NEUROCLE

DEEP LEARNING VISION SOFTWARE

MAKING
DEEP LEARNING
VISION TECHNOLOGY
MORE ACCESSIBLE

ENG

Making Deep Learning Vision Technology More Accessible

Vision

Our vision is to enable people to apply deep learning technologies anywhere they like. No matter who the users are or what kind of system they use, we help people solve all kinds of deep learning image problems with our easy-to-use software.

Product Value

Neurocle has developed a powerful software that interprets images and video data through the integration of deep learning technology to computer vision.

Optimization + **Automation** + **Generalization**

Neurocle's thoroughly designed deep learning algorithm and inference engine allow anyone to create optimized and accurate models.

The software's automation system allows users to effectively manage data, create models, and obtain results at the click of a button.

The software can be implemented to a wide range of industries willing to apply deep learning technology to solve unique project goals.

Partners

HYUNDAI, TOYOTA, DENSO, MITSUBISHI MOTORS, hp, Panasonic, NIPPON STEEL, P&G, THALES, SIEMENS, LG, SK, FABER-CASTELL, CHIMEI

History

2020

01
Released Neuro-T, Neuro-R 1.0 (Deep Learning Vision SW for Industrial Experts)

02
Established Corporate Affiliated Research Institute

Certified as Venture Company

04
Selected as SW High Growth Club 200 Preliminary High-Growth company by the Ministry of Science and ICT

06
Released Neuro-T and Neuro-R 2.0

Supported 'Fast Training' optimized for model maintenance

10
Extended business into 6 countries in Asia (Japan, China, Taiwan, Singapore, Thailand, Malaysia)

2021

02
Selected for 'SW High Growth Club 200' by the Ministry of Science and ICT for 2 consecutive years

04
Won grand award at 'Korea ImpaCT-ech 2021'

06
Registered 3 patents on Auto Deep Learning Algorithm

07
Won silver award at '2021 Innovators Awards' by Vision Systems Design

11
Named as '2021 Cool Vendor in AI for Computer Vision' by Gartner

12
Released Neuro-X (Deep Learning Vision SW for Experts)

2022

04
Released Neuro-T, Neuro-R, Neuro-X 3.0

Introduced Auto-Labeling, Flowchart and Inference center

06
Won bronze award at '2022 Innovators Awards' by Vision Systems Design

The Cowen Startup Challenge Top 10 Finalist

11
Challenge! K-Startup 2022 Excellence Award

12
Extended business into 7 countries in Europe (France, Spain, Switzerland, Ireland, Netherlands, Belgium, Luxembourg)

2023

01
Released Neuro-EDU

02
Extended business into 2 countries in Europe (Germany, Italy)

Selected as 2023 Emerging AI+X Top 100 by Articifial Intelligence Industry Association

03
Released Neuro-T, Neuro-R, Neuro-X 3.2

Supported 'Training Progress Control Tool' for efficient management of multiple training

04
Selected for 'SW High Growth Club' by the Ministry of Science and ICT

Project Workflow & Our Products

No-Code Deep Learning Vision Trainer
Intuitive and easy-to-use software for building deep learning models

Real-Time Inference Engine
Inference engine for executing models in real-time

Upload collected data | Manage data | Train and create model | Evaluate model | Apply model (Inference)

Industrial Experts

NEURO-T

Deep Learning Experts

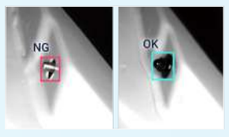
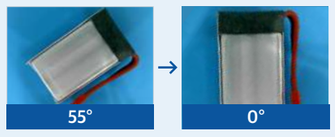
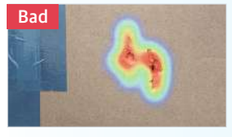
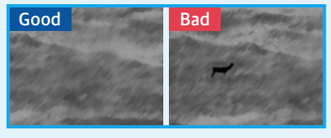
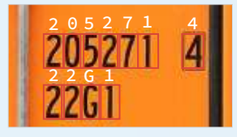
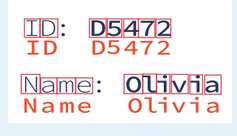
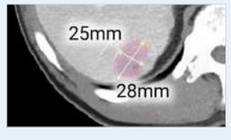
NEURO-X

Real-Time Inference

NEURO-R

Neuro-T and Neuro-X are intuitive and easy-to-use trainers for data modeling.
Neuro-R is an inference engine that allows users to run models in real-time.

