

MICRO LESSON PLAN
ANDHRA LOYOLA INSTITUTE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Subject: Machine Learning

Teacher : Dr. CH. Rathna Jyothi

Academic Year: 2022-23

Year/Semester: IV-SEM-I

Course Outcomes:

Factual	• To Recognize the characteristics of machine learning that make it useful to solve real-world Problems.
Conceptual	• To Discuss a set of well-known supervised, unsupervised and semi-supervised Learning algorithms.
Procedural	• To implement some basic machine learning algorithms
Applied	• To Evaluate machine learning algorithms.

Text books:

Text book-1 : Machine Learning, Tom M. Mitchell, MGH.

Text book-2 : Machine Learning: The art and science of algorithms that make sense of data, Peter Flach,Cambridge.

References:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai BenDavid, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

Contents/Activities:

1	Factual: Factual knowledge consists of the basic elements students must know to be acquainted with a discipline	• The Problems that can be solved with ML (UNIT-I) • The models of ML (UNIT-I) • Features (UNIT-I) • Binary Classification(UNIT-I) • Scoring & Ranking(UNIT-I) • Class Probability Estimation (UNIT-I) • Regression (UNIT-II) • Unsupervised and Descriptive Learning(UNIT- II) • Decision Trees (UNIT-III) • Descriptive rule Learning(UNIT-III) • Linear Models(UNIT-4) • Kinds of features (UNIT-V) • Feature Transformation(UNIT-V) • Feature Construction & Selection(UNIT-V) • Neural Network Representation(UNIT-VI)
2	Conceptual: Conceptual knowledge consists of the interrelations among the basic elements within a larger structure	• Handling more than two Classes (UNIT-II) • Concept Learning (UNIT-II) • Tree learning as variance Reduction (UNIT- III) • First order rule learning(UNIT-III) • Support Vector Machines(UNIT-IV) • Nearest Neighbor Classification(UNIT-IV) • Distance Based Clustering(UNIT-IV) • Hierarchical Clustering (UNIT-IV) • Probabilistic models for categorical data (UNIT-V) • Principal Component Analysis (UNIT-VI) • Multilayer Networks(UNIT-VI)
3	Procedural: methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.	• Learning Ordered Rule lists(UNIT-III) • Learning Un Ordered Rule lists(UNIT-III) • A heuristic learning algorithm for linear classifier(Unit-IV)

		• Bagging and random forests(Unit-IV) • Back propagation algorithm(Unit-V)
4	Applied: awareness of one's own learning, control and regulation of cognitive processes, self-knowledge, contextual knowledge, and conditional learning	• Beyond Conjunctive Concepts(UNIT-II) • Evaluating Postfix Expressions (UNIT-III) • Tree learning as variance reduction (UNIT-III) • Going beyond linearity with kernel methods(UNIT-IV) • Optimizing probabilistic models with hidden variables(UNIT-V) • PCA Implementation and Demonstration

Schedule and Sequence:

	Topic	Objective	Before Class-Videos, e- Books, Case Studies	In-Class-Activities, Quiz	Post-Class-Assignment, Discussion Forum
1	Chapter-I Ingredients of Machine Learning Tasks	• Understanding Ingredients of Machine Learning Tasks	• Refer the Text book -1 Chapter-1 page-13	• Lecture on Machine Learning Tasks	Discussion in Forum
2	Types of learning	• Understanding different Types of learning	Refer the Text book -1 Chapter-1 page-15 Refer the video https://www.youtube.com/watch?v=olFxW7kdtP8	• Lecture on Types of learning	Discussion in Forum
3	Problems that can be solved with Machine learning	• Understanding different types of Problems that can	• Refer the Text book -1 Chapter-1 page-17 • Refer the video	• Problems that can be solved with Machine	Discussion in Forum

		be solved with Machine learning	https://www.youtube.com/watch?v=_1QtMPuYIVw	learning	
4	Issues of machine learning	Understanding Issues of machine learning	- Refer the Text book -2 Chapter-1.1 page-57 - Refer the video https://www.youtube.com/watch?v=ngERnNIPyJI	Lecture on Issues of machine learning	Discussion in Forum
5	Case study: Playing checkers game	Analyzing the Case study: Playing checkers game	- Refer the Text book -2 Chapter-1.8 page-54 - Refer the video: https://www.youtube.com/watch?v=5WPCU5cZ_gA	Solving Case study	CASE STUDY
6	Models: the output of machine learning	Understanding Models: the output of machine learning	- Refer the Text book -1 Chapter-1 page-20 - Refer the video https://www.youtube.com/watch?v=yN7ypxC7838	Lecture on Models: the output of machine learning	Discussion in Forum
7	Features: the workhorses of machine learning	Understanding Features: the workhorses of machine learning	- Refer the Text book -1 Chapter-1 page-38 - Refer the video https://www.youtube.com/watch?v=40Fm-E2hITM	Lecture on Features: the workhorses of machine learning	Discussion in Forum
8	Scoring and ranking	Understanding Scoring and ranking	- Refer the Text book -1 Chapter-2.2 page-61 - Refer the video https://www.youtube.com/watch?v=5JrS-zzmzK4	Lecture on Scoring and ranking	Discussion in Forum
9	Class probability	Understanding Class probability	Refer the Text book -1 Chapter-2.3 page-72	Lecture on Class probability	Assignment

