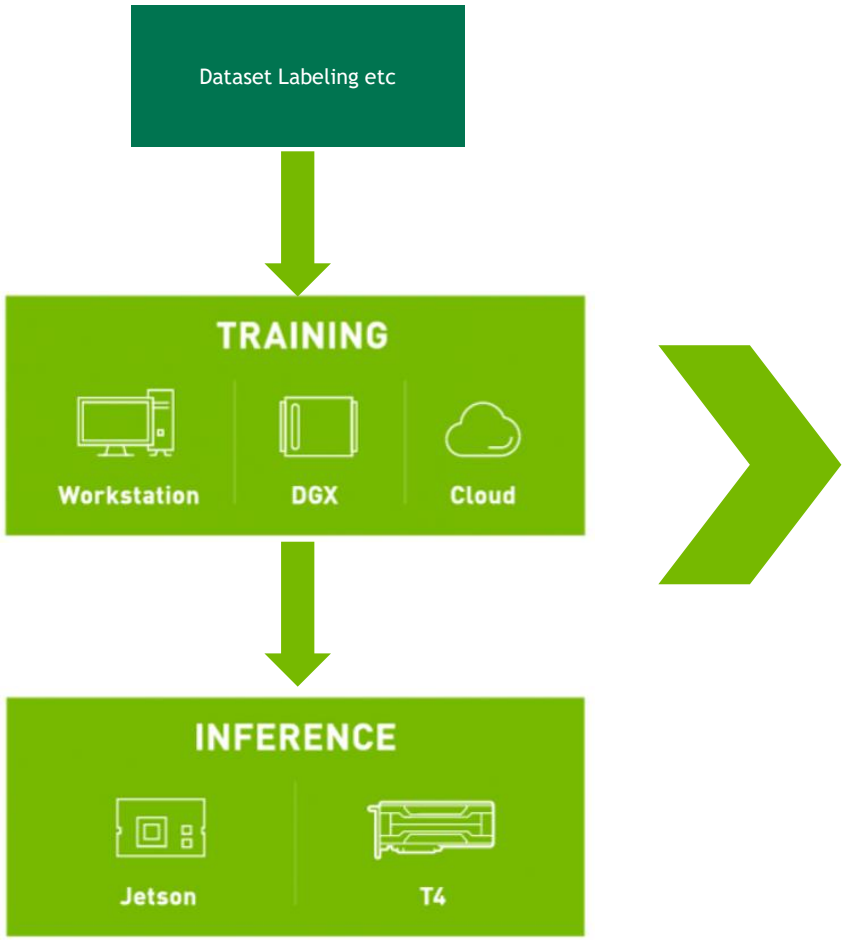
快速搭建基于PYTHON的车辆信息识别系统

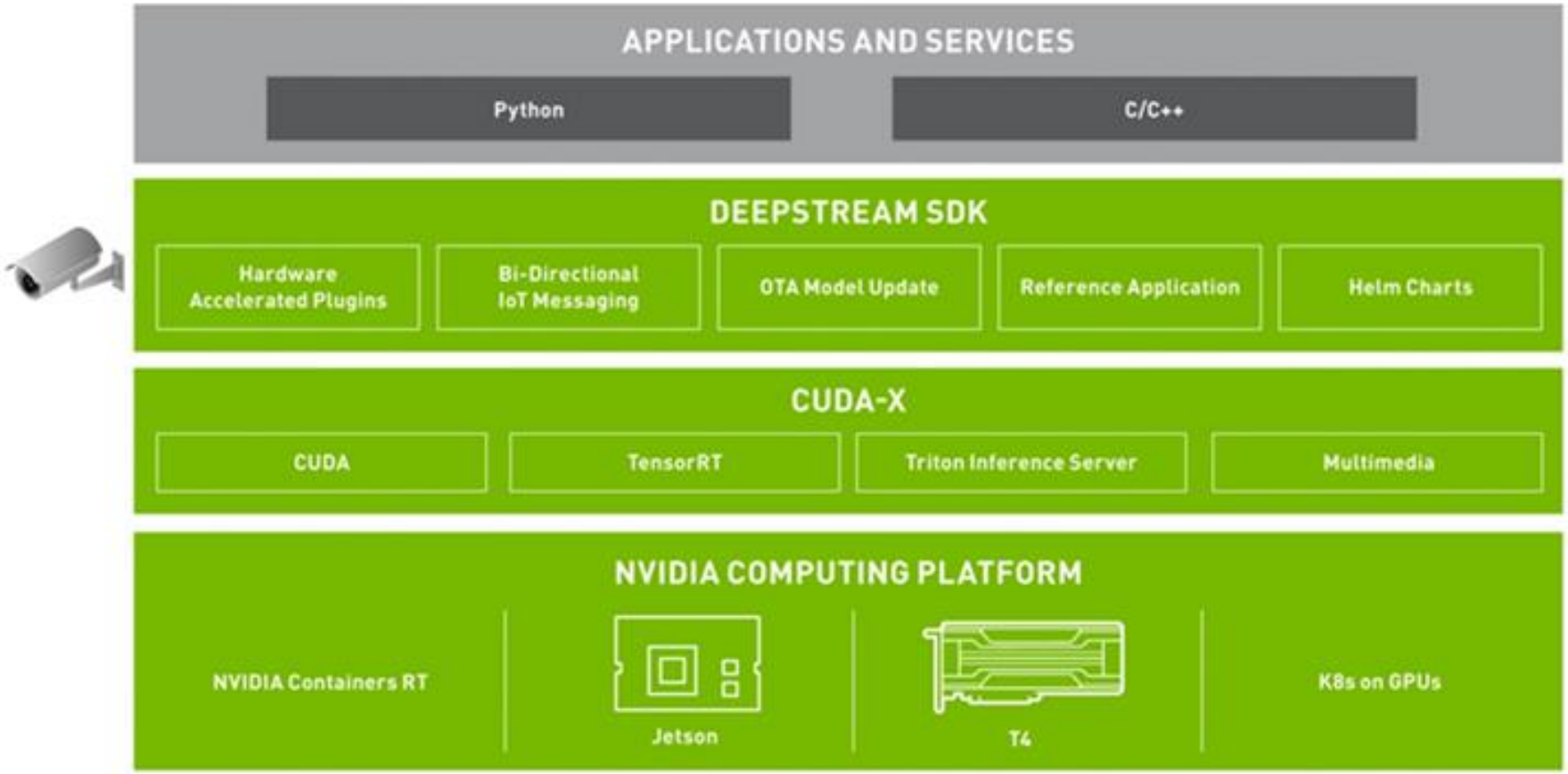
利用最新的NVIDIA TRANSFER LEARNING TOOLKIT 3.0和DEEPSTREAM 快速搭建车辆信息识别系统