Deep Learning Model Type & Application

	Classification	Segmentation	Object Detection	Anomaly Detection	OCR	Rotation
	Classifies images into separate classes such as Good/Bad | Units: Image	Recognizes the shape and location of objects in images | Units: Pixel	Detects the location and number of objects in images | Units: Object	Identifies normal/anomaly images by training normal images only Units: Image	Detects and identifies characters, numbers and symbols in images | Units: Character	Rotates images in any angle to its proper orientation Units : Image
Manufacturing	Classify surface defect 	Detect defective battery 	Verify final assembly of automotive parts 	Detect defective glass 	Identify production date/serial number 	Preprocess for defect detection 
Security / Logistics	Classify normal/torn package 	Detect drone 	Inspect baggage X-ray 	Detect abnormal object in borderline 	Identify container text 	Preprocess for OCR 
Medical / Bio	Classify normal/disease 	Detect defective pill 	Detect tooth implant 	Classify normal/lesion 	Identify chart text 	Measurement Tool *calculate actual size of lesion 

Main Features

Neuro-T and Neuro-X offer an intriguing list of powerful and user-centric features that simplify the process of data management, model building and data analysis.

Flowchart & Inference Center NEW

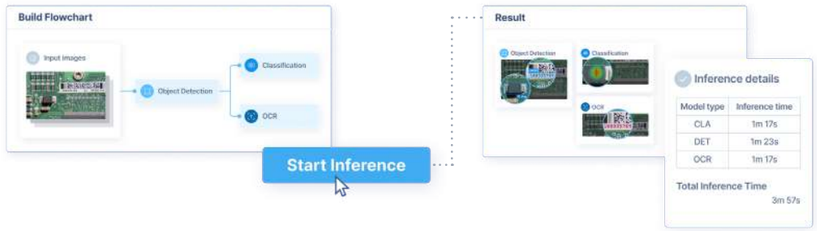
Manage deep learning project efficiently through model design and evaluation

By combining multiple models with flowchart, users can design deep learning project and visualize complex flows in an orderly fashion

Example Detect defects after multiple classifications

During the POC, users can simulate and evaluate the model performance utilizing the inference center before implementing models to the actual industrial field.

Example Evaluate the inference performance of final model by combining multiple models



Auto-Labeling NEW

Automate data labeling for higher task efficiency

The greatest advantage of Auto-Labeling is that it massively saves the time spent on data labeling.
Rather than having to label every image, Auto-Labeling does the task for you based on a small amount of labeled data.

Example Use Auto-Labeling to label PCB defects

Label few images | Click Auto-Labeling | Obtain predicted labels based on your own labels

Intuitive UX/UI

Simple and intuitive navigation structure

Unlike other software that have high demands for engineers, Neuro-T and Neuro-X are easy to use and have a sleek interface which allow you to solely focus on the project and create the best models at the click of a button.

Label images | Click 'Train' | Model created

Data Management System

Effectively reduce resources on data management

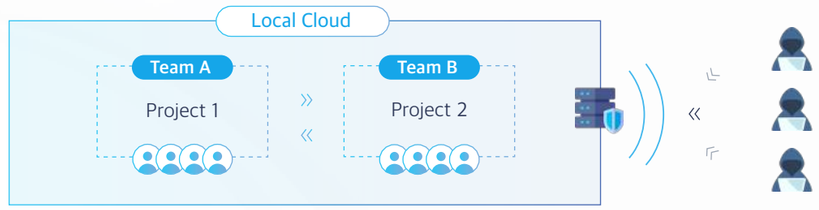
Neuro-T and Neuro-X bundle various tools to help manage and organize all original and edited data.
What's more, every process is saved helping you to keep track of the work you've done.

