

Index

action	146	density estimation	195
action preference	164	non parametric	196
activation function	34	parametric	196
active learning	10, 73, 97	differentiable programming	184
actor-critic	165	differentiation	17, 187
agent	145, 146	automatic differentiation	109,
anomaly detection	58, 59, 72	187, 188	
ansatz	112, 113, 123	manual differentiation	187
computationally tractable states		numerical differentiation	187
114		symbolic differentiation	187
mean-field	112	dimensionality reduction	51
autoencoder	36, 37, 57, 65	discount factor	148
interpretability	65	environment	145, 146
quantum autoencoder	250	environment dynamics	150
automation procedure	209	epoch	16
autoregressive models	38, 121, 199	experience replay	158
autoregressive neural network	38, 120	exploitation	149
backpropagation	4, 17, 35, 40, 190	exploration	149
baseline	161	feature	7–10, 27, 76
batch optimization	208	feature space	76
Bayes error	25, 229	Gaussian process	90, 96, 101, 102
Bayesian information criterion	100, 101	generalization	19
Bayesian optimization	95, 101, 102	generalization error	19, 21
acquisition function	96, 98	generalized approximate message	
Bayesian posterior	228	passing	229
Bellman equations	153	generative models	8, 9, 38, 121, 195
optimal Bellman equations	154	deep generative models	195
bias-variance trade-off	21, 100, 221	generative neural samplers	198
bottleneck	37, 57, 65	gradient descent	16
capacity	20, 222, 239	stochastic gradient descent	18
classification	7, 207	graphics processing unit	4, 185, 255,
clustering	9, 51	256	
committee machine	6, 230–232, 237, 238	Hamiltonian learning	214
convolutional neural network	36, 207	Hessian	18, 70, 187
interpretability	66	hyperparameter	16
critical task difficulty	223	influence functions	71
cross-validation	16	interpretability	63–66, 69, 73, 169, 219
data augmentation	208	k-local operator	114
deep Q-network	157		

INDEX

kernel	76	optimal policy	146
kernel ridge regression	85	policy gradient	159
kernel search	101, 107	policy gradient theorem	159
kernel trick	76, 79, 84	REINFORCE	160
Kullback-Leibler divergence	25, 139, 183, 197	prediction-based method	61
learning by confusion	59	principal component analysis	51
learning rate	16	Q-learning	155
linear regression	28, 94	deep Q-learning	157
logistic regression	31	double Q-learning	157
loss function	14, 100	quantum machine learning	239
loss landscape	17, 70, 71	quantum many-body problem	111, 133
Markov chain Monte Carlo	115, 120	quantum state tomography	138
Markov decision process	147, 150	quantum tomography	195
action space	147, 150	shadow tomography	142
state space	147, 150	random feature model	230, 231
trajectory	151	recurrent neural network	38, 121, 199
Markov property	150	regression	7, 21, 217
maximum likelihood	100, 196	regularization	20, 64
mean squared error	22	reinforcement learning	9, 145
minimal task difficulty	227	model-based reinforcement learning	151
mode collapse	204	model-free reinforcement learning	151
neural network	34	reliability	63
neural quantum states	118	local ensembles	72
no free lunch theorem	20	resampling uncertainty estimation	72
noisy intermediate-scale quantum era	243	underspecification	72
normalizing flow	200	replica trick	225
one hot encoding	56	representation space	51
online learning	237	representer theorem	82, 94
overfitting	20, 29, 100	reproducing kernel Hilbert space	83
overparametrization	233	restricted Boltzmann machine	118
perceptron	34, 222, 237	return	148
perceptron capacity	223	discounted return	148, 151
quantum perceptron	238	reward	146, 148
perplexity	54	score function	159
phase classification	47, 106	self-averaging	224
supervised phase classification	56	semi-supervised learning	10
unsupervised phase classification	50	Siamese neural network	67, 69
policy	146, 150	softmax	31
ε -greedy policy	149	state (RL)	146
		stochastic neighbor embedding (SNE)	
		54	

INDEX

t-distributed SNE	54	projected entangled pair states	
supervised learning	9, 215	122	
support vector machine	32	transfer learning	105
kernel support vector machine			
86			
quantum support vector machine	242	uncertainty	72, 96, 102
support vector machines		underfitting	20
interpretability	65	unsupervised learning	9, 50, 51, 54
target network	158	value function	152
teacher-student paradigm	222, 228, 239	action-value function	152
temporal-difference learning	155	advantage	153
temporal-difference error	155	state-value function	152
tensor networks	113	variational inference	197
matrix product states	113	variational quantum eigensolver	246
		variational state	112, 114, 116–118, 126, 135, 143