NEURO CHECK
Industrial Vision Systems

Application Software for Industrial Vision Systems

PI_DENKnetzeInference

Plug-In

Version 6.2.2
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Introduction

General information about NeuroCheck plug-in DLLs

A plug-in DLL is a .NET assembly that serves to enhance NeuroCheck with user-defined image processing functionality. The NeuroCheck Plug-In Interface offers the opportunity to integrate user-defined check functions for image processing and data handling. A Plug-In can contain an arbitrary number of self-developed check functions.

These check functions have full access to the NeuroCheck runtime data objects such as Images, ROI Lists or Measurement Lists. The Plug-In check function can be added to a check as well as the built-in standard check functions of NeuroCheck.

Please note that for integration of a plug-in check function into your check routine, a Premium license is required. The completed check routine then can be run with any NeuroCheck license (except the Demo Version).

Deep Learning Inference with the PI_DENKnetzeInference.NET

PI_DENKnetzeInference.NET is a plug-in for the NeuroCheck Software. The PI_DENKnetzeInference Plugin for the NeuroCheck software allows the usage of neural networks obtained from the DENKweit platform to evaluate images, allowing for the automatic detection of defects (or other features) on a work piece. It evaluates the images entirely on the local machine and therefore it does not require an internet connection. It can utilize the CPU and the GPU via NVIDIA's CUDA. There is an optional CPU-Only version of the plugin that does not require any CUDA dependencies, but can only analyze images using the CPU.

Installation

Installation of the Plug-In

Copy the following files from the zip archive to the Plug-In directory within the desired NeuroCheck project (e.g. '`C:\Users\Public\Documents\NeuroCheck\6.2\Default\Software Extensions\PlugIns`').

- All files inside the `Binaries` directory
- All *.chm files inside the `Documentation` directory

Installation of Prerequisites (CPU and GPU)

If Microsoft Visual C++ Redistributable 2015-2022 is not installed yet, start 'VC_redist.x64.exe', which you can find in the `Prerequisites` directory. If you are unsure whether MSVC is installed, start the installer anyway as it will abort if a version is found on your PC.

Installation of Prerequisites (GPU)

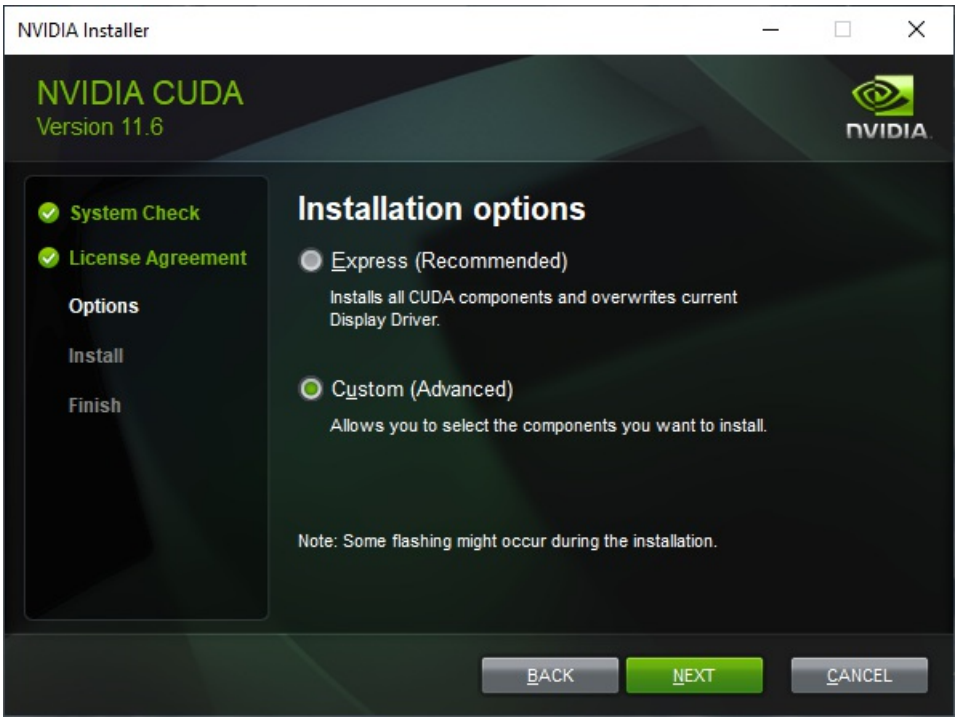
A NVIDIA GPU can be used to speed up the neural network computations. The Plug-In requires a GPU with compute capability of at least 5.0. You can find more information here.