	estimation		• Refer the video		
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		estimation	https://www.youtube.com/watch?v=PqCHXXA1Cd4c	estimation	
10	Chapter-2 Handling more than two classes	Learn how to Handling more than two classes	- Refer the Text book -1 Chapter3.1 page-81 - Refer the video https://www.youtube.com/watch?v=2LlICaC00JA	Lecture on Handling more than two classes	Discussion in Forum
11	Regression	Understanding Regression	- Refer the Text book -1 Chapter3.2 page-91 - Refer the video https://www.youtube.com/watch?v=wscb2XfW1lQ	Lecture on Regression	Discussion in Forum
12	Unsupervised and descriptive learning	Understanding Unsupervised and descriptive learning	- Refer the Text book -1 Chapter3.3 page-95 - Refer the video https://www.youtube.com/watch?v=OhKpCln-cJO	Lecture on Unsupervised and descriptive learning	Discussion in Forum
13	Concept learning: The hypothesis space	Understanding The hypothesis space	- Refer the Text book -1 Chapter 4.1 page-106 - Refer the video https://www.youtube.com/watch?v=35SHIN_QATuU	Lecture on The hypothesis space	Discussion in Forum
14	Paths through the hypothesis space	Understanding Paths through the hypothesis space	- Refer the Text book -1 Chapter 4.2 page-112. - Refer the video https://www.youtube.com/watch?v=uuTFjdcJMSM	Lecture on Paths through the hypothesis space	Discussion in Forum
15	Beyond conjunctive concepts	Understanding Beyond conjunctive concepts	- Refer the Text book -1 Chapter 4.3 page-119 - Refer the video https://www.youtube.com/watch?v=DaY1NbALZ7g	Lecture on Beyond conjunctive concepts	Quiz

16	Chapter-3: Tree models: Decision trees	Learn how to construct a Decision trees	- Refer the Text book -1 Chapter 5.1 page-133 - Refer the video https://www.youtube.com/watch?v=7VeUPuFGJHk	Lecture on Decision trees	Discussion in Forum
16	Ranking and probability estimation trees	Learn how to construct a Ranking and probability estimation trees	- Refer the Text book -1 Chapter 5.2 page-138 - Refer the video https://www.youtube.com/watch?v=PqCHXXA1CdE	Lecture on Ranking and probability estimation trees	Discussion in Forum
17	Tree learning as variance reduction	Understanding Tree learning as variance reduction	- Refer the Text book -1 Chapter 5.3 page-148 - Refer the video https://www.youtube.com/watch?v=O8ktVRu9OZg	Lecture on Tree learning as variance reduction	Assignment
18	Rule models: Learning ordered rule lists	Learning ordered rule lists	- Refer the Text book -1 Chapter 6.1 page-158 - Refer the video https://www.youtube.com/watch?v=Yx2USy1-WFE	Lecture on Learning ordered rule lists	Discussion in Forum
19	Learning unordered rule sets	Learning unordered rule sets	- Refer the Text book -1 Chapter 6.2 page-167 - Refer the video https://www.youtube.com/watch?v=3sgvMZSysRY	Lecture on Learning unordered rule sets	Discussion in Forum
20	Descriptive rule learning,	Understanding Descriptive rule learning,	- Refer the Text book -1 Chapter 6.3 page-176 - Refer the video https://www.youtube.com/watch?v=K5sH2WRTirE	Lecture on Descriptive rule learning,	Discussion in Forum
21	First-order rule learning	Understanding First-order rule	Refer the Text book -1 Chapter 6.4 page-189	Lecture on First-order rule	Discussion in Forum

