

COGNITIVE ASSEMBLY QUALITY INSPECTION

Tech Mahindra's visual inspection is the process of using cognitive capabilities to review and analyze components, products, and parts for defects. It works by comparing live assembly-line images with previously analyzed and classified pictures of image defects to identify possible faults. The system triggers an alarm if the assembly and fitting are not proper.

Increased level of automation in industries like manufacturing, demands for increase in automation of material quality inspection with little human intervention can incorporate this process for better functioning.

OUR SOLUTION

Tech Mahindra's solution leverages open-source cognitive technologies and an edge AI device (NVIDIA Jetson Server), which automates a component assembly check process. The solution includes both custom models as well as models built using transfer learning techniques (pre-trained models) to detect and validate if a given assembly (bearing and disposable is properly assembled with the plasma and blood platelet machine) follows standard quality guidelines.

Features of the Solution

- **Data Processing** – Training data sources included video recording from cameras and streaming videos during the prediction stage. OpenCV is used to process and transform the videos into image data
- **Model Building and Deployment** – Multiple pre-trained models (classification and object detection) were evaluated to build the final model using an ensemble approach that offers the most optimal predictive performance. The model is deployed on an edge AI device (NVIDIA Jetson Server) which ensures fast response

Solution Technology

- Tensorflow and Pytorch based computer vision models for detection and classification of components assembly
- Ensemble of models to perform a combination of detection and categorization of errors
- NVIDIA Jetson Server based Edge AI technology for real-time analysis

KEY CHALLENGES

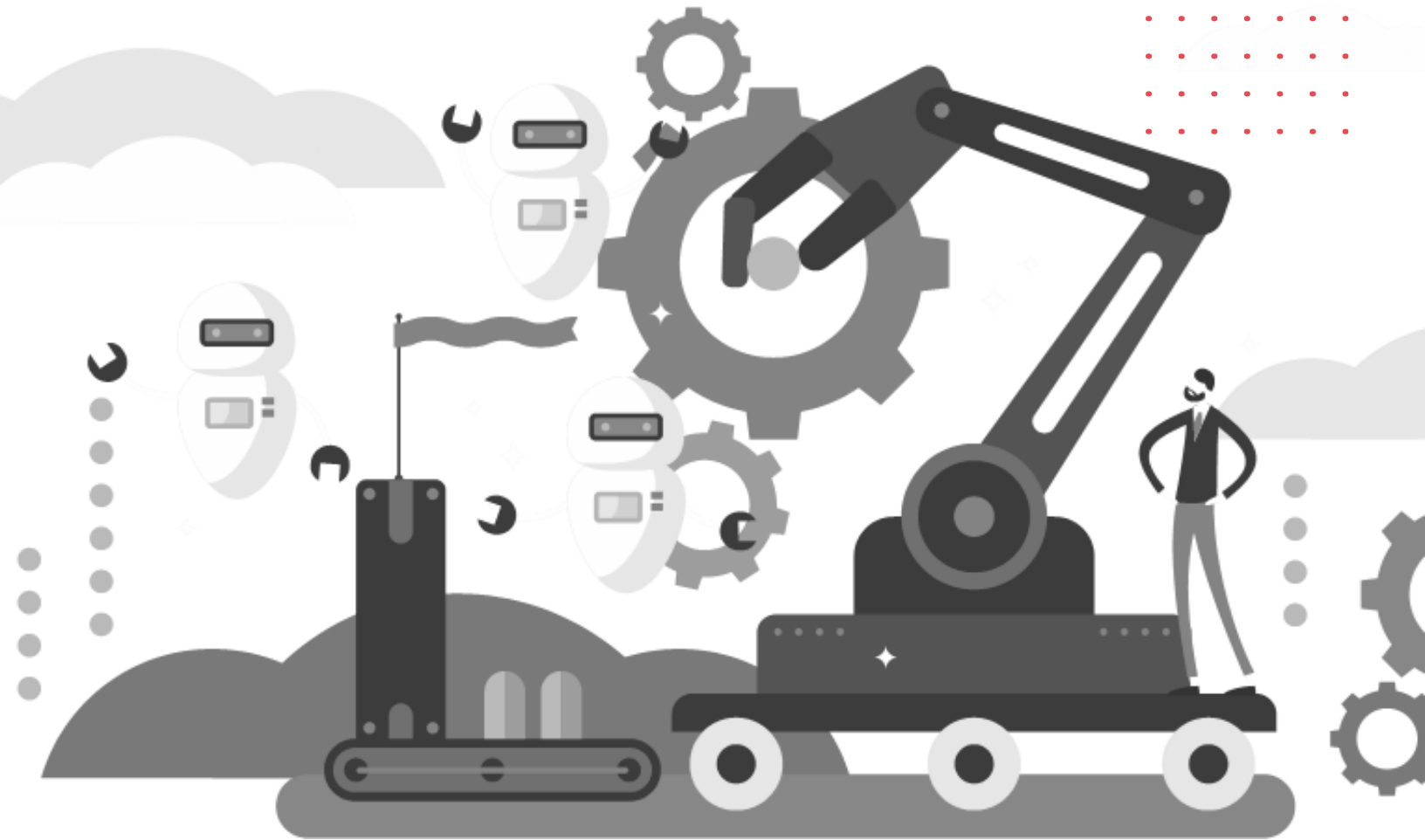
- Improper configuration of components, which pose risks to patient safety and results in unexpected downtimes
- Dependency on manual supervision for configuration augments the cost of operations. In addition, the approach is prone to error and causes a high turnaround time
- Existing systems are not user friendly and fail to show differentiation in the product line
- Single model approach does not provide the desired accuracy. Adoption of ensemble approach and transfer learning techniques would be needed to achieve improved accuracy

BENEFITS

- Automated validation resulted in considerable savings in terms of time and money
- Improved process quality and time
- Improved configuration reduces the wastage of components
- Automated process eliminates the scope of human errors and enhanced safety for patients
- Reduces manual supervision, lowers operational costs and ensures a faster turnaround time
- System offers better usability, resulting in greater operator satisfaction

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