To use a GPU as a hardware accelerator you must install CUDA and cuDNN. The dependencies are located in the `Prerequisites` directory. To perform the installation please follow the description below.

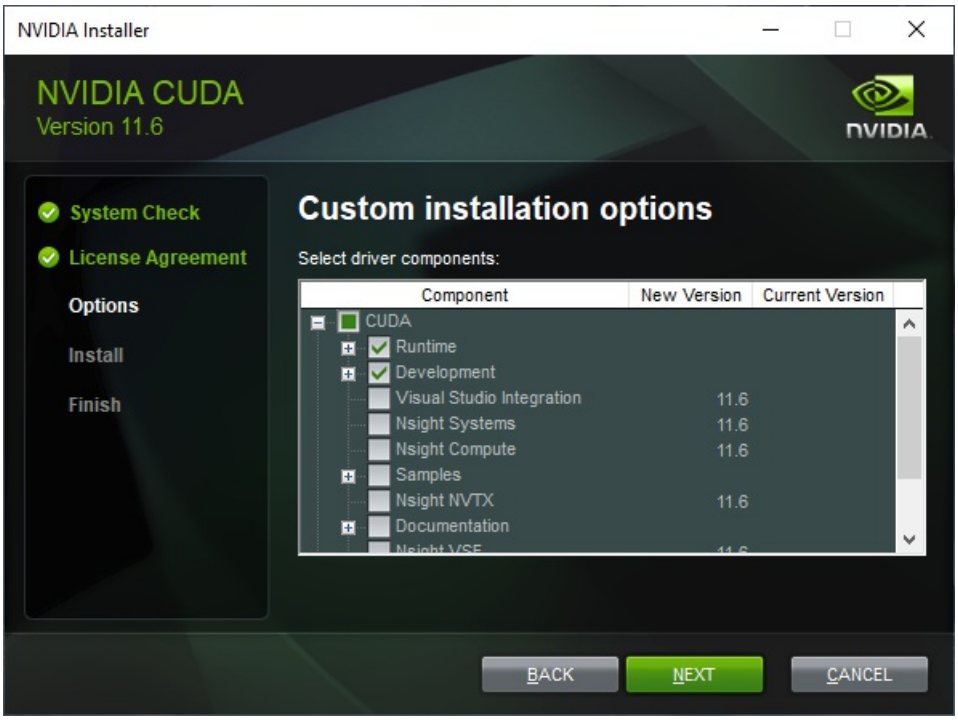
Start 'cuda_*.exe' and unpack the installation dependencies to a directory of your choice.

If done so, the installation dialog will pop up and perform a system check. If this was successful, you can install CUDA.

First select 'custom' installation:

