# COGNEX

VISIONPRO DEEP LEARNING

Graphical programming environment for deep learning-based image analysis

VisionPro® Deep Learning is the best-in-class deep learning-based image analysis software designed for factory automation. Its field-tested algorithms are optimized specifically for machine vision, with a graphical user interface that simplifies neural network training without compromising performance. VisionPro Deep Learning solves complex applications that are too challenging for traditional machine vision, while providing a consistency and speed that aren't possible with human inspection. When combined with VisionPro's rule-based vision libraries, automation engineers can easily choose the best tool for the task at hand.
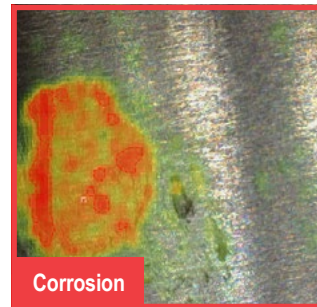
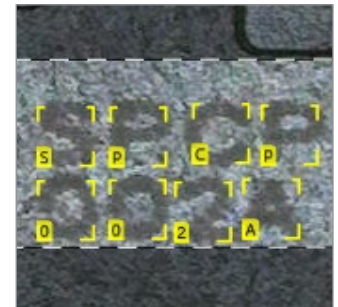**Part location and assembly verification**

📍 Locate

Defect detection

🔍 Analyze

Object and scene classification

Corrosion
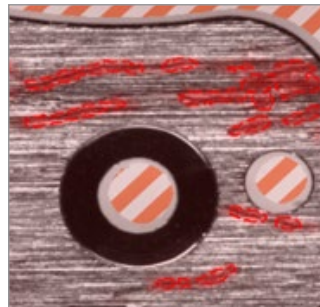
🏷 Classify

Character reading


📖 Read

Intuitive graphical training

VisionPro Deep Learning's graphical training interface simplifies the task of collecting images, training the neural network, and testing it on a variety of image sets. The unique tool-chaining capability lets users break down their problem into smaller steps, making it easier to optimize and requiring fewer training images.
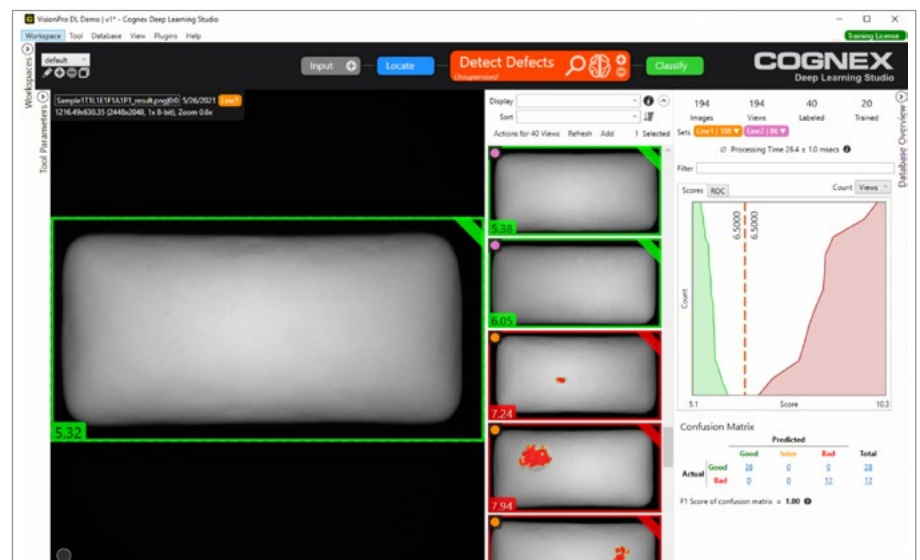
Simplified integration in a common environment

