Lovely Professional University, Punjab

Course Code	Course Title	Lectures	Tutorials	Practicals	Credits	
INT354	MACHINE LEARNING-I	2	0	2	3	
Course Weightage	ATT: 5 CA: 45 ETT: 50	**Exam Category: X4: Mid Term Exam: Not Applicable – End Term Exam: MCQ + Subjective**				
Course Focus	EMPLOYABILITY,SKILL DEVELOPMENT					

Course Outcomes :Through this course students should be able to

CO1 :: Explore Different types of Machine Learning and statistics used for risk minimization.

CO2 :: Analyze the operations of different types of Machine Learning Classifiers.

CO3 :: Examine the performance of Generative models based on Bayesian learning to solve different classification problems.

CO4 :: Develop the model that predict value of continuous variable with regression analysis.

CO5 :: Discuss the methods for Error calculations using different Regression metrics.

CO6 :: Extend the Machine Learning approach to understand the bias complexity tradeoff and algorithm independent machine learning.

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	MACHINE_LEARNING_IN_ACTION	PETER HARRINGTON	Manning Publications

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	MACHINE LEARNING	TOM M. MITCHELL	Mc Graw Hill Education
R-2	UNDERSTANDING-MACHINE-LEARNING-THEORY-ALGORITHMS FROM THEORY TO ALGORITHM	SHAI SHALEV-SHAWARTZ AND SHAI BEN-DAVID	CAMBRIDGE UNIVERSITY PRESS

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	https://towardsdatascience.com/measuring-the-power-of-a-classifier-c765a7446c1c	VC Dimension
RW-2	https://link.springer.com/chapter/10.1007/11776420_8	Rademacher complexity
RW-3	https://www.sciencedirect.com/science/article/pii/S0097316500931601	Natarajan Dimension

RW-4	https://towardsdatascience.com/learning-theory-agnostic-probably-approximately-correct-learning-dfd0d7c76467	PAC learning
RW-5	https://www.datasciencebloq.net/post/machine-learning/performance-measures-multi-class-problems/	Performance Measures for Multi-Class Problems
RW-6	http://mathworld.wolfram.com/MaximumLikelihood.html	Maximum Likelihood
RW-7	https://www.sciencedirect.com/topics/mathematics/structural-risk-minimization	Maximum Likelihood
RW-8	https://www.sciencedirect.com/topics/mathematics/structural-risk-minimization	Structural Risk Minimization
RW-9	https://www.hackerearth.com/practice/machine-learning/machine-learning-algorithms/ml-decision-tree/tutorial/	Decision Tree Learning
RW-10	https://sebastianraschka.com/Articles/2014_kernel_density_est.html	Kernel density estimation
RW-11	https://www.sciencedirect.com/topics/computer-science/minimum-description-length	Minimum Description Length

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	4

Detailed Plan For Lectures

Week Number	**Lecture Number**	**Broad Topic(Sub Topic)**	**Chapters/Sections of Text/reference books**	**Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs**	**Lecture Description**	**Learning Outcomes**	**Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned**	**Live Examples**
Week 1	Lecture 1	Introduction to machine learning(Machine Learning)	R-1		Lecture 1 will be considered as Lecture Zero and Lecture 2 will be having basic introduction to machine learning.	Students will be able to understand various scenarios about the learning in any machine.	Class room discussion using power point presentation, demonstration using videos	
		Introduction to machine learning(Need of Machine Learning)	R-1		Lecture 1 will be considered as Lecture Zero and Lecture 2 will be having basic introduction to machine learning.	Students will be able to understand various scenarios about the learning in any machine.	Class room discussion using power point presentation, demonstration using videos	

