

AI at the Edge with NVIDIA Jetson

Challenge

- > Huge computing capability is required to run AI in Autonomous Logistic Vehicles (ALVs)
- > Perception needs a variety of high-density sensors
- > Low power consumption is critical
- > Low system cost is essential

NVIDIA Solution

- > Strong support for deep-neural-net computing and acceleration
- > Rich inputs and outputs to integrate multiple sensors
- > High power efficiency
- > Fast development time

Results

- > Replaced x86-based system with one Jetson AGX Xavier module
- > Over 10X improvement in AI model performance over x86-based solution
- > Power consumption decreased by 90% compared with x86-based solution
- > Software port from x86-based solution to AGX Xavier took four weeks

CAINIAO ET LAB ADOPTS JETSON AGX XAVIER TO ACCELERATE THE DEVELOPMENT OF AUTONOMOUS LOGISTIC VEHICLES (ALVS)

"Jetson AGX Xavier is the most powerful SoM platform available today. It offers strong computing performance for the localization and perception of autonomous logistics vehicles, and its power consumption is 90 percent less than of x86-based solution."

- Chunhui Zhang, Director of Cainiao ET logistics laboratory.

Cainiao XG—The Autonomous Logistic Vehicle (ALV) by Cainiao ET Lab

The Cainiao XG ALV is designed for the last-mile delivery by Cainiao ET Lab to address increasing package quantities and labor cost. It's equipped with several sensors such as lidars, cameras, GPS, and inertial measurement units (IMUs). The main computing unit, NVIDIA Jetson® AGX Xavier, processes the signals and runs AI models to perceive the surrounding environment, make decisions, and control the vehicle. Initially, Cainiao used an x86-based solution but they switched to a Jetson AGX Xavier because it better met their performance, power, and sensor requirements.

NVIDIA Platform

Jetson AGX Xavier platform provides an easy-to-use, compute-capable and, single-chip module solution for autonomous logistic vehicles. AGX Xavier with the NVIDIA JetPack™ SDK allowed Cainiao to quickly port their algorithms and design from an x86-based solution to the Carmel ARM-based CPU on AGX Xavier. The support of TensorFlow and the powerful NVIDIA® TensorRT™ made it easy for Cainiao to run deep learning models and continuously optimize them through testing, development, and deployment.

Products Used

- > NVIDIA Jetson AGX Xavier
- > NVIDIA Jetson TX2
- > NVIDIA GeForce® GTX1080

Processing Engines Used

- > Gigabit Multimedia Serial Link (GMSL) cameras
- > Video interface controller (VIC)
- > GPU for point cloud processing
- > GPU and deep learning accelerator (DLA) for object detection

Software Used

- > TensorFlow and NVIDIA TensorRT for GPUs and DLA
- > NVIDIA CUDA for GPU acceleration
- > OpenCV for the computing vision system



Cainiao Results

With JetPack, it took Cainiao only four weeks to port their algorithms and design from an x86-based solution to Jetson AGX Xavier. The powerful TensorRTtools increased AI model performance by approximately 10X, allowing Cainiao to run more complicated AI models and achieve better overall system capability. The power-efficient AGX Xavier system-on-module (SoM) provided a longer battery life, yielding a dramatically longer operation time between charges.

Cainiao XG has been deployed in several logistic parks and college campuses, providing last-mile delivery service in Hangzhou, Shanghai, Chengdu, and other major cities in China.

About Cainiao

Cainiao Network Technology Co., Ltd., was founded by an Alibaba-led consortium in May 2013, aiming to establish a data-driven, open, collaborative, and shared socialized logistics platform and smart logistics company. Their platform spans delivery, warehouse, pick-up, rural, and cross-border logistics networks, covering 224 countries and regions globally. Their mission is to realize delivery anywhere in China within 24 hours and across the globe within 72 hours.

Cainiao ET Lab aims at the research and development of cutting-edge technology to empower the logistics sector. Now it's mainly focused on autonomous driving.

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