NVIDIA **开发者社区 何琨**

课程介绍



NVIDIA DeepStream SDK



NVIDIA DeepStream SDK

Build and deploy **AI-powered Intelligent Video Analytics** apps and services. DeepStream offers a multi-platform scalable framework with TLS security to deploy on the edge and connect to any cloud.

DEVELOP IN PYTHON

Flexibility of building apps in Python with comparable performance

INTEGRATION WITH TRITON

Deploy model natively in TF, TF-TensorRT, PyTorch, or ONNX

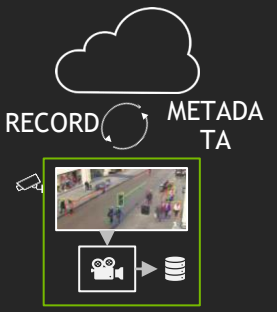
RHEL SUPPORT

Build and deploy DeepStream apps natively using RHEL

IOT

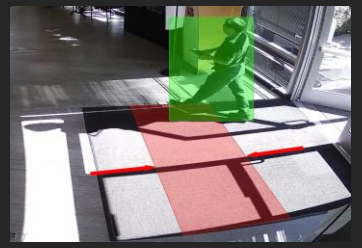
Bi-directional messaging, OTA model update, Security

SMART RECORD



Save valuable disk space by doing selective record

PEOPLE ANALYTICS



Perform ROI based filtering, line crossing, direction detection

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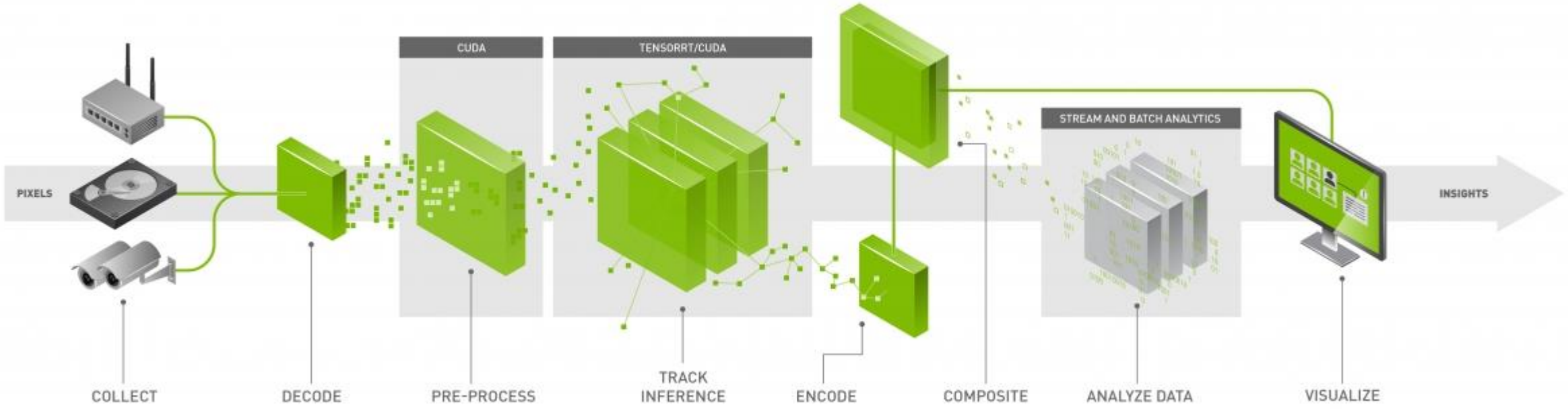

https://docs.nvidia.com/metropolis/deepstream/dev-guide/text/DS_Quickstart.html#quickstart-guide