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Week 1	Lecture 1	Introduction to machine learning(Types of Learning)	R-1		Lecture 1 will be considered as Lecture Zero and Lecture 2 will be having basic introduction to machine learning.	Students will be able to understand various scenarios about the learning in any machine.	Class room discussion using power point presentation, demonstration using videos	
	Lecture 2	Introduction to machine learning(Well Posed Learning Problems)	R-1		Well posed learning problem, statistical learning framework and designing a learning system.	Students will be able to understand designing a learning system.	Class room discussion using power point presentation	Robotic Task, OCR task
		Introduction to machine learning(Designing a Learning Systems)	R-1		Well posed learning problem, statistical learning framework and designing a learning system.	Students will be able to understand designing a learning system.	Class room discussion using power point presentation	Robotic Task, OCR task
		Introduction to machine learning(Statistical Learning Framework)	R-1		Well posed learning problem, statistical learning framework and designing a learning system.	Students will be able to understand designing a learning system.	Class room discussion using power point presentation	Robotic Task, OCR task
Week 2	Lecture 3	Introduction to machine learning(Empirical Risk Minimization)	R-1 R-2	RW-4 RW-8	Empirical risk minimization, PAC learning, Inductive bias included in empirical risk minimization.	Student will able to learn empirical risk minimization and will able to understand PAC learning, Inductive bias included in empirical risk minimization.	Class room discussion using power point presentation, demonstration using videos	
		Introduction to machine learning(Empirical Risk Minimization with Inductive Bias)	R-1 R-2	RW-4 RW-8	Empirical risk minimization, PAC learning, Inductive bias included in empirical risk minimization.	Student will able to learn empirical risk minimization and will able to understand PAC learning, Inductive bias included in empirical risk minimization.	Class room discussion using power point presentation, demonstration using videos	

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Week 2	Lecture 3	Introduction to machine learning(PAC Learning)	R-1 R-2	RW-4 RW-8	Empirical risk minimization, PAC learning, Inductive bias included in empirical risk minimization.	Student will able to learn empirical risk minimization and will able to understand PAC learning, Inductive bias included in empirical risk minimization.	Class room discussion using power point presentation, demonstration using videos	
	Lecture 4	Building good training sets (Data Preprocessing)	T-1		Data Preprocessing Techniques understadning using python programming.	Student will be able to write program for data preprocessing.	Using tools like python interpreter, any IDE with all the machine learning tools.	Using IDE of python and tools of machine learning live demo.
		Building good training sets (Dealing with Missing Data)	T-1		Data Preprocessing Techniques understadning using python programming.	Student will be able to write program for data preprocessing.	Using tools like python interpreter, any IDE with all the machine learning tools.	Using IDE of python and tools of machine learning live demo.
		Building good training sets (Handling Categorical Data)	T-1		Data Preprocessing Techniques understadning using python programming.	Student will be able to write program for data preprocessing.	Using tools like python interpreter, any IDE with all the machine learning tools.	Using IDE of python and tools of machine learning live demo.
Week 3	Lecture 5	Building good training sets (Partitioning a Dataset in Training and Test Sets)	T-1		Data Preprocessing Techniques understanding using python programming.	Student will be able to write program for data preprocessing.	Using tools like python interpreter, any IDE with all the machine learning tools.	Using IDE of python and tools of machine learning live demo.
		Building good training sets (Normalization)	T-1		Data Preprocessing Techniques understanding using python programming.	Student will be able to write program for data preprocessing.	Using tools like python interpreter, any IDE with all the machine learning tools.	Using IDE of python and tools of machine learning live demo.
		Building good training sets (Selecting Meaningful Features)	T-1		Data Preprocessing Techniques understanding using python programming.	Student will be able to write program for data preprocessing.	Using tools like python interpreter, any IDE with all the machine learning tools.	Using IDE of python and tools of machine learning live demo.
	Lecture 6	Machine learning classifiers (Choosing a Classification Algorithm)	T-1 R-1		Classification algorithm is explained with Scikit-Learn	Student will be able to perform classification task using Scikit-Learn.	Class room discussion using power point presentation and white board, problem solving.	Programming with Scikit learn on any python IDE

