

Index

A

Action recognition, 38, 41
Activations, 9, 13, 29, 31, 33, 45, 59, 226, 253, 308, 327
Active shape model (ASM), 56, 63, 216, 219
ADNI (Alzheimer's Disease Neuroimaging Initiative), 260, 360, 372, 377
ADNI dataset, 248, 259, 262
Agent, 65–70, 75, 77
AlexNet, 26, 30, 32, 33, 36, 41, 96, 126, 330
AlexNet model, 27, 32
Algorithmic strategies, 274, 286, 290, 292, 293
Alzheimer's disease (AD), 342, 360, 368, 370, 372
Anatomical structures, 57, 64, 199, 224, 249, 414
Anatomies, 57, 71, 83, 223, 233, 237, 382
Anatomy detection, 56, 71, 100
Answer, 43
APOE (Apolipoprotein E), 360, 362, 367, 372, 374
Architecture of randomized deep network, 356
Artificial agent, 57, 64–66, 78
Atlas images, 199, 206
Atlas patches, 208
Attributes, 43
Auto-encoder (AE), 12, 201, 250, 348
 basic, 202
 single, 252
 stacked, 12, 200, 247, 250, 252
Automated system, 301, 315
Automatic segmentation, 238
Auxiliary tasks, 43, 140

B

Background, 92, 139, 143, 147, 164, 197, 199, 205, 206, 281, 330, 344, 350
 voxels, 205
Backpropagation algorithm, 6, 11, 14, 30, 161
Bag-of-visual-words (BoVW), 302, 305, 310

Bag-of-words (BoW), 305
Baseline, 259, 335, 344, 359, 360, 362, 364, 370, 373
Baseline markers, 361, 362, 370
Batch normalization (BN), 21, 22, 31
Binary masks, 187, 189
Biomedical image analysis tasks, 157, 165
Blocks, 354–359
Body sections, 85, 91
Body-part recognition, 84, 86, 87, 91, 92, 95
Boundaries, 64, 115, 187, 232
BoVW model, 305
Brain images, 371
Brain MR images, 252, 255, 265
Brain MRI images, 238, 240
Brain regions, 230, 354
Breast cancer, 139, 322
 histology images, 157, 166

C

C++, 22, 45, 169, 285
Cancer, 301, 322
Cardiac histopathology, 180, 182, 184, 191
Cardiac histopathology images, 180, 182, 186, 191
Cardiovascular disease (CVD), 106
Carotid artery, 107, 112, 114, 125
 common, 108, 109, 113, 124
Carotid bulb, 108, 112–115, 121, 124
Carotid intima–media thickness (CIMT), 106, 124
Cell detection, 166
Cells
 complex, 28, 110
 simple, 28
Central processing units (CPU), 11, 72, 109
Centroid distances, 228, 230, 233, 239
Centroids, 112, 115, 140, 229, 230, 287
Cerebral microbleed detection, 143
Cerebral microbleeds (CMBs), 134, 135, 143–147, 149
Cerebral-spinal fluid (CSF), 259, 342, 343
Chest radiograph, 300, 302

