An Intel® Vision Accelerator Design Product

Mustang-F100-A10

Intel® Vision Accelerator Design with Intel® Arria® 10 FPGA

Accelerate To The Future

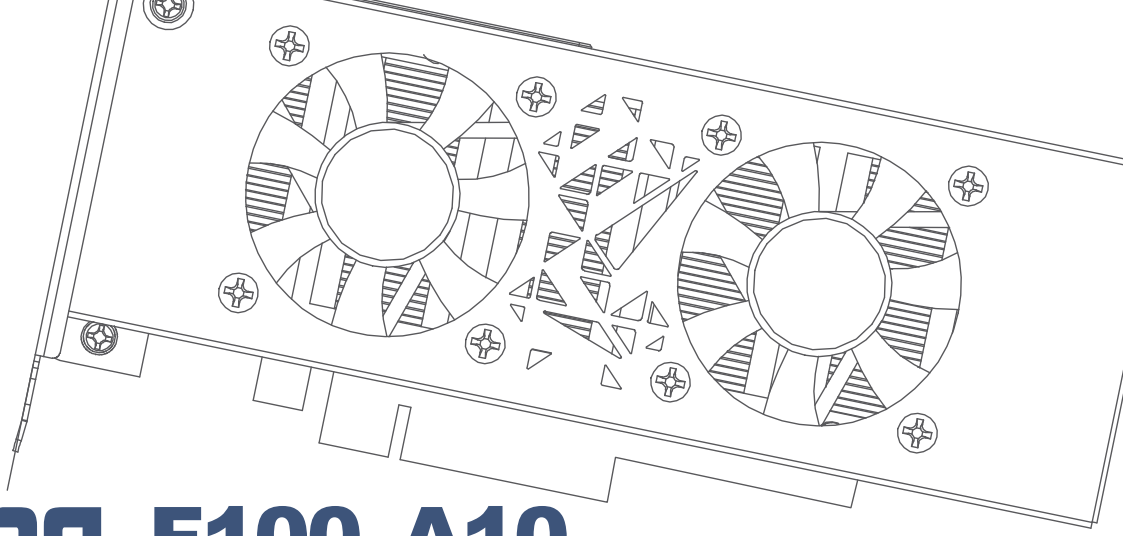
Powered by Open Visual Inference & Neural Network Optimization (OpenVINO™) toolkit

- Ubuntu 16.04.3 LTS 64bit, CentOS 7.4 64bit (Support Windows® 10 in the end of 2018 & more OS are coming soon).
- Supports popular frameworks...such as TensorFlow, MxNet, and CAFFE.
- Easily deploy open source deep learning frameworks via Intel® Deep Learning Deployment Toolkit .
- Provides optimized computer vision libraries to quick handle the computer vision tasks.
- Intel® FPGA DL Acceleration Suite.

A Perfect Choice for AI Deep Learning Inference Workloads

Compact Size | Multiple Cards | Low Power consumption | Low Latency | OpenVINO™ toolkit

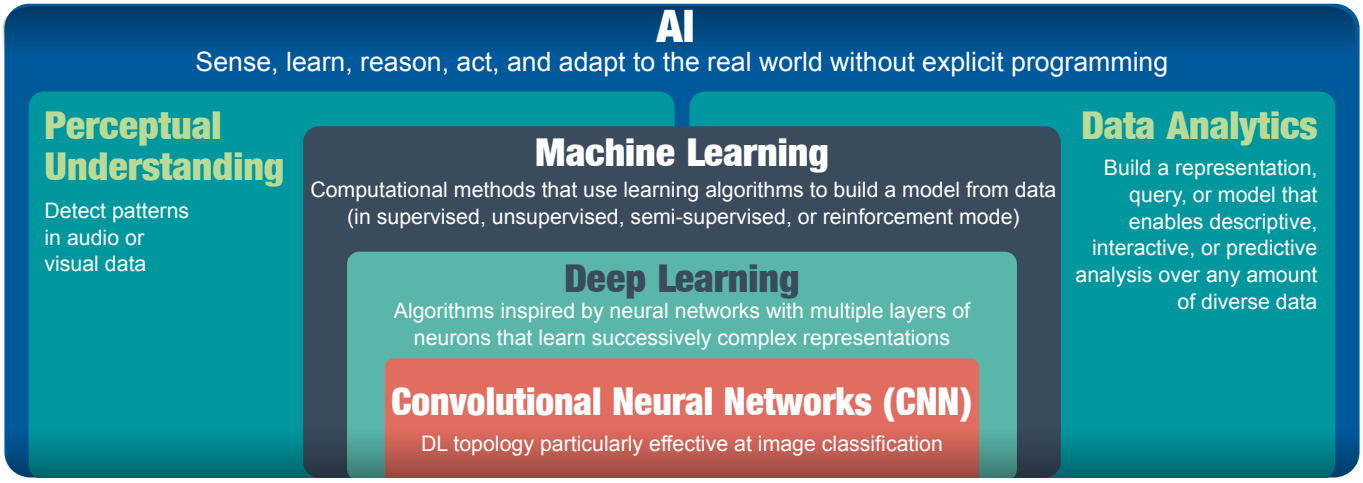
www.ieiworld.com



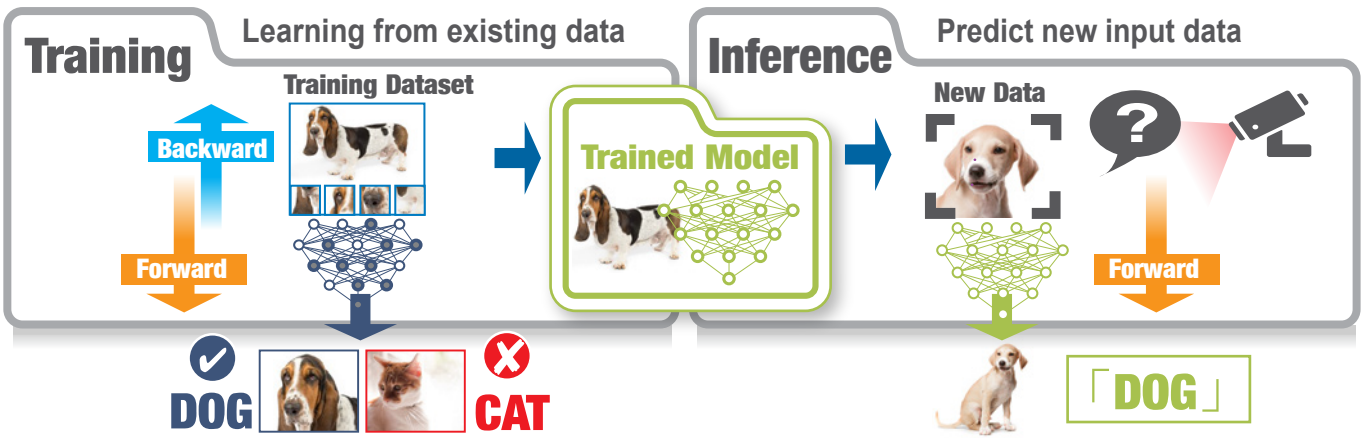
Mustang-F100-A10

Deep learning and inference

Deep learning is part of the machine learning method. It allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction.Deep neural network and recurrent neural network architectures have been used in applications such as object recognition, object detection, feature segmentation, text-to-speech, speech-to-text, translation, etc.In some cases the performance of deep learning algorithms can be even more accurate than human judgement.