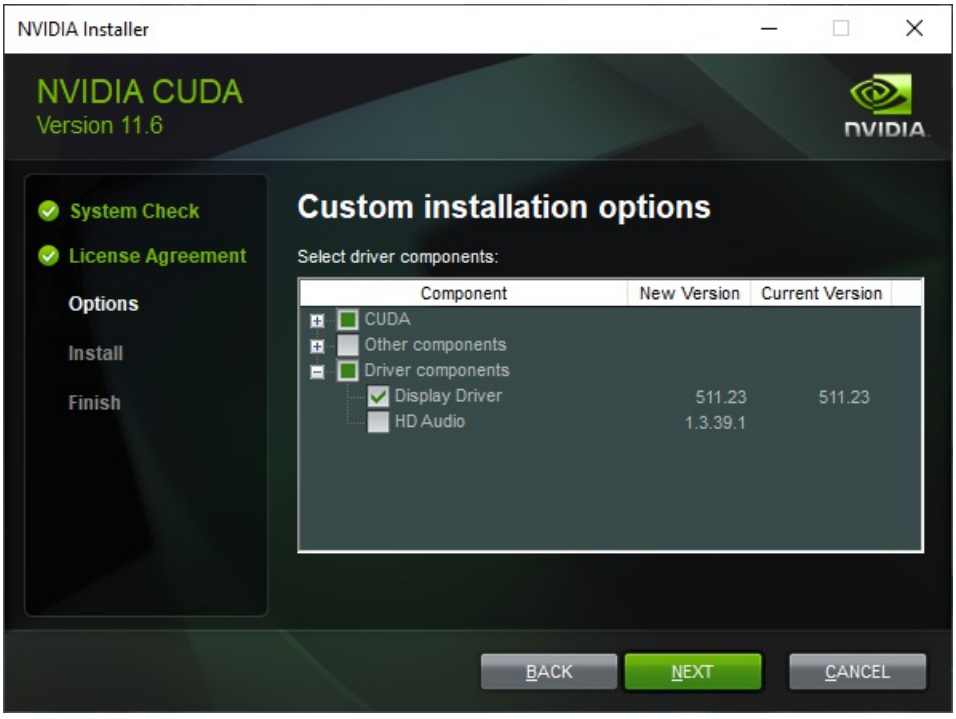


Then unselect CUDA and select 'Runtime' and 'Development'.



Unselect 'Other components' and 'Driver components'.

If you need a driver for your card or your driver is older than the provided driver, you can optionally select the 'Display Driver'.



The installation will be performed and you need to restart your computer when the installation was successfully finished.

After you installed CUDA, you need to install cuDNN.

First unzip the file 'cudnn-*.zip' in the `Prerequisites` directory.

Then copy the directory `bin` and the file `LICENSE` to the CUDA installation directory, e.g.: '`C:\ProgramData\NVIDIA GPU Computing`

`Toolkit\v11.6`'.

Done.

Loading the Plug-In

In order to use a Plug-In the Plug-In assembly must be loaded in NeuroCheck. The management of Plug-Ins takes place within the Software Settings dialog. The Software Settings dialog can be found in the System menu of NeuroCheck.

Please note that it is impossible to load or unload a Plug-In as long as a check routine is opened that contains the Plug-In check functions. If the currently opened check routine contains Plug-In check functions then close the check routine first.

Within the Software Settings dialog please select the node Plug-Ins and the sub-node Plug-In in the tree to the left. The loaded Plug-In assemblies are shown in the List of Plug-Ins. Press the Add button to open a file selection dialog in order to select a further Plug-In assembly.

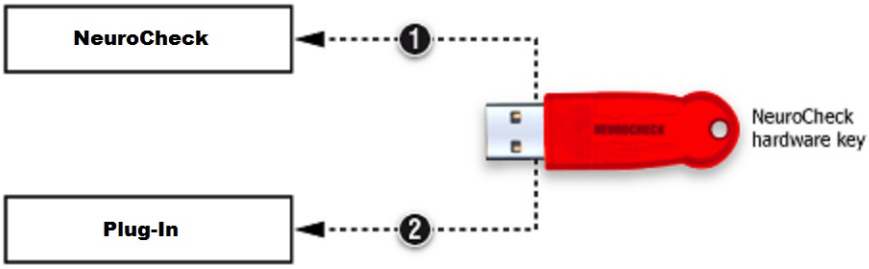
Inserting a Plug-In check function to a check routine

A Plug-In check function is inserted using the Check Function Select dialog. All check functions of loaded Plug-Ins are listed in the Plug-In category of the Check Function Select dialog. Within the Plug-In category the check functions are ordered in sub-categories where each sub-category represents the check functions of one Plug-In.