Users can take advantage of the extensive selection of traditional machine vision tools alongside innovative deep learning tools. VisionPro Deep Learning provides access to deep learning toolsets through programmatic integration, as well as through standard VisionPro software[1] and the Cognex Designer graphical development interface[2]. Tight integration with existing software and vision tools enables greater compatibility across the Cognex product continuum, giving customers more flexibility in application deployment. From low-level machine integration to deploying an application-specific HMI using Cognex Designer, VisionPro Deep Learning provides flexibility in how you develop and integrate vision inspection in your production environment.
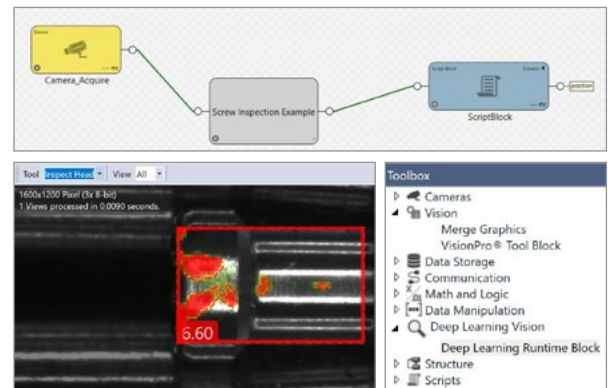
Programmatic integration

Easy conversion of images, graphics, and results between VisionPro and VisionPro Deep Learning.
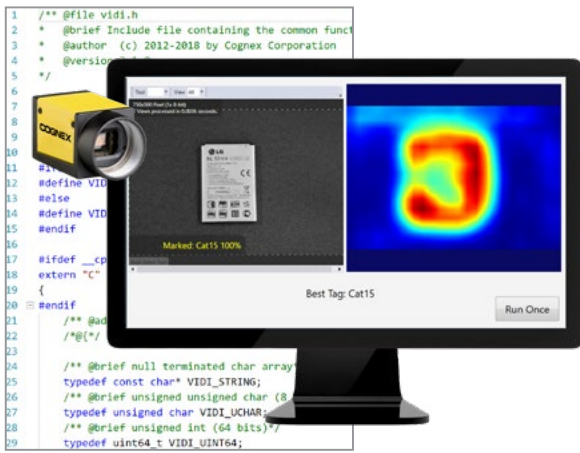
Graphical prototyping

Integrate Deep Learning workspaces into Cognex Designer applications to simplify image acquisition, results processing, and I/O[2].

Fully deployable application

Create and deploy VisionPro and Deep Learning applications using Cognex Designer[2].
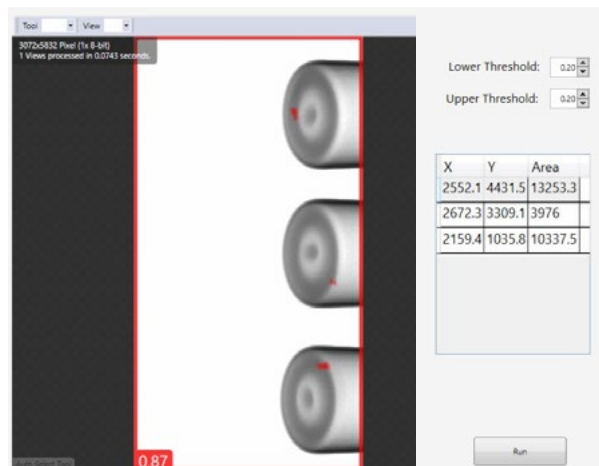
Backwards and forwards compatibilities meet every vision need

	VisionPro Deep Learning 1.1	VisionPro Deep Learning 2.0
Compatibility	VisionPro 9.7 and Cognex Designer	VisionPro 10
Features	• Backward-compatible release for legacy Cognex Designer users • Train from standalone Deep Learning Studio • Load Deep Learning workspace into Cognex Designer block for runtime	• Forward-looking release for next-gen VisionPro users • Load trained Deep Learning workspace into VisionPro ToolBlock for runtime • Generate VPP for integration into application

[1] Only available in VisionPro Deep Learning 2.0
[2] Only available in VisionPro Deep Learning 1.1

Deep learning toolset

VisionPro Deep Learning tools are trained by example, unlike traditional rule-based vision algorithms. These tools are optimized for factory automation vision inspections and require smaller image sets for quicker training. The user-friendly GUI also provides a simple environment to manage and develop your applications. Choose between Blue Locate, Red Analyze, Green Classify, and Blue Read tools to solve applications that are too complex for traditional rule-based machine vision approaches.

