MACHINE LEARNING AND DEEP LEARNING

(Professional Elective III)

Course Code: 19CS1157

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Course Outcomes: At the end of the course, the student will be able to:

CO1: Explain the machine learning framework for building models.

CO2: Summarize model selection process for an application.

CO3: Describe different supervised learning models.

CO4: Illustrate the building blocks of a convolutional neural network.

CO5: Outline the concepts of Autoencoders and GAN's.

UNIT-I **(10 Lectures)**

INTRODUCTION TO MACHINE LEARNING: Introduction to Machine learning - Human learning, machine learning, types, problems not to be solved using machine learning, Application, Issues. **PREPARING TO MODEL:** Machine learning activities, Basic types of data in Machine learning, Exploring structure of data, Data quality and Remediation, Data Preprocessing. (Textbook - 1)

Learning Outcomes: At the end of the unit, the student will be able to

1. explain the concept of learning. (L2)
2. list various applications of machine learning with its issues. (L1)
3. understand the importance of data preprocessing. (L2)

UNIT-II **(8 Lectures)**

MODELLING AND EVALUATION: Pre-processing. Selecting the Model, Training the Model, Model Representation and Interpretability, Evaluating performance of a model.

BASICS OF FEATURE ENGINEERING: Introduction, Feature Transformation, Feature Subset Selection.(Textbook -1)

Learning Outcomes: At the end of the unit, the student will be able to

1. summarize different models used for training (L2).
2. choose appropriate evaluation measures to obtain the performance of a model. (L3)
3. relate feature transformation with feature selection (L2).

UNIT-III **(12 Lectures)**

CLASSIFICATION: Classification Model, Classification learning steps, Classification Algorithms-, Decision Tree, Random Forest Model, Support Vector Machines.

REGRESSION: Introduction, Examples of Regression, Regression Algorithms- Simple Linear Algorithms, Multiple Linear Regression, Assumption in Regression Analysis, Main Problems in Regression Analysis, Logistic Regression. (Textbook -1)

Learning Outcomes: At the end of the unit, the student will be able to

1. analyse different classification models. (L4)
2. compare classification and regression.(L3)
3. identify a regression model for a real-world problem. (L3)

UNIT-IV   **(10 Lectures)**

DEEP LEARNING: concepts of deep learning, Introduction of Convolutional Networks, Components of CNN architecture, RELU layer. Properties, architectures and applications of CNN.

RECURRENT NEURAL NETWORK: Introduction, Simple Recurrent Neural Network, LSTM Implementation, Gated Recurrent Unit (GRU), Deep Recurrent Neural Network. (Textbook -2)

Learning Outcomes: At the end of the unit, the student will be able to
1. understand the fundamentals of deep learning. (L2)
2. analyse the effect of different activation functions of a CNN unit. (L4)
3. understand the concept of recurrent neural networks. (L2)

UNIT-V   **(10 Lectures)**

AUTOENCODER: Introduction, Features of Autoencoder, Types of Autoencoder, Applications of deep learning. Restricted Boltzmann Machine: Boltzmann Machine, RBM Architecture, Types of RBM. Generative Adversarial Networks. (Textbook -2)

Learning Outcomes: At the end of the unit, the student will be able to
1. classify different autoencoders architectures for various applications. (L3)
2. identify the variant of RBM to use for a real-world problem. (L3)
3. understand the architecture of GAN's. (L2)

TEXT BOOKS:
1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, *Machine Learning*, 1st Edition, Pearson Education, 2019.
2. Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr. D Karthika Renuka, *Deep Learning Using Python*, 1st Edition, Wiley India Pvt. Ltd, 2019.

REFERENCES:
1. Aurélien Géron, *Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*, 2nd Edition, Oriley, 2019.
2. Tom M Mitchell, *Machine Learning*, 1st Edition, McGraw Hill, 1997.
3. Anuradha Srinivarasaraghavan, Vincy Joseph, *Machine Learning*, 1st Edition, Wiley India, 2019.

WEB REFERENCES:
1. https://swayam.gov.in/nd1_noc20_mg37/preview
2. https://swayam.gov.in/nd1_noc20_cs73/preview
3. https://swayam.gov.in/nd1_noc20_cs95/preview
4. https://swayam.gov.in/nd1_noc20_cs62/preview