dataprophet
machine learning specialists

OMNI VISION CASE STUDY

SITUATION

Our client, the largest foundry in Southern Africa, produces engine blocks. The raw material undergoes a series of unit processes concluding in a final inspection of the end product, an engine block.

Input | Unit Process 1 | Unit Process 2 | n^{th} Unit Process | Final Product

This visual inspection was undertaken by a team of operators who would note which engine blocks contained a defect. As a human process, it lacked consistency and defective blocks were occasionally shipped to the end client resulting in heavy penalties and knock on effects for their production facility.

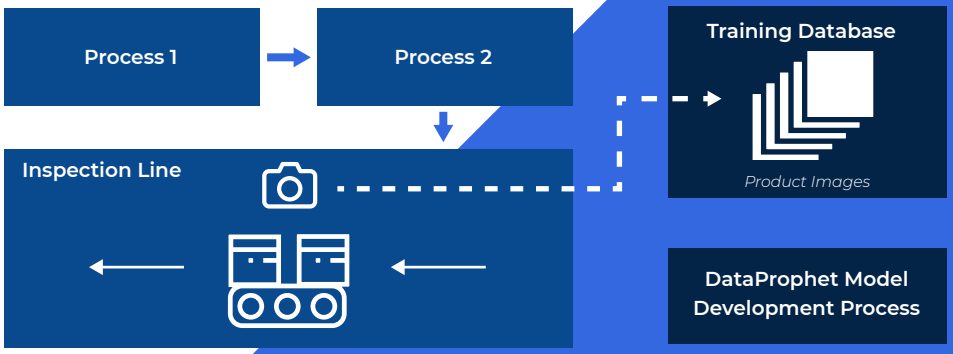
Furthermore, the inspection process was designed as a quality control gate to ensure defective blocks were captured prior to shipping - the operators only captured the primary defect. Subsequent defects on the block were not captured and neither were their features.

PROBLEM

Whilst conducting a Manufacturing 4.0 initiative to optimise the production line, DataProphet came to the realisation that more granular data including the number, type and causes of defects would be required to identify processes for improvement.

Unfortunately due to the design and implementation of the quality control gate, limited information was available upon the captured defects whilst the secondary and tertiary defects were not captured at all.

Furthermore, a harsh plant environment and the repetitive nature of the task was not conducive to a manual process and therefore the decision was made to invest in a bespoke machine vision system.

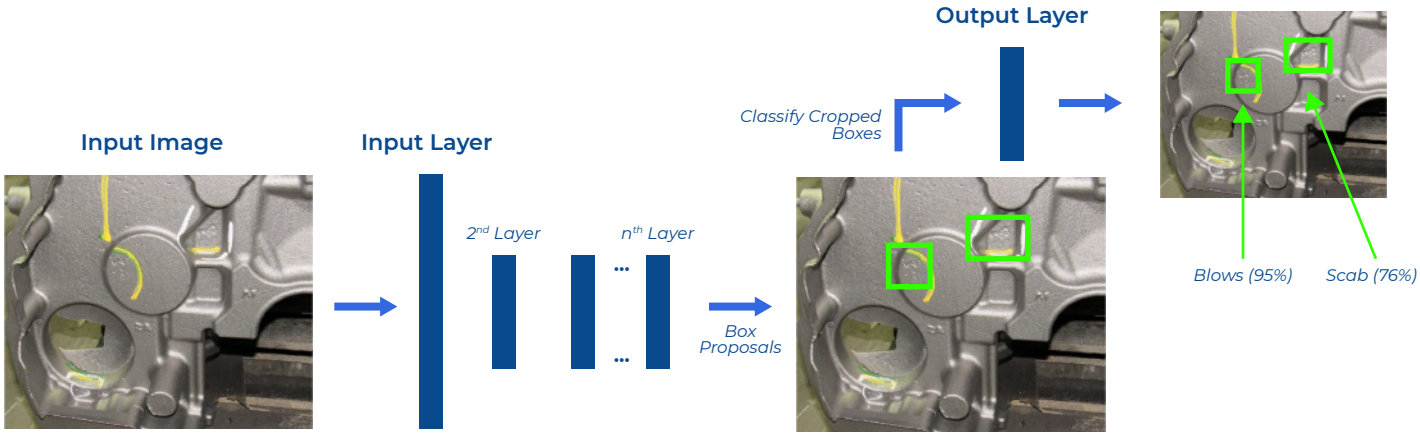


SOLUTION

DataProphet designed and installed a machine vision system upon the inspection line to detect all the defects present on the block and capture their features for further analysis.

A bespoke inspection assembly kept the frame of reference consistent whilst cameras positioned in calculated positions captured multiple images. The use of a multi-camera system enables images to be taken at different angles and within the short period of time allowed by the semi-continuous process.

These images were preprocessed by DataProphet's solution before being ingested by DataProphet's state-of-the-art, object detection models which make use of a convolutional neural networks (CNN) to determine the location, edges and type of any defects. This approach proved particularly robust for the given operating environment.



After training, DataProphet's model was applied locally upon new images. The model works by finding anchor points for the defects before determining the bounding box for, and classifying each defect.

The consistent frame of reference created by the assembly enables a grid to be overlayed. The grid location of the defects are then recorded for further analysis, along with the appropriate metadata such as item number and type.

In the unlikely event that a defect is not detected, a customised user interface enables our client to label the defect such that the system can learn and detect the same or similar defects in the future.