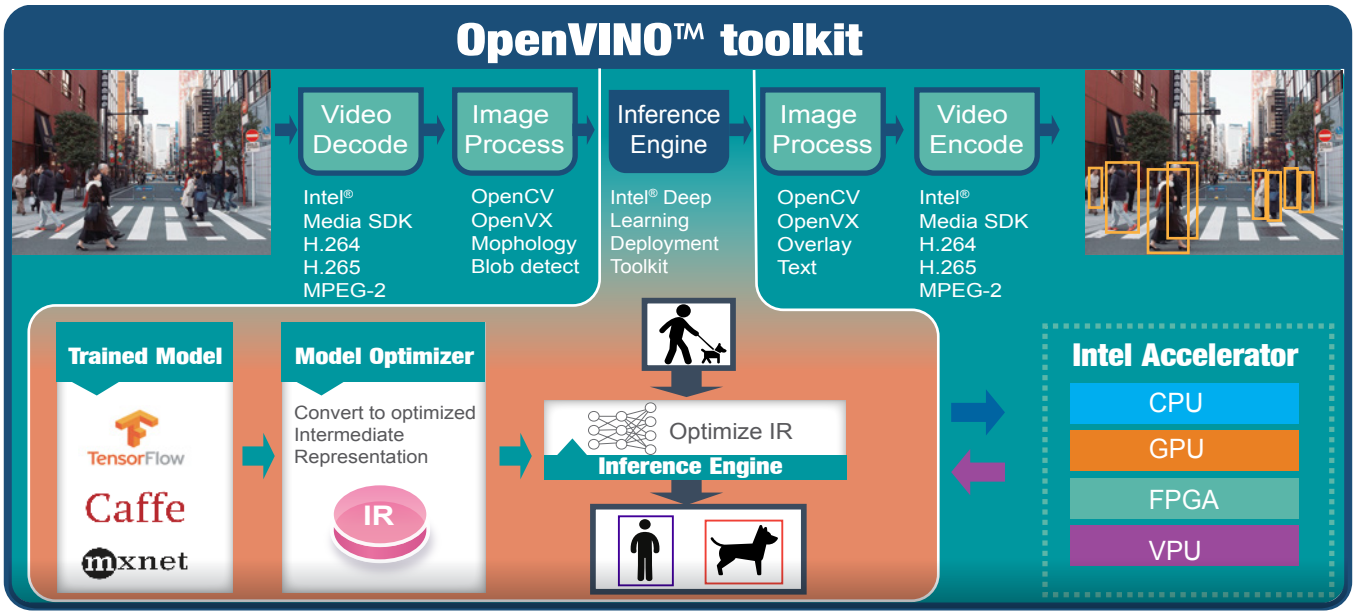
In the past, machine learning required researchers and domain experts knowledge to design filters that extracted the raw data into feature vectors. However, with the contributions of deep learning accelerators and algorithms, trained models can be applied to the raw data, which could be utilized to recognize new input data in inference.



OpenVINO™ toolkit

Open Visual Inference & Neural Network Optimization (OpenVINO™) toolkit is based on convolutional neural networks (CNN), the toolkit extends workloads across Intel® hardware and maximizes performance.

It can optimize pre-trained deep learning model such as Caffe, MXNET, Tensorflow into IR binary file then execute the inference engine across Intel®-hardware heterogeneously such as CPU, GPU, Intel® Movidius™ Neural Compute Stick, and FPGA.



IEI Mustang-F100-A10

In AI applications, training models are just half of the whole story. Designing a real-time edge device is a crucial task for today's deep learning applications.

FPGA is short for field programmable gate array. It can run AI faster, and is well suited for real-time applications such as surveillance, retail, medical, and machine vision. With the advantage of low power consumption, it is perfect to be implemented in AI edge computing device to reduce total power usage, providing longer duty time for the rechargeable edge computing equipment. AI applications at the edge must be able to make judgements without relying on processing in the cloud due to bandwidth constraints, and data privacy concerns.Therefore, how to resolve AI task locally is becoming more important.

In the era of AI explosion, various computations rely on server or device which needs larger space and power budget to install accelerators to ensure enough computing performance.

In the past, solution providers have been upgrading hardware architecture to support modern applications, but this has not addressed the question on minimizing physical space. However, space may still be limited if the task cannot be processed on the edge device.

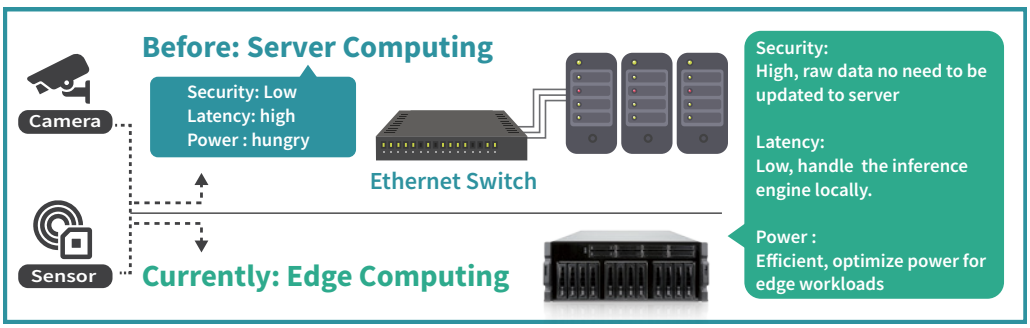
We are pleased to announce the launch of the Mustang-F100-A10, a small form factor, low power consumption, and low-latency. FPGA base AI edge computing solution compatible with IEI TANK-870AI compact IPC for those with limited space and power budget.

Mustang-F100-A10 AI Application Ready Edge Computing

- High Flexibility: FPGAs can offer reprogrammability that allows developers to implement algorithm in different applications to achieve optimized solution.
- Compact: The conventional accelerator have large form factor which is the drawback for compact edge systems.
- Low-latency.: Algorithms implemented into FPGA provide deterministic timing which is well suited for real-time applications.
- Low Power Consumption: Compared to CPU or GPU, FPGA power consumption is extremely efficient, and this feature is a great advantage in edge computing.

