

# Edge AI Solutions

Empowering AI at the Edge

- ✓ Why Edge AI
- ✓ Solution Offerings
- ✓ Software & Toolkit
- ✓ Application Stories
- ✓ Selection Guide



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## IoT Paradigm Shift:

# AI at the Edge

AI is transforming industries like manufacturing, retail, transportation, medical and more. It is moving towards edge computing to enable real-time decision making without the limitations of latency, cost, bandwidth, and power consumption. According to ABI research, 43% share of AI tasks will take place on edge devices instead of cloud in 2023.



### Real-time Intelligence

Eliminating round trips to the cloud  
minimizes data latency

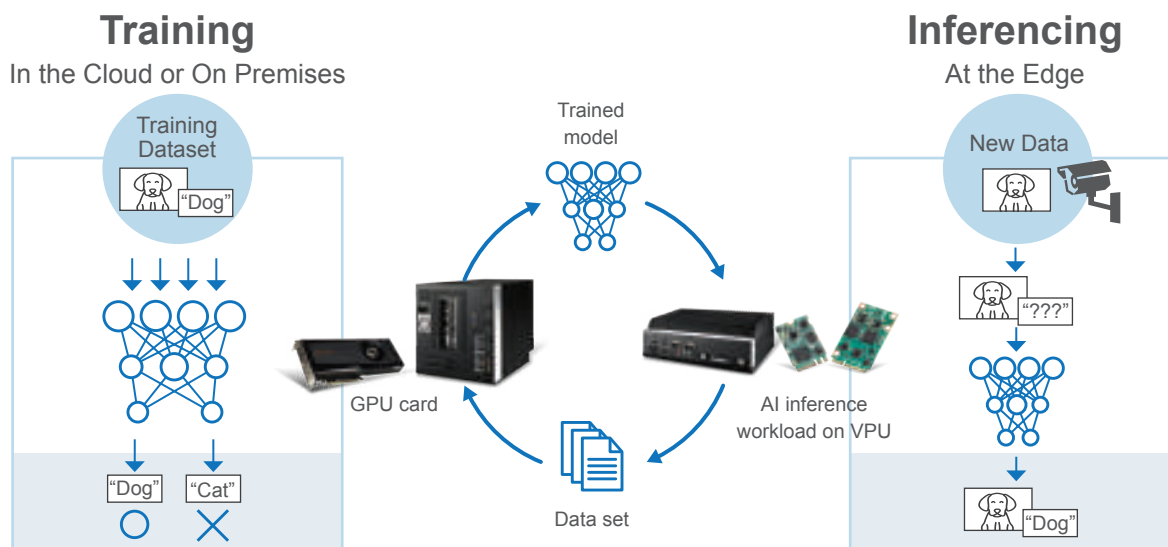


### Security & Privacy

Improves security by reducing data  
transmissions and storage in the cloud

## Why Vision Based AI

- High accuracy rate just like human
- Incredible processing speed
- Can easily inspect object details too small to be seen by the human eye
- Able to mimic human intelligence with tolerance of natural variations

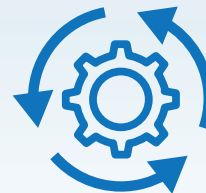






### Bandwidth Efficiency

IoT devices are designed for user mobility and minimal bandwidth usage



### Optimized Solutions

Lower data transmission costs and power consumption with optimized solutions

## AI Inferencing at the Edge



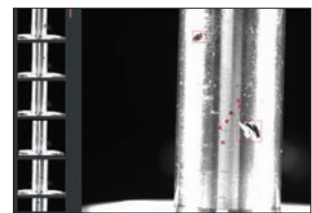
Traffic Monitoring



Drone/AGV



Retail Security



Defect Inspection

## Edge Inference with VPU Acceleration

There are many approaches for applying AI inference to the edge. In practice, the best approach is to use the same edge device that collects data. By applying additional VPU to the edge device, real-time inferencing and vision task can be efficiently executed on the VPU, freeing the CPU and GPU to handle other important tasks.

## Intel® Myriad X MA 2485 Performance Benchmark

The higher the throughput (FPS) the better

	1 x MA2485	8 x MA2485	Core i3 8100T	Core i7 8700T	Xeon Gold 5218
mobilenet-ssd	57	452	290	352	1842
inception-resnet-v2	7	59	22	41	253
googlenet-v1	89	716	147	283	1515
resnet-50	35	268	85	158	993

# Advantech Edge AI Solutions

To help customers jumpstart AI deployment and realize its full potential, Advantech has developed integrated hardware and software solutions that support AI from the cloud to the edge. Our solutions combine a high-performance AI engine with optimized industrial-grade software to enable deep learning for diverse applications such as drone and AGV control, retail management, medical imaging, and traffic monitoring.

