



Course Syllabus
 Gyanmanjari Institute of Management Studies
 Semester-5 (BBA)

Subject: Foundations of Machine Learning- BBABA15318

Type of course: Major (Core)

Prerequisite:

Students should have basic knowledge of mathematics, statistics, and computer fundamentals.

Rationale:

This course aims to introduce students to the fundamental concepts and techniques of machine learning. It helps them understand how machines can learn from data to identify patterns, make predictions, and support decision-making. The course focuses on core algorithms, data preprocessing, model evaluation, and practical applications of machine learning.

Teaching and Examination Scheme:

| Teaching Scheme | | | Credits C | Examination Marks | | | | | Total Marks |
|-----------------|---|---|--------------|-------------------|-----|-----|-----|----|----------------|
| CI | T | P | | SEE | | CCE | | | |
| | | | Theory | Practical | MSE | LWA | ALA | | |
| 3 | 0 | 2 | 4 | 75 | 25 | 30 | 20 | 50 | 200 |

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA- Lab Work Assessment V – Viva; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory
 1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical
 SEE 100 Marks will be converted in to 50 Marks
 CCE 100 Marks will be converted in to 50 Marks
 It is compulsory to pass in each individual component.



Course Content:

| Sr. No | Course content | Hrs | % Weightage |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|
| 1 | <p>Introduction to Machine Learning and Learning Concepts</p> <ul style="list-style-type: none"> • Introduction to Machine Learning and Learning Systems • Real-World Applications of Machine Learning in Business • Importance of Machine Learning in Business Analytics • Variable Types and Basic Machine Learning Terminology • Concept of Learning and Types of Machine Learning (Supervised and Unsupervised Learning) • Function Approximation and Curse of Dimensionality Bias–Variance Tradeoff, Overfitting and Underfitting | 15 | 25 |
| 2 | <p>Predictive Modeling – Regression and Classification</p> <ul style="list-style-type: none"> • Introduction to Predictive Modeling Techniques • Linear Regression and Simple Linear Regression • Model Accuracy and Evaluation using R^2 • Logistic Regression for Classification Problems • Linear Discriminant Analysis (LDA) • Bayes Theorem and Naïve Bayes Classifier • Business Applications of Regression and Classification Models | 15 | 25 |
| 3 | <p>Model Evaluation, Resampling and Tree-Based Methods</p> <ul style="list-style-type: none"> • Model Evaluation and Resampling Methods • Cross-Validation Techniques: LOOCV and k-Fold Cross Validation • The Bootstrap Method • Regularization and Dimensionality Reduction: • Principal Component Regression (PCR) • Decision Trees for Classification and Regression • Advantages and Limitations of Decision Trees • Ensemble Methods: Bagging, Random Forest and Boosting | 15 | 25 |



| | | | |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| 4 | <p>Support Vector Machines and Unsupervised Learning</p> <ul style="list-style-type: none"> • Introduction to Support Vector Machines (SVM) • Concepts of Hyperplanes and Margins • Maximum Margin Classifier and Support Vector Classifier • Principal Component Analysis (PCA) and Dimensionality Reduction • Clustering Techniques: K-Means and Hierarchical Clustering • Determining the Optimal Number of Clusters • Business Applications: Customer Segmentation and Market Basket Analysis | 15 | 25 |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|

