



MACHINE LEARNING WITH BUSINESS APPLICATIONS 23MBPE693

(COURSE HANDBOOK)

MBA

COURSE HEAD:
Asst. Prof. Ramya Bharadwaj

1. GENERAL INFORMATION

Welcome to Machine Learning with Business Applications!

This course serves as a foundational exploration of key machine learning concepts and their practical applications in business environments. It is designed to equip aspiring professionals with the knowledge and skills needed to harness the power of data and intelligent algorithms for effective decision-making and strategic business solutions.

The curriculum is structured into five comprehensive modules, each building upon the previous one. You will begin with an introduction to machine learning principles, followed by an in-depth exploration of supervised learning techniques, including predictive analytics, classification algorithms, and forecasting models. The course then covers unsupervised learning methods, such as clustering techniques. Each module includes hands-on activities and case studies aimed at enhancing your understanding and application of these concepts in real-world business scenarios.

As you progress through the course, you will be encouraged to actively participate in discussions and collaborative projects, which will not only deepen your technical comprehension but also foster essential skills such as analytical thinking, problem-solving, and teamwork. We emphasize a practical approach to learning; therefore, you will be expected to undertake coding exercises, data-driven assignments, and reflective tasks that align with the course content.

We hope this course will not only provide you with technical expertise but also inspire you to apply machine learning insights strategically in your future careers. Please familiarize yourself with this handbook, as it contains vital information regarding assessments, learning outcomes, and resources to support your academic journey. We look forward to an engaging and productive semester together!

1.1.Course Objectives

This course is designed to:

- **Impart knowledge of machine learning models** for solving business problems.
- **Provide a deeper understanding** of clustering and segmentation techniques.
- **Familiarize students with the usage of regression and classification algorithms** to analyse data and make predictions.

1.2.Course Outcomes

- **CO1:** Apply machine learning algorithms for solving predictive, classification, and forecasting problems in business contexts.
- **CO2:** Utilize regression and classification techniques to analyse business data, make predictions, and help in strategic decisions.
- **CO3:** Apply clustering algorithms for segmenting or analysing data.
- **CO4:** Apply machine learning models to solve real-world business problems.

1.3. Set Text and Suggested Sources

All the below mentioned books are available in the 1st Floor Library.

Key Text Books:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 1st Ed, 2010.
2. Paul Geertsema "Machine Learning for Managers" Routledge; 1st edition, 2023

Reference Books:

1. EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 1st Edition, 2014
2. Ahmed A. Elngar, R. Balamurali, Sandeep Kumar Panda, Vaibhav Mishra “Artificial Intelligence and Machine Learning in Business Management”, CRC Press, 2021.

2. THE COURSE

2.1.Course Description

MACHINE LEARNING WITH BUSINESS APPLICATIONS			
Semester	IV	CIE Marks	50
Course Code	23MBPE693	SEE Marks	50
Teaching Hrs/Week (L:T:P)	4:0:0	Exam Hrs	03
Total Hrs	52	Credits	04

The Machine Learning with Business Applications course is designed to provide students with foundational knowledge of machine learning concepts and their practical applications in business. The course will run for 13 weeks during Semester 1V and consists of 5 modules that cover essential topics such as supervised and unsupervised learning, regression, classification, and forecasting models. Each week includes 4 lectures, delivered by Ms. Ramya Bharadwaj, focusing on theoretical concepts, hands-on exercises, and real-world case studies. Spanning a total of 52 hours, this 4-credit course is assessed through Continuous Internal Evaluation (CIE) for 50 marks and a Semester-End Examination (SEE) for 50 marks in the form of a 3-hour exam duration. This structure ensures a balanced and engaging learning experience for students.

2.2.Initiating Contact with Staff and Other Students

Students are encouraged to use class hours for inquiries and are welcome to visit the faculty office for additional support. Given the large class size, emailing is also an effective communication option.

2.3.Resources

Resources go beyond just books-they include dynamic tools like digital libraries, e-learning platforms, and research databases. These modern learning environments offer anytime, anywhere access to academic materials, interactive courses, and cutting-edge research, empowering students to explore knowledge and excel in their fields.

Students can access a variety of resources through the college website. These include the VTU Consortium, e-learning platforms, and additional sources like open-access repositories, government portals (e.g., NPTEL, NDLI). These digital tools provide access to e-books, research papers, video lectures, and interactive tutorials, offering flexible and comprehensive learning environments.

E-learning and digital library can be accessed via the college website <https://mite.ac.in/> (Campus Life section > Library > VTU Consortium/e-learning platforms/additional sources).