Locate   Blue Locate for fixturing, counting, and assembly verification

The Blue Locate tool finds parts with variable appearance. It detects features on noisy backgrounds, in poorly lit environments, on low contrast parts, and even parts that flex or change shape. Blue Locate locates parts despite variations in perspective, orientation, luminance, glare, and color by learning from the samples provided by the user.

Blue Locate is also a reliable solution for automated assembly verification. The tool can be trained to find a variety of components, even if they appear different or vary in size, to create an extensive component library. By creating layouts based on the product being inspected, the tool checks multiple feature locations and component types simultaneously, while adjusting to varying layouts.

Counts translucent glass medical syringes
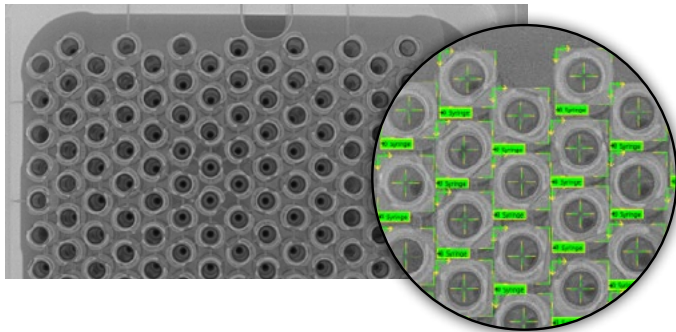
**Ensures kits are assembled correctly**
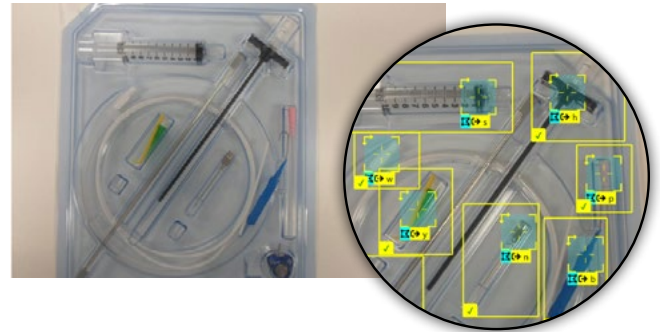
## Analyze   Red Analyze for defect detection and segmentation

The Red Analyze tool finds subtle defects on a wide variety of part backgrounds and surface textures. By showing it examples of good and bad parts, it can be trained to tolerate normal variations in lighting and part positioning, while detecting flaws, contamination and other defects. For situations where it's not practical to collect defect images, or where the defects are highly inconsistent, unsupervised mode can be trained from just good images and identify cases that deviate from the normal part appearance.

Red Analyze can also be used to segment specific variable areas in an image. These might be weld seams that are passed to a Green Classify tool, glue or paint regions whose coverage is then measured with traditional vision tools, or background features that are dynamically masked out of the image to simplify other inspections.