## Applications

License Plate  
Recognition

Vehicle  
Classification

Robot  
Vision

Facial  
Recognition

## Training

# AI

## Inference

### On-Premise Training



Training Server

#### Training & Modeling

intel Deep Learning Suite



#### Enterprise Services



kubernetes

docker

### Supported Frameworks



### Model Deployment



OpenVINO™



Pretrained  
Model



Deployment  
Wizard



3rd Party  
SDK

### Docker Container

### Acceleration Modules



VEGA-320  
M.2+Ekey



VEGA-330  
MiniPCle



VEGA-340  
PClex4

### Inference



AIR-100  
4K Multi-display



AIR-101  
Din-Rail

## AI Acceleration Modules

### VEGA-300



VEGA-300 AI modules are low-power plug-in modules in various form factors, including M.2, mini PCIe, and PCIe x4, that can be easily integrated into existing systems to reduce CPU load.

## Edge AI Inference Systems

### AIR-100/101/200





People  
Counting

Behavior  
Detection

Path  
Planning

### Cloud Training



- Unified AI Platform
- Model Management
- Cross Clouds Support

Caffe

ONNX

mxnet

### Device Management

WISE-PaaS/DeviceOn



Device  
Management



Monitoring &  
Control



Update  
Management



Alert &  
Action

(Ubuntu, Win10)

### Systems



AIR-200  
Rugged



AIR-300  
High Performance

### Industrial App



Facial Recognition

Powered by:



IoT Solutions  
Alliance  
Premier



## Edge AI Training/Inference Systems

### AIR-300

The AIR-100/101/200 series are low-power edge AI inference systems equipped with VEGA AI inference acceleration modules and are ideal for embedded applications in the factory, retail, and transportation sectors.



The AIR-300 series offer powerful server-grade performance and can serve as either training or inference systems to accelerate deep-learning operations.

# Edge AI Suite

Advantech has developed its Edge AI Suite to enable accelerated deep-learning inference on edge devices. Integrated with Intel's Distribution of OpenVINO™ toolkit, the Edge AI Suite provides a deep-learning model optimizer, inference engine, pre-trained models, as well as a user-friendly GUI toolkit. Customers can use Python-based tools to quickly import their existing Caffe, TensorFlow, Onnx, and MXNet trained models and deploy them to edge devices. The Edge AI Suite also integrates the system VPU/CPU/memory for real-time status monitoring and performance benchmarking.

## Features



### OpenVINO Toolkit

- OpenVINO R3.1 integrated
- Boosted inference performance
- Heterogeneous executions across CPU/VPU/GPU to optimize workloads



### Pre-Trained Models

- Rapid object detection (YOLOv3)
- Facial recognition
- Human pose estimation

Source: Open Model Zoo & Advantech



### Deployment Wizard

- Quick start tutorial
- Supports various deep learning frameworks
- CPU/VPU/Memory monitoring



### Third-Party AI SDK

- Facial recognition
- Vehicle classification
- License plate recognition

(available upon request)

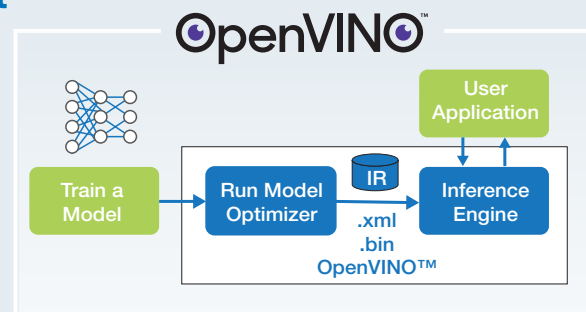
## Supported Frameworks:



## Intel® Distribution of OpenVINO™ Toolkit

Based on convolutional neural networks (CNNs), the Intel® Distribution of OpenVINO™ toolkit extends workloads across hardware and maximizes performance.

- High inference performance with optimized workloads
- Supports parallel and heterogeneous inferencing across CPU/ VPU/ GPU
- Supports 10th Gen Intel processors
- Includes optimized calls for OpenCV and OpenVX





## Function Highlights



### Quick Start

- Visualized operations
- Real-time and stored video analytics
- Supports Intel CPU/GPU/VPU accelerations



### Inference Engine/ Application

- Matching and auto-labeling technologies integrated
- Performance index
- Source code provision



### System Monitoring

- Visualized dashboard
- Benchmark evaluation
- CPU/GPU and memory status



### Model Launcher

- Leverages OpenVINO model optimization
- Supports various model frameworks
- Model conversion parameter and sample codes offered



## FaceView AI Facial Recognition Industrial App

Leveraging an industry-leading inference engine powered by CyberLink, Advantech's FaceView application provides precise, and scalable real-time facial recognition for various AIoT applications in the retail, hospitality, and public safety fields. Advantech also provides an easy-to-integrate SDK for rapid integration with existing systems using APIs.

