



AI-Driven Intelligent Surveillance System Using YOLOv8, DeepSORT, and Vision Transformers

File Number : ANRF/AISE/2025/000186

Submitted By : Dr. BHARATHI A

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PROPOSAL DETAILS

(ANRF/AISE/2025/000186)

Dr. BHARATHI A

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ASSISTANT PROFESSOR (COMPUTER APPLICATIONS)

Vels Institute of Science, Technology and Advanced Studies

Velan nagar, p.v. vaithiyalingam road, pallavaram, Chennai, Tamil nadu-600117

Technical

Program :

AI for Science and Engineering

Broad Area:

AI for Science and Science of AI (ANRF)

Sub Area:

Reimagining Design and Simulation through AI

Duration :

36 Months

Contact No :

+918248624783

Date of Birth :

12-Jun-1987

Nationality :

INDIAN

Project Summary :

This project develops an AI-based surveillance system that can automatically detect people, track their movements, and identify security risks in real time. The research aims to combine object detection (YOLOv8), tracking (DeepSORT), and transformer-based scene understanding (ViT) to test the hypothesis that explainable attention maps can improve the accuracy and clarity of surveillance decisions. The main experiments include detecting individuals in video frames, generating attention heatmaps, analyzing loitering or crowding patterns, and assigning risk levels based on density and model confidence. If successful, the system will provide a reliable and interpretable surveillance tool with strong applications in public safety, campus monitoring, and smart security environments.

Objectives :

1. To design a hybrid computer-vision pipeline integrating object detection, tracking, and transformer-based scene understanding. 2. To implement explainable AI (XAI) using attention heatmaps for transparent and interpretable surveillance decisions. 3. To develop an automated risk-scoring system for classifying Low, Medium, High, and Critical security events. 4. To detect loitering, crowding, and suspicious behavior through identity-preserving tracking. 5. To generate multi-view visual analytics combining raw footage, detection, tracking, and heatmap overlays.

Keywords :

AI Surveillance,Object Detection,DeepSORT Tracking,Vision Transformers,Explainable AI (XAI),Risk Analysis

Expected Output and Outcome of the proposal :

- A robust and scalable surveillance solution capable of identifying violent events, crowd formation, and suspicious movements in real time.

• Improved situational awareness for security teams using interpretable attention-based visual explanations.

• High-quality research contributions in AI explainability, computer vision, and intelligent surveillance.

• Potential adoption in campuses, industries, public spaces, and smart city environments.

Collaboration Details for last 5 Years :

S.No.	Name	Type of Collaboration
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Proposed Research Collaborator Details :

S.No.	Name	Type of Collaboration
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Co - Principal Investigator Details :

S. No.	Co-PI Details	
1	 Shyamala devi N Nithyanandam shyamadevi@gmail.com ASSISTANT PROFESSOR(COMPUTER SCIENCE) Vels Institute of Science, Technology and Advanced Studies Velan Nagar, P.V. Vaithiyalingam Road, Pallavaram, TAMIL NADU, Chennai D.O.B : 17 Dec, 1984	
2	 Hemamalini U hemababu2501@gmail.com ASSISTANT PROFESSOR(COMPUTER APPLICATIONS) Vels Institute of Science, Technology and Advanced Studies Velan Nagar, P.V. Vaithiyalingam Road, Pallavaram, TAMIL NADU, Chennai D.O.B : 07 Aug, 1983	

Industry-wise Contribution :

Project Proposal Format

Title

AI-Driven Intelligent Surveillance System Using YOLOv8, DeepSORT, and Vision Transformers

Vision

To develop an advanced, real-time, and explainable surveillance system that enhances public safety by automatically detecting anomalies, tracking individuals, and assessing security risks with high accuracy and transparency.