Edge Computing

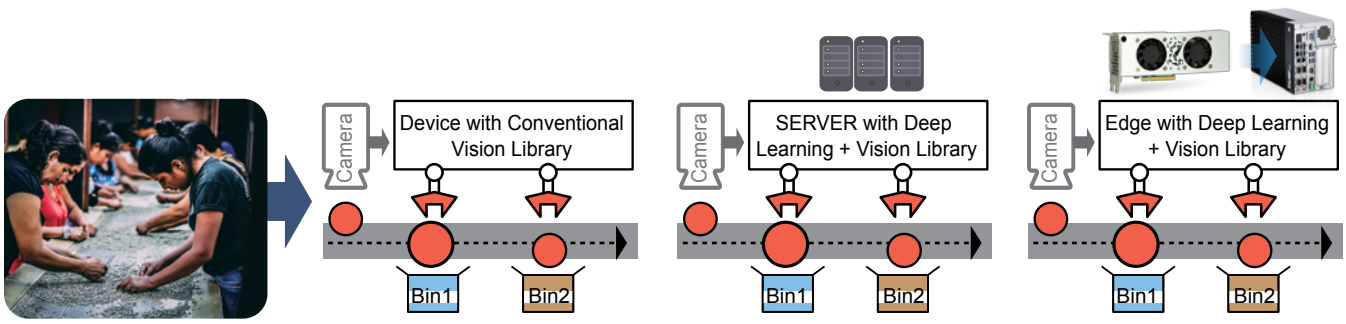
Wikipedia defines Edge Computing as “pushing the frontier of computing applications, data, and services away from centralized nodes to the logical extremes of a network.” Today, most of AI technology still rely on the data center to execute the inference, which will increase the risk of real-time application for applications such as traffic monitoring, security CCTV, etc. Therefore, it’s crucial to implement a low-latency. real-time edge computing platform.

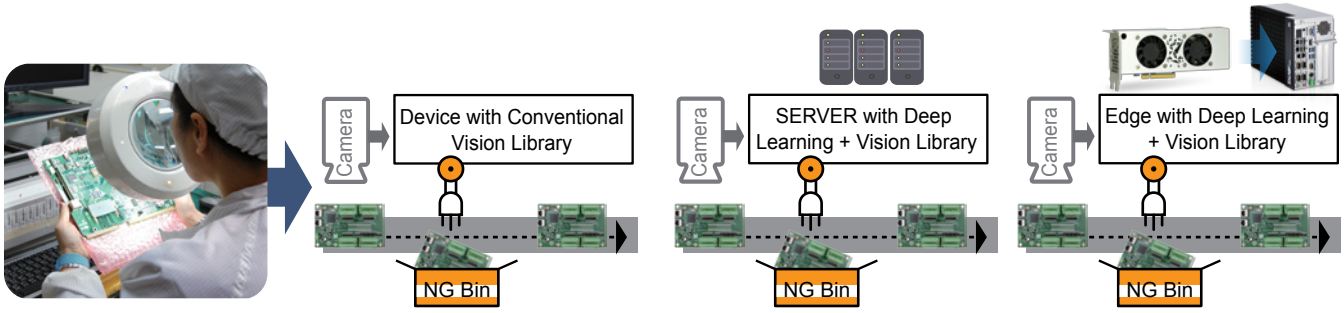


The advantages of edge computing:

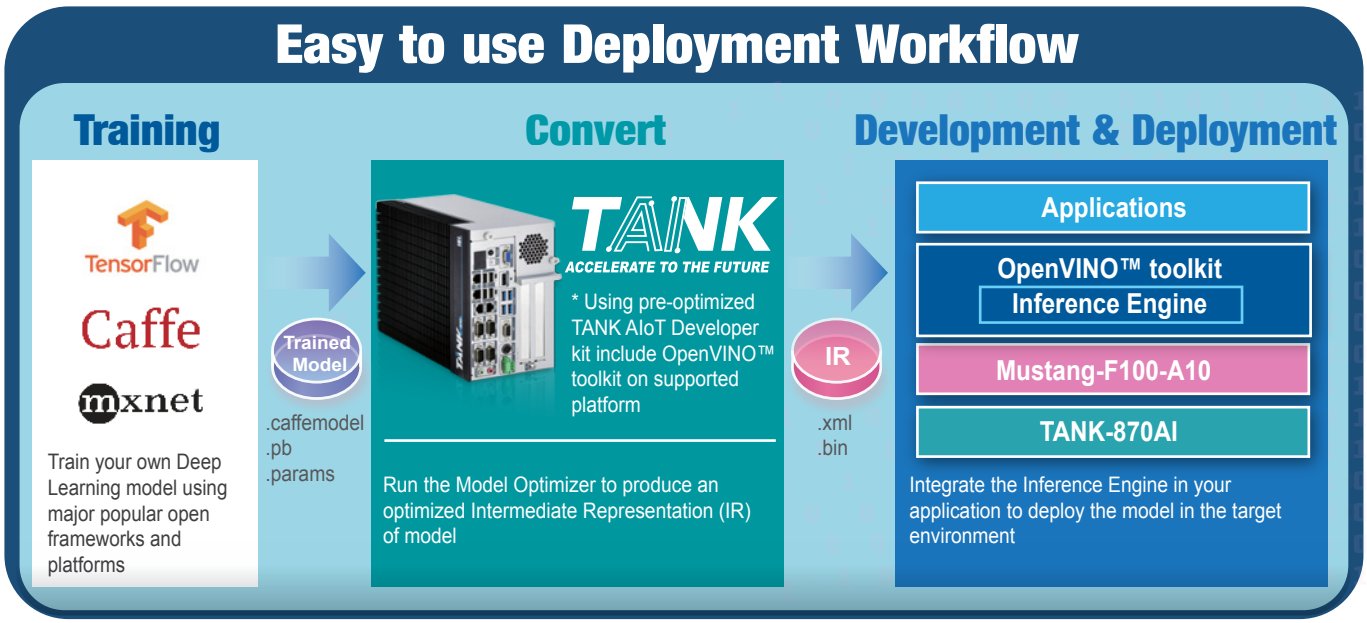
- Reduce data center loading, transmit less data, reduce network traffic bottlenecks.
- Real-time applications, the data is analyzed locally, no need long distant data center.
- Lower costs, no need to implement sever grade machine to achieve non complex applications.

