



Affiliated to Visvesvaraya Technological University, Belagavi

Approved By AICTE, New Delhi.

Recognized by UGC with 2(f) & 12(B) status

Accredited by NBA and NAAC.

## A Report on Guest lecture on **AIML ENHANCING DEFENSE AND AEROSPACE CAPABILITIES**

---

Date of the event	27.02.2025
Title of the Event	Guest lecture on “ <b>AIML ENHANCING DEFENSE AND AEROSPACE CAPABILITIES</b> ”
Organized by	Dept of Computer Science and Engineering MVJCE, Bangalore

The guest lecture was conducted by the Department of Computer Science and Engineering for 4<sup>th</sup> and 6<sup>th</sup> semester Computer science students, on 27 February 2025, at Dr. M V Jayaraman Auditorium. The event was presided over by Dr. Ajayan K R (Principal, MVJCE), Dr. Asha Joseph (Dean School of Computer Science) and Dr. Kiran Babu T S (HOD/CSE). Dr. Neeta Trivedi was the Guest Speaker with Mr. Ashish Agarwal as Co-speaker. The session provided a high-level perspective on artificial intelligence, highlighting its role in simulating real-world scenarios along with the key challenges encountered during the robot training process and ultimately improving model performance and reliability.

### **About the speakers:**

Dr. Neeta Trivedi has had a remarkable career that spans over three decades. She began her journey with the Defense Research and Development Organization (DRDO) in 1989, where she contributed to avionics and mission systems for both manned and unmanned aircraft. One of her most notable achievements was leading the team that developed the Cockpit Display Systems for India’s Light Combat Aircraft, Tejas, and later heading a group working on UAV systems. Her work on advanced technologies has made a significant impact on the defense sector.

Ashish Agrawal is a Senior Computer Vision Engineer with a knack for helping machines understand and interpret images. He specializes in areas like Image Processing, Computer Vision, Deep Learning, and Embedded Computing, working on everything from object detection to

improving image quality. He builds smart systems that can process visual data in real-time, even on devices with limited resources.

### **A brief account of the session:**

The event began with an invocation song by Ms. Divyashree and Ms. Madhura. Dr. Neeta Trivedi was warmly invited onto the stage with enthusiastic applause from the audience. As a gesture of appreciation, Dr. Asha Joseph presented her with a beautiful bouquet. The guest was introduced to the gathering, and a welcome address was delivered to the faculty members and students of the Computer Science and Engineering Department.



Figure 1: Dr. Asha Joseph presenting a bouquet to Dr. Neeta Trivedi

The session was held from 10:30 a.m. to 12:30 p.m. Dr. Neeta took the first hour, followed by Mr. Ashish in the second hour. In the first hour of the session Dr. Neeta Trivedi delivered an insightful lecture on the impact of Artificial Intelligence (AI) and Machine Learning (ML) in modern defense and aerospace technologies. She emphasized how these advanced technologies are transforming intelligence gathering, surveillance, target tracking, and autonomous navigation in military and security operations.

### **Key Highlights of Her Talk:**

1. AI in Intelligence Gathering & Surveillance:
  - AI and ML play a crucial role in processing vast amounts of satellite imagery, drone footage, and ground intelligence.

- These technologies help in detecting anomalies, movement patterns, and unexpected activities, which can be used for national security and defense planning.



Figure 2: Dr. Neeta Trivedi addressing the students

2. Monitoring Health Conditions of Targets:

- AI can analyze medical data of high-value targets, predicting their movements based on health conditions.
- For example, if a target requires regular dialysis, AI-based surveillance can help track their movements, aiding strategic operations.

3. Micro Aerial Vehicles (MAVs) & UAVs:

- She introduced Micro Aerial Vehicles (MAVs)—small, AI-powered drones used for stealth surveillance.
- These MAVs mimic natural flight patterns (e.g., birds, insects) and can navigate challenging terrains, making them valuable for covert military operations.

4. Ethical Concerns & AI Safety in Defense:

- She addressed concerns regarding AI-driven autonomous weapons, emphasizing the need for ethical regulations and human oversight.
- AI in military applications should be explainable, accountable, and aligned with safety protocols to prevent unintended consequences

Dr. Neeta Trivedi's talk provided a thought-provoking perspective on the future of AI in defense, sparking discussions on its benefits and risks.



Continued by **Mr. Ashish Agarwal**, an expert in Machine Learning and Computer Vision, discussed the challenges of deploying deep learning models in real-world applications. Rather than introducing new models and architectures, he focused on practical challenges encountered while training and deploying models for real-time applications such as surveillance, traffic monitoring, and sports tracking.



Figure 3: Students attending the guest lecture

### **Key Challenges Discussed:**

1. Data Scarcity – Lack of labeled data can cause poor model learning and overfitting.
2. Class Imbalance – Some categories may have fewer training samples, leading to biased model predictions.
3. Insufficient Data Variability – Models trained on limited scenarios struggle to generalize across different lighting, weather, and backgrounds.
4. Domain Adaptation Issues – Pretrained models may not work well in new environments (e.g., a model trained on Western roads may struggle with Indian traffic).
5. Edge Cases – Models can fail in occlusion-heavy scenes (e.g., people in crowds, football jersey number misclassification).
6. Inference Speed – Real-time applications require fast processing (e.g., traffic cameras need detections within 40ms to maintain 25-30 FPS).

## **Solutions Proposed:**

1. Discriminative Learning Rates – Adjusting learning rates for different layers of the model to fine-tune pretrained models without losing previous knowledge.
2. Transfer Learning – Adapting existing models to new domains using targeted fine-tuning.
3. Class Balance Sampling – Ensuring equal representation of all classes in training batches to prevent bias.
4. Real-time Optimization – Using lightweight architectures and model pruning to speed up inference.
5. Handling Occlusions & Edge Cases – Enhancing dataset diversity and using specialized techniques like tracking and ensemble learning.

He concluded by stating that deploying deep learning models in real-world applications is challenging due to data limitations, generalization issues, and performance constraints. Careful model fine-tuning, smart data handling, and real-time optimization are essential for achieving reliable results in practical scenarios.

## **Outcomes of the Event:**

In conclusion, the guest lecture on "Enhancing Defense and Aerospace Capabilities with AI/ML" was an insightful and engaging session for the 2nd and 3rd-year students. Dr. Neeta Trivedi's insights into the role of AI in defense, from real-world simulations to navigation and military training, provided a glimpse into the advancements shaping modern warfare and security, while Mr. Ashish Agarwal explained how to improve machine learning models sparked curiosity among the young minds. The event gave students a better understanding of AI's impact and inspired them to explore its possibilities in defense and aerospace. They actively engaged with the speakers during the Q&A session, seeking clarifications on AI's role in defense.

**Mrs. Nikitha G S**

**Co-Ordinator of the Event**

**Assistant Professor**

**Computer Science and Engineering**