Workflow	Data management	Labeling	Create and evaluate model	Analyze and manage results
Traditional	Manage data in PC / Store data in cloud	Use a labeling platform to label	Use open source codes for programming	Manage data in PC / Store data in cloud
Neurocle	One place to do all management with Neuro-T and Neuro-X			

Local Cloud Environment

Collaborate with team members in a secure environment

In the Client-Server Architecture, only team members given permission can simultaneously work on the shared project.
Your workspace is safely stored on the local server and protected from any unauthorized entry.



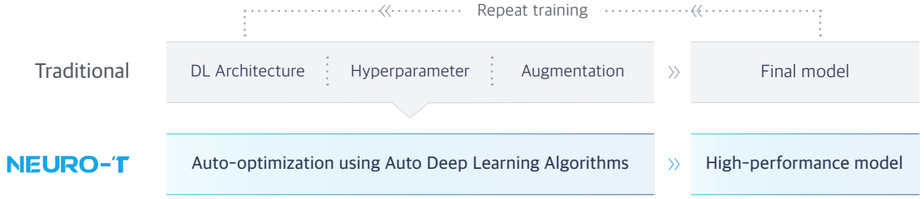
NEURO-'T

Auto Deep Learning Vision Trainer

Neuro-T is a Deep Learning Model Trainer for industrial experts with no background in deep learning, which enables anyone to easily create high-performance models.

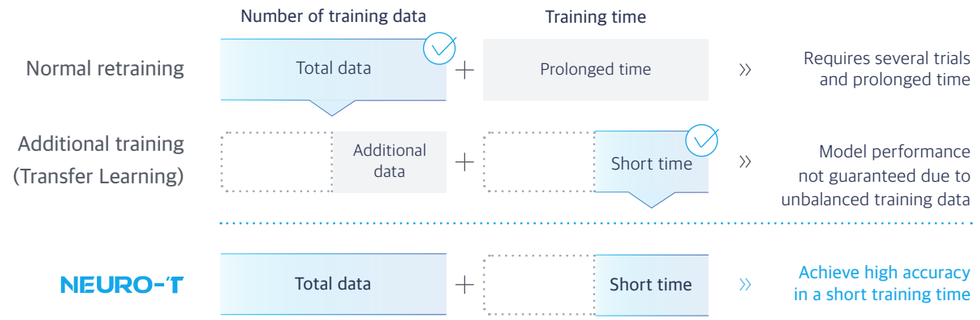
Auto Deep Learning Algorithm

Neuro-T's unique algorithm is designed to select the appropriate architecture and training parameters to automatically create the optimal deep learning model.



Fast Retraining

Fast Retraining is used when it is necessary to quickly recreate a model suitable for a new environment. This feature helps minimize the time required to retrain the model while guaranteeing the performance of the existing model.



Benefit 01

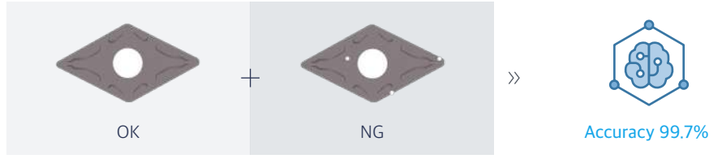
Easy to create high-performance models without deep learning knowledge

Cutting tools
Manufacturer A

Chip breaker OK/NG Classification Project

Classification model with 99.7% accuracy within 3 business days

Train images 1,158 / Test images 629 / Test period: 3 days



– By Quality Management Team deep learning non-expert

Benefit 02

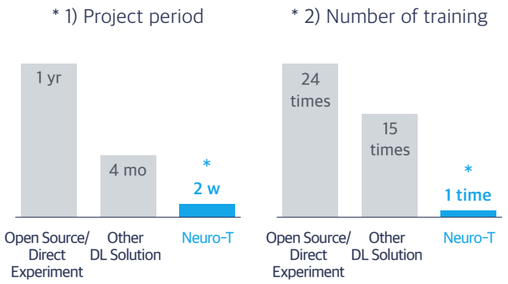
Efficiently reduces resources when conducting a project

Industrial film
Producer B

Segmentation project on 5 types of defect

Reduced resources because time spent on modeling and adjusting parameters was not a requirement

