50 Billion connected devices in 2020
50.000.000.000.000

Computer Vision, Artificial Intelligence, Machine Learning or Deep Learning, one thing is for sure.
Without hardware no data.

Computer Vision and AI on the Edge

Presenter : Erik Seijner
Division : AAEON SPD
Date : 6th of December 2018

AAEON

Company Name: AAEON Technology Inc.

Founded: 1992 (Acquired by ASUS in 2011)

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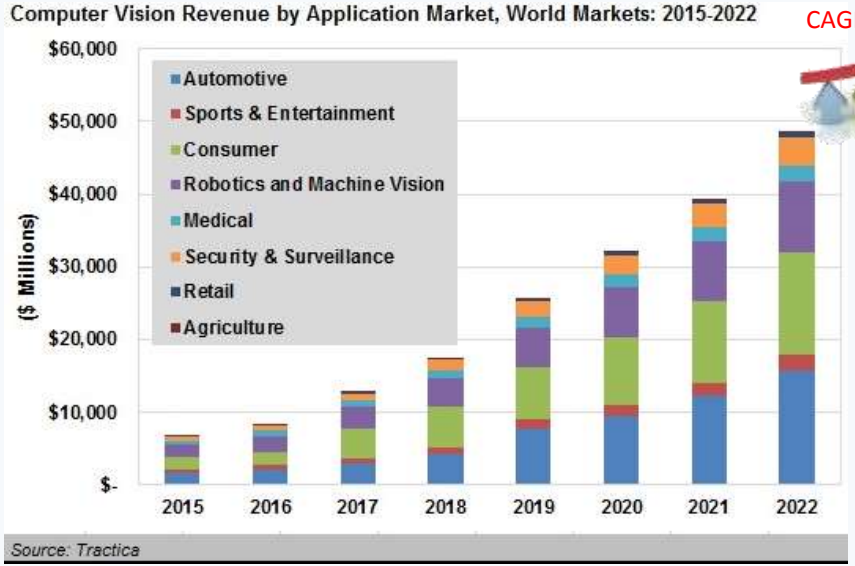
Computer Vision Market is Booming



$48.6B @ 2022
CAGR: 32.9%

According to the report of Tractica

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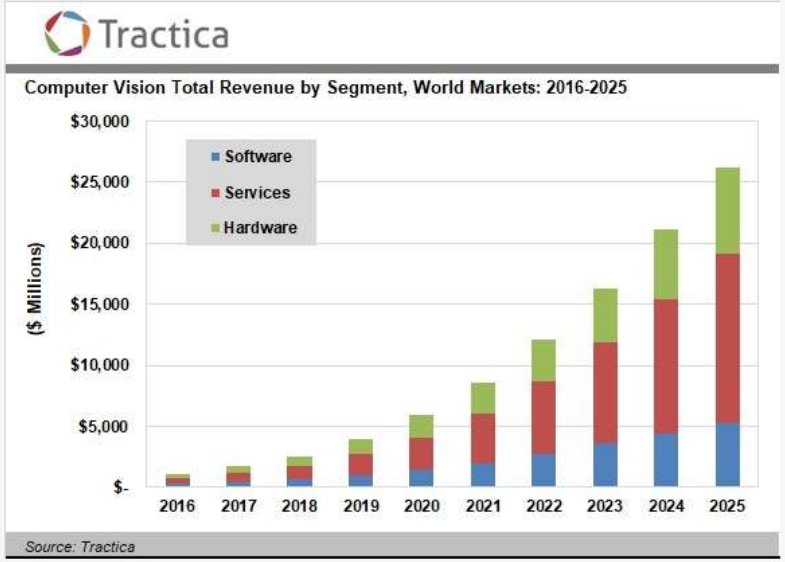


