**TOPICS IN COMPUTER SCIENCE II**

**Group Number #11**

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**Real-Time**

**Weapon Detection Using Thermal Vision Camera**

1. **Introduction:**

The rise in security threats necessitates advanced surveillance solutions. This project aims to develop a real-time weapon detection system utilizing heat vision cameras and deep learning models. The system will identify weapons based on their thermal signatures, ensuring efficient threat detection in low-visibility conditions.

**2. Objectives**

* Develop a real-time weapon detection system using a thermal imaging camera.
* Train deep learning models to recognize and classify weapons based on thermal data.
* Implement an alert mechanism to notify authorities upon weapon detection.
* Optimize the system for real-time performance and high accuracy.

**3. Scope**

* **Hardware:**
* Integration with thermal cameras (e.g., FLIR, Seek Thermal) for heat-based detection.
* **Software:**
* Utilization of machine learning frameworks (TensorFlow, PyTorch) for model training and OpenCV for image processing.
* **Deployment:**
* Edge computing platforms such as NVIDIA Jetson Nano or cloud-based solutions.
* **Testing:**
* Validation on real-world thermal datasets to ensure reliability.

**4. Feasibility Study**

* **Technical Feasibility:**
* Advances in deep learning and thermal imaging make real-time detection achievable. Pretrained models can be fine-tuned for specific weapon shapes and heat patterns.
* **Economic Feasibility:**
* Cost-effective hardware options exist, and cloud solutions reduce infrastructure expenses.
* **Operational Feasibility:** Security personnel can integrate the system into existing surveillance frameworks with minimal training.

**5. Methodology**

* **Data Collection:**
* Gather and preprocess thermal images of weapons.
* **Model Training:**
* Fine-tune models like YOLOv8 or Faster R-CNN for weapon detection.
* **Real-Time Processing:**
* Implement real-time detection pipeline using OpenCV and TensorRT.
* **Deployment & Testing:**
* Deploy on edge devices or cloud and evaluate performance.

**6. Expected Outcomes**

* Enhanced security through automated weapon detection.
* Reduction in response time for security threats.
* Scalable and adaptable system for various security applications.

**7. Conclusion** This project proposes an innovative approach to security surveillance by leveraging thermal imaging and AI. By integrating deep learning with real-time processing, the system aims to provide a reliable and efficient solution for weapon detection in critical environments.