

# Index

- accuracy, 10, 14, 20, 21, 23–28
- active contour models, 145, 147, 148
- adaptive threshold, 199
- ant colony optimization, 118
- artificial bee colony, 91, 118
- artificial neural network, 3, 15, 89
- attractiveness probability, 129
  
- bacterial foraging algorithm, 118
- bat algorithm, 117
- Baum-Welch, 91, 92, 99, 100
- Baum's re-estimation algorithm, 92
- $\beta$ -hill climbing, 91
- binarization, 194
- binary chromosome, 38
- blob detector, 96
  
- Cambridge hand dataset, 94
- cellular automata, 33
- chromosome, 1, 4, 7–9, 11–13, 17, 19, 24, 27
- chromosome design, 60
- cluster, 15–18, 22, 24, 27, 28
- code book, 89
- color-based segmentation, 88
- complex system, 33
- computer vision technology, 88
- conditional random field, 88
- confusion matrix, 10, 13, 14, 21, 23
- continuous domain, 163, 164, 168
- convergence criterion, 193, 194
  
- cooling factor, 129
- cooperative method, 19, 21
- crossover, 8, 9, 11–14, 16, 19, 27, 28
- cuckoo search algorithm, 91, 92, 94, 103, 104, 117
- cyber glove, 89
  
- decision tree, 93
- deep convolutional networks, 117
- deformable model, 146, 147
- defuzzification, 126
- density based on fish school search, 221
  - food sharing, 221
  - operator
    - collective-instinctive movement, 222
    - collective-volitional movement, 223
    - memory, 222
    - partitioning, 222
- desaturation, 95
- design of the proposed GA-SVM model, 62
- differential evaluation algorithm, 119, 128
- differential evolution, 91, 190, 215
  - crossover, 217
  - initialization, 216
  - mutation, 216
  - selection, 217
  - strategies, 218
- distance-based classification, 58
- DRIVE database, 163, 176, 179, 180
- dynamic, 4, 11, 12, 14, 18, 28

- edge detection, 33
- EIDORS, 228
- electrical impedance tomography, 224
  - direct problem, 225, 227
  - ill-posed problem, 227
  - inverse problem, 225, 227
  - objective function, 228
  - Poisson's equation, 226
- electromagnetic, 4, 5
- entropy, 126
- estimation of distribution algorithms, 164, 165, 168–170
- evolutionary algorithm, 90
- evolutionary computation, 34, 168, 211
- exhaustive search strategy, 166
- exploitation, 2, 12
- exploration, 2
  
- feature extraction, 54
- FERET database, 68, 71, 76, 78
- finite state machine, 94
- firefly algorithm, 91
- fish school search, 218
  - operator
    - collective instinctive movement, 220
    - collective volitive movement, 220
    - feeding, 219
    - individual movement, 219
- fitness, 7–13, 17, 19, 27
- fitness function, 35, 61
- footprint of uncertainty, 124
- forward-backward algorithm, 98
- fuzzification, 124
- fuzzy C-means, 3, 14, 18, 27
- fuzzy entropy, 126
- fuzzy integral, 195, 196, 199
- fuzzy intensification, 118
- fuzzy logic, 14
- fuzzy measures, 188, 196
- fuzzy particle swarm optimization, 188
- fuzzy structural dissimilarity index, 196, 199
  
- GA-HMM, 92
- Gabor filtered Zernike moments, 64, 75, 80
- Gabor filters, 54
- Gauss-Newton method, 223
- Gaussian mixture model, 117
- generalized histogram, 116
- genetic algorithm, 2–4, 6–9, 11, 15, 17, 27, 28, 33, 60, 91, 118, 119
- genetic operator, 92
- genetic programming, 91
  
- gesture recognition, 87–90, 92, 93
- global optimal, 4, 6, 8, 11, 12, 16, 18, 19, 23, 25, 27, 28
- global thresholding, 188, 196, 199
- glove-based, 92
- Goldstein–Price function, 171
- gray-level, 118
- gray-level histogram, 118
  
- haptic interface, 89
- harmony search, 91
- Hessian matrix, 95
- Hessian matrix approximation, 96
- hidden Markov model, 89, 92–94, 98
- hill-climbing, 4, 7, 8, 10, 12, 16, 17, 19, 24, 28, 91
- histogram equalization, 95, 116
- histogram of oriented gradients, 57
- Hough transform, 164, 166
- human computer interaction, 87–89
- hybrid, 1, 4, 8, 9, 12, 14–16, 18, 27, 28
  - metaheuristics, 34, 188
  - optimization method, 164, 172, 176, 180
- hybridization, 91, 229
  