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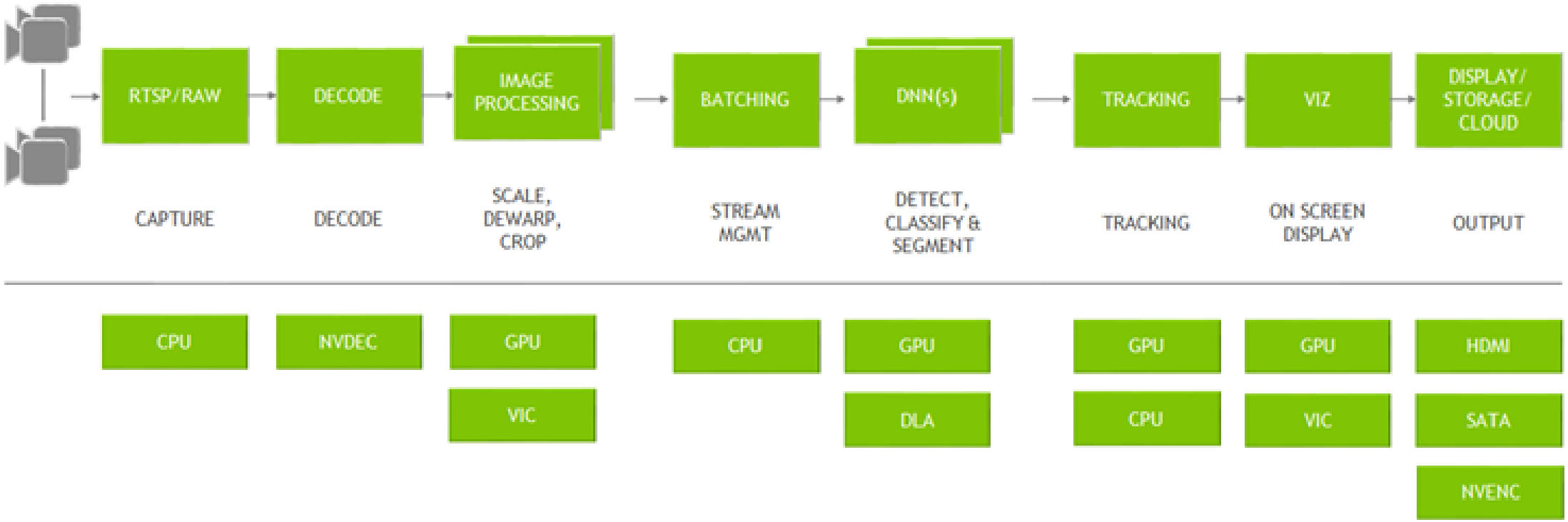

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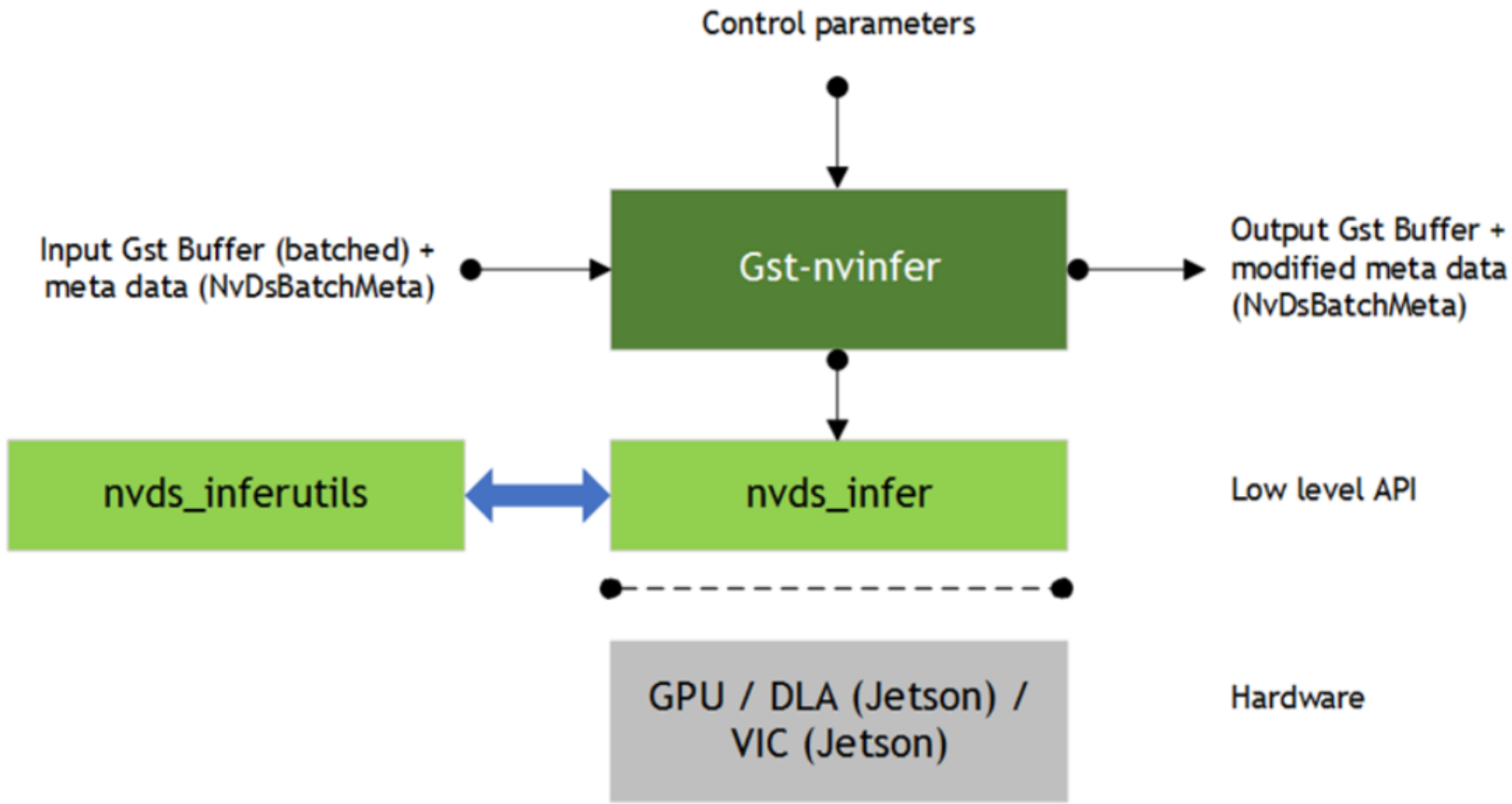

NVIDIA DeepStream SDK

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gie-unique-id	Unique ID to be assigned to the GIE to enable the application and other elements to identify detected bounding boxes and labels	Integer, >0	gie-unique-id=2	All Both
operate-on-gie-id	Unique ID of the GIE on whose metadata (bounding boxes) this GIE is to operate on	Integer, >0	operate-on-gie-id=1	All Both
operate-on-class-ids	Class IDs of the parent GIE on which this GIE is to operate on	Semicolon delimited integer array	operate-on-class-ids=1;2 Operates on objects with class IDs 1, 2 generated by parent GIE	All Both

