Report on

Five-day FDP on "Avenues of Machine Learning in Core Engineering Applications"

The Department of Mechanical Engineering and Department of Civil Engineering of ATME College of Engineering, Mysuru have Jointly organizing a Five-Day Faculty Development Program on "Avenues of Machine Learning in Core Engineering Applications" from 28th July to 1st Aug 2025 at the ATMECE Campus. The objective of the FDP is to provide an opportunity for the faculty members of Core Engineering Branches like Mechanical, Civil, Electrical and Chemical Engineering to the field of Machine Learning. Experts from Academia and Industry are the resource persons who deliver lecturing sessions, Case studies and Hands-on experience through lab sessions. Various participants from Engineering Institutions from across the state have registered for the FDP.

This FDP offers a unique platform for faculty to bridge the gap between traditional engineering and emerging machine learning technologies. With the growing role of AI in fields like Mechanical, Civil, and Electrical & Electronics, the program equips participants with both foundational and advanced machine learning knowledge for solving real-world engineering problems. It includes theoretical concepts and hands-on sessions tailored to core engineering applications.

46 participants have registered totally for the FDP, out of which 15 are from ATMECE and 31 are from various Institutions across the state. Following is a session-wise brief report of the FDP.

Objectives of the FDP was:

- Introduce faculty members to the foundational concepts of ML relevant to core engineering applications.
- Highlight real-world case studies where ML has enhanced performance, optimization, and fault detection in traditional engineering systems.
- Bridge the knowledge gap between theoretical ML concepts and their practical implementation in engineering contexts.
- Encourage interdisciplinary teaching, research, and project-based learning among faculty and students

INAUGURATION

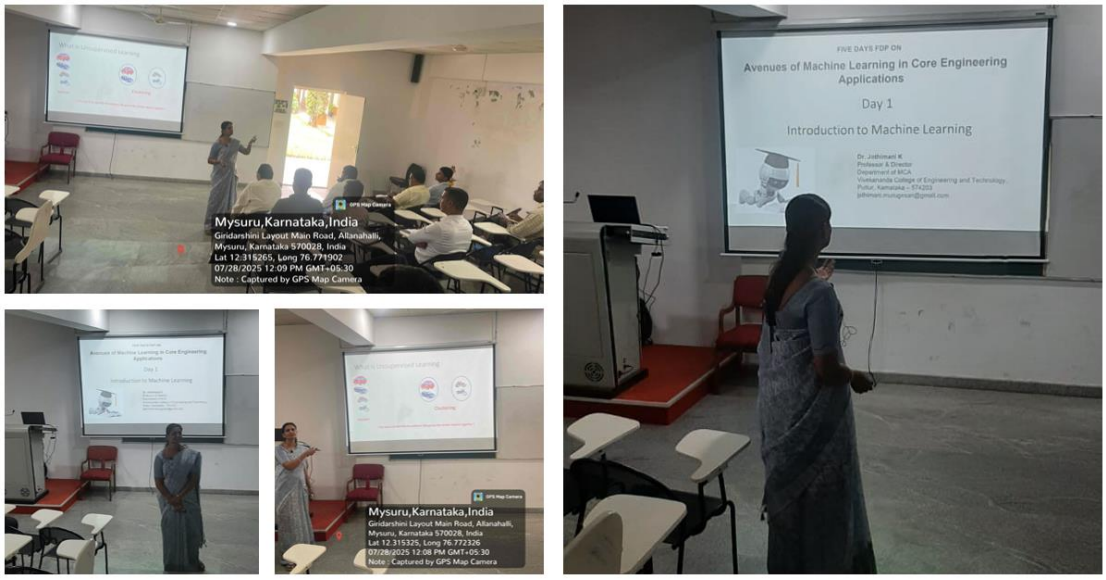
The FDP was Inaugurated on 28th July at 10:00 am in the Seminar hall of Civil Engineering Department. The Chief guest of the function was Dr. Jothimani K, Prof. and Director, Dept. of MCA, Vivekananda College of Engineering, Puttur. In the presidential address delivered by Dr. Basavaraj L, Principal, ATMECE has highlighted the use of machine Learning in the ever expanding Technological world. He has also appreciated the efforts of the organizers to identify the necessity of the knowledge on ML by the Core branch faculties and hoped that the FDP will add value to all the participants. Dr. Sachidananda Murthy, Administrative Officer, Dr. Bhagyashree SR, Dean-research, Dr. Srinivasa K, Dean-Student Affair, all the HODs of the various departments were present during the occasion. Dr. Chethan S, HOD Mech welcomed all and Prof. Devaraj MR delivered the vote of Thanks. Prof. Akhila C G hosted the Inaugural function.