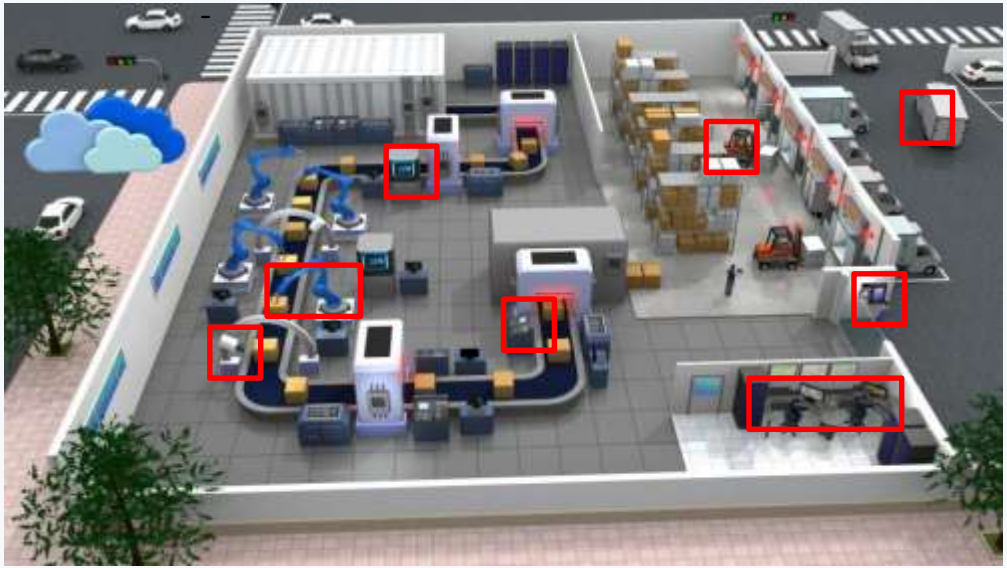
According to Tractica's analysis, the top 10 use cases for computer vision during the 2016-2025 forecast period will be as follows:

1. Video surveillance
2. Machine/vehicular object detection/identification/avoidance
3. Medical image analysis
4. Augmented reality (AR)/virtual reality (VR) development
5. Localization and mapping
6. Converting paperwork into digital data
7. Human emotion analysis
8. Ad insertions into images and video
9. Face recognition
10. Real estate development optimization

Vision System Everywhere

Machine Vision System in Smart Factory

Access Control - Incoming Production - Inspection
Robotic - Logistic Surveillance - Vehicle

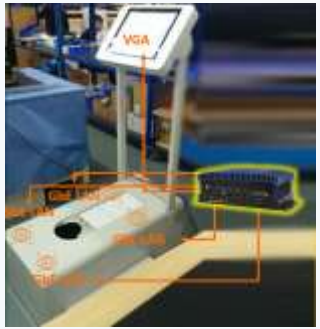


Success Story: 3D Foot Scan

- Application:
  3D scan body or foot

- Product:
  BOXER-6640M. Each one connects 8 cameras

- Why BOXER-6640M:
  - 8 low-resolution images.
  - Need powerful CPU to combine 8 images to be one 3D image.
  - Need more LAN ports.



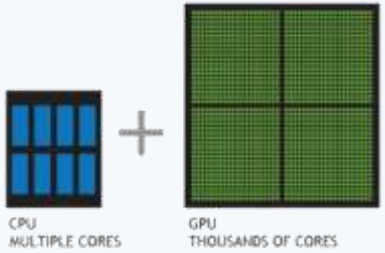
Why Computer-Based Vision?

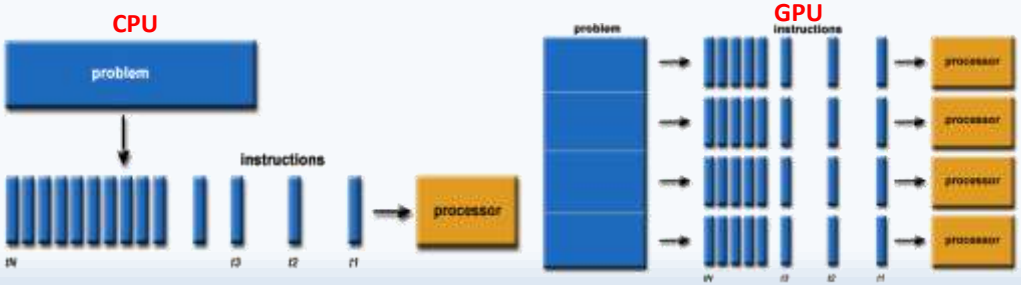
- Multiple Camera’s
- Communication
- Software
- Visualization
- Speed of the process
- Complex Image Data
- Data analysis
- AI

GigE VISION USB3 VISION PoE CAMERA Link CoaxPress

CPU vs. GPU

- CPU
  - 4~8 cores
  - Serial working procedure
  - One complex & different problem
- GPU
  - 2000~3000 cores
  - Parallel working procedure
  - Thousand simple & repeated problem
  - Picture iden. is simple & repeated action





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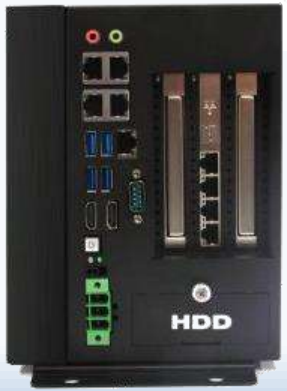
BOXER-6841M Spec