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Week 3	Lecture 6	Machine learning classifiers (First Steps with Scikit-Learn)	T-1 R-1		Classification algorithm is explained with Scikit-Learn	Student will be able to perform classification task using Scikit-Learn.	Class room discussion using power point presentation and white board, problem solving.	Programming with Scikit learn on any python IDE
		Machine learning classifiers (Perceptron Classifier)	T-1 R-1		Classification algorithm is explained with Scikit-Learn	Student will be able to perform classification task using Scikit-Learn.	Class room discussion using power point presentation and white board, problem solving.	Programming with Scikit learn on any python IDE
Week 4	Lecture 7	Machine learning classifiers (Stochastic Gradient Descent)	R-1 R-2	RW-5	Classification is performed by different techniques like SGD, SVM, Logistic Regression	Students will be able to understand the differentiate between classification techniques.	Class room discussion using power point presentation and white board, problem solving.	
		Machine learning classifiers (Modeling Class Probabilities via Logistic Regression)	R-1 R-2	RW-5	Classification is performed by different techniques like SGD, SVM, Logistic Regression	Students will be able to understand the differentiate between classification techniques.	Class room discussion using power point presentation and white board, problem solving.	
		Machine learning classifiers (Maximum Margin Classification with Support Vector Machine)	R-1 R-2	RW-5	Classification is performed by different techniques like SGD, SVM, Logistic Regression	Students will be able to understand the differentiate between classification techniques.	Class room discussion using power point presentation and white board, problem solving.	
	Lecture 8	Machine learning classifiers (Decision Tree Learning)	R-1 R-2	RW-9	Decision tree and its flavors are explained.	Students are able to understand the importance and difference between Decision tree techniques.	Class room discussion using power point presentation and white board, problem solving.	
		Machine learning classifiers (CART)	R-1 R-2	RW-9	Decision tree and its flavors are explained.	Students are able to understand the importance and difference between Decision tree techniques.	Class room discussion using power point presentation and white board, problem solving.	
		Machine learning classifiers (ID3)	R-1 R-2	RW-9	Decision tree and its flavors are explained.	Students are able to understand the importance and difference between Decision tree techniques.	Class room discussion using power point presentation and white board, problem solving.	

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Week 4	Lecture 8	Machine learning classifiers (C4.5)	R-1 R-2	RW-9	Decision tree and its flavors are explained.	Students are able to understand the importance and difference between Decision tree techniques.	Class room discussion using power point presentation and white board, problem solving.	
Week 5	Lecture 9	Machine learning classifiers (Density Estimation)	R-1 R-2	RW-1 RW-2 RW-3 RW-6 RW-7 RW-10 RW-11	Density Estimation techniques are discussed with vc dimension	Students will able to understand mathematical foundation of Density estimation and Parzen window concept.	Class room discussion using power point presentation, problem solving.	
		Machine learning classifiers (Parzen Window)	R-1 R-2	RW-1 RW-2 RW-3 RW-10 RW-11	Density Estimation techniques are discussed with vc dimension	Students will able to understand mathematical foundation of Density estimation and Parzen window concept.	Class room discussion using power point presentation, problem solving.	
		Machine learning classifiers (The Nearest Neighbour Rule)	R-1 R-2	RW-1 RW-2 RW-3 RW-6 RW-7 RW-10 RW-11	Density Estimation techniques are discussed with vc dimension	Students will able to understand mathematical foundation of Density estimation and Parzen window concept.	Class room discussion using power point presentation, problem solving.	
		Machine learning classifiers (KNearest Neighbour Estimation)	R-1 R-2	RW-1 RW-2 RW-3 RW-6 RW-7 RW-10 RW-11	Density Estimation techniques are discussed with vc dimension	Students will able to understand mathematical foundation of Density estimation and Parzen window concept.	Class room discussion using power point presentation, problem solving.	
	Lecture 10	Generative models (Maximum Likelihood Estimator)	R-1 R-2	RW-6 RW-7	Bayesian belief networks, Bayes optimal classifier and Gibs algorithm.	Student will able to understand Bayesian belief networks and its application in decision theory.	Class room discussion using power point presentation and problem solving.	
		Generative models(Bayesian Learning)	R-1 R-2	RW-6 RW-7	Bayesian belief networks, Bayes optimal classifier and Gibs algorithm.	Student will able to understand Bayesian belief networks and its application in decision theory.	Class room discussion using power point presentation and problem solving.	

