AUTOMATED OVERSIGHTS WITH ROBOTICS SYSTEMS

RMIT UNIVERSITY — School of Science, Engineering & Technology — **intel**

• NGUYEN DUC NGHIA • HOANG NGUYEN BAO DUY • LE THANH VINH • NGUYEN QUOC THINH • NGUYEN BUI HUY HOANG •
SUPERVISORS: DR. SON DAO • MR. KALVIN HO • MR. LOC NGO • MR. KHOA NGUYEN

BACKGROUND & MOTIVATION

- Intel Vietnam operates a 47,000 m² semiconductor assembly factory. Manual tray counting & 5S safety monitoring are time-consuming and labour-intensive.
- Tray counting: Each rack stores up to 1,200 trays, which are counted one by one by staff, leading to inefficiency and errors.
- 5S safety areas: Designed for safety and organization, but objects outside these zones must be visually inspected and reported by managers.
- Manual processes are time-consuming and costly, especially with the factory's large daily production volume. Automation reduces costs, improves accuracy, and ensures workplace safety.
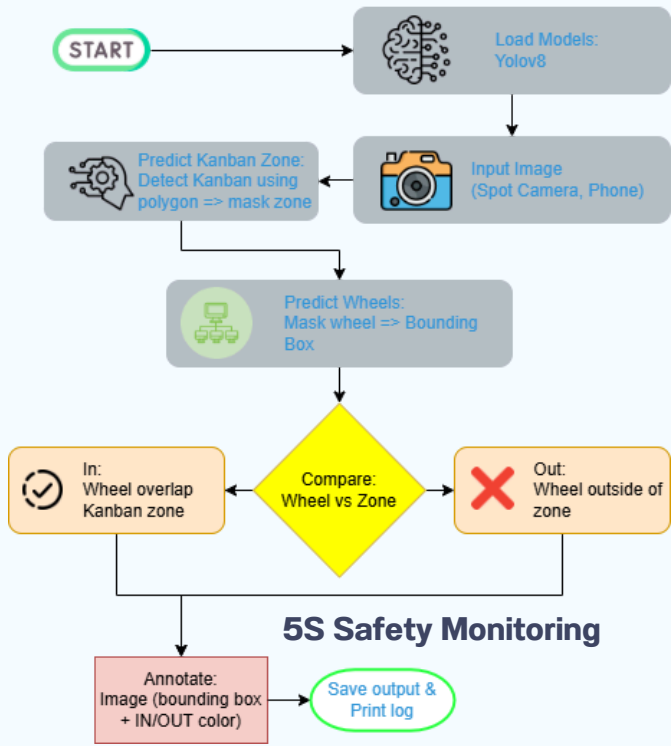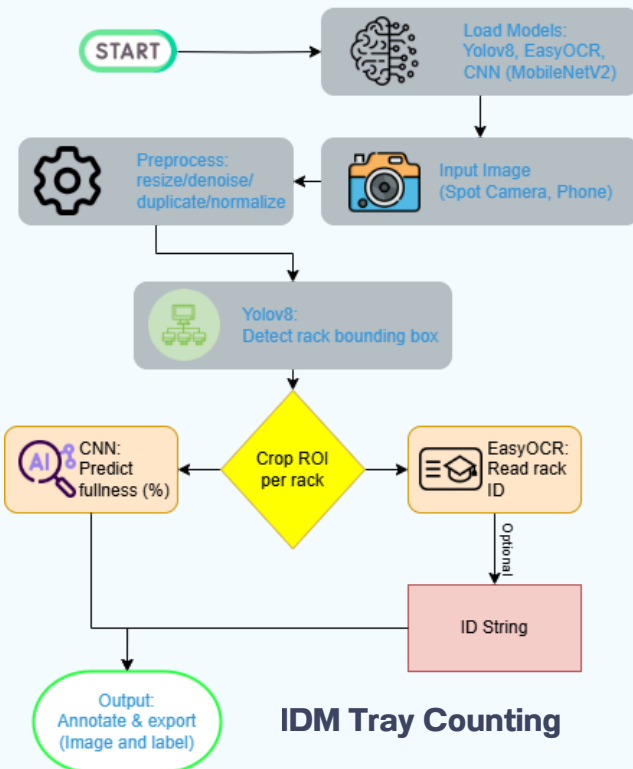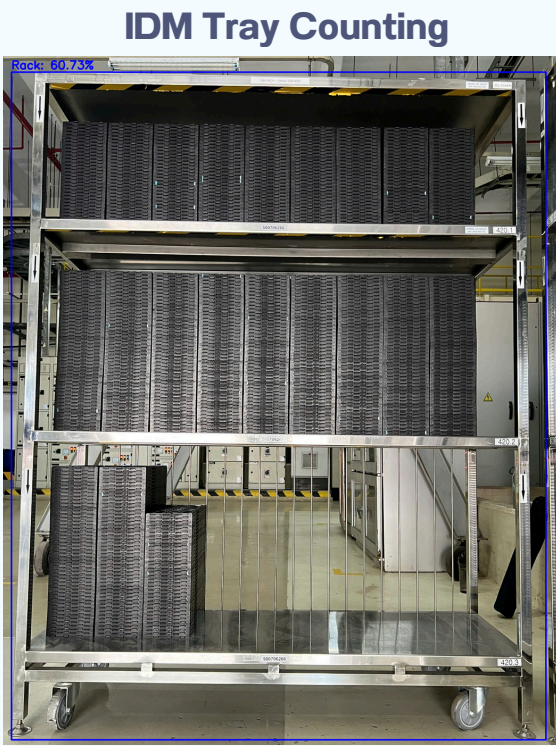
OBJECTIVES

- Automate IDM tray counting using computer vision (YOLOv8).
- Recognize tray IDs with OCR (EasyOCR) to differentiate racks.
- Monitor Kanban areas to ensure objects remain within safety boundaries.
- Integrate with Boston Dynamics Spot for autonomous navigation and data collection.
- Provide a scalable solution adaptable to other industrial facilities.

METHODOLOGY

IDM Tray Counting

START → Load Models: Yolov8, EasyOCR, CNN (MobileNetV2) → Input Image (Spot Camera, Phone) → Preprocess: resize/denoise/duplicate/normalize → Yolov8: Detect rack bounding box → Crop ROI per rack → EasyOCR: Read rack ID (Optional) → ID String; CNN: Predict fullness (%) → Output: Annotate & export (Image and label)

5S Safety Monitoring

START → Load Models: Yolov8 → Input Image (Spot Camera, Phone) → Predict Kanban Zone: Detect Kanban using polygon => mask zone → Predict Wheels: Mask wheel => Bounding Box → Compare: Wheel vs Zone → In: Wheel overlap Kanban zone / Out: Wheel outside of zone → Annotate: Image (bounding box + IN/OUT color) → Save output & Print log

RESULTS

IDM Tray Counting

5S Safety Monitoring

CONCLUSION

- Able to achieve automation in inventory tracking and safety monitoring with accuracy over 90%
- Proves that tasks once dependent on manual labour can be transformed into AI processes, directly contributing to efficiency, safety, and Industry 4.0 adoption.
- From manual checks to intelligent automation – saving time, improving accuracy, and making factories safer.