22CS3E3: MACHINE LEARNING

Course Name	Machine Learning		L	T	P	C	CIA	SEE	TM
Course Code	22CS3E3		4	0	0	4	30	70	100
Year of Introduction: 2021	Year of Offering: 2021	Year of Revision: 2022	Percentage of Revision: 100						
L-Lecture, T-Tutorial, **P**-Practical, **C**-Credits, **CIA**-Internal Marks, **SEE**-External Marks, **TM**-Total Marks									

Course Description and Purpose: Machine Learning is a course that illustrates *concepts* of *Machine Learning, Basics* of *Data Preprocessing* and *Feature Engineering, Supervised Learning Algorithms, Regression Algorithms, Unsupervised Learning Algorithms, concepts* of *Neural Networks*.

Course Objectives: This course will help enable the students t o understand and learn various *Concepts* of *Machine Learning, Basics* of *Data Preprocessing* and *Feature Engineering, Supervised Learning Algorithms, Regression Algorithms, Unsupervised Learning Algorithms, Concepts* of *Neural Networks.*

Specific Objectives include:
- To know the concepts of *Machine Leaning*.
- To understand basics of *Data Pre-processing* and *Feature Selection.*
- To learn *Supervised Learning* and *Regression Algorithms*.
- To learn the concepts of *Unsupervised Learning.*
- To understand the concepts of *Neural Networks*.

Course Outcomes:
CO1: In this course, students will explore the foundations of machine learning, including human learning principles, various types of machine learning, programming languages and tools, and a comprehensive framework for developing and evaluating machine learning models, equipping them with the skills to build and assess sophisticated machine learning applications.
CO2: In this course, students will master the fundamentals of data pre-processing and feature engineering, encompassing techniques such as feature transformation, scaling, construction, subset selection, dimensionality reduction, explorative data analysis, and hyper parameter tuning, with a comprehensive introduction to the SK Learn package, empowering them to proficiently manipulate data and optimize machine learning models.
CO3: In this course, students will gain a deep understanding of supervised learning, covering a range of classification algorithms including Naïve Bayes, KNN, Decision Trees, Random Forest, Support Vector Machines, and XG Boost, as well as regression techniques like Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, and Logistic Regression with Regularization (Lasso and Ridge), enabling them to build accurate predictive models for diverse real-world applications.
CO4: In this course, students will explore the principles of unsupervised learning, differentiating it from supervised learning, and delve into unsupervised learning models, dimensionality reduction techniques, clustering methods, association rule mining, and practical applications, enabling them to analyse complex, unstructured data and derive valuable insights for various domains.
CO5: In this course, students will master the fundamentals of neural networks, covering artificial neural networks, convolutional neural networks for tasks like hand digit and image classification, hyper parameter tuning techniques, and advanced topics including recurrent neural networks and Long Short-Term Memory networks, empowering them to design and optimize sophisticated deep learning models for diverse applications in computer vision and sequential data analysis.

UNIT-I (12 Hours)

Introduction to Machine Learning: Human Learning and Machine Learning - Types of Machine Learning - Languages and Tools in Machine Learning - Framework for Developing Machine Learning Models - Preparing to Model - Modeling and Evaluation Metrics.

UNIT-II (12 Hours)

Basics of Data Preprocessing and Feature Engineering: Feature Transformation - Feature Scaling- Feature Construction and Feature Subset Selection - Dimensionality Reduction - Explorative Data Analysis - Hyper Parameter Tuning - Introduction to SK Learn Package.

UNIT-III (12 Hours)

Supervised Learning: Introduction - Classification (Common Cassification Algorithms):Naïve Bayes,KNN, Decision Trees, Random Forest, Support Vector Machines, XGBoost.
Regression(Common Regression Algorithms): Simple Linear Regression and Multiple Linear Regression - Polynomial Regression - Logistic Regression-Regularisation:Lasso and Ridge.

UNIT-IV (12 Hours)

Unsupervised Learning: Introduction - Unsupervised Vs Supervised Learning - Unsupervised Learning Models - Dimensionality Reduction - Clustering: Association Rule Mining - Applications of Unsupervised Learning.

UNIT-V (12 Hours)

Introduction to Neural Networks: Artificial Neural Networks - Hand Digit Classification - Convolution Neural Networks - Image Classification - Hyper Parameter Tuning - Recurrent Neural Networks - Building Recurrent NN - Long Short Term Memory.

Reference Text Books:

1. Hastie, T., R. Tibshirani, and J. H. Friedman. , The Elements of Statistical Learning: Data Mining, Inference and Prediction, New York, NY: Springer, 2011, ISBN: 97803879
2. EthemAlphaydin, An introduction to Machine Learning, PHI Learning Private Limited, 2020
3. AurelienGeron, Hands-On Machine Learning with Scikit Learn, Keras and Tensor Flow, O'REILY -2019
4. Tom Mitchell, Machine Learning, Tata McGraw Hill, 2013
5. Francois Chollet, Deep Learning with Python, Manning , 2019

PARVATHANENI BRAHMAYYA SIDDHARTHA COLLEGE OF ARTS & SCIENCE

(An Autonomous College in the jurisdiction of Krishna University)

M.Sc.(Computer Science), Third Semester

Course Name: Machine Learning

Course Code: 22CS3E3

(w.e.f admitted batch 2022-23)

Time: 3 Hours **Max Marks: 70 Marks**

SECTION-A

Answer ALL questions. All Questions Carry Equal Marks. (5×4 = 20 Marks)

1. (a) Define *Machine Learning* and list different *Machine Learning Techniques*. (CO1,L1)

(or)

(b) What are the *different tools* used in Machine Learning? (CO1,L1)

2. (a) What are the techniques of *Feature Scaling*? (CO2,L1)

(or)

(b) Define *Dimensionality Reduction* and explain its Techniques. (CO2,L1)

3. (a) What are the various algorithms used for *Classification*? (CO3,L1)

(or)

(b) Define *Logistic Regression*. (CO3,L1)

4. (a) Explain *Clustering* and list out different *Clustering Algorithms*? (CO4, L2)

(or)

(b) Explain the Applications of *Unsupervised Learning*? (CO4,L2)

5. (a) List some commercial practical applications of *Artificial Neural Networks*.(CO5,L1)

(or)

(b) Define *Hyper Parameter Tuning* with example. (CO5,L1)

SECTION-B

Answer ALL questions. All Questions Carry Equal Marks. (5×10 = 50 Marks)

6. (a) Explain the *work flow* in Machine Leaning Problem Solving. (CO1,L2)

(or)

(b) Explain *Supervised* and *Unsupervised Learning* with Examples. (CO1,L2)

7. (a) Discuss *Feature Transmission* in detail. (CO2, L6)

(or)

(b) Discuss *Feature Subset Selection* and its Application. (CO2,L6)

8. (a) Explain *Classification Problem* in Supervised Learning and Explain *Decision Tree Algorithm* for Classification. (CO3,L5)

(or)

(b) Explain *Linear and Multiple Linear Regression* in Python Library Stats Models. (CO3,L5)

9. (a) Apply *K-Means Clustering Algorithm* on following X and Y values (10,34), (45,55), (23,55), (14,66), (56,25),(12,16),(14,25). (CO4,L3)

(or)

(b) Choose suitable Algorithm in SK-Learn Package to perform *Hierarchical Clustering*. (CO4, L3)

10. (a) List basic features in Neuron and different types of *Activation Functions*. (CO5,L4)

(or)

(b) List various parameters of *Convolution Neural Networks*. (CO5,L4)