Day 1 (28-07-2025): Morning Session:

Resource Person : Dr. Jothimani K Professor and Director, Dept. of MCA, VCET, Puttur.

We had the privilege of hosting Dr. Jothimani K, Professor and Director, Department of MCA, VCET, Puttur, for an insightful session on "Introduction to Supervised Learning and Model Building". Dr. Jothimani, a respected academician and an expert in computer science, began the session by introducing the participants to the foundational concepts of Machine Learning, its evolution, and its role in the modern data-driven world.

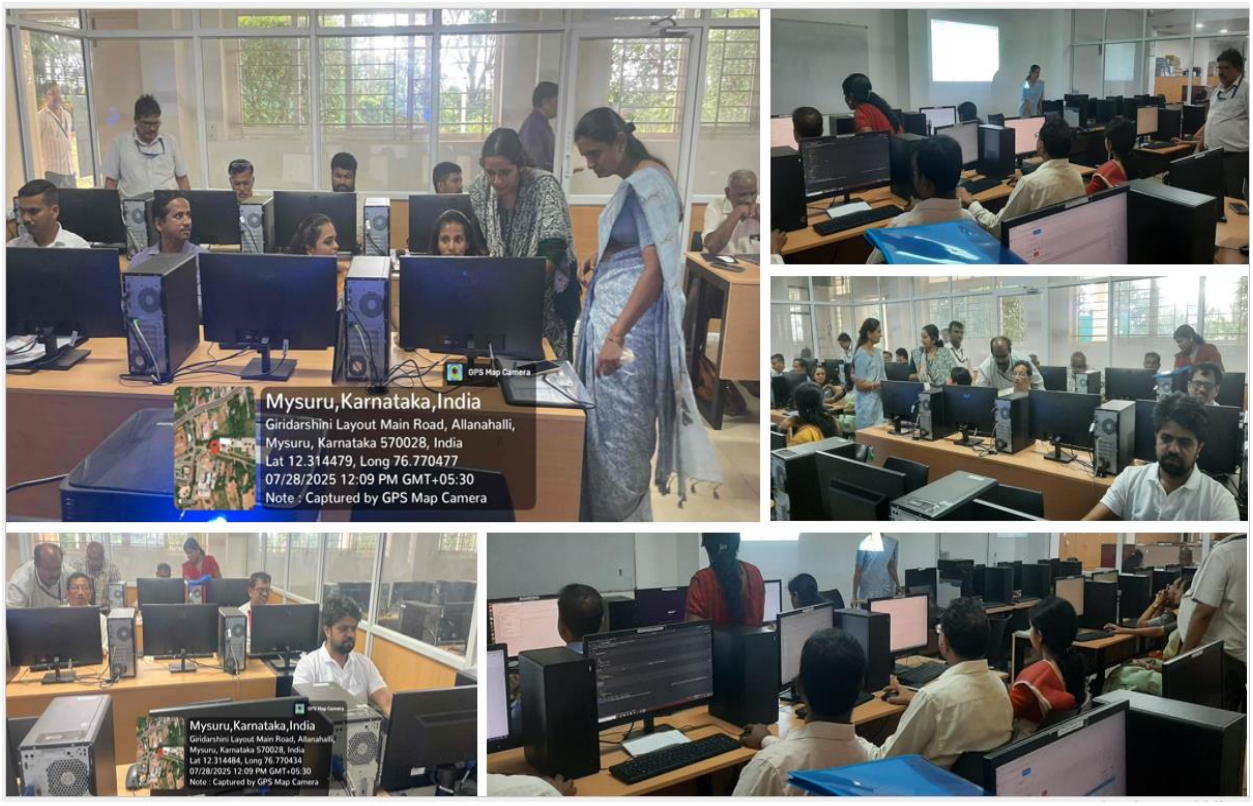
Madam began by differentiating between supervised and unsupervised learning, focusing on how labeled data in supervised learning guides model training. She highlighted the significance of data preprocessing steps like cleaning, normalization, and feature selection for enhancing model performance. Delving deeper into supervised learning, she explained classification and regression with relatable examples, clarifying that classification deals with categorical outputs while regression handles continuous values. The session also covered the model-building process, including data splitting, training, cross-validation, and evaluation using key performance metrics like accuracy, precision, recall, F1-score, and confusion matrix. Through interactive examples and real-world applications, Dr. Jothimani made the concepts approachable and engaging, making the session both insightful and inspiring for learners at all levels.



