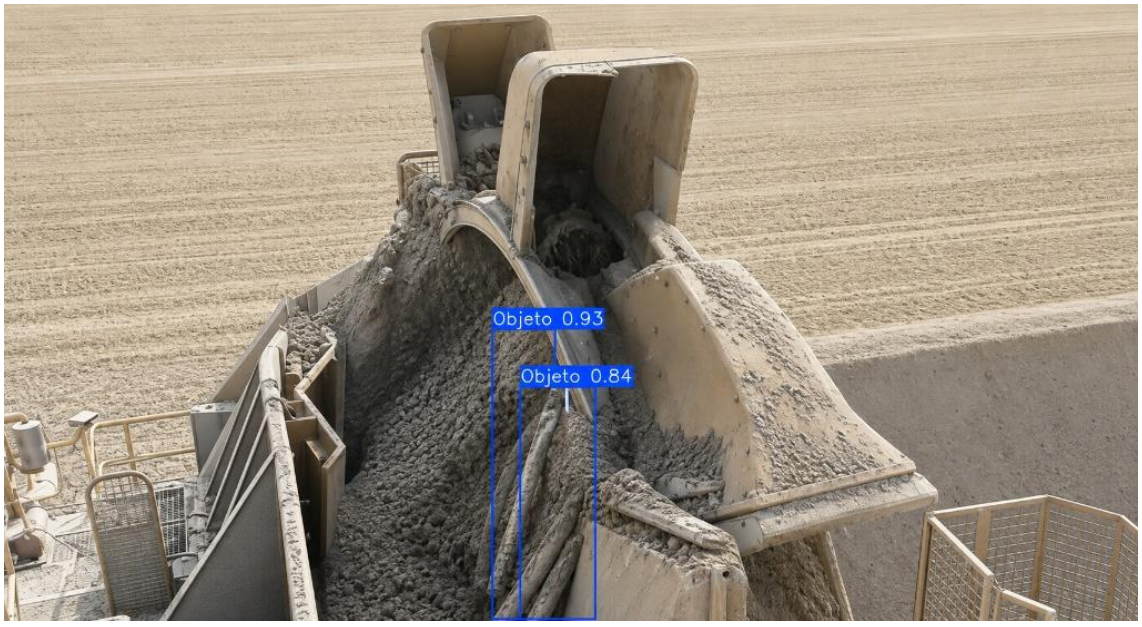
Anomalous Object Detector on Wheel Shovel

Description

This system continuously monitors mineral discharge and transfer to conveyor belts, identifying objects that may cause blockages, equipment damage, or unplanned downtime. The solution integrates industrial cameras, millimeter-wave radar, and artificial intelligence to detect and classify metallic objects, oversized material, pieces of wood, and other elements foreign to the normal material flow. Processing is performed locally on an industrial edge computer, enabling real-time image and signal analysis, early alerts, and continued operation even without permanent connectivity to external systems.



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Operation

The system operates in three stages: monitoring, detection, and event management.

Stage	Description
Multisensor monitoring	High-speed industrial cameras continuously monitor the material flow at the bucket-wheel reclaimer discharge or on the conveyor belt. In parallel, millimeter-wave radar provides a complementary signal to identify the presence of metallic elements.
Detection and classification	Images and signals are processed locally by artificial intelligence models trained to recognize anomalous objects. The system locates each object, distinguishes it from the normal mineral flow, and determines its category, confidence level, and position within the monitored area.
Alert generation	When an anomalous object is detected, the system records the event and generates an alert for the responsible personnel. The information can be viewed on a monitoring dashboard and integrated through an API with operations or maintenance platforms. Each record retains the object image, date, time, classification, and confidence level, enabling alert verification and event traceability.

Main Components

- Artificial vision.
- Millimeter-wave radar.
- Edge artificial intelligence.
- Monitoring and alert dashboard

Operational Robustness

- Protected cameras and enclosures for industrial environments.
- Capture of moving objects under variable lighting conditions.
- Operation in the presence of dust, humidity, and vibration.
- Low-latency local processing.
- Secure communications with plant networks.
- Scalable architecture for adding cameras and detection points.



Benefits and Decision-Making Support

1. Detects, identifies, and locates anomalous objects in the mineral flow.
2. Provides timely alerts to operations personnel.
3. Verifies each event through visual evidence and maintains a detection history.
4. Reduces the risk of blockages, equipment damage, and unplanned downtime.
5. Supports analysis of the frequency, type, and recurrence of anomalies.
6. Improves inspection and response protocols while reducing personnel exposure in hazardous areas.
7. Processes information locally and in real time.
8. Operates under dust, humidity, vibration, and low-visibility conditions.
9. Strengthens process continuity, reliability, and operational efficiency.
10. Allows the system to be expanded to new monitoring points.

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