



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3172421

Semester – VII

Subject Name: **AI and Machine Learning in Power Electronics**

Type of course: Professional Elective Course

Prerequisite: Data Structures, Mathematics, Basics of computer science including algorithms, data structure, Basic Linear algebra, and Probability theory

Rationale: With the usage of Internet and World Wide Web increasing day by day, the field of AI and its techniques are being used in many areas which directly affect human life. Various techniques for encoding knowledge in computer systems such as Predicate Logic, Production rules, Semantic networks find application in real world problems. Student should know some programming language for AI, basic concepts of various learning methods, algorithms used in machine learning.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Course Content	Total Hrs.
1	Introduction to AI : The AI problems, the underlying assumption, what is an AI techniques, the level of the model, criteria for success, Some general references, one final word.	04
2	Problems, State Space Search & Heuristic Search Techniques: Defining the problems as a state space search, production systems, Production characteristics, production system characteristics, and issues in the design of search programs, additional problems. Generate-and-test, hill climbing, best-first search, problem. reduction, constraint satisfaction, means-ends analysis.	06
3	Using Predicate Logic: Representation simple facts in logic, representing instance and isa relationships, computable functions and predicates, resolution.	06
4	Artificial Intelligence Trailblazers & Retail, Consumer Goods and Food and Beverage Companies: Artificial Intelligence Trailblazers Alibaba, Amazon, face book, baidu, IBM, Microsoft, Apple etc, Retail, Consumer Goods and Food and Beverage Companies like Domino, Samsung, McDonald's, Walmart etc..	05
5	Introduction to Prolog & Machine Learning: Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages. Learning Problems, designing a learning system, Issues with machine learning. Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias.	06



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6	Supervised and Unsupervised learning Decision Tree Representation: Appropriate problems for Decision tree learning, Algorithm, Hypothesis space search in Decision tree learning, inductive bias in Decision tree learning, Issues in Decision tree learning K-Nearest Neighbors Learning Locally Weighted Regression, Radial Bases, Functions, Case Based Reasoning	06
7	Artificial Neural networks and genetic algorithms: Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Remarks on Back Propagation Algorithms Case Study: face Recognition	06
8	Bayesian Learning Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, Maximum likelihood hypothesis for Predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm Case Study: Learning to classify text,	06

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	15	20	10	05

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Text Book:

1. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI.
3. Tom M Mitchell, "Machine Learning", McGraw Hill
4. Peter Harrington, "Machine Learning in Action", DreamTech

Reference Books:

1. Introduction to Prolog Programming By Carl Townsend.
2. "Programming with PROLOG" –By Klocksinn and Mellish.
3. Henrik Brink, Joseph Richards, Mark Fetherolf, "Real-World Machine Learning", DreamTech
4. Christopher Bishop, "Pattern Recognition and Machine Learning"
5. Hastie, Tibshirani, and Friedman, "Elements of Statistical Learning". Springer
6. Jiawei Han and Michelline Kamber, "Data Mining: Tools and Techniques", 3rd Edition.
7. I H Witten, Eibe Frank, Mark A Hall, "Data Mining: A practical Machine Learning Tools and techniques", Elsevier

Course Outcome:

After learning this course, the students should be able:



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Sr. No.	CO statement	Marks % weightage
CO1	Understand various search methods .	20
CO2	Use various knowledge representation methods.	20
CO3	Use Prolog Programming language using predicate logic.	20
CO4	Understand the concept of Machine learning and range of problems that can be solved by machine learning.	20
CO5	Compare different types of learning algorithms and apply machine learning concepts in real life problems.	20

The following are suggested list of experiments based on theme:

1. To study basics of Artificial Intelligence.
2. To study Artificial Intelligence Trailblazers.
3. To study Retail, Consumer Goods Food and Beverage Companies.
- 4 Describe major subfields and paradigms of AI.
5. What are the major challenges in the field of AI?
6. How AI can be used to develop a better search Engine?
7. To study Prolog: Syntax and Numeric Function.
8. To study about various AI Programming Languages.
9. To study about Machine Learning Problems and Issues with machine learning.
10. To Artificial Neural networks and genetic algorithms.

Major Equipment: Computer/Prolog Language

List of Open-Source Software/learning website:

1. <http://www.journals.elsevier.com/artificial-intelligence/>
2. <https://www.technologyreview.com/s/534871/our-fear-of-artificial-intelligence/>
3. <http://www.sanfoundry.com/artificial-intelligence-mcqs-inductive-logic-unification-lifting-1/>