TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
NO		NO
1	Machine Learning	01
	1.1. Introduction	01
	1.2. Artificial Intelligence	01
	1.2.1. Why AI?	02
	1.2.2. Differences	02
	1.2.3. Uses	03
	1.2.4. Definition	05
	1.2.5. Let's Understand what is ML Process	06
	1.2.6. Machine Learning Approaches/Types	08
	1.2.7. What is the difference between Artificial Intelligence	23
	and Machine Learning?	
	1.2.8. Well Posed Learning Problems	23
	1.2.9. Design a Learning System in Machine Learning	24
	1.2.10. Perspectives and Issues in Machine Learning	27
	1.2.11. Top Challenges	29
	1.2.12. Concept Learning and the General to Specific	31
	Ordering	
	1.2.13. ML – Candidate Elimination Algorithm	36
	1.2.14. A Concept Learning Task	38
	1.2.15. Well-posed Learning Problems-design a Learning	39
	System in Machine Learning	
	1.2.16. Perspectives and Issues in Machine Learning	41
2	Concept Learning and the General to Specific Ordering	44
	2.1. Concept Learning and the General to Specific Ordering	44
	2.2. General-to-specific Ordering	49
	2.3. FIND S Algorithm – Maximally Specific Hypothesis	50
	2.4. Version Space	55

	2.5. ML – Candidate Elimination Algorithm	56
	2.6. Remarks on Version Spaces	62
	2.7. Remarks on Candidate-Elimination Algorithm	62
	2.8. Inductive Bias	63
3	Decision Tree Learning	64
	3.1. Decision Tree Learning	64
	3.2. Building Decision Tree Using Information Gain	66
	3.3. Types of Decision Tree Algorithms Are	70
	3.4. Decision tree Representation	71
	3.5. Decision Tree	73
	3.5.1. Entropy	75
	3.5.2. Information Gain	77
	3.6. Decision Tree Classification Algorithm	81
	3.7. Hypothesis Space Search in Decision Tree Learning	85
	3.8. Best Hypothesis Search	88
	3.9. Inductive Learning Algorithm	89
	3.10. The Inductive Learning Algorithm (ILA)	90
	3.11. Decision Tree Induction	93
	3.12. Issues in Decision Tree Learning	96
4	Artificial Neural Network (ANN)	99
	4.1. Artificial Neural Network	99
	4.2. The Architecture of an Artificial Neural Network	101
	4.3. How do Artificial Neural Networks Work?	103
	4.4. Types of Artificial Neural Network	104
	4.5. Neural Networks Representation	105
	4.6. Types of Neural Networks	105
	4.7. Applications of Artificial Neural Networks	109
	4.8. Perceptron	111
	4.9. Types of Perceptron Models	114
	4.10. Perceptron Function	116

	4.11. Limitations of Perceptron Model	117
	4.12. Multi-Layer Feed Forward Networks	117
	4.13. Back-propagation Algorithm	122
	4.14. Types of Backpropagation Networks	124
	4.15. Backpropagation Algorithm	125
5	Artificial Neural Networks-2	142
	5.1. Remarks on the Back-Propagation Algorithm	142
	5.2. Face Recognition Using Artificial Intelligence	142
	5.3. Face Recognition Software's	145
	5.4. Problems and Challenges	147
	5.5. Advanced Topics in Artificial Neural Networks	149
6	Evaluation Hypotheses	151
	6.1. Evaluation Hypotheses – Motivation	151
	6.2. What is a Hypothesis in Machine Learning?	151
	6.3. Sampling Theory	159
	6.4. Population	160
	6.5. Methods and Types of Sampling	161
	6.6. Confidence Interval	164
	6.7. Constructing a Confidence Interval	165
7	Bayesian Learning	169
	7.1. Introduction	169
	7.2. When Events Are Not Mutually Exclusive	172
	7.3. Bayesian Learning Methods	176
	7.4. Bayes Theorem	177
	7.5. Worked Examples for Calculating Bayes Theorem	179
	7.6. Applications of Bayes Theorem	186
	7.7. Brute-Force MAP Learning Algorithm	187
	7.8. Maximum Likelihood and Least Squared Error Hypothesis	190
	7.9. Linear Regression as Maximum Likelihood	191
	7.10. Least Squares and Maximum Likelihood	192