NVIDIA DeepStream SDK

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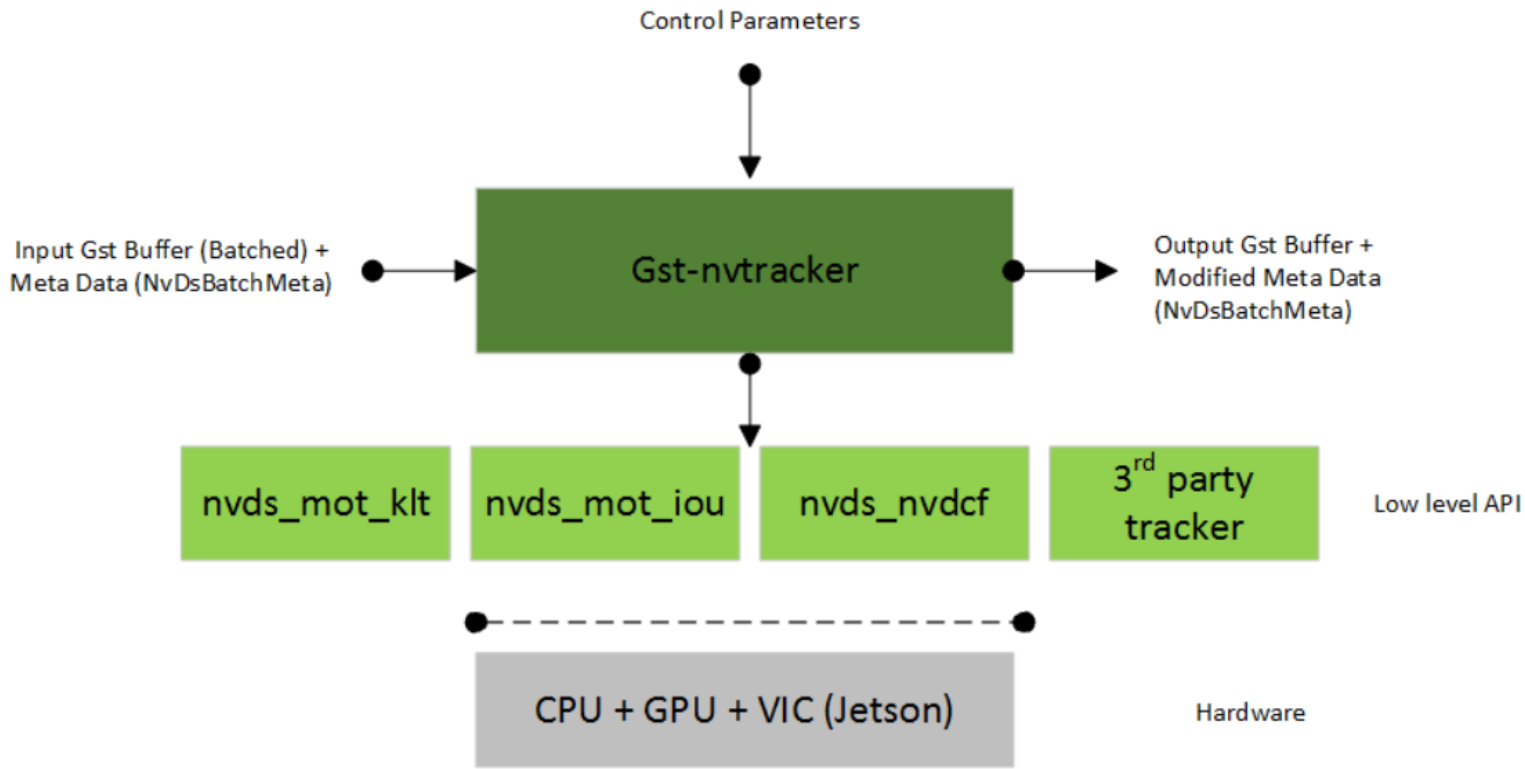