- CIMT measurements, 106, 123, 128
 - CIMT video interpretation, 106, 127
 - CIMT videos, 108–110, 117, 127
 - Class membership, 160, 187, 188, 343
 - Classes
 - body section, 92
 - non-informative, 91
 - Classification accuracies, 33, 93, 331, 343, 370
 - Classification of breast lesions
 - benign, 323, 324, 326, 330–332, 334
 - malignant, 323, 324, 326, 330–332, 334
 - Classification performance, 33, 205, 317
 - Classifier, 56, 58, 61, 64, 86, 87, 90, 91, 97, 148, 158, 166, 185, 188, 191, 310, 315
 - main, 63, 71, 73
 - Clinical dementia rating sum of boxes (CDR-SB), 361, 364, 366, 367, 372, 373
 - Clinical trials, 344, 368, 373
 - CMBs
 - detection, 135, 143, 146
 - true, 144, 148
 - CNN
 - 2D, 143, 148, 150
 - 3D, 135, 144, 226
 - CNN flavors, 34
 - CNN model, 38, 165, 280, 293, 307, 327
 - CNN regression model, 286, 292
 - CNN structure, 88, 92, 157
 - CNN-based methods, 234, 238–240
 - CNNs
 - local patch-based, 94
 - standard, 86, 93, 99
 - trained, 113
 - Co-occurrence of local anisotropic gradient orientations (CoLIAGe), 186
 - Coarse retrieval model, 136
 - Comparison of deep learning, 186
 - Computational complexity, 110, 226, 305
 - Computational limitations, 78
 - Computed tomography (CT), 84, 106, 272, 382, 409
 - Computer aided diagnosis (CAD), 83, 134, 272, 322
 - Computer vision, 26, 37, 86, 106, 109, 180, 200, 226, 248, 253, 273, 302, 324, 343, 352
 - Computer vision problems, 26, 230, 239
 - Computer vision tasks, 30, 191, 273
 - Computer-aided diagnosis, 134, 149, 322
 - Concatenation deep network (CDN), 389
 - Conditional random field (CRF), 37, 325
 - Confidence maps, 113, 116
 - Connection weights, 5, 8, 11, 14, 21, 203
 - Constrained ROI localization, 113, 118
 - Convolution kernel, 74, 137, 144, 158, 226, 227
 - Convolution layer, 8, 27, 109
 - Convolutional filters, 28, 87, 100
 - Convolutional layers, 8, 29, 33, 86, 109, 110, 117, 126, 137, 158, 163, 167, 226, 227, 307, 326
 - Convolutional networks, 33, 248
 - Convolutional neural network architecture, 226
 - Convolutional neural network (CNN), 8, 26, 27, 34, 35, 40, 85, 109, 137, 157, 166, 273, 280, 411
 - Convolutional SAE, 247, 256, 257, 259, 263, 264
 - Convolutional SAE network (CSAE), 253, 263
 - Convolutions, 8, 27, 28, 36, 37, 138, 226, 254, 281
 - Coupled sparse representation (CSR), 382, 389, 396
 - Cranio-caudal (CC), 322
 - Cross-correlation (CC), 289, 290, 329, 331, 332
 - Cross-modal medical image synthesis, 393, 401
 - Cross-modal nearest neighbor search, 382, 384, 392, 396
- D**
- Data augmentation, 31, 113, 125, 331
 - Dataset, 71, 74, 95, 140, 146, 219, 228, 286, 309, 326, 328–330, 388
 - DDSM, 324, 329–332, 334
 - InBreast, 324, 329–334
 - large, 146, 353, 407

- Decliners
 - strong, 370, 371
 - weak, 342, 363, 367, 372
 - Deconvolution, 37
 - Deep architecture, 12, 74, 126, 166, 205, 250, 343, 344, 353
 - Deep belief network (DBN), 15, 17
 - Deep Boltzmann machine (DBM), 15, 18
 - Deep cascaded networks, 136
 - Deep convolutional neural networks, 69, 135, 180, 181
 - Deep learning, 8, 57, 65, 85, 86, 134, 157, 180–182, 184, 191, 200, 248, 250, 262, 324, 325, 346, 347
 - approach, 182, 185, 191, 224, 248, 302, 315
 - architecture, 109, 209, 265
 - for medical image, 87, 157, 223, 239, 240
 - for segmentation, 188, 191, 225
 - methods, 22, 84, 200, 207, 223, 240, 303, 325, 353, 406
 - models, 26, 180, 182, 185, 186, 188, 250, 252, 324, 334, 350, 419
 - network, 187, 253, 255
 - software for, 45
 - tools for, 22
 - unsupervised, 247, 250
 - Deep learning features, 200, 207, 211, 248, 324
 - Deep models, 11, 20, 22, 247, 250
 - Deep networks, 11, 14, 20, 27, 29, 35, 73, 88, 203, 227, 306, 344, 352, 358
 - location-sensitive, 382, 383, 385, 401
 - very, 30, 31, 33
 - Deep neural networks, 11, 12, 18, 20, 67, 70, 135, 224–226, 303
 - Deep Q network (DQN), 69
 - Deep voting, 156, 163, 164
 - Deep voting model, 157, 159, 163, 165
 - Deep-learned features, 199, 206, 212
 - Deformable model, 209, 210, 216
 - Descriptor, 273, 304
 - Detection, 33, 34, 57, 58, 84, 86, 100, 300
 - accurate, 134, 143
 - computer-aided, 106
 - lymph node, 325
 - microbleed, 134, 240
 - negation, 409
 - Detection accuracy, 34, 76, 117, 142, 165
 - Detection network, 86
 - Detection of emphysema, 302, 417
 - Detection time, 136, 142
 - Dice ratios, 212, 260
 - Dice scores, 230, 233
 - Diffeomorphic demons, 257, 259, 264, 265
 - Digitally reconstructed radiograph (DRR), 272
 - Disease, 181, 310, 311, 345, 351–353, 359, 361, 368, 410, 415, 417, 419
 - Disease markers, 342, 358, 362, 363, 370, 373
 - Disease progression, 345, 358, 368, 370
 - Dropout, 20, 31, 347, 358
 - Dropout networks, 349, 353, 354
 - DSC (direct splatting correlation), 293
 - DV-1 (deep voting with no stride), 163–165
 - DV-3 (deep voting with stride 3), 163–165
 - DxConv, 361, 364, 365, 367, 370, 372, 373
- ## E
- Edge-hypersampling, 183, 187
 - Edges, 28, 185–187, 189, 190, 279, 286, 300, 305, 312
 - Effect size, 345, 361, 367
 - Effectiveness, 121, 135, 143, 199–201, 207, 212, 216, 398
 - Efficacy, 141, 142, 147, 150, 343, 344, 372, 373
 - End-diastolic ultrasonographic frames (EUFs), 106, 108, 110–113, 117, 118, 123–125, 127
 - Enrichment, 343, 359, 364, 373
 - Ensemble learning, 224, 239, 351, 352
 - Errors, 75, 228, 231, 233, 237
 - boundary, 232, 237, 239
 - labeling, 237
 - localization, 12, 120, 202, 348
 - segmentation, 74, 231, 233, 237
 - Evaluation, 71, 74, 75, 77, 212, 216
 - Experience replay, 70
 - Experimental results, 134, 135, 150, 164, 169, 259, 260, 263, 310, 330
 - Experiments, 71, 73, 117, 163, 186–188, 211, 228, 258, 260, 283, 285, 287, 309, 360, 388