Besides the category the user will hardly notice any difference between the usage of Plug-In check functions and built-in check functions.

Licensing

This section describes the licensing mechanism for this NeuroCheck Plug-In.



1. Protection of NeuroCheck

NeuroCheck requires a valid license which is provided as hardware security key (dongle). USB and LPT dongles are available. Please note that a Premium license is required in order to integrate a plug-in check function into your check routine. If the check routine is completed once (including the plug-in functions) it can be run with any NeuroCheck license (except demo).

You obtain the standard NeuroCheck license when you purchase the software from your local NeuroCheck partner.

2. Protection of denk Library

DENKnetze Inference uses an external library, the denk.dll, which requires extra licensing. The "denk" licence is provided as extra hardware key (dongle).

Run DENKnetze Inference: Introduction

Function overview

This function can be used to perform inference on the input list of ROIs.

Input data

This check function requires an image and a list of ROIs as input data objects.

Output data

List of ROIs with new features of the inference

Result view

The result view shows an image of the evaluated objects.

Properties

 Check function group Plug-In.

 The check function has a Parameter Dialog.

 The check function has own result Visualizations.

Run DENKnetze Inference: How to use

- You can deploy your pre-trained neural network obtained from the DENKweit platform on a single image or compute more than one images at once:
  - **Single image**

    To deploy the inference on a single image, create an image and a list of ROIs with exactly one entry.
  - **Multi image**

    To deploy the inference on more than one image at once, create an image and a list of ROIs with as many entries you want.
- Usage of more than one model:

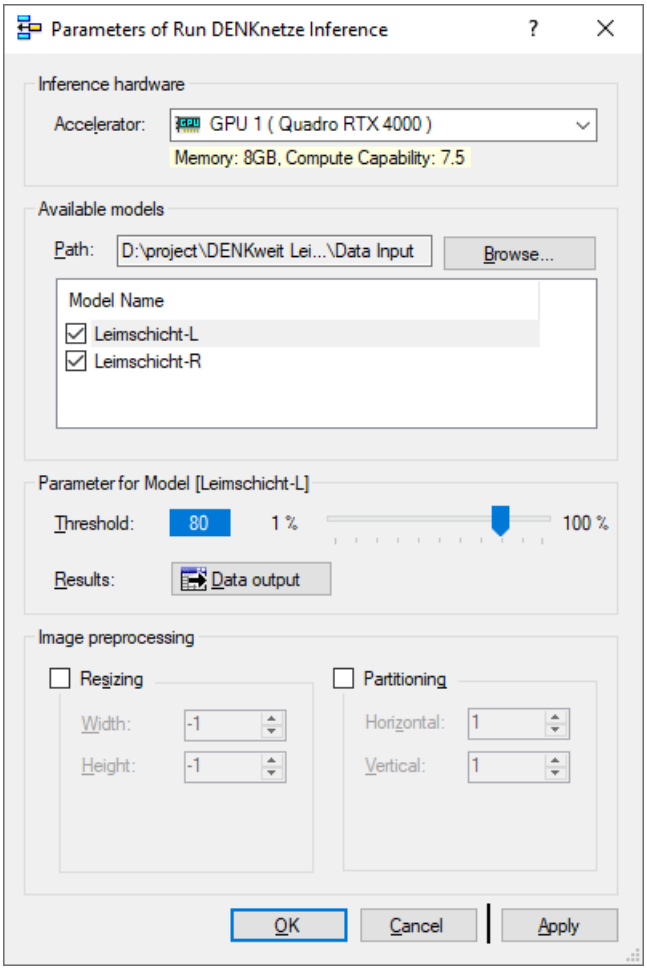
  If you plan to use more than one model in your check function/check routine/project (e.g. classification, anomaly detection, ...), make sure that ALL models are in the same directory. Even if you use multiple check routines, each of which loads different models. Because the external library "denk.dll" preloads all models at once, which can then be selected or deselected in the parameter dialog. After the models have been preloaded, the inference runs quickly.