Detects imperfections on medical screws
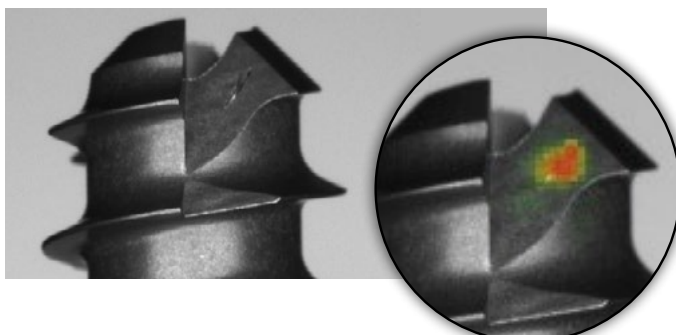
Isolates stitching problems in textiles
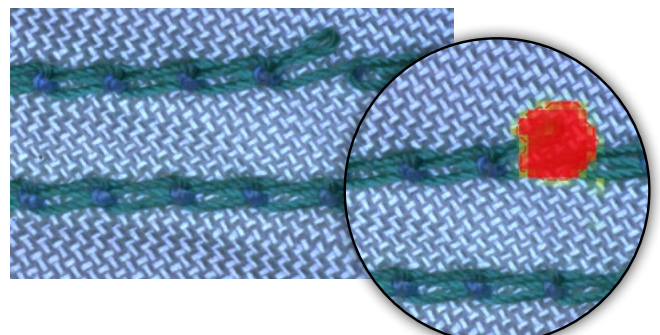
## Classify Green Classify for object and scene classification

The Green Classify tool is a robust classifier that can be used to distinguish between different types of objects, identify defect types, and even inspect images. Learning from a collection of labeled images, Green Classify identifies and sorts products into classes based on their common characteristics such as color, texture, materials, packaging, and defect type.

The tool tolerates natural deviation within the same class and reliably distinguishes acceptable variation from different classes. Green Classify solves complex classification tasks very quickly, eliminating complicated and time-consuming programming.
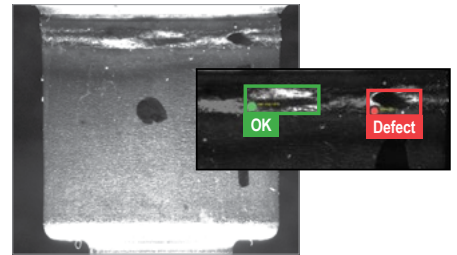
Classifies objects by type

Box
Envelope
Poly bag

Classifies defects by type

Stain
Dent
Scratch
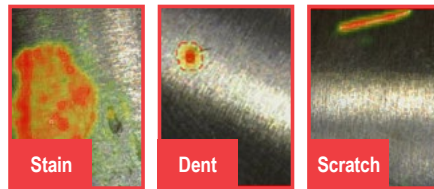
Distinguish true defects from tolerable abnormalities

OK
Defect

Read Blue Read for text and character reading

The Blue Read tool deciphers badly deformed, skewed, and poorly etched codes using optical character recognition (OCR). Blue Read works right out of the box, dramatically reducing development time, thanks to the deep-learning pretrained font library.

The easy-to-use interface eliminates complex programming. Simply define the region of interest, set the character size, and label the characters in the image set. In just a few steps, without vision expertise, the robust tool can be retrained to read application-specific codes that traditional OCR tools are not able to decode. Plus, the visual debug feature identifies mis-reads that can be easily corrected.

Reads embossed characters on injection molded products

Readout 32-127

Reads label-based codes on packaging


139272-03

DigitModel 139272-03

Choice of Tool Architecture based on Application Need

The Green Classify and Red Analyze tools can be used with two different network architecture settings: Focused Mode or High Detail Mode. Focused Mode is ideal for simpler applications where robust results are needed quickly. High Detail Mode is a powerhouse network architecture for the most challenging and complex applications which demand maximum accuracy. High Detail Mode tools offer training feedback graphs, enabling power users to optimize tool training times. Users can change between modes without re-labeling images and evaluate which architecture best suits their application needs.
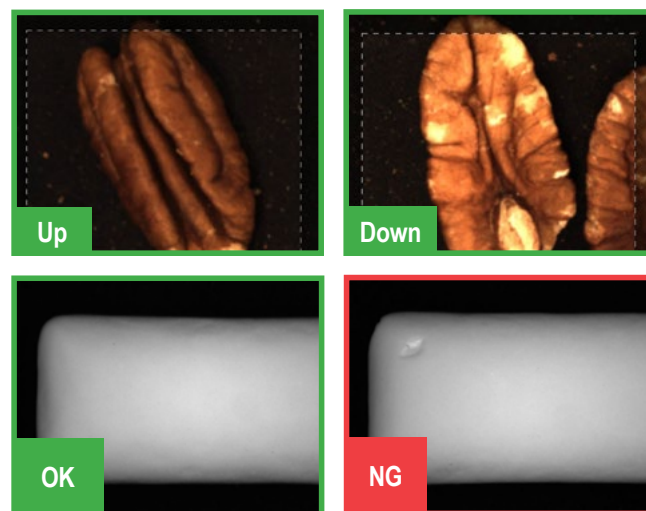
Red High Detail Mode for High-Precision Defect Segmentation

