

Assignment-7

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- **Project Plan:**

- **Computer Vision in Manufacturing:** Create a project plan with a problem statement, proposed solution, impact, and any ethical or legal considerations concerning computer vision in the manufacturing sector.

1. Defective Product Detection:

- **Problem Statement:**
 - Manufacturers often struggle with detecting defective products on assembly lines, leading to increased waste and customer dissatisfaction. Traditional quality control methods rely on human inspectors, which can be slow, inconsistent, and error-prone.
- **Proposed Solution:**
 - Implement a computer vision-based defect detection system using OpenCV and TensorFlow. High-resolution cameras will capture real-time images of products, and an AI model will classify defects such as cracks, scratches, or misalignments. The system will automatically flag defective items for removal.
- **Impact:**
 - **Increases efficiency** by automating defect detection.
 - **Reducing costs** associated with recalls and returns.
 - **Improves product quality** and customer satisfaction.
- **Ethical & Legal Considerations:**
 - **Bias in AI training:** The model must be trained on diverse datasets to ensure it identifies defects across different materials and product variations.
 - **Data privacy:** Ensuring video feeds from manufacturing lines are securely stored and not misused.

- **Workforce displacement:** Addressing concerns about job loss by upskilling employees to work alongside AI systems.

2. Worker Safety Monitoring:

➤ Problem Statement:

- Manufacturing environments pose risks such as exposure to hazardous machinery, improper use of safety gear, and fatigue-related accidents. Current safety measures rely on manual monitoring, which is insufficient for real-time risk prevention.

➤ Proposed Solution:

- Deploy computer vision-powered surveillance using OpenCV and YOLO (You Only Look Once) object detection to monitor workers in real-time. The system will check for compliance with safety protocols (e.g., wearing helmets, gloves, and high-visibility jackets) and alert supervisors if any violations occur.

➤ Impact:

- **Enhances workplace safety** by reducing accidents.
- **Ensures compliance** with industry safety regulations.
- **Reduces liability and insurance costs** for manufacturers.

➤ Ethical & Legal Considerations:

- **Employee privacy:** Clear policies should be established regarding video surveillance to avoid misuse.
- **False positives:** The model must be fine-tuned to avoid unnecessary alerts.
- **Legal compliance:** Adherence to labor laws concerning workplace monitoring is essential.

3. Predictive Maintenance for Machinery:

➤ Problem Statement:

- Unexpected machinery failures disrupt production, leading to downtime and financial losses. Traditional maintenance schedules follow fixed intervals, which may be inefficient as they do not consider actual equipment wear and tear.

➤ Proposed Solution:

- Use computer vision with AI-based anomaly detection to analyze real-time video feeds of machinery and detect early signs of malfunction (e.g., overheating, vibration irregularities, oil leaks). The system will provide predictive alerts, allowing for timely maintenance before failure occurs.

➤ Impact:

- **Reduces unplanned downtime**, improving productivity.

- **Extends machinery lifespan**, lowering maintenance costs.
- **Optimizes resource utilization**, ensuring parts are replaced only when needed.

➤ **Ethical & Legal Considerations:**

- **Data security:** Preventing unauthorized access to machine performance data.
- **Accuracy & accountability:** Ensuring AI predictions are reliable to prevent unnecessary maintenance expenses.
- **Regulatory compliance:** Meeting industry standards for automated maintenance systems.