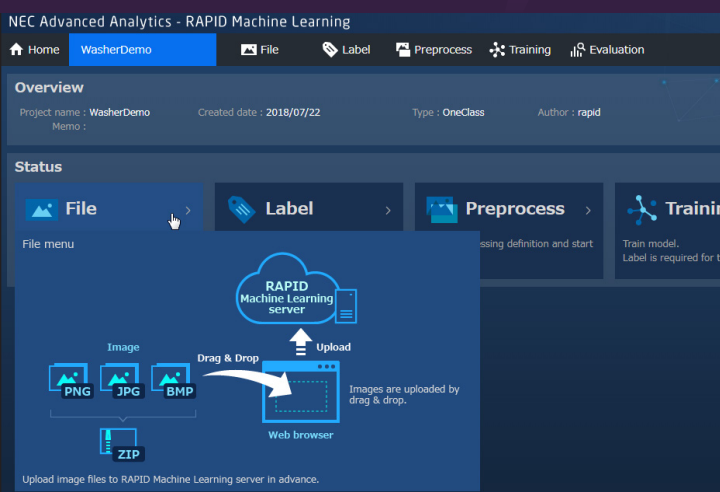


## Deep Learning Automation for Manufacturing Vision Inspection

# ARTIFICIAL INTELLIGENCE (AI)



## At a Glance

- Premier Deep Learning software for cost effective, efficient quality control
- Simplified one-class classification utilizes quality-approved images of perfect products
- Easy to train and deploy, with intuitive web-based model creation
- Learns acceptable variations and adapts controls to meet demand parameters
- Reduces False-Negative shipping and increases product reliability

## Overview

In the world of precision manufacturing, failures in Visual Inspection have real world consequences, and can mean high-profile recalls, dissatisfied customers, and damage to a hard-earned reputation. The conventional approach of quality control, manual reviews by highly trained and qualified inspectors, often faces challenges of product inconsistency, the high cost of inspector turnover and required trainings, human unreliability, speed issues, and, ultimately, customer confidence issues.

Using “machine vision” systems and automated imaging-based analysis does offer manufacturers a certain level of assurance in defect inspection. However, this safeguard can be expensive, complex and time-consuming to configure; the system may exhibit an inability to tolerate deviations that are actually acceptable, and when some anomalies are too difficult to catch, inconsistencies can occur, opening the door to a quality failure.

Researchers have long sought to develop reliable, repeatable, fully optimized Machine Learning that is adaptable, with a simplified set-up that will dependably manage the most difficult of applications.

## Solution

NEC RAPID Machine Learning (RAPID) is NEC’s premier deep learning software, and the result of more than 20 years of research and development experience with Artificial Intelligence (AI). Offering powerful control for Defect Inspection operations, and a simplified deployment of automated visual inspection, NEC RAPID cuts inspection time through fast recognition of a wider variety of defects than conventional machine vision techniques.

Reducing the need for manual inspections, NEC RAPID improves the reliability and quality consistency by decreasing the instance of human error. Given its ability to detect manufacturing defects on diverse material surfaces, NEC RAPID is also highly adaptive--ideal for a wide range of industries, and the perfect solution for a broad scope of hard-to-solve manufacturing applications.

## Simplified Visual Inspection

NEC RAPID's "one-class" classification (One Class) feature is an AI-based surface inspection algorithm with no need for the collection and uploading of defective product images for identification—only good products. This feed image data creates a model, for automatic detection. NEC's One Class enables image analysis that is powerful, yet simple to configure, and is specially optimized for precision manufacturing.

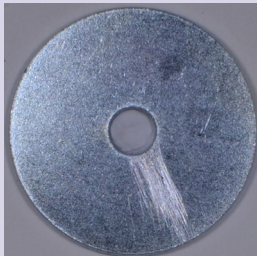
## Easy to Train and Deploy

As a "system agnostic" solution, this flexibility allows smooth deployment with existing systems and an easy integration into operations. NEC RAPID can connect to historical images databases to generate a model, or retrain to detect defects. The created model can then be integrated into an existing Machine Vision inspection process to automatically detect defects.

### RAPID Core Deliverables

- **Dependable Intelligence** Delivers reliable insight that is based on real-time information
- **Improved Efficiency** Cuts inspection time and enables the capability of making meaningful time-saving, cost reducing changes.
- **Risk Mitigation** Identifies a potential quality issue before it can become a critical situation.

INPUT IMAGE



DETECTION RESULT



## Simplified Model Creation with Web Interface

- Upload Good Images
- Label Images
- Image Pre-processing
- Training (Create detection model)
- Evaluation (Check detection accuracy)

## RAPID's Built-in Image Pre-processing Supports Improved Image Quality

- Cropping
- Hue, Saturation and Lightness adjustment
- Color normalization
- Image Duplication, to increase number of training images
- Flip, Rotate, Color adjustment

## Automotive Case Study

A recent evaluation of an automotive parts operation utilizing NEC RAPID revealed that the number of false-positives were reduced, there was a decrease in the inspector turnover rate, and the number of manual inspectors could actually be reduced by 66%, dramatically cutting quality control operational costs.

### Minimum System Requirements

<b>OS</b>	Windows 7 Professional SP1 64bit / Windows 10 Pro 64bit Windows Server 2012 Standard / 2012 R2 / 2016 Standard / 2016 Datacenter
<b>CPU</b>	Intel Core i3/i5/i7/i9 or above Intel Xeon E3/E5/E7 or above Intel Xeon Bronze/Silver/Gold/Platinum
<b>GPU *option</b>	NVIDIA Tesla P4/NVIDIA Quadro P4000
<b>Memory</b>	4GB (minimum), 16GB (recommended)
<b>Disk Free Space</b>	1GB (minimum), 1TB (recommended)
<b>Other modules for GPU</b>	CUDA Toolkit 8.0.61
<b>Other modules for Web API or GUI</b>	NEC WebOTX Application Server Express v10.1 PostgreSQL 9.6 Java SE Development Kit 8 (Update 144 or later)
<b>Web Browser for Web GUI</b>	Microsoft Edge 38.14393.2068 or later Google Chrome 65.0.3325.162 or later

For more information, visit [necam.com/ai](http://necam.com/ai) or contact us at [ai@necam.com](mailto:ai@necam.com).

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