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Week 5	Lecture 10	Generative models(Bayes Theorem)	R-1 R-2	RW-6 RW-7	Bayesian belief networks, Bayes optimal classifier and Gibs algorithm.	Student will able to understand Bayesian belief networks and its application in decision theory.	Class room discussion using power point presentation and problem solving.	
Week 6	Lecture 11	Generative models(Brute-Force Concept Learning)	R-1 R-2		Bayes optimal classifier and Gibs algorithm.	Students will able to understand Bayes optimal classifier and Gibs algorithm.	Class room discussion using power point presentation and problem solving.	
		Generative models(Bayes Optimal Classifier)	R-1 R-2		Bayes optimal classifier and Gibs algorithm.	Students will able to understand Bayes optimal classifier and Gibs algorithm.	Class room discussion using power point presentation and problem solving.	
		Generative models(Gibs Algorithm)	R-1 R-2		Bayes optimal classifier and Gibs algorithm.	Students will able to understand Bayes optimal classifier and Gibs algorithm.	Class room discussion using power point presentation and problem solving.	
	Lecture 12	Generative models(Naive Bayes Classifier)	R-1 R-2		Bayesian belief networks	Student will able to understand Bayesian belief networks and its application in decision theory.	Class room discussion using power point presentation and problem solving.	
		Generative models(EM Algorithm)	R-1 R-2		Bayesian belief networks	Student will able to understand Bayesian belief networks and its application in decision theory.	Class room discussion using power point presentation and problem solving.	
Week 7	Lecture 13	Model evaluation and hyperparameter tuning (Streamlining Workflows with Pipelines)	R-1 R-2		Learning how to program streamlining Workflows with Pipelines	Student is able to understand programming of cross validation fine tuning	Class room discussion using power point presentation and problem solving.	
		Model evaluation and hyperparameter tuning (Using k- fold Cross Validation to Access Model Performance)	R-1 R-2		Learning how to program streamlining Workflows with Pipelines	Student is able to understand programming of cross validation fine tuning	Class room discussion using power point presentation and problem solving.	
		Model evaluation and hyperparameter tuning (Debugging Algorithms with Learning and Validation Curves)	R-1 R-2		Learning how to program streamlining Workflows with Pipelines	Student is able to understand programming of cross validation fine tuning	Class room discussion using power point presentation and problem solving.	

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Week 7	Lecture 13	Model evaluation and hyperparameter tuning(Fine-Tuning Machine Learning Models via Grid Search)	R-1 R-2		Learning how to program streamlining Workflows with Pipelines	Student is able to understand programming of cross validation fine tuning	Class room discussion using power point presentation and problem solving.	
		SPILL OVER						
Week 7	Lecture 14				Spill Over			
		MID-TERM						
Week 8	Lecture 15	Predicting continuous target variables with regression analysis(Introducing Linear Regression)	T-1 R-1 R-2		Prediction models are studied using Linear Regression and RANSAC	Students will be able to perform prediction using Linear regression.	Class room discussion using power point presentation and problem solving.	
		Predicting continuous target variables with regression analysis(Fitting a Robust Regression Model using RANSAC)	T-1 R-1 R-2		Prediction models are studied using Linear Regression and RANSAC	Students will be able to perform prediction using Linear regression.	Class room discussion using power point presentation and problem solving.	
	Lecture 16	Predicting continuous target variables with regression analysis(Relationship Using a Correlation Matrix)	T-1 R-1 R-2		Data analysis is performed in depth for example correlation matrix, useful component analysis.	Student will be able to identify relationships among attributes of data.	Class room discussion using power point presentation and problem solving.	
		Predicting continuous target variables with regression analysis(Exploratory Data Analysis)	T-1 R-1 R-2		Data analysis is performed in depth for example correlation matrix, useful component analysis.	Student will be able to identify relationships among attributes of data.	Class room discussion using power point presentation and problem solving.	
Week 9	Lecture 17	Predicting continuous target variables with regression analysis(Regularized Methods for Regression)	R-1 R-2		Methods to reduce the problem of overfitting in regression and non linear relationship between dependent and independent variables.	student will be able to perform model training with error free or less error.	Class room discussion using power point presentation and problem solving.	
		Predicting continuous target variables with regression analysis(Polynomial Regression)	R-1 R-2		Methods to reduce the problem of overfitting in regression and non linear relationship between dependent and independent variables.	student will be able to perform model training with error free or less error.	Class room discussion using power point presentation and problem solving.	
		Predicting continuous target variables with regression analysis(Decision Tree)	R-1 R-2		Methods to reduce the problem of overfitting in regression and non linear relationship between dependent and independent variables.	student will be able to perform model training with error free or less error.	Class room discussion using power point presentation and problem solving.	

