HD VISION
high dimensional vision systems

LumiScan Training Framework

User Guide

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Imprint

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Version_2024_2_19

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1 Introduction

1.1 About This Manual

This document contains important information about the installation and operation of the LumiScan Training Framework. Please read the manual carefully before using this software.

1.2 Formatting Convention

This guide uses special formatting to highlight certain words and phrases:

- Keywords/important information and buttons are highlighted in bold (e.g. Only two values are possible: **0.5** or **1.0**).
- Links and references are highlighted in green (e.g. info@hdvisionsystems.com).
- File and path names are highlighted in a special font (e.g. `exportDirectory`).

1.3 Disclaimer

NOTE: By accessing or using these commercial software products, you expressly agree to the following terms and conditions.

Any attempt to use a debugger to examine, analyze, or tamper with the software provided by HD Vision Systems is strictly prohibited and may have immediate and irreversible consequences.

If the software detects the presence of a debugger, security protocols will be activated to protect the intellectual property, functionality and stability of the software. This may result in, among other things, immediate suspension of the associated Software license, loss of data, and, in extreme cases, forced termination of all instances of the Software operating under the same license, as well as legal consequences.

By using the Software, you acknowledge that you have read, understood and accepted the terms of this Disclaimer (see also General Disclaimer).

2 LumiScan Training Framework

2.1 Introduction

The LumiScan Training Framework allows easy training of neural networks for computer vision tasks. This includes object recognition tasks. It also allows the user to train an existing network to adapt it to new data, or to train a network from scratch and convert it to ONNX.

2.2 Requirements

- CUDA Toolkit 11.8 or higher
- Code Meter 7.60 or higher
- NVIDIA GeForce RTX 2080 SUPER
- Anaconda
- Windows 10 or higher/Linux

If you have any problems or questions about the product, please contact HD Vision Systems Customer Support at +49 6221 6721905
or by e-mail: customer.success@hdvisionsystems.com

2.3 User Interface

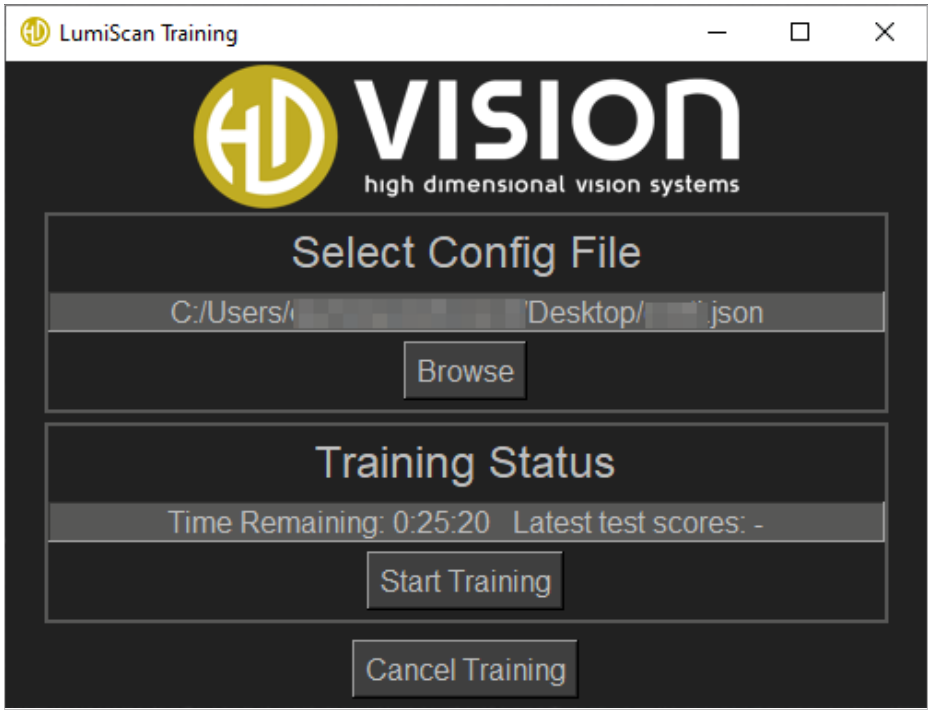

Fig. 1: LumiScan Training Framework: Main window

The user interface is simplified and limited to file selection, training status, and starting and stopping training.
For correct and successful training, it is necessary to configure all relevant parameters in the JSON settings beforehand. An example of such a setting is given in the next section.

