Bootstrapping Computer Vision Models With Synthetic Data (BCVMSD)

ID BCVMSD **Price** 500.— €(excl. tax) **Duration** 1 day

Course Overview

Training computer vision models is complex, iterative, and requires a vast amount of high-quality, relevant visual data. Traditionally, this process relies on visual data gathered from the real world with cameras and sensors, often manually labeled, to represent the scenarios and situations that the model needs to learn.

NVIDIA Omniverse™ Replicator is a powerful synthetic data generation (SDG) engine that produces physically simulated synthetic data for training deep neural networks (DNNs). It augments costly, laborious human-labeled data, which can be error-prone and incomplete, with diverse physically accurate data tailored to the needs of developers.

In this course, you'll use Omniverse Replicator and the Omniverse Defects Generation Extension to generate synthetic data. Next, you'll iterate on the dataset to train a DNN to find target objects (scratches) in a scene.

Please note that once a booking has been confirmed, it is non-refundable. This means that after you have confirmed your seat for an event, it cannot be cancelled and no refund will be issued, regardless of attendance.

Prerequisites

- Intermediate understanding of Python (including classes, objects, and decorators)
- Basic understanding of machine learning and deep learning concepts and pipelines

Suggested materials to satisfy prerequisites: Python tutorial, Deep Learning in a Nutshell, Deep Learning Demystified

Course Objectives

By participating in this workshop, you'll learn how to:

- Create a synthetic training dataset for later processing using NVIDIA Omniverse Replicator
- Customize and refine existing tools to match your dataset feature and format requirements
- Parameterize data generation offline for faster iteration when creating new or refined datasets
- Import a synthetic dataset into your workflow, train it, iterate on the design, and export a model to be used for inference

Detailed Course Outline

Introduction

- Meet the instructor.
- Create an account at courses.nvidia.com/join

Introduction to Synthetic Data Generation (SDG) With Omniverse Replicator

- Learn how to create a synthetic training dataset for later processing:
  - Discuss the case for synthetic data.
  - Learn the basics of the Replicator Python API for SDG.
  - Create example datasets using Python scripts using an NVIDIA Omniverse application interface.
  - Create a defects dataset using the Omniverse Defects Generation Extension and the Omniverse Defects demo pack.
  - Modify the extension code to change the dataset generated.

Headless SDG and Replicator YAML Extension

- Learn to parameterize data generation offline using the Replicator YAML extension for faster iteration when creating new or refined datasets:
  - Discuss the advantages and disadvantages of running Omniverse Replicator in headless mode.
  - Learn to run Omniverse Replicator in headless mode using a configuration file.
  - Iterate on changes to the configuration file to generate new datasets.

Integrating Dataset Iteration Into the Training Workflow

- Learn how to import a synthetic dataset into your workflow, train it, iterate on the dataset design, and export a model to be used for inference:
    - Discuss practical guidelines and examples for training a perception dataset to find a target object.
    - Fine-tune a visual transformer (ViT) model using NVIDIA TAO as the example workflow.
    - Iterate on the model by improving the data to solve accuracy issues.
    - Export the model for later deployment.

Assessment and Q&A

- Review key learnings.
- Take a code-based assessment to earn a certificate

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