Experts, 122
 Extracting the image information, 409

F

False negative (FN), 141, 142, 170, 315
 False positive (FP), 93, 135, 137, 140–142,
 147, 150, 163, 170, 237, 315, 325
 Fast scanning, 164
 Feature extraction, 56, 277
 Feature maps, 9, 227
 Feature representations, 200, 214, 225, 248,
 262, 305, 411
 abstract, 224
 intrinsic, 248–250, 255
 latent, 251, 253, 255, 260, 265
 low-dimensional, 249, 256, 259
 Feature selection, 246, 247, 258, 265, 309,
 313, 317
 Feed-forward neural networks, 4, 6, 412
 Feldman, 191
 FH (family history), 360, 361, 370, 372, 374
 Fine discrimination model, 134, 136, 139
 Fine-tuning, 14, 32, 331
 Fine-tuning process, 328, 331
 Frame selection, 108, 110, 118, 126, 128
 Fully connected hidden layers, 109
 Fully connected neural networks, 9, 59
 Fully convolutional network (FCN), 35–37,
 44, 127, 136, 137
 2D, 145
 3D, 144, 145, 147, 148, 150
 Fully-connected layers, 29, 33, 168, 229,
 280, 286
 Function
 activation, 4, 10, 59, 158, 168, 227, 346
 network response, 59
 optimal action-value, 66, 69
 Fundamentals of natural language
 processing, 407
 Fusion process, 169

G

Gaussian mixture model (GMM), 248, 249
 Gaussian smoothing, 119, 125
 Generative models
 deep, 14
 GIST, 310, 311

GLCM (gray-level co-occurrence matrix),
 303, 304, 310

Gradient correlation (GC), 284, 289

Graphics processing units (GPUs), 11, 22,
 27, 106, 110, 230, 285, 324

Gray matter (GM), 259

Ground truth, 59, 77, 117, 140, 141, 146,
 159, 211, 234, 246, 247, 274, 284,
 287, 397

Ground-truth regions, 163

H

HAMMER, 259, 263–265

Handcrafted features, 137, 139, 140, 143,
 157, 182, 191, 199–201, 207, 209,
 214, 246, 248, 256, 273, 323, 324

