MDM2 – Case Study: Intelligent Systems in Production
One-Page Proposal

Team	Group B, Team 2
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Project Title	Integration and Comparison of vision models for smart inspection cell
GitHub Repository URL	https://github.com/Pallelayaswitha1/Integration-and-Comparison-of-vision-models-for-smart-inspection-cell
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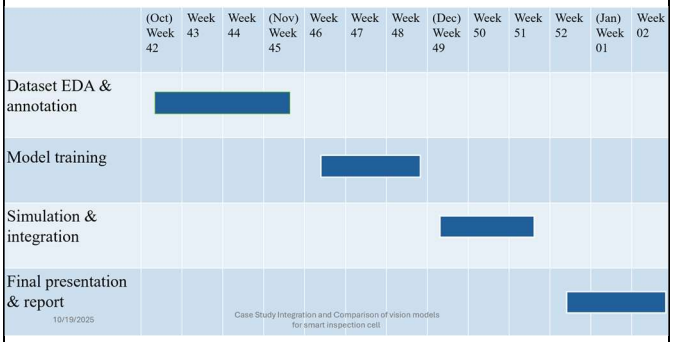
Industrial Application (target domain/use-case)	This project simulates an AI-driven inspection cell for automotive metal components, integrating YOLOv8 and MobileNetV2 models into a virtual conveyor system.
Keywords (3–6)	Computer Vision, YOLOV8, RoboDK, Inference Latency
Submission Date (YYYY-MM-DD)	2026-01-10
Gant Chart	

1) Problem Statement & Measurable Outcomes (3–4 sentences)	• Manual inspection of automotive metal components is slow, inconsistent, and prone to human error, leading to missed defects and production inefficiencies. To ensure reliable quality control, there is a need for an AI-driven vision system capable of accurately detecting and classifying surface defects in real time within a simulated smart inspection cell. • **Measurable Outcomes:-** defect detection accuracy, precision, recall, F1-score, throughput, inference latency
2) Motivation & Industrial Relevance (2–3 sentences)	Increasing demand for zero-defect manufacturing in the automotive industry requires faster and more reliable quality inspection systems. By integrating AI-based vision models into automated inspection cells, this work enhances defect detection accuracy, reduces human dependency, and supports the transition toward Industry 4.0 smart factories.

<table>
<tr><td>3) Related Work Snapshot (2–3 key references)</td><td>Recent studies such as Zhang et al. (2023) demonstrated that deep learning models like YOLOv5 and EfficientNet can accurately detect surface defects in metal parts, yet most lack real-time integration within automated inspection systems. Ultralytics YOLOv8 (2024) introduced enhanced real-time detection capabilities, but comparative analysis with lightweight models like MobileNetV2 in simulated smart factory environments remains underexplored.

Gap Addressed: This project bridges the gap by integrating and comparing YOLOv8 and MobileNetV2 within a simulated smart inspection cell, focusing on both accuracy and operational efficiency for real-time defect detection and routing.</td></tr>
<tr><td>4) Method & Feasibility (≤6 sentences)</td><td>A labeled dataset of automotive metal components with surface defects (scratches, dents, cracks) will be prepared using CVAT and data augmentation. YOLOv8 and MobileNetV2 will be trained using transfer learning to detect and classify defects. The models will be integrated into a simulated conveyor setup using SimPy and RoboDK for real- time inspection and routing. Performance will be evaluated through accuracy, precision, recall, F1-score, and inference latency. The approach is highly feasible using open-source tools and accessible GPU or cloud resources.</td></tr>
<tr><td>5) Milestones & Timeline (short table/list)</td><td>
<table>
<tr><td>Phase</td><td>Process</td><td>Deadline</td></tr>
<tr><td>P1</td><td>Dataset Preparation</td><td>26.10.2025</td></tr>
<tr><td>P2</td><td>Model Training</td><td>09.11.2025</td></tr>
<tr><td>P3</td><td>Simulation Build</td><td>23.11.2025</td></tr>
<tr><td>P4</td><td>Model integration and testing</td><td>4.12.2025</td></tr>
<tr><td>P5</td><td>Add-on Features and reporting</td><td>10.01.2026</td></tr>
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<tr><td>6) Risks & Ethics (1–2 sentences)</td><td>• Simulation-only environment; no physical machinery risk.
• Dataset is synthetic/anonymized (no personal data).</td></tr>
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Phase 1 rubric (15%): Team & GitHub (2%), On-time (2%), Topic & Proposal (5%) — Industrial Application, Problem+Outcomes, Feasibility+Timeline; Presentation (6%).