

Master of Engineering - ME (Big Data Analytics)

Course File

Course Name	:	Fundamentals of Machine Learning Lab
Course Code	:	BDA 5153
Academic Year	:	2024 - 25
Semester	:	I
Name of the Course Coordinator	:	Dr. Arockiaraj S
Name of the Program Coordinator	:	Dr. Prathviraj N


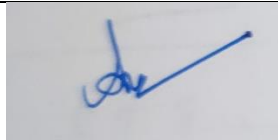
	
Signature of Program Coordinator with Date	Signature of Course Coordinator with Date

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Program Education Objectives (PEOs)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for **ME (Big Data Analytics)**, program are as follows.

PEO No.	Education Objective
PEO 1	Develop in depth understanding of the key technologies in data engineering, data science and business analytics.
PEO 2	Practice problem analysis and decision-making using machine learning techniques.
PEO 3	Gain practical, hands-on experience with statistics, programming languages and big data tools through coursework and applied research experiences.

Program Outcomes (POs)

By the end of the postgraduate program in **ME (Big Data Analytics)**, graduates will be able to:

PO1	Independently carry out research /investigation and development work to solve practical problems.
PO2	Write and present a substantial technical report/document.
PO3	Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
PO4	Develop and implement big data analysis strategies based on theoretical principles, ethical considerations, and detailed knowledge of the underlying data.
PO5	Demonstrate knowledge of the underlying principles and evaluation methods for analyzing data for decision-making.

1. Course Plan

1.1 Primary Information

Course Name	:	Fundamentals of Machine Learning Lab [BDA 5153]
L-T-P-C	:	0-0-3-1
Contact Hours	:	36 Hours
Pre-requisite	:	Basic Programming with Python
Core/ PE/OE	:	Core

1.2 Course Outcomes (COs), Program outcomes (POs) and Bloom's Taxonomy Mapping

CO	At the end of this course, the student should be able to:	No. of Contact Hours	Program Outcomes (PO's)	BL
CO1	Apply different types of supervised and unsupervised machine learning algorithms to practical problems.	8	PO3	3
CO2	Analyse different types of machine learning paradigms.	12	PO4	4
CO3	Evaluate the performance of machine learning algorithms.	16	PO5	5

1.3 Assessment Plan

Components	Lab test	Flexible Assessments (2 – 3 in number)	End semester/ Makeup examination
Duration	90 minutes	To be decided by the faculty.	180 minutes
Weightage	0.3	0.2	0.5
Typology of questions	Applying; Analyzing and Evaluating.	Applying; Analyzing. Evaluating.	Applying; Analyzing; Evaluating.
Pattern	Answer all the questions. Maximum marks 30.	Assignment: Solving problems by applying, analyzing and evaluating Generative AI use cases. [To be decided by the faculty.]	Answer all the questions. Maximum marks 50.
Schedule	To be decided by the faculty	Assignment submission: (To be decided by the faculty)	To be decided by the faculty
Topics covered	Introduction to Machine Learning; Decision Trees- Linear Model: K-nearest Neighbours Algorithm- Cross-validation - Dimension Reduction.	Lab assignment: Implement pre-training, fine-tuning, and evaluation of large language models.	Comprehensive examination covering the full syllabus. Students are expected to answer all questions.

1.4 Lesson Plan

L. No.	TOPICS	Course Outcome Addressed
L0	Course delivery plan, Course assessment plan, Course outcomes, Program outcomes, CO-PO mapping, reference books	---
L1	Program data ingestion, perform data wrangling, understand the data matrix, and differentiate between sample and feature.	CO1
L2	Implement decision tree models in Python, fine-tune model parameters, and interpret results.	CO1
L3	Implement linear models in Python and interpret model coefficients for practical problems.	CO2
L4	Implement and visualize bias-variance trade-off using linear regression as a basis; Implement the K-nearest neighbours algorithm.	CO2
L5	Implement, visualize, compare, contrast, and interpret the results of dimension reduction applied to practical data using PCA, MDS, and t-SNE.	CO2
IT1	Internal lab test	CO1 & CO2
L6	Through coding, understand how ensemble methods in machine learning work.	CO3
L7	Implement maximum likelihood estimation for a simple model.	CO3
L8	Analyse the performance of the Naive Bayes and logistic regression models for practical problems using appropriate performance metrics.	CO3