Heart failure, 181, 191, 300

Hidden layers, 5, 6, 12, 28, 92, 94, 202, 227,
 250, 286, 385
 dimension of, 203

 first, 14, 207, 385

 second, 14, 205, 387

Hidden nodes, 87, 96, 203, 251, 259, 264

High-power fields (HPFs), 140, 142

Hippocampal volume, 361, 362, 364, 368,
 370, 373

Hippocampus, 224, 260, 263, 265

Histogram of oriented gradients (HOG), 26,
 33, 85, 199–201, 214, 219, 303

Histology images, 139, 141

Hyperparameters, 358

I

ICPR MITOSIS dataset, 140

Image analysis, 106, 180, 227

Image classification, 22, 26, 32, 34, 87, 93,
 95, 135, 334, 419

Image classification tasks, 32, 35, 85, 90, 93,
 99, 100

Image patches, 34, 35, 45, 93, 113, 115, 156,
 166, 169, 186, 202, 227, 246, 247

Image registration, 239, 246, 249, 256, 259,
 265

 methods, 246, 257

Image representation, 42, 157, 303, 305, 306

Image representation, schemes, 303

Image segmentation, 180

Image-based tool for counting nuclei (ITCN), 171
 ImageNet, 27, 303, 307, 331, 332, 334, 406
 ImageNet classification, 26, 307
 ImageNet data, 303, 307
 Images
 fluoroscopic, 272, 275, 283
 hematoxylin or eosin grayscale, 186
 original, 88, 138, 188
 radiology, 406, 407, 412, 414, 419
 Implementation, 73, 93, 163, 182, 183, 305, 324, 368, 374
 Improvement, 34, 72, 94, 100, 140, 260, 312, 313, 332, 334, 344, 373
 Inclusion criteria, 359
 Information
 contextual, 143, 184, 249, 323
 topological, 166, 172
 Input channels, 280
 Input data, 13, 84, 202, 249, 251, 324, 348, 352
 Input feature maps, 8, 158
 Input features, 13, 19, 229, 277
 Input image, 9, 36, 42, 84, 109, 137, 158, 182, 226, 304, 307, 330, 334
 Input layer, 5, 11, 158, 202, 229, 250, 358
 Input patches, 10, 118, 228, 251, 386
 Input training patches, 202, 253
 Input vector, 13, 19, 158, 202
 Intelligence, 65
 Intensity, 143, 144, 147, 148, 185, 207, 209, 214, 216, 219, 225, 272, 279, 391
 Intensity features, 186, 216, 384
 Intensity patch, 199, 208, 219
 Intensity transformation, 382
 Intensity values, 94, 125, 246, 383, 389, 392, 393, 397
 Intensity-based methods, 272, 285, 288
 Intervention, 342, 344
 Invariant, 85, 203, 254, 346
 Iterations, 8, 258, 286, 292, 396
 Iterative radial voting (IRV), 171

K

K-nearest neighbor for pose estimation, 273
 Krizhevsky network, 307

L

Label fusion, 93
 Labels
 assigned, 415
 correct, 88, 315, 415
 true, 59, 230, 239
 Landmark detection, 57, 67, 71, 74, 78
 accurate, 43, 74
 anatomical, 83
 robust, 75
 Landmarks, 68, 74, 77, 206, 288, 289, 386
 Language, 42, 183, 411, 413
 Latent Dirichlet allocation (LDA), 410
 Layer-wise learning, 14, 252
 Layers, 5, 6, 8, 13, 15, 17, 18, 27, 31–34, 36, 37, 45, 117, 118, 158, 160, 161, 202, 253, 312, 313
 connections between, 13
 final, 42, 227, 306, 327
 first, 17, 28, 158
 last, 158, 166, 170, 347
 neighboring, 5, 18, 202
 penultimate, 158, 312
 second, 17, 229
 single, 4, 38, 41, 247, 313
 sub-sampling, 96, 326
 Learned feature representations, 86, 203, 205, 248, 256, 257, 259, 262–264
 Learned features, 36, 38, 148, 214, 219, 247, 255
 Learning models, 26, 71, 249, 250, 343, 354, 355
 Learning problems, 38, 56, 344, 352, 354
 Leave-1-patient-out cross-validation, 118–122
 Left consolidation (LCN), 310
 Left cuneus, 234, 237
 Left pleural effusion (LPE), 310, 315
 Lesions, 143, 321–325, 332, 334
 classification, 305, 322, 325
 detection, 322, 323, 325
 segmentation, 322, 323, 325
 Likelihood map, 209, 210
 Likelihood ratios, 311
 Local binary patterns (LBP), 186, 199–201, 214, 219, 302
 Local image residual (LIRs), 286–288, 290, 292, 293

Local information, 86, 88, 100
 Local maxima, 112, 272, 290, 293
 Local patches, 86, 88, 95, 207
 discriminative, 88, 94
 extracted, 95
 Local regions, 29, 85, 100
 discriminative, 85, 86, 95, 100
 non-informative, 87
 Localization, 34, 44, 106, 125, 157, 302, 317
 Locations, 34, 56, 58, 111–115, 125, 145,
 239, 277, 323, 417
 Logistic regression (LR), 85, 87, 225
 Logistic sigmoid function, 4, 6, 20, 251
 Longitudinal change, 359
 LONI dataset, 248, 262
 Loss function, 30, 87–90, 110, 157, 161,
 168, 389
 LSDN (location-sensitive deep network),
 382–385, 400
 LSDN-1, 389
 LSDN-2, 389
 LSDN-small, 389
 LSTM (long short term memory), 41–43
 Lumen–intima and media–adventitia
 interfaces, 107, 115–117, 123
 Lung diseases, 301, 302