2.4.Staff

Course Convenor: Prof. Ramya Bharadwaj
Cabin: 3rd floor, PG Block
Email: Suchithra@mite.ac.in

2.5.Topics and Reading materials for each module

<p><u>Module 1</u></p> <p>- Topic: Introduction to Machine Learning</p> <ul style="list-style-type: none">○ Introduction, components of machine learning, types, applications of machine learning in business. The machine learning workflow, learning models, geometric models, probabilistic models, logic models, perspectives and issues, version spaces, PAC learning, VC dimension. <p>- Essential Readings:</p> <ul style="list-style-type: none">○ Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 1st Ed, 2010. (Chapter 1 and 2)○ Paul Geertsema “Machine Learning for Managers” Routledge; 1st edition, 2023. (Part 1) <p>- Additional Reading:</p> <ul style="list-style-type: none">○ EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 1st Edition, 2014. (Chapter 1)	<p><i>No. of Hours: 09</i></p>
<p><u>Module 2</u></p> <p>- Topic: Supervised Learning Algorithms with Applications in Predictive Analytics</p> <ul style="list-style-type: none">○ Simple linear regression: Coefficient of determination, significance tests, residual analysis, confidence and prediction intervals. Multiple Linear Regressions (MLR): Coefficient of multiple coefficient of determination, interpretation of regression coefficients, categorical variables, heteroscedasticity, multi collinearity, outliers, auto-regression and transformation of variables. MLR model development and feature selection. Application of supervise learning in solving business problems such as pricing, customer relationship management, sales and marketing. <p>- Lab Component:</p> <ul style="list-style-type: none">○ Regression, SVM and K-model clustering using Python Libraries <p>- Essential Reading:</p> <ul style="list-style-type: none">○ Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 1st Ed, 2010. (Chapter 4,5 and 6) <p>- Additional Reading:</p> <ul style="list-style-type: none">○ EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 1st Edition, 2014. (Chapter 2)	<p><i>No. of Hours: 11</i></p>

Module 3

No. of Hours: 10

- **Topic: Supervised Learning Algorithms with Applications in Classification Problems**
 - o Logistic and Multinomial Regression: Logistic function, estimation of probability using logistic regression, Deviance, Wald test, Hosmer Lemeshow test. Feature selection in logistic regression. Ensemble Methods – Random Forest and Boosting. Business applications of classification problems such as sales conversion, employee attrition, and B2B sales management.
- **Lab Component:**
 - o Module 3: Decision Tree and Genetic Algorithms using Python Libraries.
- **Essential Reading:**
 - o Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 1st Ed, 2010. (Chapter 2,3 and 5)
- **Additional Reading:**
 - o EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 1st Edition, 2014. (Chapter 2,4 and 5)

Module 4

No. of Hours: 11

- **Topic: Supervised Learning Algorithms for Forecasting**
 - o Moving average, exponential smoothing, Trend, cyclical and seasonality components, ARIMA (autoregressive integrated moving average), and ARIMAX models. Application of supervised learning algorithms in retail, direct marketing, health care, financial services, insurance, supply chain etc.
- **Lab Component:**
 - o KNN using Python Libraries.
- **Essential Reading:**
 - o Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 1st Ed, 2010. (Chapter 3,4 and 5)
 - o Paul Geertsema “Machine Learning for Managers” Routledge; 1st edition, 2023. (Part 1)
- **Additional Reading:**
 - o EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 1st Edition, 2014. (Chapter 9,10 and 11) .

Module 5

No. of Hours: 11

- **Topic: Unsupervised Learning Algorithms**
 - o Clustering: K-means and Hierarchical Clustering.
- **Lab Component:**
 - o Reinforcement Learning using Python Libraries
- **Essential Reading:**
 - o Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 1st Ed, 2010. (Chapter 6)

- **Additional Reading:**
 - EthemAlpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press, 1st Edition, 2014. (Chapter 7 and 8)

3. ASSESSMENT

The assessment for the Machine Learning with Business Applications course is divided into two components: Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), each accounting for 50% of the total marks.

Continuous Internal Evaluation (CIE) comprises two internal tests, scheduled for 8th and 13th week, which together contribute 30% of the total marks. Additionally, students can earn 20% through the completion of assignments. (10 marks is allotted for exercises in machine learning tools and 10 marks is allotted for LAB Experiment (Practical Component)).

Semester End Examination (SEE) constitutes the remaining 50% of the total marks. Key information regarding examination dates and related details can be accessed via the college website (Academics and Courses section > Calendar of Events > PG Even Sem).

Rubrics for Other Assessment (Total: 20 Marks / 40% of CIE)

1. Exercises in Machine Learning Tools (10 Marks)				
Criteria	10-9 Marks (Excellent)	8-7 Marks (Good)	6-5 Marks (Fair)	4-1 Marks (Poor)
Completion	Completed all exercises with correct output. Works for all scenarios.	Completed all exercises with correct output. However, few defects found.	Completed most exercises with few defects	Incomplete or multiple defects found
Articulation	Able to articulate the solution clearly and able to explain the logic.	Somewhat able to articulate the solution	Significant gaps in articulation	Unable to articulate submitted solutions
Timeliness	Completed on time.	Completed slightly late.	Completed much later than due.	Missed the deadline.

2. Lab Experiment (10 marks)			
Practical Component	Experiment Conduction, Record & Viva	5	10
	Test	5	