- Real-time identification with 99.85% accuracy and advanced image pre-processing
- VIP and watchlist management
- Alert notifications
- Plug & play interface for rapid integration



# Application Stories

## AI-Powered Smart Street Lights

Cities are illuminated by thousands of street lights that help drivers and pedestrians find their way home safely. Equipped with AI technology, street lights can be used to not only light up roads, but also support city services such as air quality, humidity, and temperature monitoring, as well as traffic and parking management.

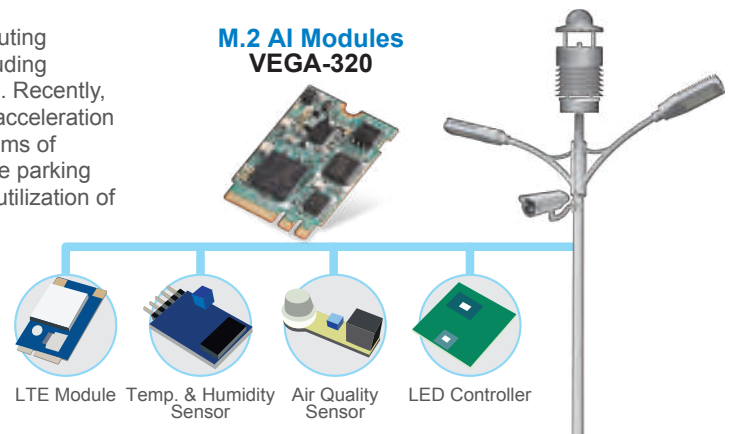


### Solution

The customer had already implemented Advantech's edge computing platform to serve as a gateway computer for collecting data, including temperature and humidity levels, to facilitate operational analysis. Recently, the platform was upgraded with Advantech's VEGA-320 edge AI acceleration modules embedded into the cameras for analyzing multiple streams of video data and handling real-time tasks such as locating available parking spaces. The customer estimated that this solution increases the utilization of roadside parking by at least 10% to 15%.

### Key Benefit

- Compact, low-power design with minimal installation effort
- Video analysis at the edge for instant response
- Saves bandwidth resources and costs



## AI-Based AGV Navigation

Automated guided vehicles (AGV) are used to transport and handle goods predictably and reliably. With the integration of AI-based navigation, the optimal route is determined in real time, effectively increasing the runtime efficiency of AGVs for faster and smarter operations.

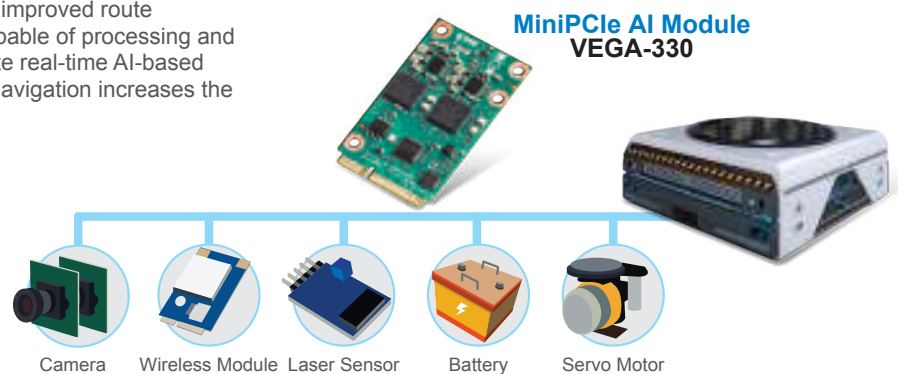


### Solution

For vision-guided AGVs equipped with cameras, Advantech's VEGA-330 edge AI acceleration mini-PCIe module acts as a vision analytics engine, optimizing image processing and local inference for improved route planning and collision avoidance. This module is capable of processing and analyzing images captured by the camera to facilitate real-time AI-based navigation. By optimizing route planning, AI-based navigation increases the AGV runtime efficiency by up to 20%.

### Key Benefit

- Compact design with standard interface for easy integration
- Low power consumption extends the battery life
- Enables AI-based vision-guided navigation





# AI Facial Recognition for Retail

The accuracy of facial recognition algorithms has improved significantly in the past few years. AI facial recognition can help retailers proactively prevent shoplifting and enhance customer service.