NVIDIA DeepStream SDK

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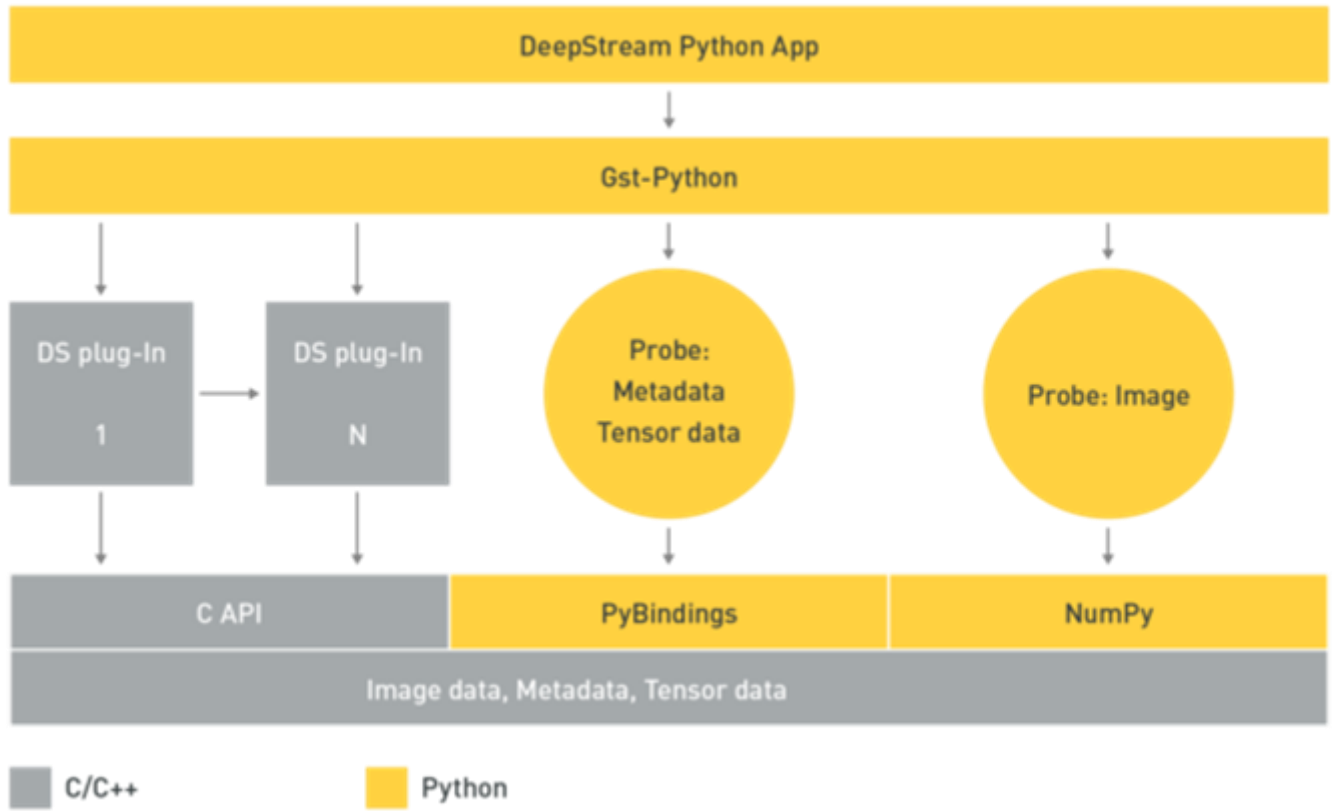
Gst-nvtracker plugin Gst Properties

Property	Meaning	Type and Range	Example Notes
tracker-width	Frame width at which the tracker is to operate, in pixels.	Integer, 0 to 4,294,967,295	tracker-width=640
tracker-height	Frame height at which the tracker is to operate, in pixels.	Integer, 0 to 4,294,967,295	tracker-height=368
ll-lib-file	Pathname of the low-level tracker library to be loaded by Gst-nvtracker.	String	ll-lib-file=/opt/nvidia/-deepstream/libnvds_nvdcf.so
ll-config-file	Configuration file for the low-level library if needed.	Path to configuration file	ll-config-file=/opt/nvidia/-deepstream/tracker_config.yml
gpu-id	ID of the GPU on which device/unified memory is to be allocated, and with which buffer copy/scaling is to be done. (dGPU only.)	Integer, 0 to 4,294,967,295	gpu-id=1
enable-batch-process	Enables/disables batch processing mode. Only effective if the low-level library supports both batch and per-stream processing. (Optional.)	Boolean	enable-batch-process=1
enable-past-frame	Enables/disables reporting past-frame data mode. Only effective if the low-level library supports it.	Boolean	enable-past-frame=1
tracking-surface-type	Set surface stream type for tracking. (default value is 0)	Integer, ≥0	tracking-surface-type=0
display-tracking-id	Enables tracking id display on OSD.	Boolean	display-tracking-id=1
iou-threshold	Intersection over union threshold for considering two bounding boxes for association	float, [0..1]	tracker-width=0.6

NVIDIA DeepStream SDK

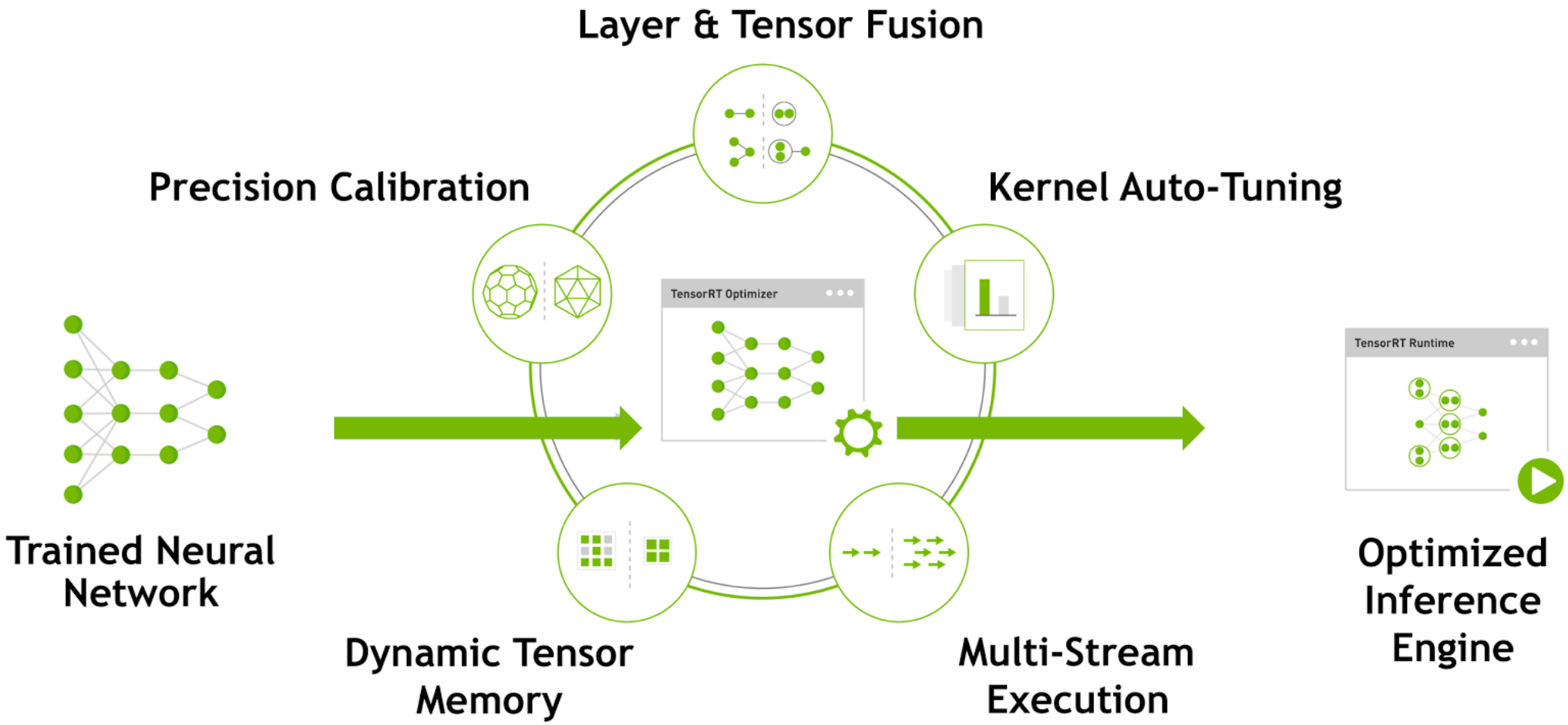
Build and deploy **AI-powered Intelligent Video Analytics** apps and services. DeepStream offers a multi-platform scalable framework with TLS security to deploy on the edge and connect to any cloud.