Compare project period



* 1) Performed in the second quarter of 2021 / Time taken from data acquisition to model application

* 2) Achieved 98% of target accuracy

Benefit 01

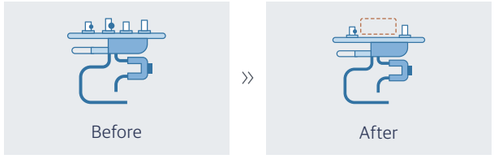
Replaces a new model within a short period of time

Air conditioner parts
Company C

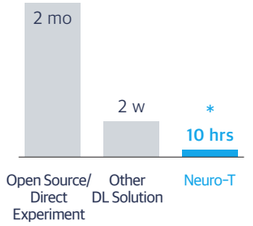
Object Detection project to locate specific parts

2 business days to apply new model and reactivate process

Created a new model due to changes in air conditioner parts



Time taken to replace model



* Data collection, preprocessing time excluded

Benefit 02

Ensures high performance of an existing model

Food Producer D

Classification project to classify OK/NG

99.4% model accuracy using previously optimized hyperparameters

Created a high-performance model when a new defect was added

NEURO-X

Deep Learning Vision Trainer for Experts

Neuro-X is a Deep Learning Model Trainer for deep learning experts that provides an array of adjustable hyperparameters to optimize the performance of models.

Provides deep learning researchers an environment for unlimited optimization

Neuro-X offers a wide variety of adjustable hyperparameters for unlimited optimization. Hyperparameters include data-related parameters and modeling-related parameters.

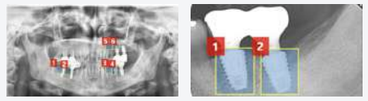
Data Augmentation		Hyperparameters	
Contrast	Horizontal flip	Network	Batch size
Brightness	Vertical flip	Image size	Optimizer
Hue	Rotation	Resize method	Decay method
Saturation	Noise	Epoch	Learning rate

Use Case

Publication of medical paper using Neuro-X

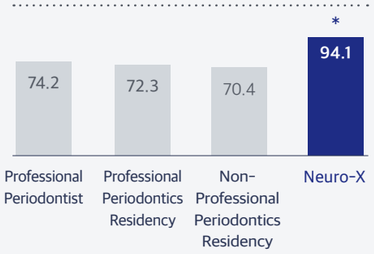
Case 1

Classification of 6 similar dental implant systems



* Average AUC of 6 classes
* Used 180 randomly selected images

Classification Accuracy % (AUC)



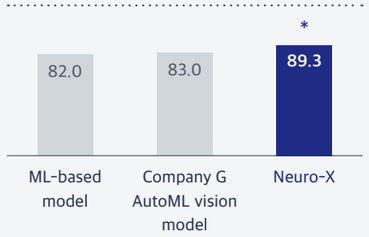
* Lee JH, Kim YT, Lee JB, Jeong SN. A performance comparison between automated deep learning and dental professionals in classification of dental implant systems from dental imaging: a multi-center study. Diagnostics (Basel) 2020;10:910.

Case 2

Classification of gastric tumor invasion stages

* Used 290 randomly selected images

Classification Accuracy % (Accuracy)



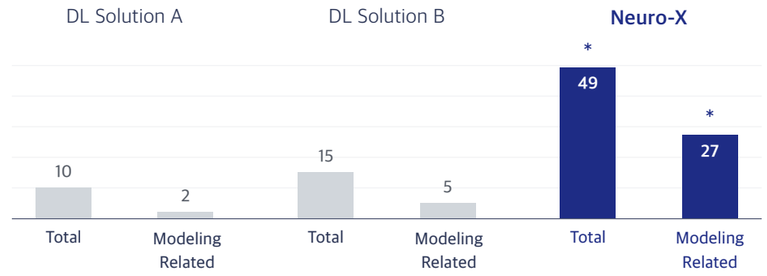
* Bang CS, Lim H, Jeong HM, Hwang SH. Use of Endoscopic Images in the Prediction of Submucosal Invasion of Gastric Neoplasms: Automated Deep Learning Model Development and Usability Study. J Med Internet Res 2021;23:e25167.

