzzification 75, 81
fuzziness 3, 5, 9
fuzzy attributes 1, 3, 7, 8, 10, 11, 12, 13, 15, 16, 17, 20, 21
fuzzy classifier 94, 96, 98, 100, 101
fuzzy comparators 21
fuzzy data 72
fuzzy database modeling 1, 2, 17
fuzzy databases 1, 2, 17, 20, 21
fuzzy degrees 1, 7, 9, 13, 14, 15, 17, 20, 21
fuzzy EER model 1, 2, 7, 8, 10, 12, 15, 16, 17, 21
FuzzyEER model, composite attribute 11
FuzzyEER model, derived attribute 11
FuzzyEER model, identifying attribute 10
FuzzyEER model, multivalued attribute 11
FuzzyEER model, simple attribute 10
fuzzy entities 1, 2, 3, 4, 5, 7, 16, 17, 21
fuzzy extended entity-relationship (FEER) model 6
fuzzy if-then rules 93, 94, 95, 96, 97, 101
fuzzy inference systems 75
fuzzy information 1, 3, 12, 20
fuzzy interface systems 72, 73, 85
fuzzy lines 49, 50, 53, 59, 61, 63, 71
fuzzy linguistic value 74, 92
Index

fuzzy logic (FL)  1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 73, 74, 76, 77, 80, 81, 92, 103, 104, 105, 121, 122, 170, 172, 176, 177, 179, 180, 181, 182, 189, 191, 271, 282, 283, 289
fuzzy membership functions  72, 73, 74, 76, 83, 85, 92
fuzzy notation  1
fuzzy object-oriented database (FOODB) scheme  6
fuzzy points  49, 50, 53, 59, 61, 64, 71
fuzzy query  21
fuzzy query approach  53
fuzzy regions  49, 50, 53, 59, 60, 61, 63, 64, 65, 71
fuzzy relational databases (FRDB)  5
fuzzy rule based classifiers  99
fuzzy rule-based system (FRBS)  76
fuzzy semantics  1, 7, 17, 21
fuzzy sets  73, 74, 75, 76, 92, 103
fuzzy set theory (FST)  2, 6, 49, 50, 52, 59, 61, 106, 120, 209, 289
fuzzy spatial algebra (FUSA)  49, 50, 51, 53, 59, 66, 67
fuzzy spatial databases  53
fuzzy spatial data types  49, 50, 53, 59, 63, 71
fuzzy spatial objects  52, 53, 59, 67
fuzzy SQL (FSQL)  7, 8, 17, 20, 21
fuzzy systems  72, 73, 77
fuzzy topology  49, 50, 59, 61, 63
fuzzy tuple  5

G

GA-fuzzy classification systems  93
gene expression analysis  93
gene expression data  93, 98, 99, 101
generalized modus ponens (GMP)  75
generalized modus tollens (GMT)  75
general purpose graphic processing units (GP-GPU)  22, 23, 34, 35
generic evolutionary loop  26
genes  93, 94, 99, 100, 101
genetic algorithms (GA)  23, 24, 27, 28, 31, 34, 40, 42, 43, 44, 45, 46, 93, 94, 96, 101, 103, 170, 172, 176, 180, 192
genetic programming  23, 24, 29, 34, 35
genotype  24, 29, 33, 38
GENTLE/s system  248
genetic algorithm  105, 122
IFO model  4
ILP, inductive inference in  215
impedance control  252, 264
implicative assertions  242
imprecise information  3, 4, 8, 9
imprecision  1, 2, 3, 4, 7, 8, 9, 13, 21
inconsistency  2
indeterminate geographic data  49, 50
indiscernibility relation  209, 213
individual  23, 24, 25, 26, 27, 28, 30, 31, 32, 33, 35, 38, 48
inductive logic programming (ILP)  215
inductive transitions  223, 242

H

hardware redundancy  39, 46
hedging  207
higher education (HE) provision  106
hip and knee rehabilitation  249
human computer interactions (HCI)  133
humanities  126, 127, 143, 144
human-machine interface (HMI)  247, 249, 250, 251, 254, 255, 258, 259, 260, 263
good irredundant test (GIRT)  222, 226, 229, 242
good maximally redundant test (GMRT)  222, 227, 229, 230, 231, 242
grids of membership, crisp  76
graphical models  126, 127
good maximally redundant test (GMRT)  222, 227, 229, 230, 231, 242
grades of membership, fuzzy  76
genetic algorithms (GA)  23, 24, 27, 28, 31, 34, 40, 42, 43, 44, 45, 46, 93, 94, 96, 101, 103, 170, 172, 176, 180, 192
GA-fuzzy classification system  93