NVIDIA DeepStream SDK

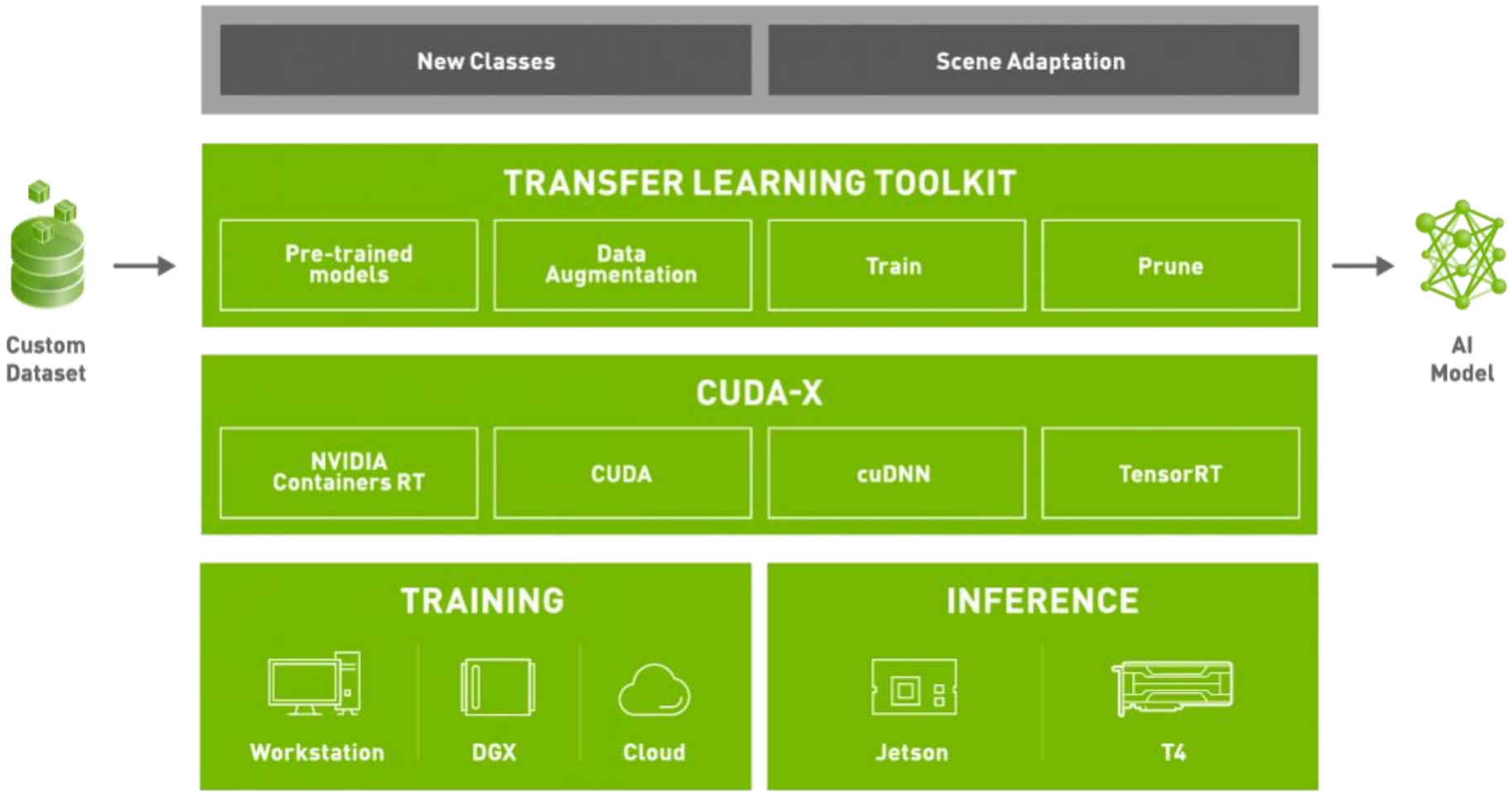
- 流数据可以通过RTSP通过网络传输，也可以从本地文件系统或直接从摄像机传输。这些流是使用CPU捕获的。一旦帧在内存中，他们被发送为解码使用NVDEC加速器。decode的插件名为Gst-nvvideo4linux2
- 解码后，还有一个可选的图像预处理步骤，在此步骤中可以对输入图像进行预处理，然后进行推理。预处理可以是图像的色彩空间的变换等。Gst-nvdewarper插件可以从鱼眼或360度相机变形图像。Gst-nvvideoconvert插件可以在帧上执行颜色格式转换。这些插件使用GPU或VIC(视觉图像合成)
- 下一步是批处理帧以获得最佳推理性能。批处理使用Gst-nvstreammux插件完成
- 一旦帧被成批处理，它就被发送去进行推理。推理可以使用NVIDIA的推理加速器运行时TensorRT完成，也可以使用Triton推理服务器在本地框架(如TensorFlow或PyTorch)中完成。本机TensorRT推断使用Gst-nvinfer插件执行，Triton推断使用Gst-nvinferserver插件执行。推理可以使用GPU或DLA(深度学习加速器)的Jetson AGX Xavier和Xavier NX
- 在推断之后，下一步可能涉及跟踪对象。在SDK中有几个内置的参考跟踪器，从高性能到高精度。使用Gst-nvtracker插件执行对象跟踪
- 有一个可视化插件名为Gst-nvdsosd，用于创建诸如边框、分割掩码、标签等可视化工件
- 最后，为了输出结果，DeepStream提供了各种选项:用屏幕上的边框呈现输出，将输出保存到本地磁盘，通过RTSP流输出，或者直接将元数据发送到云。为了向云发送元数据，DeepStream使用Gst-nvmsgconv和Gst-nvmsgbroker插件。Gst-nvmsgconv将元数据转换为模式有效负载，Gst-nvmsgbroker建立到云的连接并发送遥测数据。有几个内置的代理协议，如Kafka、MQTT、AMQP和Azure IoT。可以创建自定义代理适配器