Benefit 01

Enables unlimited model optimization using an array of hyperparameters

Models can be optimized without any limits and be improved using a vast number of combinations

Total number of hyperparameters & number of modeling-related hyperparameters



Benefit 02

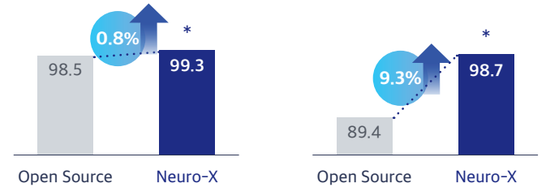
Provides consistent model performance regardless of knowledge and experience

Smart Factory Solution
Company D

Object Detection and Classification Project

A company's skill is not determined by a deep learning researcher's skill because it guarantees a consistent model performance

Deep learning model performance % (Accuracy)



Benefit 03

Easy to handoff work when project collaborators change

Neuro-X automatically stores all information and results in a way that anyone can easily track and get access to the history

Handover process to the next person in charge (Original vs Neuro-X)

1) Data Manager	2) Labeler	3) Model Builder
• Organize data type • Manage each project's dataset composition • Manage dataset's Train/ Test history	• Organize project labels • Organize labeling files • Write labeling guides	• Organize experiment's parameter combinations • Organize history of created models • Organize model results and evaluation reports • Maintain project summary

Data Management System of Neuro-X

NEURO-R

Real-time Inference Engine

Neuro-R is a runtime API that allows users to inference models created in Neuro-T and Neuro-X in real-time.

Inference in diverse environments and devices

Apply your models to any low-spec device to high-performance GPU.

Embedded based (light) — **PC based** (heavy)

Platform	Movidius	Jetson	CPU	GPU
Industry	**Medical:** Endoscopy **Security, Traffic:** CCTV			**Manufacturing:** Semiconductor, Display

Benefit 01

Supports programming languages to integrate models to a device or system

Neuro-R supports C++, C#, Python, allowing you to use the appropriate programming language

Benefit 02

Allows real-time inference on any device

Models can be integrated not only to PCs, but also to medical devices and smart cameras for real-time inference

Hospital A

Real-time airway recognition using an endoscopy equipment

Food Production Company B

Real-time inference of instant noodles using smart cameras

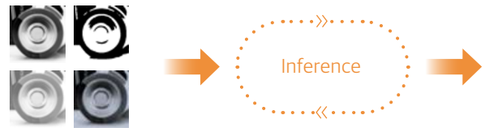
Benefit 03

Inference at a suitable speed even where fast processing time is important

Battery Manufacturer E

Cylindrical battery cap OK/NG inspection

Achieved target processing time due to the fast inference speed



Used 4 optical conditions to acquire 800x800 images

Real-time defect inspection using a Classification model

Inference speed = 8ms (4 images)

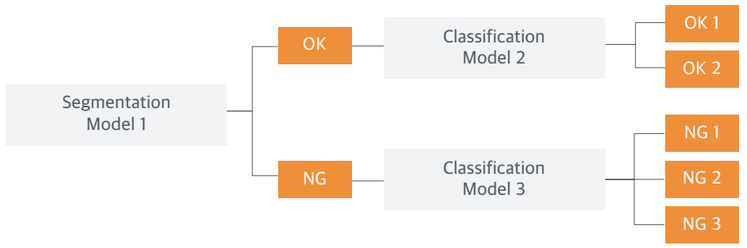
* (Batch Size : 4)

Benefit 04

Design sequence models using various APIs

Flexibly adjust the model's composition and predicted areas for real-time inference

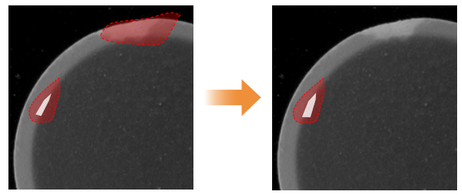
1) Multi-model serial/parallel inference design and application