| Sr. No | Practical | Unit no | App hours |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|
| 1 | Installation and introduction to Python environment (Anaconda/Google Colab) and basic libraries used for Machine Learning such as NumPy and Pandas. | 1 | 2 |
| 2 | Import a business dataset in Python and perform data exploration using Pandas (view dataset, variable types, summary statistics). | 1 | 2 |
| 3 | Visualize dataset variables using graphs such as scatter plots, histograms and correlation plots using Python or Excel. | 1 | 2 |
| 4 | Demonstrate the concept of overfitting and underfitting using graphical representation in Python. | 1 | 2 |
| 5 | implement Simple Linear Regression using Python on a sample dataset (e.g., sales prediction based on advertising). | 2 | 2 |
| 6 | Evaluate the regression model using R ² score and error metrics in Python. | 2 | 2 |
| 7 | Implement Logistic Regression to classify a dataset (e.g., customer purchase prediction). | 2 | 2 |
| 8 | Implement Naïve Bayes classifier for a basic classification problem using Python. | 2 | 2 |
| 9 | Apply k-Fold Cross Validation using Python libraries to evaluate model performance. | 3 | 2 |
| 10 | Implement Decision Tree classification model using a sample dataset. | 3 | 2 |
| 11 | Implement Random Forest model and compare its performance with Decision Tree. | 3 | 2 |
| 12 | Apply Boosting technique (AdaBoost or Gradient Boosting) on a dataset and analyze results. | 3 | 2 |
| 13 | Implement Support Vector Machine (SVM) classification model using Python. | 4 | 2 |
| 14 | Perform Principal Component Analysis (PCA) for dimensionality reduction using Python. | 4 | 2 |



| | | | |
|--------------|-------------------------------------------------------------------------------------------|---|-----------|
| 15 | Perform K-Means Clustering for customer segmentation and visualize clusters using Python. | 4 | 2 |
| Total | | | 30 |

Continuous Assessment:

| Sr. No | Active Learning Activities | Marks |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1 | Machine Learning Application Identification: Students will identify any one business application of Machine Learning (recommendation systems, fraud detection, demand forecasting etc.) and explain how ML helps in decision making. They will upload the PDF on GMIU Web Portal. | 10 |
| 2 | Dataset Exploration Activity: Students will download a small business dataset and identify types of variables such as numerical, categorical, dependent and independent variables. They will upload the PDF on GMIU Web Portal. | 10 |
| 3 | Predictive Model Analysis: Students will study one predictive model (Regression or Classification) and explain how it can be used in a business problem such as sales prediction or customer churn prediction. They will upload the PDF on GMIU Web Portal. | 10 |
| 4 | Model Evaluation Discussion: Students will explain the importance of model evaluation techniques such as cross-validation, accuracy and error rate using simple examples. They will upload the PDF on GMIU Web Portal. | 10 |
| 5 | Customer Segmentation Case Study: Students will study the concept of clustering and explain how businesses use customer segmentation for marketing strategies. They will upload the PDF on GMIU Web Portal. | 10 |
| Total | | 50 |

Suggested Specification table with Marks (Theory): 75

| Distribution of Theory Marks (Revised Bloom's Taxonomy) | | | | | | |
|------------------------------------------------------------|--------------------|----------------------|--------------------|----------------|-----------------|---------------|
| Level | Remembrance (R) | Understanding (U) | Application (A) | Analyze (N) | Evaluate (E) | Create (C) |
| Weightage | 30% | 30% | 20% | 20% | 0% | 0% |

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



Course Outcome:

| | |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After learning the course, the students should be able to: | |
| CO1 | Understand the fundamental concepts of Machine Learning, learning systems, types of variables, and the importance of Machine Learning in business analytics. |
| CO2 | Apply predictive modeling techniques such as Linear Regression, Logistic Regression, and Naïve Bayes for solving business-related problems. |
| CO3 | Analyze and evaluate Machine Learning models using resampling methods, cross-validation techniques, and decision tree-based algorithms. |
| CO4 | Implement advanced Machine Learning techniques such as Support Vector Machines, Principal Component Analysis, and clustering methods for business analytics applications. |

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction. Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses. The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] James, G., Witten, D., Hastie, T., & Tibshirani, R. (2021). An introduction to statistical learning (2nd ed.). Springer.

[2] Kelleher, J. D., Mac Namee, B., & D’Arcy, A. (2015). Fundamentals of machine learning for predictive data analytics: Algorithms, worked examples, and case studies. MIT Press.

[3] Géron, A. (2022). Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow (3rd ed.). O’Reilly Media.

[4] Mueller, J. P., & Massaron, L. (2016). Machine learning for dummies. Wiley.

[5] Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.

