intel.

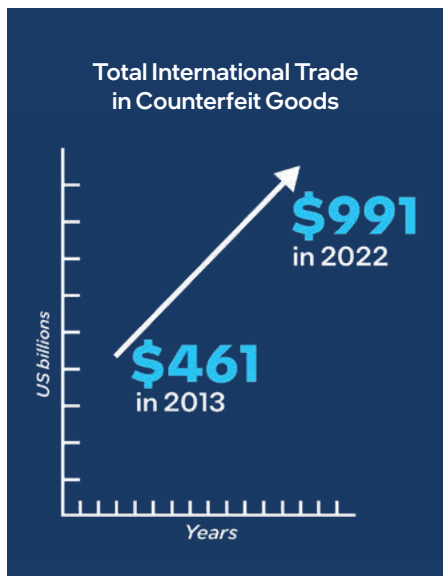# Utilizing Machine Learning to Detect Counterfeit Goods in the Supply Chain

**Counterfeited goods are a trillion-dollar threat to the safety and security of the global supply chain. Deploying innovations based on Intel® technology may assist with detecting threats.**

**Impacts of Counterfeiting and Piracy**

By 2022, counterfeiting and piracy are projected to devour USD 2.3 trillion from the global economy and put 5.4 million jobs at risk.



Total International Trade in Counterfeit Goods

$991 in 2022

$461 in 2013

US billions

Years

Source: International Chamber of Commerce[1]

One of the largest criminal activities in the world is counterfeited goods, and no industry is exempt from the negative impacts. Counterfeit goods range from luxury items such as clothing, footwear, and perfumes to electrical machinery and equipment. Also included are consumer goods that have an impact on consumer health and safety such as pharmaceuticals, beverages, e-cigarettes, toys, and medical equipment.

A report by the International Chamber of Commerce (ICC) estimates that international trade in counterfeit goods could reach USD 991 billion in 2022, a 53 percent increase in less than a decade. This accounts for an estimated product value of USD 1.9-2.3 trillion.

## Threat to the Global Supply Chain

Globalization and specialization of labor and commodities transformed supply chains into disaggregated and complex components. Criminals used this as an opportunity to insert counterfeit products into the supply chain, which caused businesses to tighten their procurement practices and focus on supplier relationships and quality. The problem expanded during the global pandemic due to supply shortages, putting businesses at more risk of purchasing counterfeit products.

## Product Fraud at Intel

Intel is not immune to product tampering. When an Intel customer returns a product stating quality or performance issues, the product is thoroughly analyzed. In some cases, the analysis shows the product had been tampered with—a process called re-marking. Electronic component counterfeiters remove the original markings applied during the manufacturing process, usually on an engineering sample or a lower valued or lower performing product, and re-mark them to indicate a higher valued or higher performing product. Product re-marking is a multi-million-dollar problem for Intel and its customers that impacts revenue, quality, and brand value.

Intel employs various measures to identify, detect, and track these re-marked products. For instance, Intel works with customers and fraud enforcement authorities to prosecute offenders and eliminate the offending products. The detection process involves a careful and meticulous analysis of the returned products to assess the quality, authenticity, and origin. New innovations, including machine learning, are being explored to detect product fraud as counterfeiting increases in this highly dynamic environment.

## Proof of Concept to Detect Product Tampering

A proof of concept is underway at Intel to determine if product re-marking can be detected using machine learning. Today, vision solutions such as high-quality video and photography are used successfully to detect manufacturing defects; some of the same methodologies may be adopted to detect product fraud.

Artificial intelligence (AI) combines cameras, edge- or cloud-based computing, and software to enable systems to "see" and identify objects. Intel® technologies enable and accelerate AI, including software (OpenVINO™) and hardware (Intel® Core™ Processors and Intel® Movidius™ VPU).

The AI ecosystem uses deep learning to form neural networks that guide systems in their image processing and analysis. Once fully trained, computer vision models can perform object recognition and detection. The output of this process is a machine learning model that can be applied to new data to generate a predictive analysis. One example is to quickly assess the quality of a product in and out of its manufacturing process. An inspection of the deep learning layers may help identify multiple codes on a product—the original product code applied during the manufacturing process and a fraudulent code applied above it. To optimize the deep learning models during the proof of concept, a cloud-based sandbox for prototyping and experimenting is used with AI inference workloads on Intel hardware specialized for deep learning.

## Collaboration with IoT Market Ready Solutions Partner

- Intel has always fostered relationships with innovative companies. And with the growth of high-performance computing and AI, our vast ecosystem of innovative partners has also grown. To find a partner whose technology may help us detect product tampering, we searched Intel® IoT Market Ready Solutions (Intel® IMRS)—an ecosystem of innovative companies that offer scalable, end-to-end solutions for solid business results.

Intel and Qualitas Technologies* have plans to engage in a limited collaboration to determine if existing machine learning methodologies can be applied to detect fraud. Qualitas has built a solid reputation as a producer of automated visual processes that utilize machine learning, with optimized performance on Intel hardware and architecture. One specific field that Qualitas excels at is the detecting of surface defects and anomalies in the manufacturing environment. Using this technology to detect the re-marking of a product may be possible.



**Intel Startup Program: Powering Innovation to Scale**

The Intel Startup Program brings together leading businesses, such as Qualitas Technologies*, with technology and business mentors to nurture innovation.
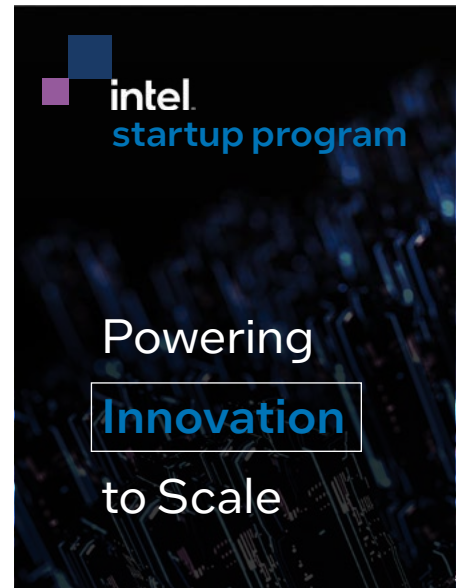


*"The Intel Startup Program is at the forefront of driving innovation and entrepreneurship through high impact collaborations with the industry. It enables deep-tech startups in the end-to-end journey of building innovative technologies and solutions."*

– Nivruti Rai, Country Head, Intel India and Vice President, Intel Foundry Services

## Optimizing Machine Learning with Intel® Technology

At Intel, we are democratizing machine learning and AI so more people and organizations can benefit from its transformative powers. Our processors, memory and storage innovations, and high-speed data fabrics deliver the performance needed to gain new intelligence in minutes or seconds, versus weeks or months. In addition, faster decisions can deliver more value, reduce costs, or even save lives, and our optimized software libraries and tools make it easier for developers to create new applications and solutions. The ingredients below optimize deep learning models:

- Intel® Distribution of OpenVINO™ Toolkit

- 12th Gen Intel® Core™ Processors

- Intel® Movidius™ VPU (Vision Processing Units)

- Intel® Neural Compute Stick 2 (NCS2)

## Learn More

To learn more about Intel's machine learning solutions, please contact us at SupplyChainIoT@intel.com or visit
https://www.intel.com/content/www/us/en/analytics/machine-learning/overview.html

Find out more about Qualitas Technologies* and the Qualitas EagleEye* platform

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