L9	Lab assignment: Implement pre-training, fine-tuning, and evaluation of large language models.	CO3
L10	Lab assignment: Implement pre-training, fine-tuning, and evaluation of large language models.	CO3
L11	Lab assignment: Implement pre-training, fine-tuning, and evaluation of large language models.	CO3
L12	Lab assignment: Implement pre-training, fine-tuning, and evaluation of large language models.	CO3

1.5 References

1. Module: Introduction to Machine Learning (<https://www.intel.com/content/www/us/en/developer/tools/oneapi/training/academic-program/educators/intro-machine-learning-training-kit.html>)
2. Module: Get started with AI on Azure (<https://learn.microsoft.com/en-us/training/modules/get-started-ai-fundamentals/>)
3. Module: Microsoft Azure AI Fundamentals: Get started with artificial intelligence (<https://learn.microsoft.com/en-us/training/paths/get-started-with-artificial-intelligence-on-azure/>)
4. Learning path: Understand data science for machine learning (<https://learn.microsoft.com/en-us/training/paths/understand-machine-learning/>)
5. Module: Generative AI with Large Language Models (<https://www.coursera.org/learn/generative-ai-with-llms>)
6. Grokking Machine Learning, Luis G. Serrano, Manning Publications; 1st Edition, 2019 - Online resource from Manning Publications available at <https://www.manning.com/books/grokking-machine-learning>
7. A Course in Machine Learning, Hal Daumé III - Online resource available at <http://ciml.info/>
8. An Introduction to Statistical Learning: with Applications in Python (Springer Texts in Statistics), Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, and Jonathan Taylor, 1st Edition, 2023 - Online resource available at <https://www.statlearning.com/>

1.6 Other Resources (Online, Text, Multimedia, etc.)

1. Web Resources: Blog, Online tools and cloud resources.
2. Journal Articles.

1.7 Course Timetable

1 st Semester Big Data Analytics				Lab:				
	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5
MON								
TUE		FML LAB						
WED								
THU								
FRI								
SAT								

1.8 Assessment Plan

COs		Marks & Weightage			
CO No.	CO Name	Mid semester (Max. 50)	Assignment (Max. 20)	End Semester (Max. 100)	CO wise Weightage
CO1	Apply different types of supervised and unsupervised machine learning algorithms to practical problems.	25	5	20	0.30
CO2	Analyse different types of machine learning paradigms.	25	5	40	0.40
CO3	Evaluate the performance of machine learning algorithms.	-	10	40	0.30
	Marks (weightage)	0.3	0.2	0.5	1.0

Note:

- In-semester Assessment is considered as the Internal Assessment (IA) in this course for 50 marks, which includes the performances in class participation, assignment work, class tests, mid-term tests, quizzes etc.
- End-semester examination (ESE) for this course is conducted for a maximum of 100 and the same will be scaled down to 50.
- End-semester marks for a maximum of 50 and IA marks for a maximum of 50 are added for a maximum of 100 marks to decide upon the grade in this course.

Weightage for CO1 = (mid semester marks for CO1 / 1.6666 + Assignment marks for CO1/1.0 + ESE marks for CO1 / 2)/100

1.9 Assessment Details

The assessment tools to be used for the Current Academic Year (CAY) are as follows:

Sl. No.	Tools	Weightage	Frequency	Details of Measurement (Weightage/Rubrics/Duration, etc.)
1	Internal Test	0.3	1	<ul style="list-style-type: none">• Performance is measured using internal test attainment level.• Reference: question paper and answer scheme.• Each internal test is assessed for a maximum of 50 marks and scaled down to 40 marks.
2	Assignments	0.2	2	<ul style="list-style-type: none">• Performance is measured using assignments/quiz attainment level.• Assignments/quiz are evaluated for a maximum of 10 marks.
3	ESE	0.5	1	<ul style="list-style-type: none">• Performance is measured using ESE attainment level.• Reference: question paper and answer scheme.• ESE is assessed for a maximum of 100 marks and scaled down to 50 marks.

1.10 Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5
CO1			Y		
CO2				Y	
CO3					Y
Average Articulation Level			Y	Y	Y