M

Machine learning, 4, 56, 58, 64, 200, 248,
 273, 324, 343, 406
 Machine learning methods, 180, 342, 343,
 409
 Madabhushi, 191
 Mammograms, 226, 321, 323, 325, 328, 330,
 334
 Mammography view, 322, 324, 330
 Manual ground truth annotations, 183
 Marginal space, 62, 63, 276
 Marginal space deep learning (MSDL), 56,
 61, 77
 Marginal space learning (MSL), 56, 61, 67
 Marginal space regression (MSR), 277,
 286–288, 292
 Markov decision process (MDP), 65, 67
 Mass, 325, 330–332, 334
 Matlab, 165, 169
 Max pooling, 182, 229, 254, 259, 264, 330,
 331
 Maximally stable extremal region (MSER),
 156
 Media–adventitia interface, 115, 116, 122
 Medical image analysis (MIA), 16, 74, 83,
 85, 106, 157, 180, 181, 200, 226,
 239, 315, 324, 325, 419
 Medical image applications, 87, 246, 248
 Medical images, 83, 84, 86, 87, 134, 144,
 149, 224, 239, 246, 250, 253, 299,
 335, 387, 406, 419
 Medio-lateral oblique (MLO), 322, 331
 Methodology, 58, 87, 158, 166, 324, 326
 MHD (modified Hausdorff distance), 188
 Micro-calcifications, 322, 324–326,
 330–332, 334
 Microscopy images, 156, 166, 172
 Mild cognitively impaired subjects (MCIs),
 342, 360–362, 364, 370–372
 late, 359–362, 370, 371
 Mimics, 137, 139, 140, 143–145
 Mini mental state examination (MMSE),
 359, 361, 364, 367, 372, 373
 Mini-batches, 21, 30, 69, 110, 230
 Minimum variance unbiased (MVUB), 351,
 355, 358, 359
 Mitoses, 134, 139, 157
 Mitosis detection, 134–137, 139, 140, 166,
 182, 225, 325
 automated, 141
 MKL (multi-kernel support vector machine),
 361
 MKLm (MKL markers), 361, 362, 368, 370,
 373
 Modalities, 38, 43, 272, 284, 323, 342, 355,
 360, 362, 371, 382, 388, 392, 393,
 403
 Modality propagation (MP), 383, 389, 400
 Model selection and training parameters, 71
 Model’s outputs, 161, 162, 169, 358
 Montreal cognitive assessment (MOCA),
 361, 362, 364, 373
 Morphological signature, 249, 250, 256, 263
 MR brain images, 248, 255
 MR images, 74, 197, 198, 211, 214, 247,
 259, 263
 MR (magnetic resonance), 84, 135, 197, 409
 MR prostate images, 200, 207, 219
 MR volumes, 135, 143, 144

MRI images, 305, 360, 370
 MRI (magnetic resonance images), 224, 228,
 272, 353, 355, 360, 371, 382, 409
 MRI scans, 388, 397
 MSDL framework, 71
 MSER (maximally stable extremal region),
 156
 MTREproj (mean target registration error in
 the projection direction), 285, 290,
 292
 Multi-atlas, 199–201, 206, 207, 224, 228
 Multi-instance learning (MIL), 86, 93–95,
 97–99
 Multi-layer perceptron (MLP), 5, 33, 227,
 273, 385
 Multi-modal baseline rDAm, 361, 363–365
 Multi-task learning, 43
 Mutual information maximization, 384, 393,
 401
 Mutual information (MI), 231, 272, 289,
 382, 384, 392, 393, 397
 Myocytes, 180–183, 185–187

N

Natural language processing (NLP), 84, 343,
 352, 406, 407, 411, 417, 419
 Neighbors, 93, 166, 169, 391, 392
 NERS (non-overlapping extremal regions
 selection), 163, 164, 166, 171
 Network, 9, 13, 20, 26, 28, 32, 35, 43, 44,
 57, 59, 84, 140, 144, 286, 354, 355
 cascaded, 144
 decoder, 247, 248, 250
 deep belief, 26
 simplified, 388
 smaller, 349, 350, 390
 Network architecture, 21, 76, 138, 146, 148,
 163, 183, 230, 307
 learning, 6
 Network parameters learning, 6
 Network representation, 308
 Network structure, 253, 280, 347
 Neural language models, 411
 Neural network model, 45
 deep convolutional, 415
 Neural networks, 4, 12, 22, 29, 30, 34, 59,
 67, 70, 76, 148, 160, 225–227, 285,
 345, 384

deep max-pooling convolutional, 137
 feed-forward, 6, 411
 multi-layer, 5, 8, 14, 87, 346
 single-layer, 4, 346
 sparse adaptive deep, 59
 two-layer, 11
 Neurons, 4, 11, 30, 139, 182, 227
 Non-informative patches, 92
 Nonlinear transformation, 12, 158, 224, 225,
 250
 Nonlinearities, 29
 Number of hidden units, 5, 11–13