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Week 9	Lecture 17	Predicting continuous target variables with regression analysis(ARIMA)	R-1 R-2		Methods to reduce the problem of overfitting in regression and non linear relationship between dependent and independent variables.	student will be able to perform model training with error free or less error.	Class room discussion using power point presentation and problem solving.	
	Lecture 18	Regression Metrics(R2 Score)	R-1 R-2		Different performance matrix are studied to evaluate machine learning algorithms.	Student will be able to check the algorithm performance and compare.	Class room discussion using power point presentation and problem solving.	
		Regression Metrics(Mean Absolute Error)	R-1 R-2		Different performance matrix are studied to evaluate machine learning algorithms.	Student will be able to check the algorithm performance and compare.	Class room discussion using power point presentation and problem solving.	
Week 10	Lecture 19	Regression Metrics(Mean Squared Error)	R-1 R-2		Performance calculation with different error calculation methods.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	Class room discussion using power point presentation and problem solving.	
		Regression Metrics(Mean Squared Logarithmic Error)	R-1 R-2		Performance calculation with different error calculation methods.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	Class room discussion using power point presentation and problem solving.	
	Lecture 20	Regression Metrics(Mean Absolute Percentage Error)	R-1 R-2		Performance calculation with different error calculation methods.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	
		Regression Metrics (Explained Variance Score)	R-1 R-2		Performance calculation with different error calculation methods.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	
		Regression Metrics(D2 Score Visual Evaluation of Regression Models)	R-1 R-2		Performance calculation with different error calculation methods.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	Students will be capable enough to evaluate and compare the performance of ML algorithms.	

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Week 11	Lecture 21	The bias-complexity tradeoff(No Free Lunch Theorem)	R-1 R-2		Error decomposition and No free lunch theorem.	Students will be able to understand Error decomposition and No free lunch theorem.	Class room discussion using power point presentation, problem solving.	
		The bias-complexity tradeoff(Error Decomposition)	R-1 R-2		Error decomposition and No free lunch theorem.	Students will be able to understand Error decomposition and No free lunch theorem.	Class room discussion using power point presentation, problem solving.	
	Lecture 22	The bias-complexity tradeoff(The VC-Dimension)	R-1 R-2		The VC dimension and Surrogate loss function	Students will be able to understand mathematical foundation of VC dimension and Surrogate loss function.	Class room discussion using power point presentation, problem solving.	
		The bias-complexity tradeoff(The Rademacher Complexity)	R-1 R-2		The VC dimension and Surrogate loss function	Students will be able to understand mathematical foundation of VC dimension and Surrogate loss function.	Class room discussion using power point presentation, problem solving.	
		The bias-complexity tradeoff(The Natarajan Dimension)	R-1 R-2		The VC dimension and Surrogate loss function	Students will be able to understand mathematical foundation of VC dimension and Surrogate loss function.	Class room discussion using power point presentation, problem solving.	
Week 12	Lecture 23	Algorithm-Independent machine Learning (Combining Classifiers)	R-1 R-2		Combination of classifiers and selection of algorithm based on voting.	Students will be able to understand how classifiers are used in combination.	Class room discussion using power point presentation.	
		Algorithm-Independent machine Learning(Majority Voting Classifier)	R-1 R-2		Combination of classifiers and selection of algorithm based on voting.	Students will be able to understand how classifiers are used in combination.	Class room discussion using power point presentation.	

