CASE STUDY

TECH mahindra

Optimization of Assembly Line Operations Using Video Analytics in Mahindra & Mahindra Automotive Factory

Overview

Assembly line operations are predominantly manual in factories around the world. Complex product assemblies are often bogged down by hidden bottlenecks and low worker utilization. Continuous improvement (Kaizen) activities by manufacturers yield limited results due to a lack of unbiased, accurate data on manual operations.

LineSense leverages AI-powered video analytics to help manufacturers continuously observe, analyze, and improve their assembly line operations.

Client Background and Challenges

Mahindra & Mahindra (M&M) is one of the leading automotive OEMs in India. They have multiple factories spread across India. One of their major factories is in Chakan, Pune where automotive engines, SUVs, and trucks are manufactured.

M&M was interested in improving operational productivity in their 3-cylinder engine assembly line in their Chakan factory. It has more than 50 workstations and produces more than 100,000 engines per year. Most of the assembly operations are manual and to date, Kaizen activities were based on visual observation only.

M&M was looking for a solution that would provide the following for their Kaizen activities:

- Accurate, unbiased, large scale time study dataset
- Actual worker utilization rate
- Insights on hidden bottlenecks causing line imbalance
- Quantify NVA time of workers
- Causes for high cycle time variations

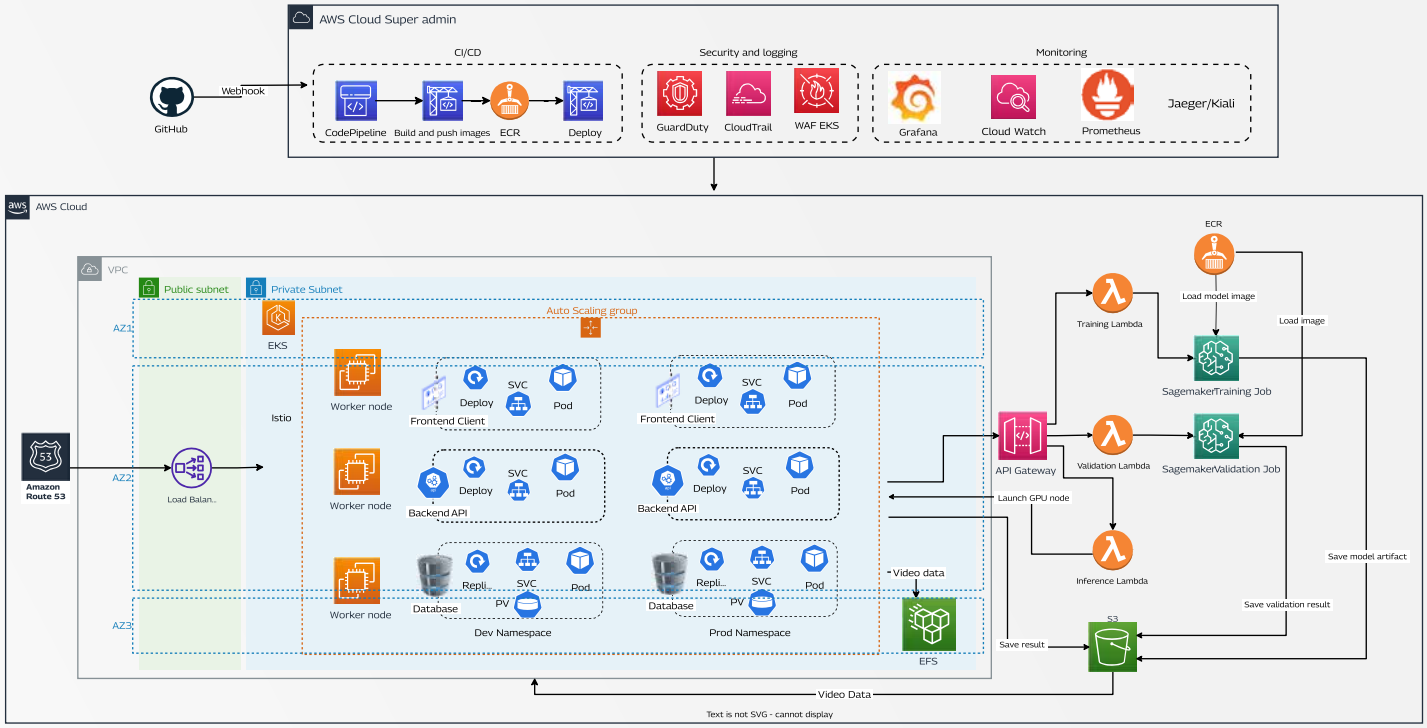
Our Approach and Solution

To address this requirement, Tech Mahindra deployed LineSense, its proprietary AI-powered video analytics software in 5 workstations in M&M's 3-cylinder engine assembly line. It leverages Vision AI to provide continuous, unbiased, accurate time and motion study data of manual operations.

The trial started by gathering video data for 2 weeks from these 5 workstations. This data was then annotated manually using a proprietary UI and then used for training ML models. The trained machine learning (ML) models were then deployed to inference on the video dataset and provided accurate unbiased time and motion study data.

LineSense is based on AWS and has the following components:

- Video data is stored in EFS and S3
- ML models are trained, validated, and deployed using Sagemaker
- Various routines are triggered using Lambda functions
- Scaling of UI is done using EKS and ALB
- Monitoring is done using Grafana and Prometheus



Business and Community Impact

By using LineSense to observe their 3-cylinder assembly line operations over 2 weeks, M&M was able to get the following insights:

- Actual worker utilization at 55% compared to 86% as per plan
- Root causes for high cycle time variations
- Non value adding (NVA) time in each workstation

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