Human Sorting	Machine Vision	Deep Learning Server	Deep learning Edge
Sorting by human bare-eyes, the standard can not fix due to different person. Low accuracy, low productivity	Training and sorting by conventional machine vision method,need well-trained engineer to teach and modify the inspection criteria. Low latency, but low accuracy if product has too much variations.	Implement deep learning method for training and sorting, reduce human bias and machine vision training process. High CTO, high latency, power hungry, high power consumption	Implement deep learning method for training and sorting, reduce human bias and machine vision training process. Low latency, low CTO, power efficiency, low power consumption





Software



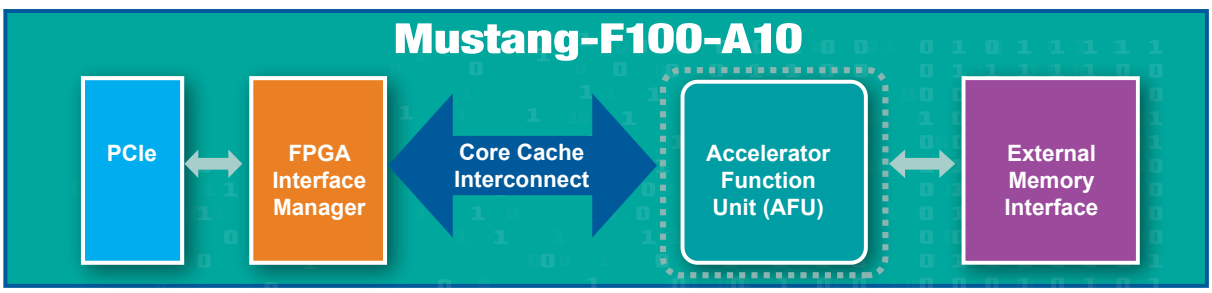
Mustang-F100-A10 Software

- Operating Systems
  Ubuntu 16.04.3 LTS 64bit, CentOS 7.4 64bit
  (Support Windows 10 in the end of 2018 & more OS are coming soon)

- OpenVINO™ toolkit
  – Intel® Deep Learning Deployment Toolkit
    - Model Optimizer
    - Inference Engine
  – Optimized computer vision libraries
  – Intel® Media SDK
  – *OpenCL™ graphics drivers and runtimes.
  – Current Supported Topologies: AlexNet, GoogleNet, Tiny Yolo, LeNet, SqueezeNet, VGG16, ResNet (more variants are coming soon)
  – Intel® FPGA Deep Learning Acceleration Suite

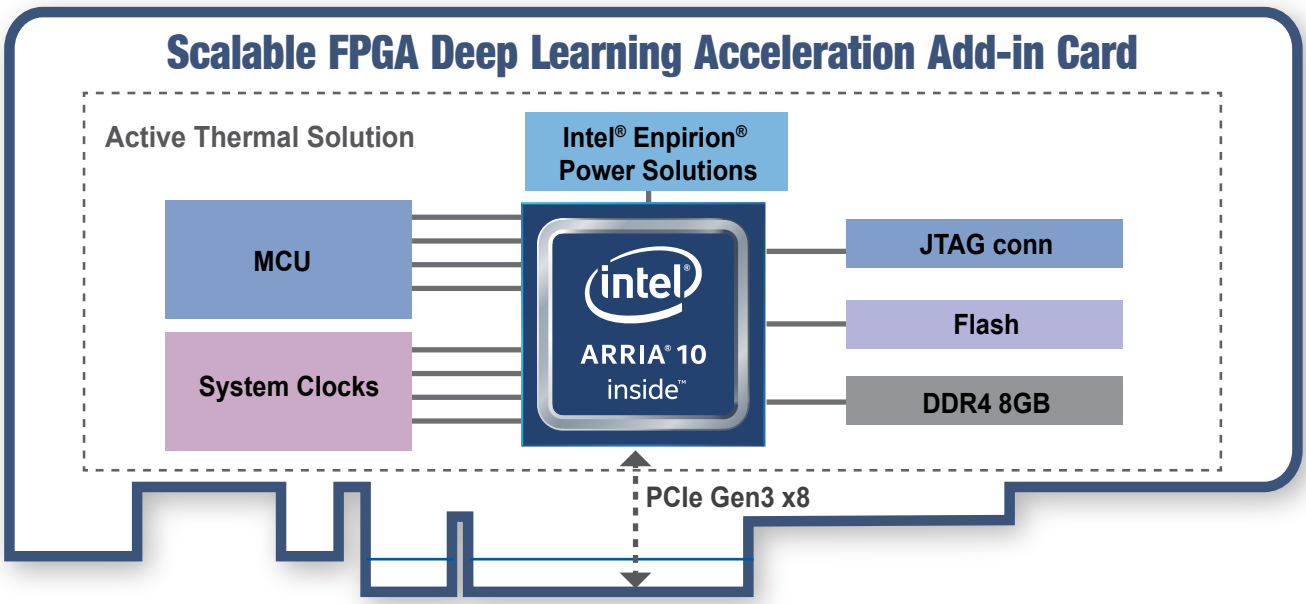
- High flexibility, Mustang-F100-A10 develop on OpenVINO™ toolkit structure which allows trained data such as Caffe, TensorFlow, and MXNet to execute on it after convert to optimized IR.

*OpenCL™ is the trademark of Apple Inc. used by permission by Khronos



***AFU could be compiled via FPGA Runtime Environment. Therefore, it could be optimized for different applications such as LPR, face recognition…etc.**