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Week 12	Lecture 24	Algorithm-Independent machine Learning(Re-sampling for Estimating Statistics)	R-1 R-2		Observation of statistics of classifiers based on resampling.	Students will be able to understand statistics of classifiers.	Class room discussion using power point presentation and problem solving	
		Algorithm-Independent machine Learning(Lack of Inherent Superiority of Classifier)	R-1 R-2		Observation of statistics of classifiers based on resampling.	Students will be able to understand statistics of classifiers.	Class room discussion using power point presentation and problem solving	
Week 13	Lecture 25	Algorithm-Independent machine Learning(Bagging and Boosting Classifier)	R-1 R-2		Different methods of classifier selection in combined classifier approach.	Student will be able to use bagging and boosting techniques for selection of best classifiers output.	Class room discussion using power point presentation and problem solving	
	Lecture 26	Algorithm-Independent machine Learning(Random Forest Classifier)	R-1 R-2		Method random forest classifier is explained.	Student will be able to understand the use of random forest classifier.	Class room discussion using power point presentation and problem solving	
Week 14	Lecture 27	Algorithm-Independent machine Learning (Regressor)	R-1 R-2		Method to regressor and SVM is studied.	Student will be able to use prediction and classification at a time.	lass room discussion using power point presentation and problem solving.	
		Algorithm-Independent machine Learning(Support Vector Classifier and Regressor)	R-1 R-2		Method to regressor and SVM is studied.	Student will be able to use prediction and classification at a time.	lass room discussion using power point presentation and problem solving.	
		SPILL OVER						
Week 14	Lecture 28				Spill Over			
Week 15	Lecture 29				Spill Over			
	Lecture 30				Spill Over			

Scheme for CA:

CA Category of this Course Code is:C020102 (Total 4 tasks, 2 compulsory and out of remaining 1 best out of 2 to be considered)

Component	Iscompulsory	Weightage (%)	Mapped CO(s)
Project	Yes	35	CO1, CO2, CO3, CO4, CO5, CO6

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Practical Work	Yes	35	CO1, CO2, CO3, CO4, CO5, CO6
Test - Code based 1	NO	30	CO1, CO2
Test - Code based 2	NO	30	CO3, CO4, CO5, CO6

Details of Academic Task(s)

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Project	Implementing Mini Project	Project is based on ML Techniques: Student is required to prepare a project on automation of routine computer related Execution: 5 marks Viva: 5 marks Presentation: 5 marks Report: 5 marks tasks	Group	Online	30	2 / 12
Practical Work	Hackathon	Online Hackathon is given by students which is graded: Student will be evaluated on the basis of a problem given on the spot Accuracy and efficiency (15 marks). External Hackathon.	Group	Online	30	13 / 13
Test - Code based 1	Code Based Test	Online MCQ based on coding as well as theoretical concepts of Machine Learning: Student will have more hold on logic application in code. 10 code based questions of 1 mark each, Total 10 marks	Individual	Online	30	5 / 6
Test - Code based 2	ETT	Mixed category Student will be prepared for application of Machine Learning 25% MCQ and 75% Subjective in final exam. Internal but through examination department.	Individual	Online	30	13 / 14

Detailed Plan For Practicals

Practical No	Broad topic	Subtopic	Other Readings	Learning Outcomes
Practical 1	List of Practical	Write a Program to perform missing data handling.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform categorical data handling.		Students will be able to understand practical aspects of ML and can be able to do the projects.

Practical 1	List of Practical	Write a Program to select features from data after normalization.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform binary classification using single layer perceptron.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform classification using support vector machine.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform clustering using K-Nearest Neighbor algorithm.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to evaluate model using K-fold cross validation.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform hyper-parameter tuning using grid search.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform prediction using Linear regression.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform data pre-processing using correlation matrix.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to perform prediction using decision tree.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to evaluate the performance of any ml algorithm using R2 score, mean absolute error metrics.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a Program to evaluate the performance of any ml algorithm using mean squared error, mean squared logarithmic error		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a program to perform classifier combination and perform classification based on majority voting classifier.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	List of Practical	Write a program to compare different classifier performance like bagging boosting, random forest and support vector classifier.		Students will be able to understand practical aspects of ML and can be able to do the projects.
	SPILL OVER			
Practical 15	Spill Over			