		learning	Refer the video https://www.youtube.com/watch?v=LSghD5yHtjE	learning	
22	Chapter-4: Linear models: The least-squares method	Understanding The least-squares method	- Refer the Text book -1 Chapter 7.1 page-194 - Refer the video https://www.youtube.com/watch?v=P8hT5nDai6A	Lecture on The least-squares method	Discussion in Forum
23	Analysis of least squares method	Understanding Analysis of least squares method	- Refer the Text book -1 Chapter 7.1 page-205 - Refer the video https://www.youtube.com/watch?v=UkN2ARQGxpo	Lecture on Analysis of least squares method	Discussion in Forum
24	Implementation & Demonstration of least squares method using Python	Coding of least squares method using Python	Refer the article https://towardsdatascience.com/least-squares-linear-regression-in-python-54b87fc49e77?gi=daf937416779	Lecture on Implementation & Demonstration of least squares method using Python	Coding Challenge
25	The perceptron : a heuristic learning algorithm for linear classifiers	Understanding The perceptron: a heuristic learning algorithm for linear classifiers	- Refer the Text book -1 Chapter 7.2 page-207 - Refer the video https://www.youtube.com/watch?v=du5fyS44DR8	Lecture on The perceptron: a algorithm for linear classifiers	Discussion in Forum
26	Support Vector Machine	Understanding Support Vector Machine	- Refer the Text book -1 Chapter 7.3 page-211 - Refer the video https://www.youtube.com/watch?v=H9vACitf-KM	Lecture on Support Vector Machine	Assignment

27	Obtaining probabilities from linear classifiers	Understanding how to obtain probabilities from linear classifiers	Refer the Text book -1 Chapter 7.4 page-219	Lecture on Obtaining probabilities from linear classifiers	Discussion in Forum
28	Going beyond linearity with kernel methods	Understanding Going beyond linearity with kernel methods	- Refer the Text book -1 Chapter 7.5 page-224 - Refer the video https://www.youtube.com/watch?v=8bFKyb77vp0	Lecture on Going beyond linearity with kernel methods	
29	Distance Based Models: Introduction	Understanding different metrics used in distance based models	- Refer the Text book -1 Chapter 8.1 page-231 - Refer the video https://www.youtube.com/watch?v=qOE0OC1yUZw	Lecture on Introduction	Discussion in Forum
30	Neighbors and exemplars	Understanding what is a Neighbor and exemplar	- Refer the Text book -1 Chapter 8.2 page-237 - Refer the video https://www.youtube.com/watch?v=JoJjKJDev0s	Lecture on Neighbors and exemplars	Discussion in Forum
31	Nearest Neighbors classification analysis	Understanding Nearest Neighbors classification analysis	- Refer the Text book -1 Chapter 8.3 page-242 - Refer the video https://www.youtube.com/watch?v=HVXime0nQeI	Lecture on Nearest Neighbors classification analysis	Discussion in Forum
32	Nearest Neighbor classification algorithm with example	Understanding Nearest Neighbor classification algorithm with	Refer the video https://www.youtube.com/watch?v=IPqZKn_cMts	Lecture on Nearest Neighbor classification	Assignment

		example		algorithm with example	
33	Implementation & Demonstration of nearest neighbor algorithm using Python	Coding of nearest neighbor algorithm using Python	Refer the video https://www.youtube.com/watch?v=jls-MvKnayo	Lecture on Implementation & Demonstration of nearest neighbor algorithm using Python	Coding Practice
34	Distance Based Clustering Analysis	Understanding Distance Based Clustering Analysis	- Refer the Text book -1 Chapter 8.4 page-245 - Refer the video https://www.youtube.com/watch?v=B936YxqrrXI	Lecture on Distance Based Clustering Analysis	Discussion in Forum
35	Distance based clustering algorithm & Example	Distance based clustering algorithm & Example	Refer the video https://www.youtube.com/watch?v=FllcPjvztTI	Lecture on Distance based clustering algorithm & Example	Discussion in Forum
36	Hierarchical Clustering Analysis	Understanding Hierarchical Clustering Analysis	- Refer the Text book -1 Chapter 8.5 page-253 - Refer the video https://www.youtube.com/watch?v=7xHsRkOdVwQ	Lecture on Hierarchical Clustering Analysis	Discussion in Forum
37	Hierarchical clustering algorithm with example	Understanding Hierarchical clustering	Refer the video https://www.youtube.com/watch?v=RdT7bhm1M3E	Lecture on Hierarchical clustering	

		algorithm with example		algorithm with example	
38	Chapter-5: Probabilistic models: The normal distribution and its geometric interpretations	Understanding Probabilistic models: The normal distribution and its geometric interpretations	- Refer the Text book -1 Chapter 9.1 page-266 - Refer the video https://www.youtube.com/watch?v=rzFX5NWojp0	Lecture on The normal distribution and its geometric interpretations	Quiz
39	Probabilistic models for categorical data	Understanding Probabilistic models for categorical data	Refer the Text book -1 Chapter 9.2 page-273	Lecture on Probabilistic models for categorical data	Discussion in Forum
40	Discriminative learning by optimizing conditional Likelihood	Understanding Discriminative learning by optimizing conditional Likelihood	- Refer the Text book -1 Chapter 9.3 page-282 - Refer the video https://www.youtube.com/watch?v=XepXtl9YKwc	Lecture on Discriminative learning by optimizing conditional Likelihood	Discussion in Forum
41	Probabilistic models with hidden variables	Learn Probabilistic models with hidden variables	- Refer the Text book -1 Chapter 9.4 page-286 - Refer the video https://www.youtube.com/watch?v=rwgbJxr1VMk	Lecture on Probabilistic models with hidden variables	Discussion in Forum
42	Features: Kinds of feature	Learn different types of feature	- Refer the Text book -1 Chapter 10.1 page-298 - Refer the video https://www.youtube.com/watch?v=rwgbJxr1VMk	Lecture on Kinds of feature	Quiz