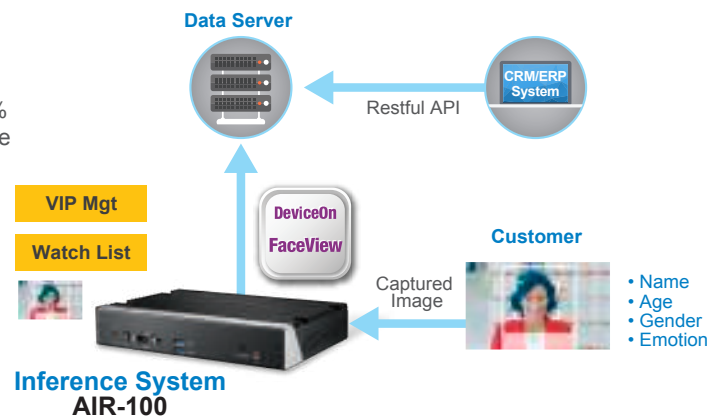


## Solution

The company required a hardware and software integrated solution to enhance its shoplifting prevention and customer service via AI facial recognition. The AIR-100 inference system integrated with FaceView can detect customers' gender, age, and mood in real-time with 99.85% accuracy rating, enabling further analysis and precision marketing. The solution can also identify VIP customers or people with a shoplifting record, and send instant notifications to staff.

## Key Benefit

- High recognition accuracy
- Plug & play functionality, no training required
- Provides functional APIs for easy integration



# Robotic AOI Defect Inspection

Manufacturing quality controls have long relied on visual inspection. Traditional machine vision systems may fail to distinguish defects due to the variability and deviation between visually similar parts. By leveraging AI deep learning technology, this problem can be overcome and overall detection accuracy improved.

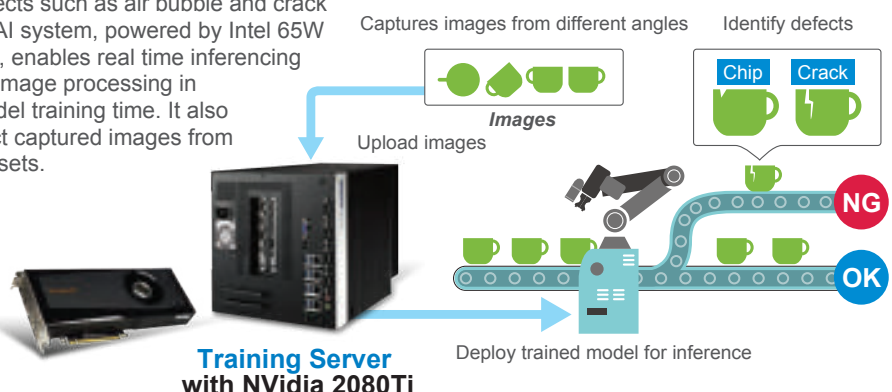


## Solution

Our customer is a robotic visual equipment builder. Their defect inspection solution combines robotic arms with AI capability to detect defects such as air bubble and crack among enamel coated products. Advantech AIR-300 AI system, powered by Intel 65W Core i7 quad core processor and a NVIDIA GPU card, enables real time inferencing and continuous training. It guarantees a high density image processing in real time and parallel computation to accelerating model training time. It also provide high bandwidth and storage capacity to collect captured images from multiple product lines and store massive training datasets.

## Key Benefit

- Intel® Core™ i7 quad-core processor with NVidia 2080Ti GPU card
- Four GbE ports offer sufficient bandwidth
- Four 2.5" SATA III drive bays offer 20TB storage capacity



# Product Selection Guide

## AI Acceleration Modules

### VEGA-300 Series



	VEGA-320	VEGA-330	VEGA-340
SoC	1 x Myriad X MA2485	1/2 x Myriad X MA2485	4/8 x Myriad X MA2485
Form Factor	M.2 2230 (Key A+E)	Full-size mini PCIe	Low-profile PCIe x 4
Dimensions	22 x 30 x 3.63 mm	30 x 50.95 x 4.86 mm	171.1 x 68.9 mm
Signal Interface	PCIe x1, USB 2.0	PCIe x1, USB 2.0	PCIe x4, Gen 2
Operating Temperature	-20 ~ 60 °C	-20 ~ 55 °C	-20 ~ 60 °C
Power Consumption	3.8W	3.8W/7.6W	16.8W/28W
Driver Support	Windows 10 Enterprise(64bit), Ubuntu 16.04.3 LTS(64 bit), CentOS 7.4(64 bit)		Windows 10 Enterprise(64 bit), Ubuntu 18.04. LTS(64-bit)