O

Object detection, 26, 34, 35, 38, 39, 43, 71,
 73, 134, 155, 157, 200
 Object recognition, 84, 140, 302, 353, 371
 Optimal enrichment criterion, 345, 350
 Optimization, 93, 230, 290, 395
 Optimization problem, 161, 167, 387, 394,
 396
 Optimizer, 272, 289, 290
 Orientations, 56, 58, 61, 72, 124, 277, 278,
 283, 304, 312
 Outcome measure, 344, 361
 Output layer, 5, 12, 14, 91, 144, 160, 202,
 204, 205, 227, 229, 250, 280, 286,
 346, 386, 387
 Outputs, 9, 13, 30, 36, 41, 44, 87, 92, 123,
 136, 158, 161, 167, 168, 226, 357,
 358
 Overfitting, 9, 20, 21, 59, 61, 94, 97, 230

P

Paired t-test, 122, 214, 219, 262
 Parameter space, 56, 61, 276, 286, 347
 Parameter space partitioning (PSP), 276,
 286–288, 292
 Parameters, 140, 161, 211, 231, 277
 large number of, 29, 31, 33, 148
 learned, 349, 350
 model's, 30, 159, 161, 162, 168
 out-of-plane rotation, 277
 out-of-plane translation, 277
 tuned, 118
 Patch binarization, 125, 128
 Patch representation, 182, 187

- Patches, 35, 58, 69, 91, 97, 107, 112, 113, 115, 121, 122, 125, 140, 144, 156, 187, 229
 - local image, 35, 166
 - sampled image, 255
 - selected image, 164, 255
 - training image, 159, 252
 - Pathologies, 182, 301–303, 310, 313–315, 317, 342
 - digital, 180, 187
 - examined, 310
 - Pattern matching, 407, 409
 - PCNN, 94, 97
 - Perceptron, 4
 - Performance, 31–33, 43, 44, 70–74, 77, 78, 107, 125, 126, 134, 135, 140–143, 147, 148, 156, 157, 165, 166, 171, 172, 233, 238, 239, 286, 287
 - Performance speedup, 127
 - Perturbations, 284
 - PHOG (pyramid histogram of oriented gradients), 303, 310
 - Picture archiving and communication systems (PACS), 406, 408
 - Pixel-wise classification (PWC), 137, 170
 - Placebos, 343, 344
 - Pneumonia, 300, 301, 415
 - Pooling layers, 8, 9, 37, 110, 158, 226, 227, 306
 - Population, 344, 345, 350, 359, 362, 372
 - Pose estimation via hierarchical learning (PEHL), 274, 285–290, 292, 293
 - Positive predictive value (PPV), 188
 - Pre-trained CNN, 88, 307
 - model, 95, 306, 307
 - Pre-trained models, 22, 26, 32, 45, 332–335
 - Precision, 93, 147, 165, 170, 171, 212, 214, 287
 - Predictive power, 181, 362, 364, 369, 370
 - Preprocessing, 84, 95, 106, 140, 146, 159, 211, 315, 360
 - Pretraining, 12, 14
 - layer-wise, 14, 347
 - Principle component analysis (PCA), 203, 247–250, 259, 260, 305
 - Probability, 5, 112, 114, 116, 126, 136, 138, 144, 160, 187, 255, 304, 310, 311, 343, 416
 - Probability signals, 112, 118, 125, 128
 - Problem formulation, 58, 67
 - Prostate, 199, 206, 211, 219
 - Prostate boundary, 197, 198, 200, 201, 210, 211, 214, 219
 - Prostate likelihood map, 206, 207, 209, 210, 219
 - Prostate region, 198, 206, 209
 - Prostate segmentation, 199, 216, 217
 - MR, 199, 219
 - Proximity mask, 166, 169
 - Proximity patch, 166
 - PsyEF (summary score for executive function), 361, 362, 364, 372
 - PsyMEM (neuropsychological summary score for memory), 361, 372
 - PWC (pixel-wise classification), 137, 170
 - Python, 45, 93
 - Theano, 22, 45, 149, 230
- ## Q
- Question, 43
- ## R
- Radiology text, 410, 412, 417
 - RadLex, 414
 - Random forest (RF), 148, 156, 182, 185, 186, 188, 189, 191, 382
 - Randomized deep networks, 344, 350, 352, 353, 356, 360
 - Randomized denoising autoencoder marker (rDAm), 358, 359, 361–364, 367, 368, 370–373
 - Randomized dropout network marker (rDrm), 358–368, 370–373
 - RAVLT (Rey auditory verbal learning test), 361, 372, 373
 - RBM (restricted Boltzmann machines), 15, 26, 347
 - RCasNN (randomly initialized model), 141
 - RCN (right consolidation), 310
 - RDA (randomized denoising autoencoders), 355, 356, 359, 362, 364, 370, 371, 373
 - Recall, 93, 141, 147, 163, 165, 170, 171, 262
 - Receptive fields, 9
 - Recognition, 57, 371