Hardware

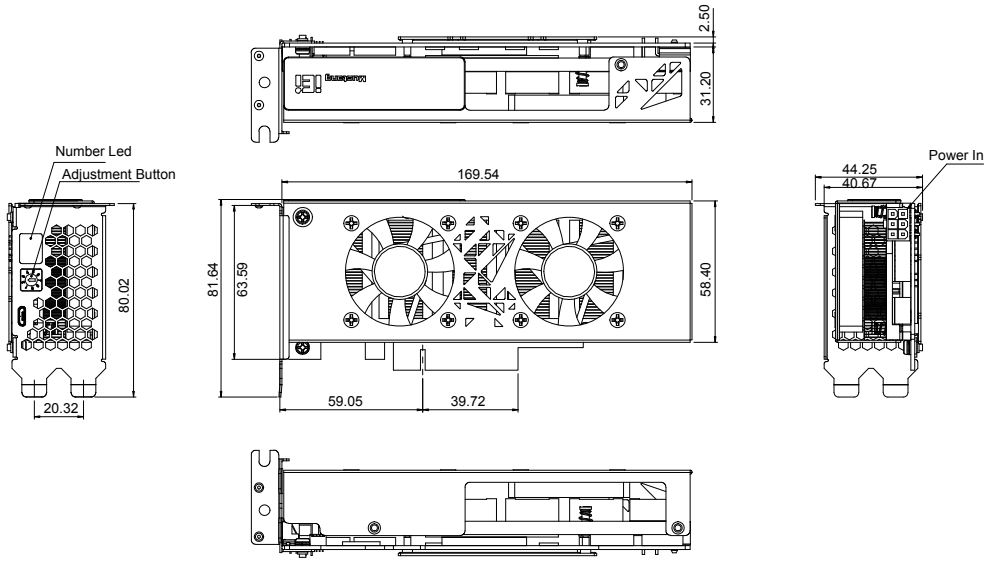


Mustang-F100-A10 Block Diagram

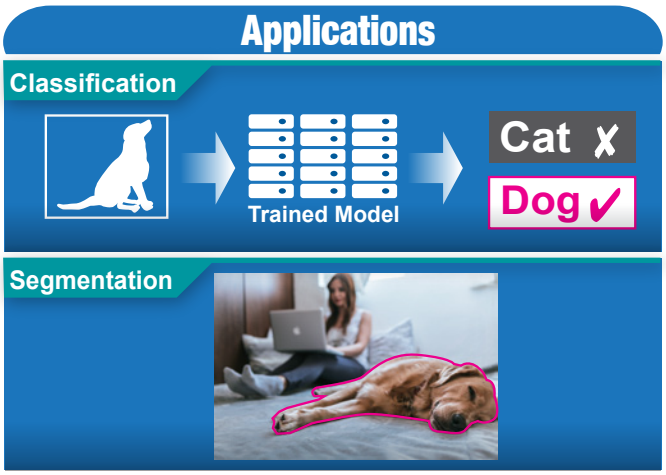
- Intel® Arria® 10 1150 GX FPGAs delivering up to 1.5 TFLOPs
- Interface: PCIe Gen3 x 8
- Form Factor: Standard Half-Height, Half-Length, Double-slot
- Cooling: Active fan.
- Operation Temperature : 5°C~60°C(ambient temperature)
- Operation Humidity : 5% to 90% relative humidity
- Power Consumption: < 60W
- Power Connector: *Preserved PCIe 6-pin 12V external power
- DIP Switch/LED Indicator: Identify card number.
- Voltage Regulator and Power Supply: Intel® Enpirion® Power Solutions

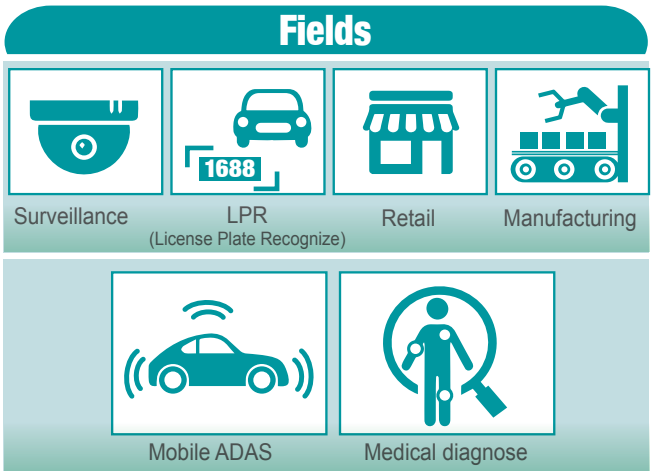
*Standard PCIe slot provides 75W power, this feature is preserved for user in case of different system configuration.

Dimensions (Unit: mm)



Applications





		TS-X77 with GPU	GRANG-C422 with GPU	TANK-870AI with Mustang-F100-A10	TANK-870AI with Mustang-V100-MX8
Applications	Inference Training	O	O		
	Inference Engine	O	O	O	O
	Image Classification	O	O	O	O
	Image Segementation	O	O	O	
Features	Energy Efficent			O	O
	Low-latency.			O	O
	Compact Size			O	O

Surveillance

• Traffic

The Mustang-F100-A10 edge computing device can be utilized to capture data and send traffic to a control center to optimize a traffic light system. It can also perform license plate recognition (LPR) to help law enforcement if vehicles break traffic laws or help parking services identify available parking spaces to assist drivers in congested urban areas.

• Security

With the algorithms developed using the Mustang-F100-A10 edge device, trained deep neural networks now have inference capabilities to identify suspicious persons to alert law enforcement or for security departments to early warning scenarios.

Traffic management

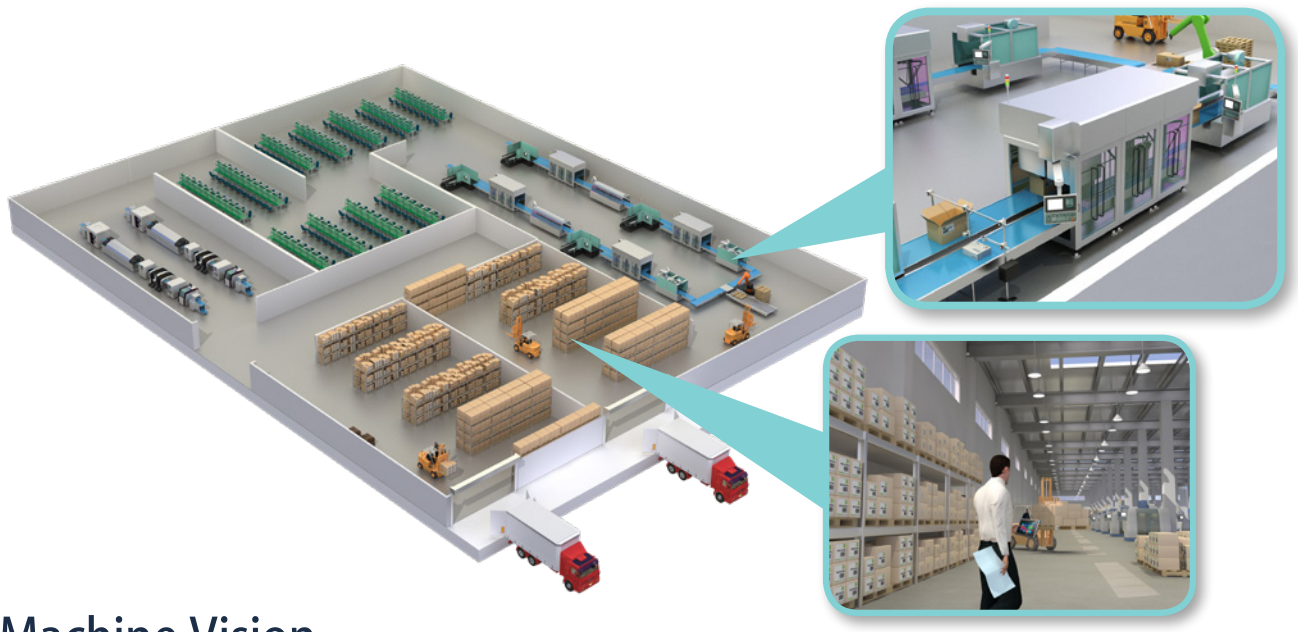
LPR

Face Recognition

Industrial Manufacturing

• Industrial automation

Mustang-F100-A10 solutions help enable intelligent factories to be more efficient on work order schedule arrangements.In today's production line, sticking to manufacturing schedules is becoming more and more important for business efficiency. From raw material storage to fabrication and complete products, all information from factory such as manufacturing equipment process time and warehouse storage status are essential to achieve production goals. Solutions based on AI technology can produce more detailed, accurate, and meaningful digital models of equipment and processes for product management.