  If the models are in different directories, the models are unloaded and the new models in the other directories will be preloaded again each time the program is executed. This slows down the execution time enormously.

Run DENKnetze Inference: Parameter Dialog

This plug-in check function has a **Parameter** dialog.

Screenshot of Parameter Dialog



The **Parameter** dialog contains the following elements:

Element	Description
Accelerator	The hardware accelerator to use for inference (Default CPU).
Path	The full path to the directory of the pre-trained models (see How to use for more information). To active or deactivate a model, check or uncheck the corresponding box. If a model is deactivated, it does not produce any output.
Threshold	The threshold for a model, with the minimum quality (class probability) of the result.

Element	Description
Results	The output (class name and/or class probability) of a model will be written into the register if parameterized. In this subdialog you can set the start index of the register for the respective attribute. If you have multiple input ROIs and/or your model has more than one output per ROI (e.g. for segmentation), you have to make sure that there are enough register cells starting from the start index with the correct type.
Resizing	• Width: Resizing of the with of every input ROI (separately). The default is '-1', which means NO resizing of the width. • Height: Resizing of the height of every input ROI (separately). The default is '-1' which means NO resizing of the height. Some models only allow resizing with certain conditions. For instance the width and height must be divisible by a certain value. This info will be displayed in a little info text underneath. It may also happen that a model requires a fixed size. In that case the option to resize will be disabled with a small info text underneath.
Partitioning	• Horizontal: Partitioning of every input ROI (separately) in horizontal direction. • Vertical: Partitioning of every input ROI (separately) in vertical direction. To reduce the amount of GPU memory used, the ROI can be separated into parts which will be send to the device one after another. The ROI will be divided into the given number of partitions in the horizontal and vertical direction.

Run DENKnetze Inference: Visualization

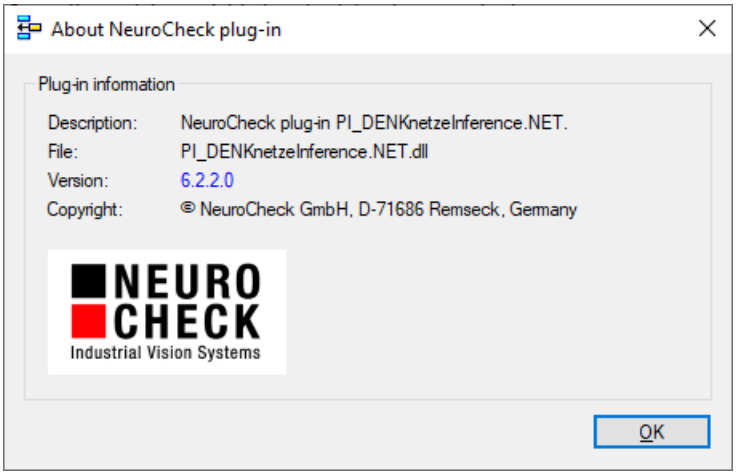
This section describes the result visualizations the check function "Run DENKnetze Inference" provides.

Element	Description
Input Image	Displays the input image of the check function.
Input ROIs	Displays a list of the input ROI collection data of the check function.
Output ROIs	Displays the evaluated image.

About Dialog

This dialog displays version information about the NeuroCheck Plug-In **PI_DENKnetzeInference.NET.dll**.

Screenshot of About Dialog



Support Services

For technical support, please contact your local NeuroCheck partner or NeuroCheck GmbH:

Phone: +49 (0) 7146 - 89 56-40
E-Mail: support@neurocheck.com
Web: www.neurocheck.com

Before contacting us, please provide some important information about your system:

Information about your NeuroCheck installation and your PC setup:

- Use the NeuroCheck Diagnostics tool to check your installation and computer configuration.
- The NeuroCheck Diagnostics is installed in the "Tools" folder within your NeuroCheck installation.

Log file information:

- Logging for NeuroCheck can be activated in **System** > **Software Settings** > **Diagnosis** > **Logging**.