Reconstructions, 203, 205, 252, 349
 Recover, 10, 248, 250, 273, 274, 290
 Rectified linear unit (ReLU), 20, 29, 40, 59,
 93, 144, 158, 160, 227, 280
 Recurrent neural network (RNN), 37, 40–42,
 413
 Registration, 206, 224, 231, 238, 255, 258,
 324, 334, 386, 388
 2-D/3-D, 272–275, 283, 284, 288, 289,
 292, 293
 real-time, 287, 290, 292, 293
 Registration accuracy, 259, 265, 272, 285
 Registration methods, 263, 287
 2-D/3-D, 272, 288, 293
 baseline HAMMER, 260, 262, 263
 conventional, 248
 Registration problems, 273–275, 292, 293
 Registration-based methods, 223, 224, 228,
 231, 233, 234, 238, 239
 Regressors, 157, 275, 282, 289, 384
 Reinforcement learning, 65, 67, 69
 Representations, 12, 14, 17, 26, 35, 42, 55,
 59, 84, 148, 184, 225, 226, 254, 275,
 311–313
 Responses, 59, 88, 91, 203
 Restored wavelets, 111, 112, 125
 Reward, 68
 Right pleural effusion, 301, 310
 Right pleural effusion (RPE), 301, 310, 315
 RMSDproj (root mean squared distance in
 the projection direction), 287, 288
 Robust approach, 156
 Robust cell detection, 155, 165, 171
 Robust cell detection using convolutional
 neural network, 165
 ROI localization, 108, 115, 121, 126, 128
 ROI (region of interest), 106, 112–115, 121,
 125, 136, 183, 259, 260, 278, 285
 Root mean squared error (RMSE), 289

S

Sample enrichment, 344, 370
 Sample sizes, 361, 365, 367, 373
 Scales, 21, 56, 58, 143, 226, 304, 360
 Screening stage, 144
 SDA (stacked DA), 348–350, 354, 356, 357,
 371
 Segmentation, 22, 58, 71, 72, 84, 86, 100,
 180, 181, 199, 200, 212, 224, 225,
 227, 228, 231–234, 237–240, 302,
 315
 ground-truth, 212, 216
 registration-based, 228, 231
 semantic, 35, 135
 stroma, 180, 182, 185
 Segmentation accuracy, 107, 128, 214, 219
 Segmentation maps, 328, 331, 334
 Shallow models, 247, 250
 Shapes, 64, 107, 125, 140, 156, 170, 210,
 304
 ShrinkConnect, 388–390, 401
 SIFT, 26, 33, 85, 199, 248, 256, 303, 304
 Signal-to-noise ratio (SNR), 246, 263, 322,
 388
 Similarity maps, 201
 Similarity measures, 231, 272, 273, 285,
 289, 292, 392
 Small sample regime, 344, 350, 353
 Sonographer, 106, 109, 117, 127
 Source and target modalities, 382, 384, 390,
 396
 Sparse adaptive deep neural networks
 (SADNN), 57, 59, 61, 62, 64, 74
 Sparse auto-encoder (SAE), 13, 14, 17, 203,
 204, 247, 248, 252–254, 265
 Sparse histogramming MI (SHMI), 293
 Sparse patch matching, 206, 214
 Sparse representation, 207, 210, 248, 396
 coupled, 382, 389, 396, 400
 Sparsely distributed objects, 134, 150
 Spatial information, 143, 144, 149, 227, 239,
 305, 382, 383, 401
 Spatial locations, 28, 225, 385, 386, 389
 Spatial resolution, 36, 37, 71
 Stacked sparse auto-encoder (SSAE), 201,
 203–206, 208, 211, 213, 214, 216,
 219
 networks, 205
 Stages
 boosting, 88, 91, 96
 Standard deviation, 16, 117, 122, 163, 171,
 186, 260, 265, 284, 292, 304, 310,
 331, 345, 350
 State-of-the-art image classification method,
 305