- ICA, 117
- image enhancement, 116
- image segmentation, 34, 145, 147, 148, 187, 188, 204
- image thresholding, 187, 190, 204
- intangible interface, 88
- integrating OC-LBP and HOG features, 63, 71, 80
- inter-class variance, 189
- interference, 39
- irradiance map, 118
- iterative process, 90
  
- Kinect sensor, 88
- krill-herd algorithm, 91
  
- leap motion sensor, 88
- level set method, 146
- linear index of fuzziness, 132, 134
- linear regression, 93
- local binary patterns, 55
- local histogram, 116
- local thresholding, 188, 199
- logistic regression, 93
- low contrast image, 116

- machine learning algorithm, 89–91, 93
- mean square error, 133
- measure, 38
- membership function, 125
- meta-heuristic/meta-heuristic approach, 2, 3, 6, 14, 15, 18, 23–25, 27, 28, 33, 90, 94, 128, 145–149, 153, 155, 156, 158, 159
- Metropolis criterion, 167, 168
- Moore neighborhood, 40
- multi-objective, 91
- multi-target tracking, 92
- mutation, 1, 6–9, 11–14, 16, 19, 27, 28
  
- natural-inspired algorithm, 90
- naïve Bayes, 93
- nonparametric, 4, 14, 15, 28
- number of iterations, 194, 198
  
- objective function, 90, 167, 168, 190, 194, 196, 199, 204
- optimization, 34
- ORL database, 67, 75–77
- orthogonal combination of local binary patterns, 56
  
- panchromatic QuickBird, 128
- parabola detection problem, 163, 165, 173, 174, 176
- parameter-less function, 91
- particle swarm optimization, 91, 118, 188, 190, 191, 198, 212
- pattern recognition, 88, 95, 97, 98, 102
- PCA, 117
- peak signal to noise ratio, 133
- performance comparison of the grid-based and GA-SVM model, 81
- performance comparison with literature, 77
- pheromone intensity, 120
- picture quality scale, 132, 133
- population, 1, 2, 4, 6–9, 11–13, 17, 19, 24, 27, 28
- population-based methods, 164, 168
- principle component analysis-SIFT, 95
  
- quantum chromosome, 38
- quantum computers, 36
- quantum computing, 35
- quantum crossover, 39
- quantum gates, 37
- quantum genetic algorithm, 37
- quantum mutation, 39
- quasi-Newton method, 92
- qubit, 36
  
- recognition rate, 88
- recursiveness, 93
- remote sensing, 2, 4, 5
- reproduction, 1, 4, 6, 7, 10, 12–14, 16, 19, 27
- responsiveness, 25, 26
- retinal fundus images, 163, 176, 180
- RGB-D camera, 89
- robotic arm, 90
  
- satellite image, 1, 5, 6, 14, 21, 26, 28, 116
- scalability, 93
- scale invariant feature transform, 95
- S-curve, 118
- segmentation, 2–7, 9, 11, 13–29, 31
- self-generated database, 71, 80
- self-organizing maps, 15, 24, 27
- Shannon’s function, 126
- sign language recognition, 89
- simulated annealing, 1–3, 91, 163–165, 167, 176, 180, 214
- Sobel operator, 95
- sparse coding, 89, 117
- speeded-up robust feature, 95
- spotting algorithm, 89
- standard deviation, 89
- stochastic mathematical approach, 92
- structural dissimilarity index, 196, 199
- structural similarity index, 194–196, 198
- structural similarity metrics, 132–134
- support vector machines, 59, 93
- swarm colony, 125
- swarm search strategy, 127
  
- tabu search, 91
- TCO, 119–121
- tele-operation, 90
- temperature, 167, 168
- termite colony, 120
- thresholding, 95
- time efficiency, 82
- touchless electronic gadget, 89

2D Haar wavelet, 96  
type-2 fuzzy sets, 124

univariate marginal distribution algorithm, 163,  
168, 169, 176, 180  
universal quality index, 132, 133  
unsupervised, 3, 4, 14, 15, 28  
user interface, 88

virtual reality, 88, 89, 92  
vision-based, 92  
Viterbi algorithm, 92, 98, 102

wavelet, 116

Yale database, 68, 75–77