Accurate pixel-level defect segmentation is the primary advantage of the Red High Detail Mode tool. Leveraging the powerful and exhaustive High Detail Mode architecture, the tool can accurately learn the appearance of challenging defects and predict them in untrained images with remarkable pixel-level precision. High Detail Mode Red is the perfect fit for applications that call for both detection and measurement of challenging and subtle defects like blemishes, cracks, scratches, and other types of aesthetic imperfections on manufactured products.
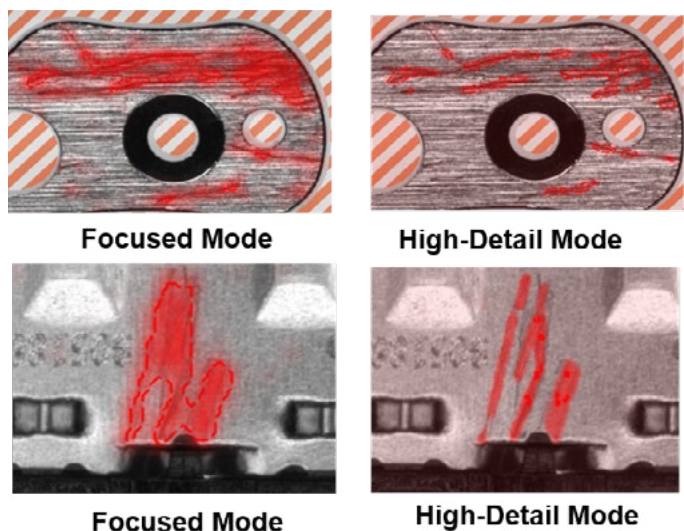
Green High Detail Mode for High-Accuracy Classification

The Green High Detail Mode tool excels at identifying subtle characteristics in an image or a region of interest and classifying it accordingly. It provides best-in-class classification accuracy even when dealing with significant variation. The Green High Detail Mode tool is also very versatile, tackling a range of applications types from defect type classification, OK/NG classification, and part SKU classification. The High Detail Mode Green also comes with a visual feedback feature to help developers further tune the neural network.

Focused Mode

High-Detail Mode

Focused Mode

High-Detail Mode

Up

Down

OK

NG

SPECIFICATIONS

Graphical & application programming interfaces		Windows based graphical user interface (GUI) with plugin support C library (Windows DLL) for runtime and/or training Microsoft .NET library (Wrapper for C library and WPF GUI components)
Hardware & OS Requirements	CPU	Intel Core i7 or higher (recommended)
	GPU	Cognex only supports NVIDIA GPUs. Recommend GPU memory of 11GB or higher (GTX 1080Ti, RTX 2080Ti, 3070, 3080, 3090). Note: VisionPro Deep Learning performance — in terms of processing time — will depend on hardware selection.
	RAM Memory	32 GB or more (recommended)
	USB	1 free USB port (for the license dongle)
	OS	Windows 10 64-bit Windows Server 2019 64-bit
	Storage	Solid-state drive (SSD) with 100 GB or more of free space (recommended)
Supported image file formats		PNG, BMP, TIFF, JPEG
Supported image properties		1–4 channels, 8 or 16 bits

COGNEX

Companies around the world rely on Cognex vision and barcode reading solutions to optimize quality, drive down costs and control traceability.

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