Afternoon Session: **Hands on**

Resource Person : Dr. Jothimani K Professor and Director, Dept. of MCA, VCET, Puttur.

The hands-on session on Introduction to Machine Learning provided participants with a practical understanding of fundamental ML concepts and algorithms. Attendees were guided through real-world datasets and learned how to apply basic supervised and unsupervised learning techniques using popular tools like Python and scikit-learn. The session covered key steps in the ML pipeline, including data preprocessing, model training, testing, and evaluation. By implementing algorithms such as linear regression and k-means clustering, participants gained valuable insights into how machine learning can be used to solve real-life problems, thereby reinforcing theoretical concepts through practical exposure.



Day 2 (29-07-2025) : Morning Session

Resource Person : Dr. Prabhakar M, Professor, Department of CS&E, Dayanand Sagar University, Bangalore, Karnataka.

The morning session of Day 2 was led by **Dr. Prabhakar M**, Professor from the Department of Computer Science and Engineering at Dayanand Sagar University, Bangalore. He spoke on the topic **"Feature Engineering in Machine Learning"**, emphasizing its significance in improving the accuracy and effectiveness of machine learning models. He explained that transforming raw data into relevant and meaningful features is a critical step that can directly impact model performance.

Dr. Prabhakar discussed various techniques such as feature selection, feature extraction, and feature construction. He also highlighted the importance of combining domain knowledge with statistical methods to create strong predictive variables. The session was engaging and included practical demonstrations, helping participants understand how to apply these techniques in real-world machine learning problems.

AFTERNOON SESSION

Resource Person : Dr. Prabhakar M, Professor, Department of CS&E, Dayanand Sagar University, Bangalore, Karnataka.

The hands-on Python lab session following the morning talk on Feature Engineering in Machine Learning provided participants with practical exposure to key techniques using real datasets. Under the guidance of Dr. Prabhakar M, attendees explored how to preprocess data, handle missing values, and apply transformations like encoding categorical variables and normalizing numerical features. The session emphasized the impact of these preprocessing steps on machine learning model outcomes.

Participants also practiced using popular Python libraries such as Pandas, NumPy, and scikit-learn to perform feature selection and dimensionality reduction. Through step-by-step coding exercises, Dr. Prabhakar demonstrated how to implement feature extraction methods like PCA and apply correlation analysis to remove redundant features. This hands-on experience helped reinforce theoretical concepts and gave participants the confidence to apply feature engineering in their own machine learning projects.






Day 3 (30-07-2025) : Morning Session

Resource Person : Dr. Arunadevi M, Associate Professor, Department of ME, Dayanand Sagar College of Engineering, Bengaluru, Karnataka.

The morning session of Day 3 was led by Dr. Arunadevi M, Associate Professor in the Department of Mechanical Engineering at Dayanand Sagar College of Engineering, Bengaluru. She delivered an informative lecture on the topic "Basic Models and Simple Algorithms for Supervised Learning." Dr. Arunadevi began by explaining the fundamental concepts of supervised learning, where models learn from labeled data to make predictions. She discussed key algorithms such as Linear Regression, Decision Trees, and k-Nearest Neighbors, elaborating on their working principles and practical use cases.

The session also focused on evaluating model performance using metrics like accuracy, precision, and recall. Dr. Arunadevi emphasized how choosing the right algorithm depends on the problem type, data nature, and performance requirements. Through illustrative examples and real-world applications, she helped participants understand how these basic models form the foundation for more complex machine learning techniques. The session was especially helpful for beginners looking to build a strong base in supervised learning.

AFTERNOON SESSION

Resource Person : Dr. Arunadevi M, Associate Professor, Department of ME, Dayanand Sagar College of Engineering, Bengaluru, Karnataka.

