Process Monitoring Using Video Analytics

System Architecture

Hardware Components:

- Nvidia Jetson Nano: This edge device is used for real-time video processing and inference of the trained AI models.
- CCTV Cameras: Cameras are installed strategically to capture high-resolution video feeds of the assembly process. These are connected to the Jetson Nano via.
- IP-based Cameras: Cameras are directly connected to the Jetson Nano to capture real-time footage from the assembly area.
- Assign the same IP to jetson and camera to make a system on the same network.

Software Components:

- Linux-based OS: Ubuntu is commonly used to run the software stack on Jetson Nano.
- Use Yolov8 and Detectron2 to detect the object.
- OpenCV (Computer Vision Library): Used for video stream processing and preprocessing tasks.
- Deep Learning Frameworks (TensorFlow, PyTorch): For developing and running the AI models trained for assembly process monitoring.

System Architecture Flow:

1. Video Stream Capture: The camera continuously captures video feeds of the assembly line.
2. Preprocessing: The video is processed using OpenCV to detect Regions of Interest (ROI) and ensure clarity in footage.
3. AI-based Analysis: The processed frames are passed through a trained AI model for detecting actions, tracking the operator's performance, and validating each step of the assembly process.
4. Real-time Feedback: The system provides real-time feedback, flagging any incorrect or incomplete steps.
5. Edge-based Processing: All processing happens on the Jetson Nano for real-time performance and avoiding cloud dependency.

AI Training and Development

1. Collect variations to discuss with customers.
2. Annotate this data using Labelme.
3. Train data .
4. Test data on the local system on the train dataset before deploying the model .

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Project workflow

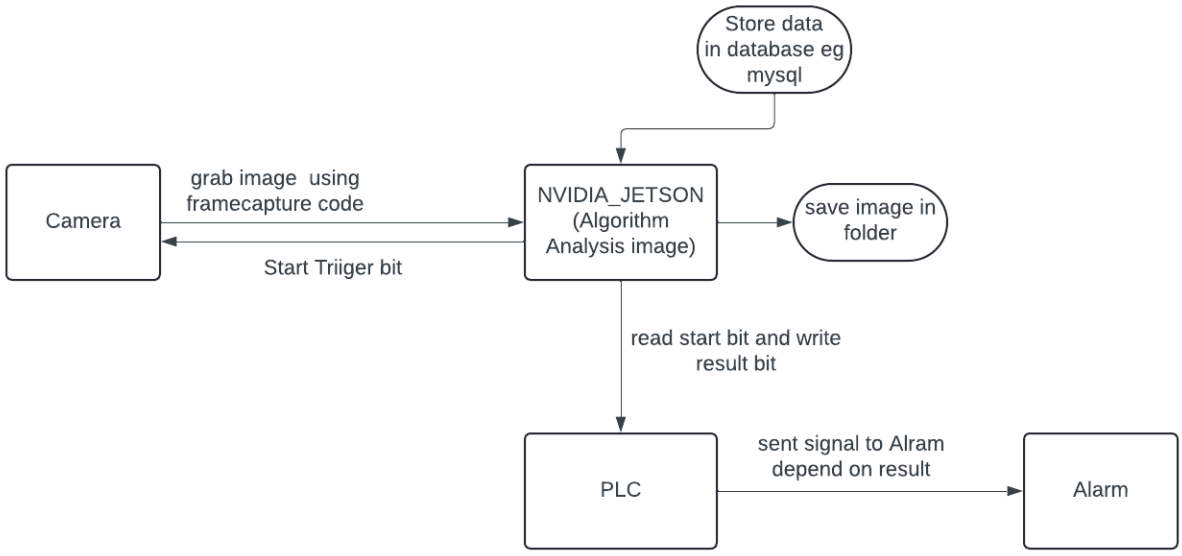

Fig 1.