	7.11. Maximum Likelihood Hypothesis for Predicting Probabilities	193
	7.12. Minimum Description Length Principle	195
	7.13. Bayes Optimal Classifier	197
	7.14. Naive Bayes Classifier Algorithm	199
	7.15. Text Classification Using Naive Bayes Classifier	206
	7.16. Bayesian Belief Network (BBN)	212
	7.17. Gibbs Algorithm	218
	7.18. Naive Bayes Classifier	220
	7.19. Gaussian Naive Bayes Classifier	226
	7.20. Multinomial Naive Bayes	230
	7.21. Bayesian Belief Networks	231
	7.22. Expectation Maximization (EM) Algorithm	238
8	Computational Learning Theory	245
	8.1. Introduction	245
	8.2. Probably Learning and Approximately Correct Hypothesis	252
	8.3. Sample Complexity for the Finite Hypothesis Space	253
	8.4. The Mistake Bound Model of Learning	254
9	Instance-based Learning	256
	9.1. Introduction	256
	9.2. k-Nearest Neighbour Algorithm	256
	9.3. Locally Weighted Regression	269
	9.4. Radial Basis Functions	272
	9.5. Case-based Reasoning	274
	9.6. Remarks on Lazy and Eager Learning	276
10	Genetic Algorithm	277
	10.1. Genetic Algorithm	277
	10.2. Genetic Algorithms - Motivation, Genetic Algorithms, An	277
	Illustrative Example	
	10.3. Operators of Genetic Algorithms	281
	10.4. Population Models	288

	10.5. Stochastic Universal Sampling (SUS)	291
	10.6. Lamarckian Model	300
	10.7. Understanding Hypothesis Space Search	307
	10.8. Simple Genetic Algorithm (SGA)	310
	10.9. Genetic Programming (GP)	312
	10.10. Lamarckian Evolution Theory	316
	10.11. Additional Explanation	318
	10.12. An Illustrative Example	325
	10.13. Illustrative Example	327
11	Learning Sets of Rules	334
	11.1. Learning Sets of Rules	334
	11.2. Sequential Covering Algorithms	334
	11.3. Learn-One-Rule Algorithm	337
	11.4. Learning Rule Sets: Summary	337
	11.5. Learning First-Order Rules	338
	11.6. Learning Sets of First-Order Rules: FOIL	340
	11.7. Induction as Inverted Deduction	344
	11.8. Inverting Resolution	344
12	Reinforcement Learning	352
	12.1. Introduction	352
	12.2. Reinforcement Learning	353
	12.3. Approaches to Implement Reinforcement Learning	356
	12.4. Reinforcement Learning Algorithms	364
	12.5. The difference Table between RL and Supervised Learning	368
	12.6. Temporal difference Learning	369
	12.7. Parameters	371
	12.8. Benefit of Temporal Difference Learning	372
	12.9. Dynamic Programming	373
	12.10. Principle of Optimality	377

13	Analytical Learning - 1	379
	13.1. Analytical Learning	379
	13.2. Learning with Perfect Domain Theories	379
	13.3. Prolog-EBG	379
	13.4. What is Prolog	380
	13.5. Explanation-Based Learning (EBL)	384
	13.6. Learning with Perfect Domain Theories: PROLOG-EBG	393
	13.7. Remarks on Explanation-based Learning	394
	13.8. Explanation-based Learning of Search Control Knowledge	395
14	Analytical Learning - 2	396
	14.1. Hypothesis Space Search	396
	14.2. The KBANN Algorithm	396
	14.3. Using Prior Knowledge to Alter the Search Objective	397
	14.4. The TANGENT PROP Algorithm	397
	14.5. Using Prior Knowledge to Augment Search Operators	399
	14.6. The FOCL Algorithm	399
	14.7. Tangents and Normal's	399
15	Combining Inductive and Analytical Learning	404
	15.1. Inductive-analytical Approaches to Learning	404
	15.2. Hypothesis Space Search	404
	15.3. Inductive Learning Algorithm	405