The hands-on session held was an extension of the morning session on **Basic Models and Simple Algorithms for Supervised Learning**. Participants were introduced to the Python programming environment and key libraries such as **scikit-learn**, **Pandas**, and **NumPy**. They began by importing datasets, performing basic data preprocessing like handling missing values and encoding categorical variables, and then moved on to building models using algorithms like **Linear Regression, Decision Trees, and k-Nearest Neighbors**. The step-by-step coding walkthrough allowed participants to follow along and understand each stage of the machine learning workflow.

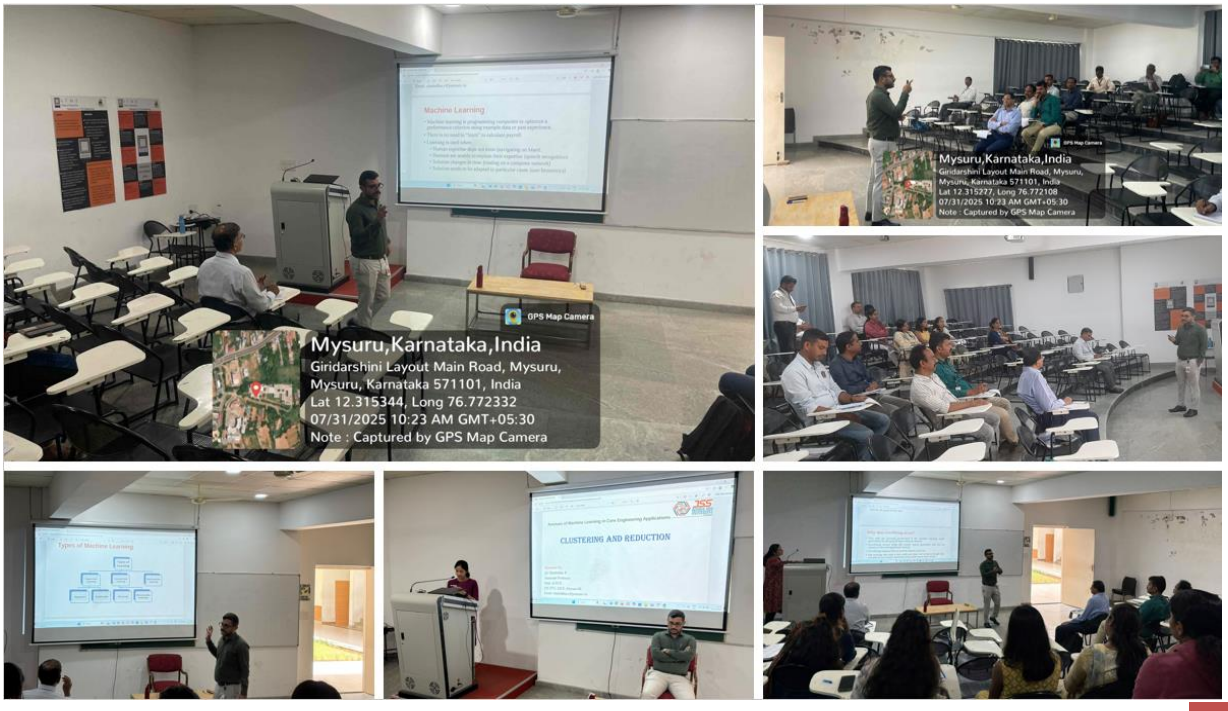
The session also emphasized evaluating model performance using various metrics such as **accuracy, precision, recall**, and the **confusion matrix**. By the end of the session, participants had not only built and tested basic supervised learning models but also gained practical exposure to comparing different algorithms and understanding their strengths and limitations. The session was highly interactive and beneficial for building foundational skills in applied machine learning.

Day 4 (31-07-2025) : Morning Session

Resource Person : Dr. Shashidhar R, Associate Professor, Department of ECE, SJCE, Mysuru.

The morning session of Day 4 was delivered by **Dr. Shashidhar R**, Associate Professor in the Department of Electronics and Communication Engineering at SJCE, Mysuru. He began with an insightful introduction to **Unsupervised Learning**, explaining how it differs from supervised methods by working with unlabeled data to uncover hidden patterns and structures. Dr. Shashidhar highlighted the importance of unsupervised techniques in real-world scenarios such as customer segmentation, anomaly detection, and data compression, where labeled data is often unavailable.