States, 67, 68
 Stochastic gradient descent (SGD), 8, 30, 32, 37, 69, 76, 283
 Stride, 28, 36, 138
 Stroma, 180–183, 186, 190, 191
 Stromal tissue, 180, 187
 Structured regression model, 166–168, 171
 Success rate, 274, 285
 Superior performance, 128, 164, 165, 172, 214, 219, 265
 Supervised SSAE, 201, 205, 206, 213, 214, 216, 217, 219
 Synthetic data, 93, 294

T

Target image, 88, 201, 206, 210, 219
 Target information, 159
 Target modalities, 384
 Target modality images, 389, 391
 Target objects, 138, 199, 272, 277, 284, 285
 Template image, 255, 258, 264
 Tensorflow, 22, 45
 Test patients, 117, 118, 120–123, 125
 Test set, 71, 117, 230, 331, 363
 Testing images, 162
 Texture, 140, 185, 224, 325
 Tissue, 180, 259
 Tissue segmentation, 182
 Topic modeling, 410
 Total knee arthroplasty (TKA), 283–286, 290
 Toy example, 40, 89, 90
 Training, 31, 45, 60, 64, 74, 185, 230, 253, 326, 382, 386, 388, 389
 two-stage, 331
 Training annotations, 182, 187, 190, 191
 Training data, 14, 27, 31, 32, 84, 140, 141, 156, 159, 166, 168, 183, 184, 187, 188, 203, 225, 239, 240, 250
 paired, 384, 390, 391, 397, 401
 synthetic, 289
 Training dataset, 139–141, 230, 238
 Training images, 32, 87, 110, 141, 239, 246, 255, 259, 260, 264, 331, 389
 Training patches, 113, 115, 118, 121, 160, 183, 184, 186, 202, 203
 Training patients, 117–119, 121
 Training PEHL, 286, 289, 294
 Training phase, 145, 229
 Training regressors, 274
 Training samples, 8, 11, 13, 59, 93, 137, 139–141, 161, 167, 168, 247, 283, 347, 387
 artificial, 332
 Training set, 13, 63, 64, 71, 88, 93, 112, 115, 117, 145, 147, 182, 185, 203, 228, 230
 stratified, 113, 115
 Training time, 20–22, 74, 332
 Transfer learning, 140, 299, 307, 324
 Transformation parameters, 56, 61, 273, 278, 289, 290, 293, 349
 Transformations, 56, 139, 210, 274, 276, 294, 345, 357, 383, 386
 Translation, 9, 10, 35, 36, 42, 61, 62, 90, 93, 95, 112, 113, 115, 137, 140, 145, 226, 227, 254, 276–278
 Treatment, 143, 182, 197, 342–345, 350
 Trial, 200, 342, 350, 368, 371
 Tricks, 31, 33
 True negative rate (TNR), 188
 True negative (TN), 315
 True positive rate (TPR), 188
 True positive (TP), 141, 142, 315, 323
 True targets, 136
 Tuberculosis, 301

U

Ultrasound images, 56, 71, 124
 UMLS Metathesaurus, 414
 Unified medical language system (UMLS), 414
 Unsupervised SSAE, 201, 205, 213, 214, 216, 217

V

Validation set, 76, 230
 Vanilla deep network (VDN), 389
 Vanishing gradient problem, 11, 20, 41
 Ventricle, 210, 234, 237, 255, 259
 VGG network, 313
 VGG-L4, 311
 VGG-L5, 308, 313
 Videos, 38, 106, 108, 112, 117, 123
 fluoroscopic, 283
 Virtual implant planning system (VIPS), 283, 285, 286, 290

Visible layer, 4, 15, 17, 18
Volumes, 39, 145, 147, 224

Volumetric data, 143

Voting confidence, 159

Voting offsets, 159

Voting units, 160

Voxels, 8, 57, 201, 208, 212, 227, 229, 234,
255, 272, 353, 354, 371, 384, 391,
392, 397
center, 385, 386, 392

W

Weak learners, 352

Weight units, 160

White matter (WM), 259

Whole-slide imaging (WSI), 180, 187

Word embedding, 411

Word-to-vector models, 411

X

X-ray attenuation map, 272

X-ray echo fusion (XEF), 284, 289

X-ray images, 272, 273, 275, 277, 279, 283,
284, 287, 289

real, 281, 294

synthetic, 275, 279, 281

X-ray imaging model, 274

XEF dataset, 287

Z

Zone, 277