• Machine Vision

Implementing AI into machine vision makes smart-automation applications easier. Previously, factory AOI needed sophisticated engineers to fine tune inspection parameters such as length, width, diameters and many other specifications that required many adjustments.

The Mustang-F100-A10 powered using AI technologies supports workloads such as defect detection and quality control to improve production yield.

Retail

• Smart Retail

Using the Mustang-F100-A10 for computer vision solutions at the edge of retail sites can quickly recognize the gender and age of the customers and provide relevant product information through digital signage display to improve product sales and inventory control. Self-checkout can reduce human resource cost so that retail owners can spend more resources on promoting products and understanding business patterns.

In addition, it can help to analyze customer's in-store behavior, and provide customer information based on gender and age to facilitate product positioning. Quickly converting the business intelligence gained and help build better business practices and increase profitability.

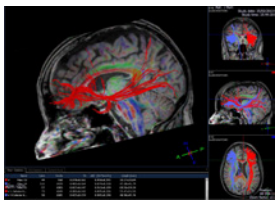
Self-checkout

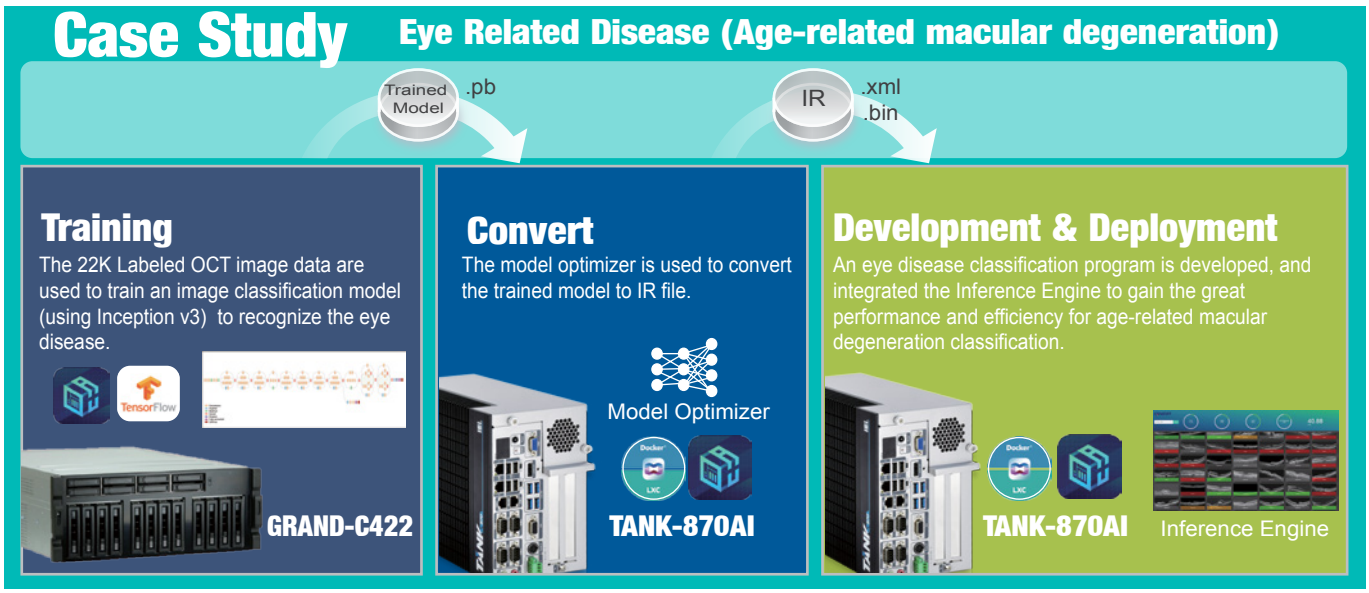
Smart Retail


Interactive digital signage

• Medical Diagnostics

With AI based technology, healthcare and medical centers can diagnose, locate and identify suspicious areas such as tumors and other abnormalities more quickly and accurately. Using segmentation technology and trained models on the Mustang-F100-A10 can be used to locate and identify abnormalities with a high degree of accuracy helping doctors and researchers quickly serve the patient.





Mustang-F100-A10

Feature

- Half-Height, Half-Length, Double-slot.
- Power-efficiency, low-latency.
- Supported OpenVINO™ toolkit, AI edge computing ready device.
- FPGAs can be optimized for different deep learning tasks.
- Intel® FPGAs supports multiple float-points and inference workloads.

Specifications

Model Name	Mustang-F100-A10
Main FPGA	Intel® Arria® 10 GX1150 FPGA
Operating Systems	Ubuntu 16.04.3 LTS 64-bit, CentOS 7.4 64-bit (Support Windows® 10 in the end of 2018 & more OS are coming soon)
Voltage Regulator and Power Supply	Intel® Enpirion® Power Solutions
Memory	8G on board DDR4
Dataplane Interface	PCI Express x8
	Compliant with PCI Express Specification V3.0
Power Consumption	<60W
Operating Temperature	5°C~60°C (ambient temperature)
Cooling	Active fan
Dimensions	Standard Half-Height, Half-Length, Double-slot
Operating Humidity	5% ~ 90%
Power Connector	*Preserved PCIe 6-pin 12V external power
Dip Switch/LED indicator	Identify card number

*Standard PCIe slot provides 75W power, this feature is preserved for user in case of different system configuration.