TensorRT



NVIDIA Transfer Learning Toolkit

Create **accurate and efficient AI models** for Intelligent Video Analytics and Computer Vision without expertise in AI frameworks. Develop like a pro with **zero coding**.

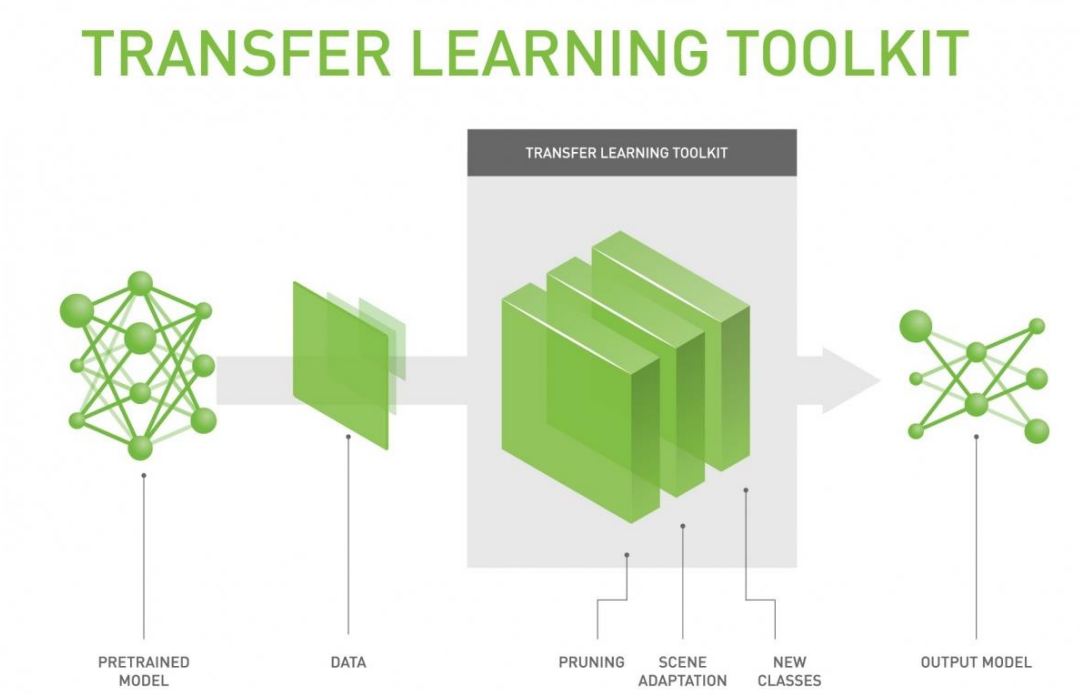


NVIDIA TRANSFER LEARNING TOOLKIT

Develop like a pro with **zero coding**.

Transfer Learning Toolkit是一个基于python的工具包，它使开发人员能够利用NVIDIA预先训练的模型，并为开发人员提供一系列的工具，使流行的网络架构适应他们自己的数据，并且能够训练、调整、修剪和导出模型以进行部署。它还拥有简单的接口和抽象API，提高了深度学习训练工作流的效率。

- GPU优化的预训练模型，可用于计算机视觉任务
- 轻松修改配置文件以添加新类并使用自定义数据重新训练模型
- 在异构的多GPU环境中执行模型调整和重新训练
- 使用修剪功能缩小模型尺寸
- 模型导出API，可在具有NVIDIA Tesla和Jetson产品的NVIDIA DeepStream SDK上部署



Computer Vision

People Detection

Detect person, bags and face in crowded spaces such as transport hubs, improve customer experiences, analyze pedestrian foot traffic and more.

VIEW MODELS ›

License Plate Detection & Recognition

Detect and identifies vehicle license plates for various applications including parking enforcement, automated toll booth, traffic monitoring, etc.

VIEW MODELS ›

Vehicle Detection & Classification

Detect type of vehicle or make/model of cars for smart city applications

VIEW MODELS ›

Gaze Estimation

Estimates where a person is looking at with 3d line of sight.

VIEW MODELS ›

Facial Landmark

Detect key landmarks on the face and track them for shape prediction, localizing the face in the image etc.

VIEW MODELS ›

Heart Rate Estimation

Estimates heart rate using Computer vision for applications in healthcare and patient monitoring.