			atch?v=OTPz5plKb40		
43	Feature transformations	Understanding Feature transformations	- Refer the Text book -1 Chapter 10.2 page-307 - Refer the video https://www.youtube.com/watch?v=3gfhbXt9TcQ	Lecture on Feature transformations	Discussion in Forum
44	Feature construction and selection	Understanding Feature construction and selection	- Refer the Text book -1 Chapter 10.3 page-322 - Refer the video https://www.youtube.com/watch?v=EqLBAmtKMnQ	Lecture on Feature construction and selection	Discussion in Forum
45	Model ensembles: Bagging and random forests,	Learn What is Model ensemble and Bagging and random forests,	- Refer the Text book -1 Chapter 11.1 page-331 - Refer the video https://www.youtube.com/watch?v=yrVVN29oCPI	Lecture on Model ensembles : Bagging and random forests,	Discussion in Forum
46	Boosting	Learn Boosting Algorithm	- Refer the Text book -1 Chapter 11.2 page-334 - Refer the video https://www.youtube.com/watch?v=kho6oANGUA	Lecture on Boosting	Discussion in Forum
47	Bagging Vs Boosting	Identify the differences between Bagging and Boosting	Refer the article https://www.geeksforgeeks.org/bagging-vs-boosting-in-machine-learning/	Lecture on Bagging Vs Boosting	assignment
48	Chapter-6: Dimensionality Reduction: Principal Component Analysis	Understanding Principal Component Analysis (PCA)	Refer the video https://www.youtube.com/watch?v=FgakZw6K1QQ	Lecture on Principal Component Analysis (PCA)	Discussion in Forum

	(PCA)				
49	PCA algorithm	Learn PCA algorithm	Refer the video https://www.youtube.com/watch?v=MLaJbA82nzk	Lecture on PCA algorithm	assignment
50	Algorithm Implementation and demonstration.	Write the code for PCA	Refer the video https://www.youtube.com/watch?v=8klqIM9UvAc	Lecture on Algorithm Implementation and demonstration	Coding Practice
51	Artificial Neural Networks: Introduction	Learn what is an Artificial Neural Network	Refer the video https://www.youtube.com/watch?v=bfmFfD2RIcg	Lecture on Introduction to ANN	Discussion in Forum
52	Neural network representation	Understanding Neural network representation	Refer the video https://www.youtube.com/watch?v=WtUfEIRD3rU	Lecture on Neural network representation	Discussion in Forum
53	Perceptron architecture	Understanding Perceptron architecture	Refer the video https://www.youtube.com/watch?v=LbLcEiSfA-c	Lecture on Perceptron architecture	Discussion in Forum
54	appropriate problems for neural network learning	Understanding appropriate problems for neural network learning	Refer the video https://www.youtube.com/watch?v=i8rGS6nZTEk	Lecture on Appropriate problems for neural network learning	Discussion in Forum

55	Multilayer networks	Understanding Multilayer networks	Refer the video https://www.youtube.com/watch?v=w8KV1Hbmez4	Lecture on Multilayer networks	Discussion in Forum
56	Applications of Neural networks in ML	Understanding Applications of Neural networks in ML	Refer the article https://www.analyticsinsights.net/blogs/8-applications-neural-networks	Lecture on Applications of Neural networks in ML	Discussion in Forum
57	Exclusive- OR problem	Understanding Exclusive-OR problem	Refer the video https://www.youtube.com/watch?v=su7JMsTaI8w	Lecture on Exclusive-OR problem	Discussion in Forum
58	Back propagation algorithm	Learn Back propagation algorithm	Refer the video https://www.youtube.com/watch?v=3oOTnFM-3lg	Lecture on Back propagation algorithm	
59	Error reduction in Back Propagation	Understanding Error reduction in Back Propagation	Refer the article https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-66131930012-9	Lecture on Error reduction in Back Propagation	Discussion in Forum
60	Problems on Back Propagation	Practice Problems on Back Propagation	Refer the article https://mattmazor.com/2015/03/17/a-step-by-step-backpropagation-example/	Lecture on Problems on Back Propagation	Case Studies