Packing List

1 X Full height bracket
1 x External power cable
1 x QIG

Ordering Information

Part No.	Description
Mustang-F100-A10-R10	PCIe FPGA Highest Performance Accelerator Card with Arria 10 1150GX support DDR4 2400Hz 8GB, PCIe Gen3 x8 interface

IEI Tank AIoT Development Kit

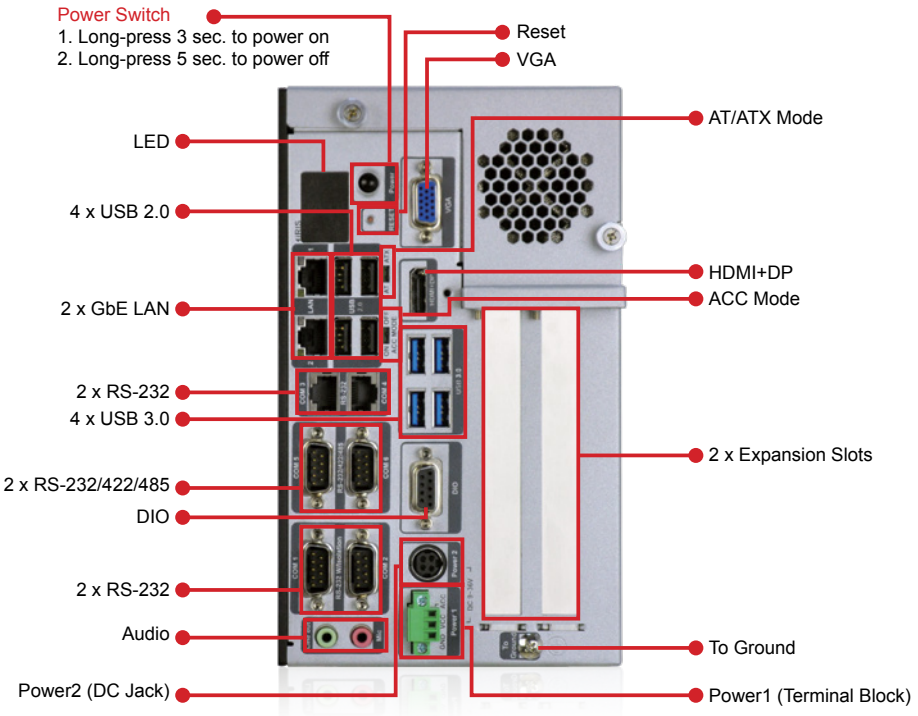
Feature

- 6th/7th Gen Intel® Core™ processor platform with Intel® Q170/C236 chipset and DDR4 memory
- Dual independent display with high resolution support
- Rich high-speed I/O interfaces on one side for easy installation
- On-board internal power connector for providing power to add-on cards
- Great flexibility for hardware expansion
- Support Open Visual Inference & Neural Network Optimization (OpenVINO™) toolkit
- Support Ubuntu 16.04 LTS

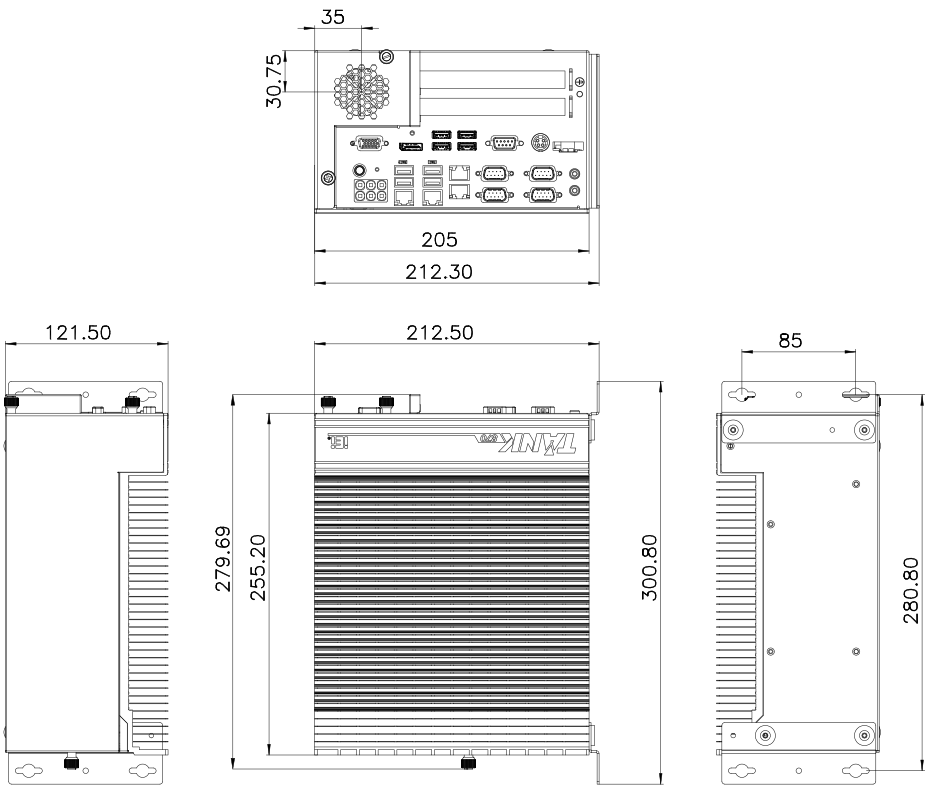
Specifications

Model Name		TANK AIoT Dev. Kit
Chassis	Color	Black C + Silver
	Dimensions (WxHxD) (mm)	121.5 x 255.2 x 205 mm (4.7" x 10" x 8")
	System Fan	Fan
	Chassis Construction	Extruded aluminum alloys
	Weight (Net/Gross)	4.2 kg (9.26 lbs)/ 6.3 kg (13.89 lbs)
Motherboard	CPU	Intel® Xeon® E3-1268LV5 2.4GHz (up to 3.4 GHz, Quad Core, TDP 35W) Intel® Core™ i7-7700T 2.9GHz (up to 3.8 GHz, Quad Core, TDP 35W) Intel® Core™ i5-7500T 2.7GHz (up to 3.3 GHz, Quad Core, TDP 35W) Intel® Core™ i7-6700TE 2.4 GHz (up to 3.4GHz, quad-core, TDP=35W) Intel® Core™ i5-6500TE 2.3 GHz (up to 3.3GHz, quad-core, TDP=35W)
	Chipset	Intel® Q170/C236 with Xeon® E3 only
	System Memory	2 x 260-pin DDR4 SO-DIMM, 8 GB pre-installed (for i5/i5KBL/i7 sku) 16 GB pre-installed (for i7KBL sku) 32 GB pre-installed (for E3 sku)
Storage	Hard Drive	2 x 2.5'' SATA 6Gb/s HDD/SSD bay, RAID 0/1 support (1x 2.5" 1TB HDD pre-installed)
I/O Interfaces	USB 3.0	4
	USB 2.0	4
	Ethernet	2 x RJ-45 LAN1: Intel® I219LM PCIe controller with Intel® vPro™ support LAN2 (iRIS): Intel® I210 PCIe controller
	COM Port	4 x RS-232 (2 x RJ-45, 2 x DB-9 w/2.5KV isolation protection) 2 x RS-232/422/485 (DB-9)
	Digital I/O	8-bit digital I/O, 4-bit input / 4-bit output
	Display	1 x VGA 1 x HDMI/DP 1 x iDP (optional)
	Resolution	VGA: Up to 1920 x 1200@60Hz HDMI/DP: Up to 4096×2304@24Hz / 4096×2304@60Hz
	Audio	1 x Line-out, 1 x Mic-in
	TPM	1x Infineon TPM 2.0 Module
Expansions	Backplane	2 x PCIe x8
	PCIe Mini	1 x Half-size PCIe Mini slot 1 x Full-size PCIe Mini slot (supports mSATA, colay with SATA)
Power	Power Input	DC Jack: 9 V~36 V DC Terminal Block: 9 V~36 V DC
	Power Consumption	19 V@3.68 A (Intel® Core™ i7-6700TE with 8 GB memory)
	Internal Power output	5V@3A or 12V@3A
Reliability	Mounting	Wall mount
	Operating Temperature	Xeon® E3 -20°C ~ 60°C with air flow (SSD), 10% ~ 95%, non-condensing i7-7700T -20°C ~ 35°C with air flow (SSD), 10% ~ 95%, non-condensing i5-7500T -20°C ~ 45°C with air flow (SSD), 10% ~ 95%, non-condensing i7-6700TE -20°C ~ 45°C with air flow (SSD), 10% ~ 95%, non-condensing i5-6500TE -20°C ~ 60°C with air flow (SSD), 10% ~ 95%, non-condensing
	Operating Vibration	MIL-STD-810G 514.6 C-1 (with SSD)
	Safety/EMC	CE/FCC/RoHS
OS	Supported OS	Linux Ubuntu 16.04 LTS