Objectives

- 1. To design a hybrid computer-vision pipeline integrating object detection, tracking, and transformer-based scene understanding.
 - 2. To implement explainable AI (XAI) using attention heatmaps for transparent and interpretable surveillance decisions.
 - 3. To develop an automated risk-scoring system for classifying Low, Medium, High, and Critical security events.
 - 4. To detect loitering, crowding, and suspicious behavior through identity-preserving tracking.
 - 5. To generate multi-view visual analytics combining raw footage, detection, tracking, and heatmap overlays.
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Keywords

AI Surveillance, YOLOv8, DeepSORT, Vision Transformer (ViT), Explainable AI, XAI, Risk Analysis, Computer Vision, Real-Time Monitoring, Video Analytics

Team and Their Expertise

Team Member	Expertise
Principal Investigator	Artificial Intelligence, Computer Vision, Research Design
Co-Investigator(s)	Machine Learning, Deep Learning Models, Edge/Cloud Deployment

Team Member	Expertise
Research Scholar(s)	Model training, dataset preparation, coding (Python, PyTorch)
Technical Assistant	Data annotation, video processing, system testing
Industry Mentor (optional)	Surveillance systems, security operations domain expertise

Deliverables

1. Fully functional AI-driven surveillance prototype with real-time detection, tracking, and risk classification.
 2. Explainable AI dashboard with attention-based heatmap visualization.
 3. Loitering and anomaly detection modules with alert-generation capability.
 4. Documentation:
 - System architecture
 - Dataset description
 - Model performance report
 - User guide
 5. Research outputs (journal papers, conference presentations).
 6. Deployment package or API for real-world implementation.
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Expected Outcome

- A robust and scalable surveillance solution capable of identifying violent events, crowd formation, and suspicious movements in real time.
 - Improved situational awareness for security teams using interpretable attention-based visual explanations.
 - High-quality research contributions in AI explainability, computer vision, and intelligent surveillance.
 - Potential adoption in campuses, industries, public spaces, and smart city environments.
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Collaborations

National

- IITs / NITs for research collaboration
- DRDO-recognized research centres
- Police departments / Smart City Mission projects
- Indian academic institutions with AI/ML expertise

International

- Universities working on XAI and computer vision (e.g., MIT, Carnegie Mellon, NTU)
- Research labs focusing on surveillance and video analytics
- AI industry collaborators (NVIDIA, OpenCV community, IBM Research)

Budget*

(You can adjust as per funding requirement and institution guidelines)

Category	Estimated Cost (INR)
Hardware (GPU workstation / cloud credits)	₹2,00,000 – ₹3,00,000
Software & Licenses	₹25,000 – ₹50,000
Data collection & Storage	₹30,000 – ₹75,000
Research Assistance (Stipend)	₹1,20,000 – ₹1,80,000
Travel & Conferences	₹40,000 – ₹60,000
Contingency	₹20,000 – ₹40,000
Total Estimated Budget	₹4,35,000 – ₹6,00,000

Dr. A.BHARATHI

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PROFILE SUMMARY

Dedicated and accomplished Assistant Professor with a Ph.D. in Computer Science and over 9 years of teaching and research experience. Demonstrated excellence in academics, research, and innovation through peer-reviewed publications, patents, and authored books. Passionate about mentoring students and contributing to academic and research excellence.

ACADEMIC QUALIFICATIONS

- Ph.D. in Computer Science – Vels Institute of Science, Technology and Advanced Studies, 2023
- M.Phil – Shri Ramakrishna College of Arts & Science, Coimbatore, 2010
- M.Sc [5 years]– Kamaraj College of Engineering and Technology, 2009

TEACHING EXPERIENCE

Assistant Professor – 9 YEARS

- Handling UG/PG courses in [Subject Areas].
- Mentoring students for projects and research work.
- Organized and participated in seminars, FDPs, and workshops.

RESEARCH & PUBLICATIONS

- Publications: 14 Research articles in indexed international and national journals.
- Books Authored: 6 books and 8 book chapters in Computer Science & Applications.
- Patents: 6 patents published.
- Awards: Received 10 awards from Various Organizations.

AREAS OF INTEREST

Machine Learning | Image Processing | Data Science | Artificial Intelligence | Cybersecurity

PROFESSIONAL MEMBERSHIPS

Member – IAENG MEMBERSHIP -INTERNATIONAL ASSOCIATION OF ENGINEERS