Pill defects detection

Adjusted predicted areas of a Segmentation model

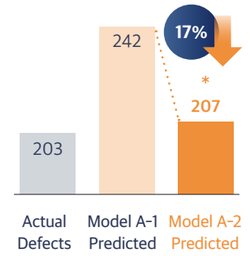
2) Adjust predicted results using the Threshold API



Model A-1
(Initial Model)
Detected defect outside the target area

Model A-2
(Threshold Model)
Filtered unnecessary areas using Size/Probability Threshold API

Over-Detected Defects



* Total dataset: 126 images
* Overdetection: 'Normal' predicted as 'Defect'

License Overview

Neurocle provides a list of license types to meet the needs of each project and customer. Choose the license type based on the number of user accounts and the number of GPUs you want to use for your project.

License

Product	License Type		Number of Accounts	Max. Number of GPU
Neuro-T Neuro-X	Basic		1	1
	Standard		3	2
	Team		5	4
	Enterprise		10	8
Neuro-R	Embedded		N/A	1
	PC	Single		1
		Double		2
		Multi		4

*Neurocle's software are provided on-premise that require to be installed and used on a PC.

Requirement Specification

Product	Category		Minimum	Recommended
Neuro-T Neuro-X	Server	CUDA Compute Capability	3.5 or higher	NVIDIA RTX 4080 NVIDIA RTX 4090
		GPU	8GB or higher (NVIDIA RTX 3060, RTX 3070)	
		OS	Windows 10 64-bit, Windows 11 64-bit	
		CPU	1 GPU: i5 or higher Multi GPU: i7 or higher	1 GPU: i7 or higher Multi GPU: i9 or higher
		RAM	16GB or higher	32GB or higher
	Client	Browser	Chrome, Microsoft Edge, Firefox	
Neuro-R	PC	CUDA Compute Capability	3.5 or higher	NVIDIA RTX 4080 NVIDIA RTX 4090
		GPU	2GB or higher	
		OS	Windows 10 64-bit, Windows 11 64-bit Linux Ubuntu 18.04 amd64	
		CPU	CPU Evaluation available	
		Development Environment	Visual Studio 2017 or higher	Visual Studio 2019
	Embedded	Available Platform	Jetson™ AGX Orin series, Jetson™ Xavier NX series, Jetson™ AGX Xavier Series	
		OS	Jetpack v5.0.2 (Linux Ubuntu 20.04 arm64)	

FAQ

Q1 What is Auto Deep Learning?

In general, in order to proceed with a deep learning project, various parameters need to be adjusted. Neuro-T's Auto Deep Learning Algorithm eases the adjusting task by automatically finding you the optimal deep learning model through 3 key aspects: Deep Learning Architecture, Training Hyperparameters, and Data Augmentation. This algorithm allows you to create and apply the optimal models, even if you are not a deep learning expert.

Q2 What is Fast Retraining?

If the object to be detected or the environment of the model changes, the model can no longer be used and has to be replaced with a new model. Neuro-T provides the Fast-Retraining feature that minimizes the time required to retrain a new model while guaranteeing the performance of the existing model.

Q3 What is the minimum size that can be detected by a model?

The minimum size mostly depends on the resolution of the camera used to collect the dataset. However, the smallest object that our software can detect is a 3x3 pixel object.

Q4 What is the minimum number of images required to create a deep learning model?

The number of required images to train a model is 10 images per class and a total of at least 3 test images. However, this is simply a requirement limited to our software and for real-life application, you will need a larger number of images to get a high-performance model. The requirement may vary depending on the project, but in general, we recommend 100-200 images or more for each class.

Q5 What are the supported image file formats? Is there a limit to the number or size of images?

Neuro-T & Neuro-X 3.0 support .jpg (.jpeg), .png, .bmp, .tif (.tiff), .dcm (.dicom) formats.
There isn't a limit to the number of images that can be uploaded to the software, but we recommend no more than 100,000 images per project, and a maximum size of 64MB per image file.

Q6 Can I use a previous labeling data?

Neuro-T and Neuro-X allow you to import labeling data made from another platform or software.
You may import labeling data in JSON files or masked image files (.png, .jpg, .bmp).

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