VIEW MODELS ›

Human Gestures and Emotion

Computer vision tasks for detecting various hand gestures and emotion.

VIEW MODELS ›

Segmentation

Identify each instance of multiple objects in a frame at the pixel level.

VIEW MODELS ›

Text Recognition

Recognizes text from an image.

VIEW MODELS ›

Object Detection

Detect one or multiple objects in a frame and place bounding boxes around the object.

VIEW MODELS ›

Image Classification

Easily classify images into designated classes based on the image features. Supported network architectures: ResNet, GoogLeNet, EfficientNet, VGG, DarkNet, MobileNet and CSPDarkNet.

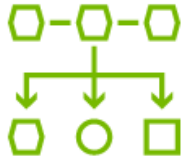
VIEW MODELS ›

Conversational AI

Speech Recognition (ASR)

Automatic speech recognition (ASR) takes human voice as input and converts it into readable text.

VIEW MODELS ›



Natural Language Processing (NLP)

Natural language understanding (NLU) takes text as input, understands context and intent, and uses it to generate an intelligent response.

VIEW MODELS ›

NVIDIA TRANSFER LEARNING TOOLKIT

在指定的公共数据集上训练的图像分类和目标检测模型，可与Transfer Learning Toolkit一起使用。

	Image Classification	Object Detection						Segmentation	
		DetectNet_V2	FasterRCNN	SSD	YOLOV3	YOLOV4	RetinaNet	DSSD	MaskRCNN	UNET
ResNet 10/18/34/50/101	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VGG16/19	✓	✓	✓	✓	✓	✓	✓	✓		✓
GoogLeNet	✓	✓	✓	✓	✓	✓	✓	✓		
MobileNet V1/V2	✓	✓	✓	✓	✓	✓	✓	✓		
SqueezeNet	✓	✓		✓	✓	✓	✓	✓		
DarkNet 19/53	✓	✓	✓	✓	✓	✓	✓	✓		
CSPDarkNet 19/53	✓					✓				
EfficientNet	✓		✓	✓			✓	✓		

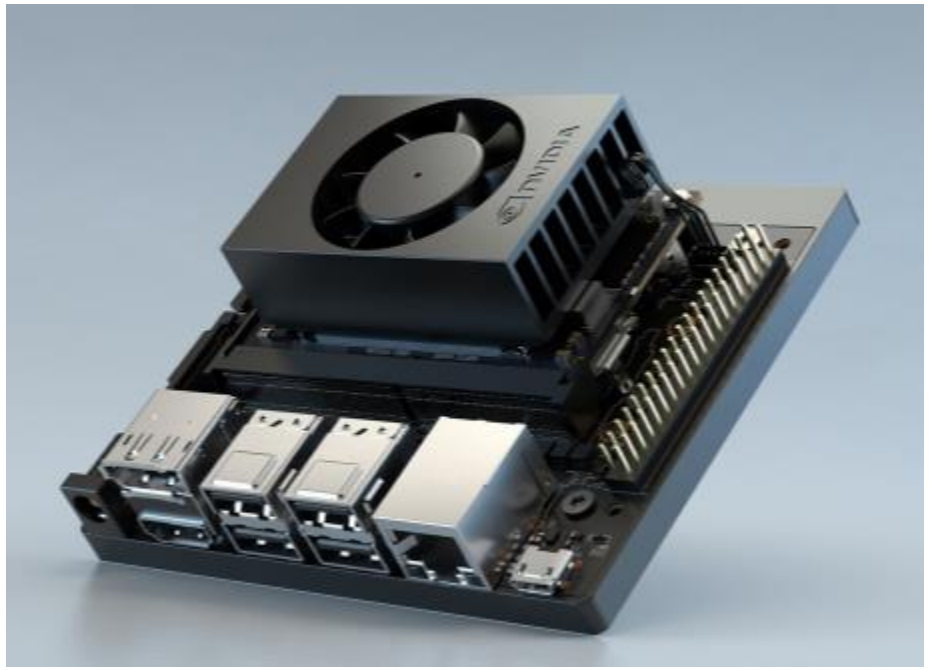
NVIDIA TRANSFER LEARNING TOOLKIT

在指定的公共数据集上训练的图像分类和目标检测模型，可与Transfer Learning Toolkit一起使用。

				Jetson Nano	Jetson Xavier NX			Jetson AGX Xavier			T4	A100
Model Architecture	Inference Resolution	Precision	Model Accuracy	GPU (FPS)*	GPU (FPS)	DLA1 (FPS)	DLA2 (FPS)	GPU (FPS)	DLA1 (FPS)	DLA2 (FPS)	GPU (FPS)	GPU (FPS)
PeopleNet-ResNet34	960x544x3	INT8	84%	11	182	58	58	314	75	75	1043	6001
TrafficCamNet	960x544x3	INT8	84%	19	264	105	105	478	140	140	1703	10054
License Plate Detection	640x480x3	INT8	98%	66	784	194	194	1370	256	256	5921	21931
Facial Landmark	80x80x1	FP16	6.1 pixel error	128	769	-	-	1462	-	-	4795	23117
GazeNet	224x224x1 224x224x1 224x224x1 25x25x1	FP16	6.5 RMSE	104	927	-	-	1654	-	-	5219	26534
GestureNet	160x160x3	FP16	0.85 F1 Score	96	993	-	-	1646	-	-	5660	34086

课程介绍

本次课程实验作者需要以下实验环境:
硬件平台： NVIDIA Xavier NX
软件平台：
NVIDIA Jetpack 4.4
Ubuntu 18.04 L4T
Python 3.6.9
TensorRT 7.1
CUDA 10.2
Tensorflow 1.15
NVIDIA Transfer Learning Toolkit 2.0
Numpy 1.16.1
Opencv 4.1.1
Deepstream 5.0




THANK YOU
NVIDIA