## Edge AI Inference Systems

### AIR-100/200/300



	AIR-100	AIR-101	AIR-200	AIR-300
Processor	Intel® Atom® x7-E3950	Intel® Atom® x5-E3940	Intel® Core™ i5-6442EQ	Intel® Xeon® E3/6th, 7th Gen. Core™ i3/i5/i7
Memory	4GB DDR3L installed	8GB DDR3L installed	8GB DDR4 installed	DDR4 SODIMM (up to 32GB)
Inference Engine	VEGA-320	VEGA-330	VEGA-330	NVidia 2080Ti GPU card (optional)
Display	2 x HDMI 1.4, 2 x HDMI 2.0	2 x HDMI 1.4	1 x VGA, 1x HDMI 1.4	1 x VGA, 1x HDMI 2.0
Expansion	1 x mini PCIe	1 x M.2 2230 E key	1 x mini PCIe 1 x M.2 2230 E key	1 x PCIe x16, 1 x M.2 2230 E key, 2 x mini PCIe
Storage	1 x 2.5" SSD (64GB)	1 x SATA Slim SSD (64GB)	1 x 2.5" SSD (64GB)	2 x 2.5" SATA III drive bays
Operating System	Win10 IoT 2019 (64bit)	Win10 IoT LTSC (64bit)	Win 10 IoT Enterprise 2019 (64 bit)	Win10 IoT LTSC (64bit)
Cooling	Passive, fanless	Passive, fanless	Passive, fanless	Active, with fan
Power	19 V <sub>DC</sub>	12~28 V <sub>DC</sub>	12~24 V <sub>DC</sub>	100-240 V <sub>AC</sub>
Operating Temperature	0 ~ 50 °C	-20 ~ 55 °C	0 ~ 60 °C	0 ~ 50 °C

## FaceView AI Facial Recognition Industrial App



FaceView Application			
Key Features	<ul style="list-style-type: none"><li>• Visitor Identification</li></ul>	<ul style="list-style-type: none"><li>• Customer Analytics</li></ul>	<ul style="list-style-type: none"><li>• Customer Management</li></ul>
	- Registered ID and gender/age/emotion recognition	- Statistical analysis for customer behavior	- Maintain customer database
	- Image improving for poor lighting and motion blurry	- Watchlist history dashboard	- Import & export VIP/blacklist ID data
Working environment			
OS	Windows 10 64bit		
Memory	4GB or above		
Storage	32GB or above (Including Windows 10 OS)		
Performance			
HW Platform	Atom CPU + VEGA-320	Atom CPU + VEGA-330	Core i5 CPU + VEGA-330
True Acceptance Rate(@FAR 1E-4 )	98.25%	98.95%	99.50%
True Acceptance Rate(@FAR 1E-6 )	94.12%	97.99%	98.50%
Runtime Memory	1GB	2GB	2.5GB
Ordering Information			
Part Number	31ASFCWWAD0110		



# Advantech Edge AI Solution Advantages



## Complete Solutions

Our solutions range from acceleration modules, inference systems to solution ready packages



## GUI-Based AI Toolkit

Edge AI Suite helps with features and power across various neural networks based on OpenVINO toolkit



## IoT Management

With IoT device operation management built-in, our solutions help easily manage connected devices.

## Regional Service & Customization Centers

**China** | Kunshan  
86-512-5777-5666

**Taiwan** | Taipei  
886-2-2792-7818

**Netherlands** | Eindhoven  
31-40-267-7000

**Poland** | Warsaw  
00800-2426-8080

**USA** | Milpitas, CA  
1-408-519-3898

## Worldwide Offices

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Toll Free 800-810-0345  
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Shanghai 86-21-3632-1616  
Shenzhen 86-755-8212-4222  
Chengdu 86-28-8545-0198  
Hong Kong 852-2720-5118

**Taiwan**  
Toll Free 0800-777-111  
Taipei & IoT Campus 886-2-2792-7818  
Taichung 886-4-2329-0371  
Kaohsiung 886-7-229-3600

### Middle East and Africa

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Osaka 81-6-6267-1887  
Nagoya 81-0800-500-1055

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Seoul 82-2-3663-9494

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Penang 60-4-537-9188

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Toll Free 00800-2426-8080/81  
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London 44-0-870-493-1433

**Poland**  
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Irvine 1-949-420-2500  
Ottawa 1-815-434-8731

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Toll Free 1-800-467-2415  
Mexico City 52-55-6275-2727

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