

Machine Learning Case Study: Anomaly Detection on steel surfaces

Machine Learning helps Steel Surface Inspection

This JLI Steel inspection system is designed to withstand the harsh environment. The Machine Learning network performs inline inspection for anomalies. Faster, better and more reliable than any human.

Introduction

In the past, it has been difficult to inspect vibrant/vivid materials like steel, wood and fabric for anomalies. It is extremely difficult to design a traditional, feature based algorithm to detect anomalies in such materials. Often a traditional algorithm would have flaws, like too high **false reject rate** or a low **detection rate** on certain type of defects.

With Machine Learning, this can be trained to a network, based on a large annotated sample set. A network is trained with both anomalies and acceptable sample images.

The optimum state of the Machine Learning network, is when the network is capable of generalizing and thereby detect anomalies in unprecedented images.

Challenge

The JLI **Rail Surface Inspection**, is an example of a system, which previously required a number of people to visually evaluate each image for anomalies. The job requires a high level of focus and can be very cumbersome.

A Machine Learning solution on top of the **Rail Surface Inspection**, makes a lot of sense, when it comes to robust, repetitive inspections on the fly.

Solution

JLI designed a network that could work on the output from the **Rail Surface Inspection** system. The network was trained on a large number of annotated anomalies and tested on +10.000 images to ensure a low false reject rate and high true detection rate.

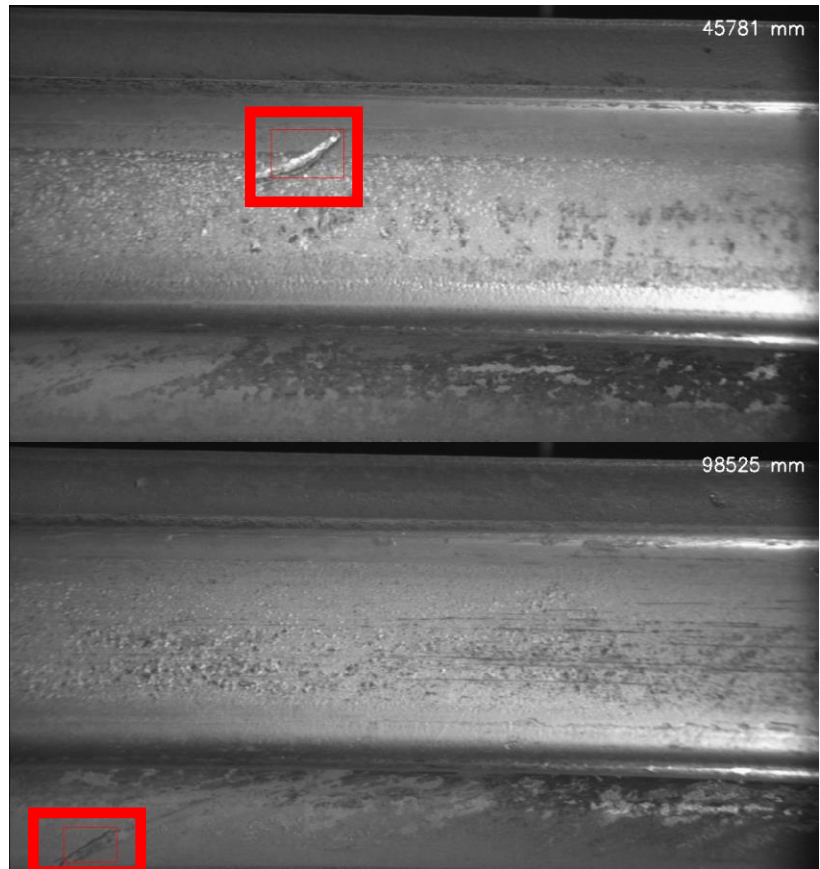
It is of great importance that a Machine Learning network is able to handle the large data flow - in the **Rail Surface Inspection** system case - live stream pictures from 6 mega pixels cameras.

The hardware design utilizes a GPU to accelerate the algorithm locally. It can be scaled with more GPU's if required.

JLI have chosen to execute the Machine Learning network locally to avoid any latency in execution

Results and Feedback

Detection rate is >95% which is better and more consistent than the previous manual inspection. Defective images are stored for review by an operator, who can decide how to handle defects. An early warning signal can be raised, when recurring process related defects are detected. This feature, enables the operator to use the Anomaly Network as a tool to improve production yield and gain a higher throughput of good objects.



JLI is currently experiencing an increasing demand in inspection of aesthetic defects in vivid materials. The JLI Anomaly Network is a state-of-the-art technique to solve these inspections tasks. The Anomaly Network can also be combined with traditional vision to get the best from both worlds.