I

ID3 algorithm  105, 122
IFO model  4
ILP, inductive inference in  215
impedance control  252, 264
implicative assertions  242
imprecise information  3, 4, 8, 9
imprecision  1, 2, 3, 4, 7, 8, 9, 13, 21
inconsistency  2
indeterminate geographic data  49, 50
indiscernibility relation  209, 213
individual  23, 24, 25, 26, 27, 28, 30, 31, 32, 33, 35, 38, 48
inductive logic programming (ILP)  215
inductive transitions  223, 242

327
information accuracy  153
information integrity  153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 169
information retrieval (IR)  170, 171, 177
INGRES DBMS  154
initial annealing temperature  48
integrity control  153, 169
intelligent computer systems  214
intelligent control  264
intelligent decision support  72
internet-based rehabilitation  264
IPv6 (Internet protocol version six)  275

J
Jeffrey-Divergence  174
joint method of agreement and difference  217, 220, 224, 237
JSM-method  216

K
KBDTA system  154, 155
kernel line object  54
kernel point objects  54
kernel region object  55
Kerre, Etienne E.  2, 4
key words  171
knowledge-based systems (KBS)  92
knowledge discovery in databases (KDD)  193, 194, 195, 197
knowledge engineering  125, 126, 143, 146
knowledge management (KM)  193
knowledge representation, explicit  72, 80, 81, 83, 88, 92
knowledge representation, implicit  72, 82, 88
Kullback-Leibler Divergence  174

L
leaf node  124
learning and execution  214
leukemia  93, 99
limb functionality  247
limbs, damaged  248
limbs, lower  247, 249, 263
limb strength  247
limbs, upper  249
line2D data type  54, 55, 56
linguistic term  124
linguistic variable  124
LINUS  215
local test  169
logistic regression techniques  94
loosely coupled subsystems  154
lymphoma  99

M
machine learning algorithms  214, 216
Mahalonobis distance  174
membership functions (MF), two-valued  106
Merdan, Osman  4, 5
metadata  171, 174
method of concomitant variations  217, 220
method of difference  217, 220, 226, 227, 236
methods of agreement  217
methods of residues  217
microarray data  94
microarray expression data  94
microarrays  93
microarray studies  93
Minkowski-Form Distance  174
MIT-MANUS  248
Moyne, James R.  5
multimedia content  170, 171
multimedia databases  170, 171, 172, 174, 175, 177
multivalued disjunctive attributes  1, 17
mutation  26, 28, 29, 30, 31, 34, 38
mutation operation  42

N
nearest neighbour classifiers  94, 100, 101
necessary test  169
neural networks (NN)  81, 94, 170, 172, 176, 178, 181, 190, 191
Index

neuro-fuzzy approaches 72, 73, 80, 81, 83, 88, 92
neuro-fuzzy systems 72, 73, 81
neurons 72, 78, 79, 80, 85
node 124
NVidia 23

O
optimization techniques 39
ORACLE DBMS 154, 155

P
packet admission control 280
packets dropped 289
partial least squares 94
pattern classification 94, 103
phenotype 24, 25
physiotherapists (PT) 247, 248, 249, 250, 251, 252, 254, 255, 256, 257, 258, 260, 263
PID position control 254
point2D data type 54, 55, 56
population 48
population-based stochastic optimizers 25
population size 48
positive engagement 132, 135
PRISMA project 154, 155
probabilistic neural networks 94
probability theory 53
proportional/integral/derivative (PID) controller 251, 252, 253, 254, 259, 263
Puma 240 robot 248

Q
Quadratic-Form Distance 174
qualitative Bayesian networks (QBN) 131
qualitative propagation 131
quality of approximation (QoA) 202, 204
quality of classification (QoC) 199, 200, 201, 202
quality of service (QoS) 271, 289
quantitative financial analysis 194
query modification strategies 154
queue management 271, 281, 285

R
Radial Basis Function (RBF) Networks 178
random early drop (RED) 271, 280, 281, 283, 286, 287, 289
random explicit marking (REM) 271, 281, 286, 287
reactive therapy 250, 257, 258, 260, 262
reduct 213
region2D data type 54, 55, 56
rehabilitation 247, 248, 249, 251, 252, 257, 263, 264
rehabilitation robot 250, 264
REHAROB project 249
reliability control 153
residual function 40, 41, 42, 48
robot-aided neuro rehabilitation system 248
robottherapy 250, 253, 256, 257, 260
robotic therapy 248
robot manipulator (RM) 249, 250, 251, 252, 254, 255, 256, 257, 258, 259, 260, 263, 264
root node 124
rough sets (RS) 170, 172, 176, 180
rough set theory (RST) 176, 193, 194, 195, 197, 199, 200, 201, 209, 210, 213
routers 271, 279, 281, 284, 289
rule-based classifier 103
rule-based intelligent controlling structure 247
Rundensteiner, Elke A. 5
Ruspini, Enrique H. 2, 6