2.4 JSON-Settings

```
{
    "trainingDataRoot": "C:/Users/user_name/Desktop/recordings/raw",
    "validationDataRoot": "C:/Users/user_name/Desktop/recordings/raw",
    "exportDirectory": "C:/Users/user_name/Desktop/recordings/net-
work",
    "classList": [
        "Arrow",
        "Disk"
    ],
    "nonRotables": [
        "Disk"
    ],
    "numClasses": 1,
    "imageScale": 0.5,
    "networkBase": null,
    "baseConfiguration": "LumiScanROD",
    "schedule": "Full",
    "trainingProfile": "B8x1",
    "deploymentConfiguration": "LumiScanVGR",
    "anacondaEnvironment": "C:/Users/user_name/Desktop/LumiTrainin-
gInstaller/orientedObjectDetection",
    "anacondaActivation": "C:/tools/Anaconda3/Scripts/activate.bat",
    "tempFiles": "tmp"
}
```

These are standard elements of the JSON settings. Their meaning is explained in Table 1. Exactly which parameters are needed depends on the application.

2.4.1 JSON-Parameters Description

Table 1: LumiScan Training Framework: JSON-Settings

Parameter	Description
trainingDataRoot	Path to training data. * This folder is generated by LumiScan Annotation and contains the images along with the label data. The latter is available as CSV or JSON files. There should be one label data file for each image.
validationDataRoot	Path to the trained data to see how training improves accuracy.* It can be set to the same path as trainingDataRoot.
exportDirectory	Storage path for ONNX, classes/labels in CSV or JSON files generated from LumiScan Annotation and other training results.*
classList	List of the available classes / labels in CSV format that have been received by the LumiScan Annotation and that are to be recognized by the network.
nonRotables	Describes objects without a clear orientation (e.g. a disk or a scratch). If these classes do not have a defined orientation, their name should be entered here. It must match the name specified in classlist.
Arrow, Disk	Examples of class names to recognize.
numClasses	Displays the number of classes in the class list. For example, if there are 2 classes, there is a 2 in numclasses.
imageScale	Shows the scaling of the image compared to the original image. Only two values are possible: **0.5** or **1.0**.
networkBase	Path to the network base *. Here you can select a network that has already been trained. The value is: `null`** if there is no previous network or if you want to start training from scratch. If you want to add an existing network to the training, enter the path of the network here.

* NOTE: When specifying the path, pay special attention to the direction of the slashes. All **backslashes (\)** must be replaced with **slashes (/)**.

** If the value is zero, you must ensure that it is written exactly like this: `null` and does not contain any capital letters or quotation marks.

Parameter	Description
baseConfiguration	It is provided by HD Vision Systems. Here you can choose between two options: • `LumiScanOOD`: if the object has a top side and you want to localize it. • `LumiScanROD`: on rotation, if the top of the object has not been localized.
schedule	Three options are possible in the schedule: **Full**, **Finetune** and **Quicktune**. • **Full** performs a new training, assuming a network is seeing the dataset for the first time. This takes longer and should only be used for initial training. • **Finetune**: All further refinement steps should be done with this option. It shortens the training time, but is designed so that all data is available. The goal is to achieve consistent results for existing and new properties. • **Quicktune**: This option allows you to quickly add new data to the network for specific objects. In this case, the training data contains only new images.
trainingProfile	An option to set the allowed number of GPUs and influence the required memory. Currently only 1 GPU is supported, with the following options: • **B8x1**: Please set this as a default value • **B4x1**: If the training fails with the default value set, or the part of the training is outsourced to shared GPU memory, please select this option. You can check this in the Task Manager. An unexpectedly long training time (of several days) is also a good indicator.
deploymentConfiguration	Basic application configuration. This parameter is already defined as `LumiScanVGR` and remains unchanged.
anacondaEnvironment	This parameter leads to the environment that was installed with LumiScanTraining. You will therefore find the environment in the folder in which you installed the program. The environment is called „orientedObjectDetection“.
anacondaActivation	This is the path to activate the BAT file [Batch-Skript] ("activate.bat"), normally to be found under: "C:\tools\Anaconda3".
tempFiles	Path for saving temporary files, is deleted after training. This can be any path to which the program has write permission.

3 General Disclaimer

1. The manufacturer is not liable for damage to life, body or health or damage to property resulting from improper use. Please note that operating and/or connection errors are beyond our control. We cannot accept any liability for damage resulting from this.
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6. For more information about the warranty, please contact the manufacturer of the product.

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