Fully Integrated I/O



Dimensions (Unit: mm)



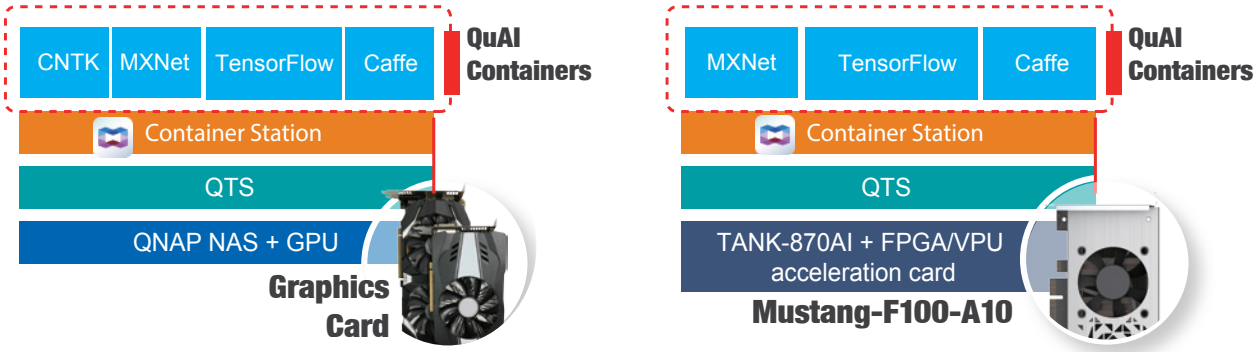
QNAP QuAI

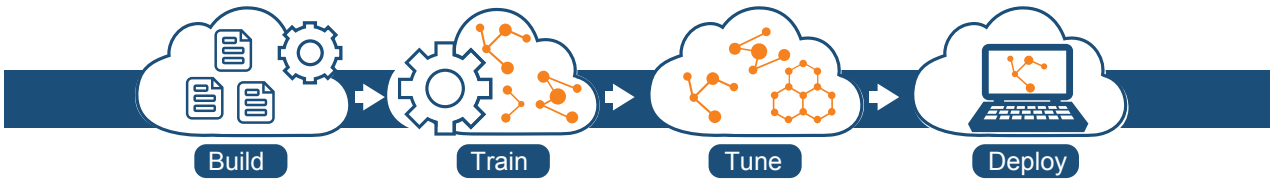
QNAP Systems, Inc. is a wholly owned subsidiary under IEI Group.which specializes in providing networked solutions for file sharing, virtualization, storage management and surveillance applications. QNAP implements deep learning method into its main product Network-Attached Storage (NAS) to enable more AI applications.

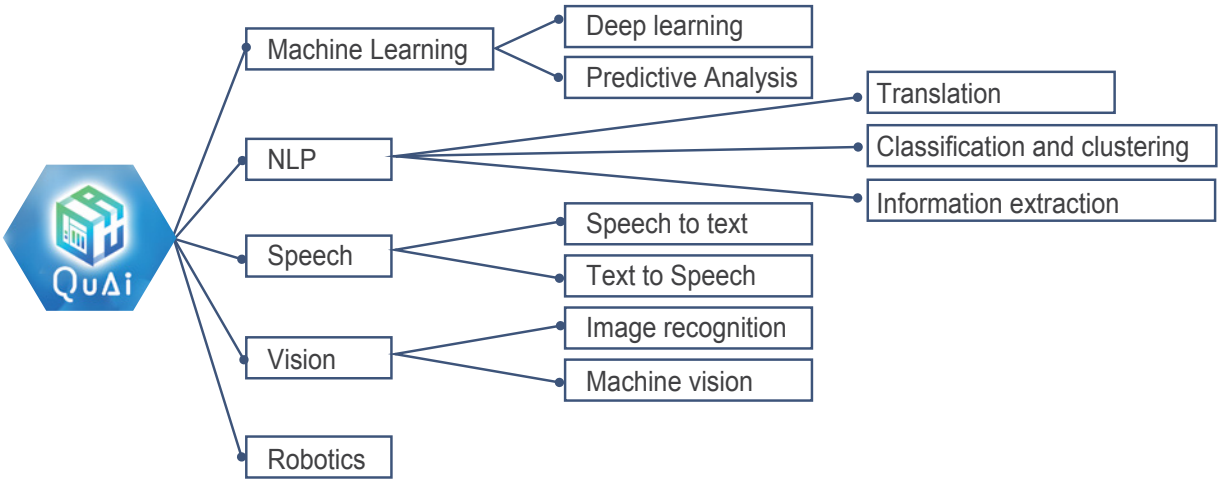
QNAP QuAI enables data scientists and developers to quickly build, train, optimize, and deploy machine-learning models with high-performance machine-learning algorithms that come with a wide range of supported AI frameworks.

QuAI is an integrated platform to empower your AI-related computing needs. QNAP NAS now supports graphics cards, Intel FPGA acceleration card, and Intel VPU acceleration card; from training to edge computing, it provides additional computational power and end-to-end solution to help run your tasks more efficiently. On top of that, software enhancements are also provided to help you deploy your solutions faster than ever.

Major frameworks and libraries are supported through Container Station (1.8 and later), such as Caffe, MXNet, TensorFlow, CNTK and NVIDIA CUDA. You can easily migrate existing containerized solutions to the QuAI platform, or start a new one with QuAI, to fully realize benefits of cognitive technologies.







2018

*Specifications are subject to change without prior notice.

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2018.10