Following the introduction, he focused on **Clustering techniques**, particularly **K-Means, Hierarchical Clustering**, and **DBSCAN**, elaborating on how each method groups data based on similarity. He also presented a compelling **case study** that demonstrated the practical application of clustering in analyzing large-scale data for market analysis. Through visual examples and discussions on cluster evaluation metrics like silhouette score, Dr. Shashidhar emphasized the role of clustering in gaining data insights. The session effectively bridged theoretical understanding with practical relevance, engaging participants across disciplines.

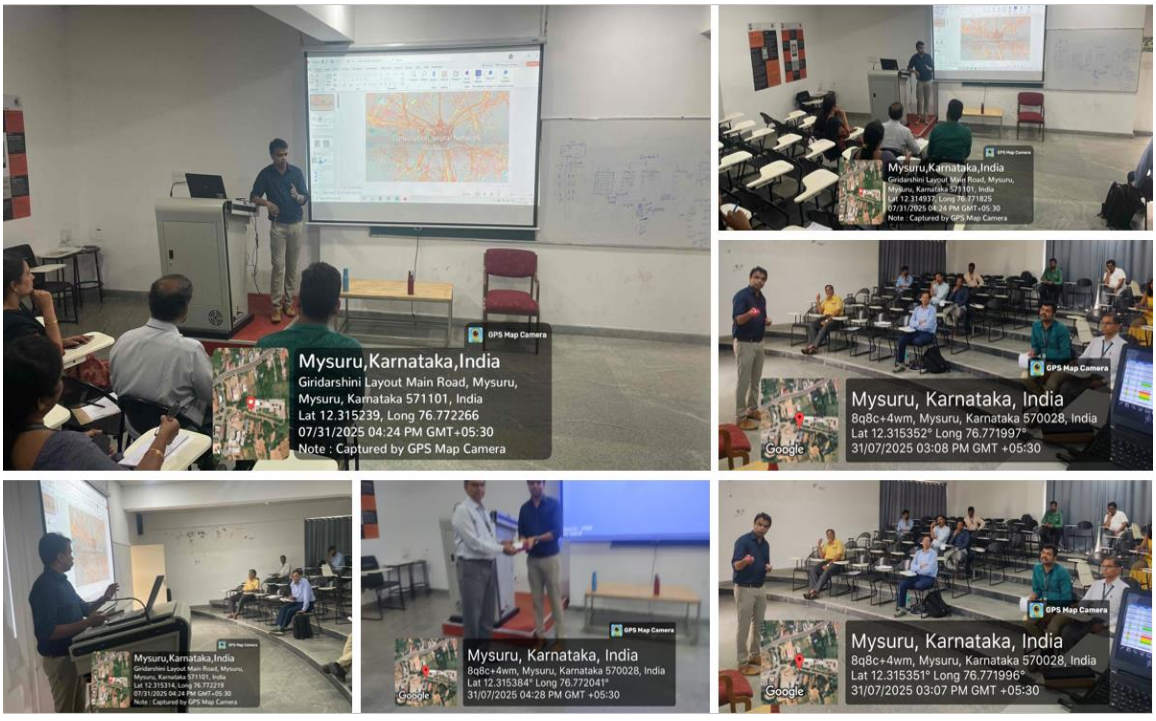


Day 4 (31-07-2025) : Afternoon Session

Resource Person : Mr. Puneeth S, Assistant Professor, Department of ECE, NIE, Mysuru.

The afternoon session was conducted by **Mr. Puneeth S**, Assistant Professor in the Department of Electronics and Communication Engineering at NIE, Mysuru. He introduced the participants to the fundamentals of **Deep Learning**, a rapidly evolving subset of machine learning that focuses on neural networks with multiple layers. Mr. Puneeth began by explaining the basic structure of artificial neural networks (ANNs), including concepts like neurons, weights, biases, activation functions, and how they collectively mimic the human brain's decision-making process.

He then elaborated on popular deep learning architectures such as **Convolutional Neural Networks (CNNs)** for image processing and **Recurrent Neural Networks (RNNs)** for sequence data. The session also touched upon the importance of frameworks like **TensorFlow** and **Keras** in building and training deep learning models efficiently. Through simple examples and visual aids, Mr. Puneeth clarified how deep learning is powering advancements in fields like computer vision, natural language processing, and autonomous systems.



Day 5 (01-08-2025) : Morning Session

Resource Person : Sri K V Subbaiah Setty, Founder Partner, DTC Infotech (P) Ltd., Jayanagar, Bangalore.