S
SABRE project 154, 155
Sardar Patel University (India) 72, 73, 84
scalars 7, 8
SC paradigms 170, 176, 177, 181
SC techniques 170, 187
security control 153
self-adaptive mutation methods 30
semantic integrity constraints 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167
semantic integrity subsystem (SIS) 154, 155
sensor discrerdibility 39, 40, 41, 42, 43, 44, 46, 48
sensor discredibility detection 39, 40, 41, 42, 43, 46
sensor model parameters 40, 41, 42, 43, 48
sharp boundaries 49, 50, 52
SICSDD project 154, 155
simbolic-valued attribute language (AVL) 214
simulated annealing 23
simulated annealing algorithm 40, 43, 44, 46, 48
single instruction multiple data parallel architecture 22
social capital 125, 126, 127, 129, 131, 132, 133, 135, 137, 138, 139, 140, 141, 142, 145, 146, 151
social issues 127, 142, 144, 146
social sciences 126, 127, 143, 144, 145
soft computing methodology 195
soft computing (SC) 104, 105, 120, 121, 170, 172, 176, 177, 181, 182, 187, 188, 265
soft computing techniques 49, 50, 67
software redundancy 39
SPADA, ILP system 215
spatial database systems (SDBS) 49, 50
spatial data, complex 51
spatial data, simple 51
spatial data types 49, 50, 51, 52, 53, 54, 55, 56, 59, 63, 67, 71
spatial fuzziness 52
spatial uncertainty 52
spatial vagueness 52
SQL (structured query language) 7, 17, 20, 175
stabilized RED (SRED) method 280, 281
standard genetic algorithm 42
Starbust project 154, 155
stochastic fair BLUE (SFB) 281
stochastic optimization paradigms 23
stretching 249, 250, 256, 258, 259
students, weekly online activity of 104, 106, 119
sufficient test 169
support vector machines (SVM) 94, 178, 191
synapses 78

T
Tabu Search 23
target window (twnd) 277, 278, 279
term-based queries 171
textual metadata 171
therapy mode 250, 256, 257, 258, 260
tightly coupled subsystem 154
tissues 93, 99
tissues, cancerous 93
tissues, colon 93, 99
torque value 255
traditional logic 2
transaction design tools 154, 155
transaction modification strategies 154
transient congestion 271
transmission control protocol (TCP) 272, 275, 276, 277, 278, 279, 280, 281, 284, 288
tree structures 105, 110, 111
triangular fuzzy sets 94, 95
tumors 93, 99
type-1 fuzzy systems (T1 FS) 73, 76, 77
type-2 fuzzy systems (T2 FS) 72, 73, 76, 77, 82, 88, 92

U
UFO database model 3, 4
uncertainties 125, 131, 146
uncertainty 1, 2, 3, 4, 9, 13, 14, 15, 21
uncertainty modeling 2
US bank credit ratings 193
user datagram protocol (UDP) 275, 276
user friendliness 72

V
vague convex hull 58
vague line object 54, 55, 56
vague lines 49, 50, 52, 54, 55, 71
vagueness 2
vague point objects 54, 55, 56
vague points 49, 50, 52, 54, 55, 71
vague regions 49, 50, 52, 54, 55, 57, 71
vague spatial algebra (VASA) 49, 50, 51, 52, 53, 54, 57, 66, 67, 71
Index

vague spatial data type  71
vague spatial objects  51, 54
vague spatial operations  54, 57, 58, 71
Vandenberghe, R.  2, 6
Van Gyseghem, Nancy  2, 3
variable precision rough sets (VPRS)  193, 194, 195, 196, 197, 199, 200, 201, 202, 204, 206, 207, 209, 210, 213
vector machine techniques  94
virtual capacity  281, 282, 289
virtual learning community (VLC)  139, 140
virtual learning environments (VLE)  106, 113
virtual queue-based marking schemes  271
von Neumann, John  22

W
weighted voting scheme  94

Y
Yazici, Adnan  2, 4, 5

Z
Zadeh, Lotfi A.  2, 6, 20, 74, 75, 76, 77, 104, 105, 106, 107, 119, 123
zone concept  52
Zvieli, Arie  2, 3, 5, 6