The final day's morning session was led by **Sri K V Subbaiah Setty**, Founder Partner of DTC Infotech (P) Ltd., Jayanagar, Bangalore. He delivered a highly engaging talk on **Machine Learning Applications in Core Engineering**, with a focus on how ML is being integrated into traditional engineering domains such as Mechanical, Civil, and Electronics. Sri Setty began by introducing practical scenarios where machine learning is revolutionizing engineering processes, from defect detection and predictive maintenance to quality control and structural analysis.

What made the session especially impactful was the use of **branch-specific case studies**. He illustrated mechanical applications using examples involving **bolts, nuts, bearings**, and wear prediction, while for civil engineering, he discussed the use of ML in analyzing **building structures and materials**. Additionally, he used relatable examples like **fruit classification** to explain ML model logic in a simplified manner. The session effectively bridged the gap between theoretical knowledge and industrial application, offering participants a deeper understanding of ML's real-world relevance in their respective fields.




Day 5 (01-08-2025) : Afternoon Session: Assessment followed by Feedback session

The final session of the FDP concluded with an **assessment followed by a feedback session** on 01-08-2025. The assessment aimed to evaluate the participants' understanding of key concepts covered throughout the five days, including supervised and unsupervised learning, feature engineering, clustering, deep learning, and real-world applications in core engineering. It was followed by an interactive feedback session where participants shared their thoughts on the overall structure, content delivery, hands-on sessions, and relevance of the topics. The session highlighted positive takeaways as well as constructive suggestions for future improvements, marking a thoughtful and reflective end to the program.

VALEDICTORY FUNCTION

The **Valedictory Function** of the 5-Day Faculty Development Program was gracefully anchored by **Prof. Ravikumar**, who extended a warm welcome to all dignitaries, participants, and guests. He set the tone for the session by briefly acknowledging the collective efforts that led to the successful completion of the program.

This was followed by a **brief report of the entire FDP** presented by **Dr. Chethan S**, highlighting the key sessions conducted over the five days, the resource persons involved, and the overall learning outcomes.

Participants then shared their experiences and feedback, offering encouraging reflections on the five-day FDP. **Miss Rashmi** from Bahubali College of Engineering expressed her gratitude for the well-organized sessions and emphasized how the practical exposure enhanced her understanding of the subject. **Dr. Muthuraj** from VVCE appreciated the structured flow of the program and the technical depth offered by the expert speakers.

Adding to the feedback, **Mr. Kiran P** from Bahubali College of Engineering lauded the event for fostering a collaborative learning environment and providing new perspectives in the domain. **Mr. Janardhan** from PES University also echoed similar thoughts, acknowledging the value the FDP brought in terms of academic enrichment and professional development.

Following the feedback session, **certificates were distributed by the dignitaries** to all the participants, marking the successful culmination of the program.

Dr. Bhagyashree S R delivered the concluding remarks, expressing sincere appreciation for the efforts of the organizing team who worked tirelessly to ensure the smooth execution of the five-day program. She acknowledged the contributions of the resource persons, whose expertise and engaging sessions greatly enriched the learning experience.

She also extended her gratitude to the participants from various institutions for their enthusiastic involvement and active participation throughout the FDP. Their commitment and engagement played a vital role in making the program a meaningful and successful academic endeavour.


The event concluded with a formal **vote of thanks** delivered by **Prof. Devaraj M. R.**, who acknowledged the support of the management, speakers, coordinators, and participants for making the FDP a resounding success.


OUTCOMES OF THE FDP:

- Enhanced competency of faculty members in contemporary technologies such as Machine Learning, with specific relevance to core engineering domains.
- Empowered departments to integrate ML concepts into curriculum design, research initiatives, and student projects.
- Bridged the gap between theoretical ML knowledge and its practical applications in engineering contexts, fostering deeper understanding and applicability.
- Fostered interdisciplinary collaboration by encouraging faculty across departments to explore ML-driven innovations in mechanical, civil, electrical, and related fields.
- Stimulated interest in real-world case studies, enabling participants to appreciate how ML enhances performance, fault detection, and process optimization in traditional systems.
- Initiated the groundwork for project-based learning and collaborative research proposals at the intersection of core engineering and data-driven technologies.
- Encouraged adoption of emerging pedagogical tools and teaching strategies for effectively imparting ML concepts to undergraduate and postgraduate students.