- Intel 7th/6th Desktop CPU Celeron/Pentium/Core-i / Xeon Processor
- Intel H110/C236 PCH
- DDR4 SODIMM x 2, Max. 32G
- USB 3.0 x 4, HDMI x2
  RS-232/422/485 x 1 (Option additional RS-232 x 4)
  LAN x 5 (i211AT*4 + i219LM*1, iAMT support)
- Expand Slot
  - PCIe[16] x1+PCIe[1] x1
    or
  - PCIe[8]x2+PCIe[x1]x1
  - Full-size Minicard x 2, SIM x 1
- Power: DC12~24V
  Optional 240W AC/DC Adapter
- Working Temp.: -20~45 °C



AI@Edge Computing
Nvidia GTX 1080/1070/1050/1030

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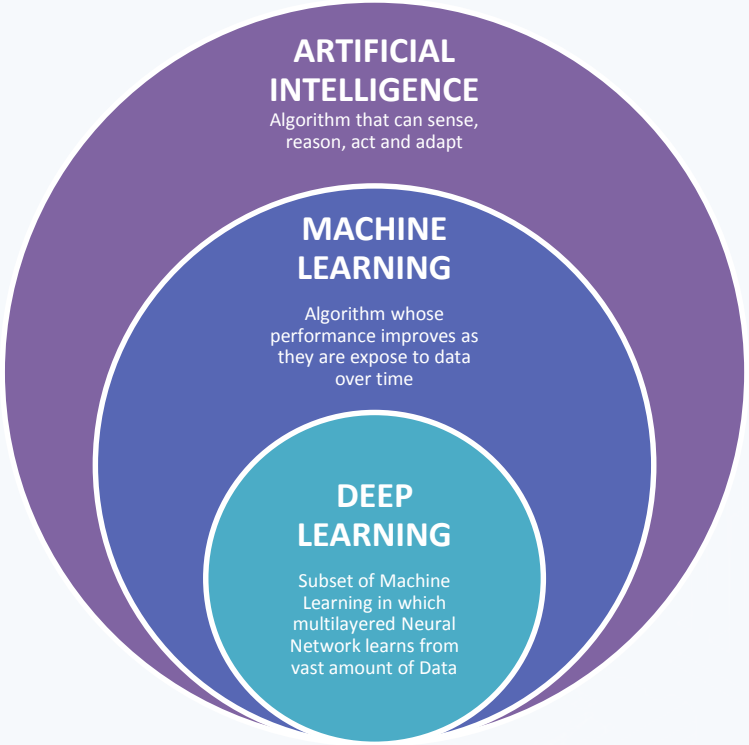
AAEON
an ASUS assoc. co.

TEXIM EUROPE

AI @ the Edge

Turingtest

AI is de intelligentie waarmee software en apparaten beslissingen kunnen nemen zoals een mens dat zou doen.



Machine Learning:
Algoritmes die data verzamelen.
Uit deze data leren en dat wat ze geleerd hebben
toepassen om beslissingen te nemen.

Deep Learning:
Wordt niet gevoed met algoritmes, maar kan zelf algoritmes aanleren. Gelijkwaardig aan menselijk brein. Het vangt iets op, denkt erover na, en trekt conclusies.

CNN: **C**onventional **N**eural **N**etwork

Machine Learning en Deep Learning zijn de systemen die ervoor zorgen dat Netflix weet welke serie je als volgende wilt zien, of hoe Facebook de gezichten van je vrienden kan herkennen in een foto

Voorspellen

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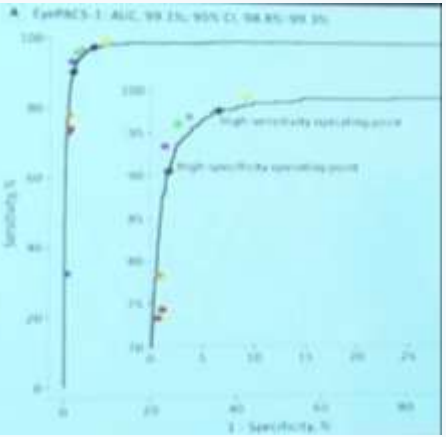
Screening for diabetic retinopathy

People with diabetes can have an eye disease called diabetic retinopathy. This is when high blood sugar levels cause damage to blood vessels in the retina. These blood vessels can swell and leak. Or they can close, stopping blood from passing through. Sometimes abnormal new blood vessels grow on the retina. All of these changes can steal your vision

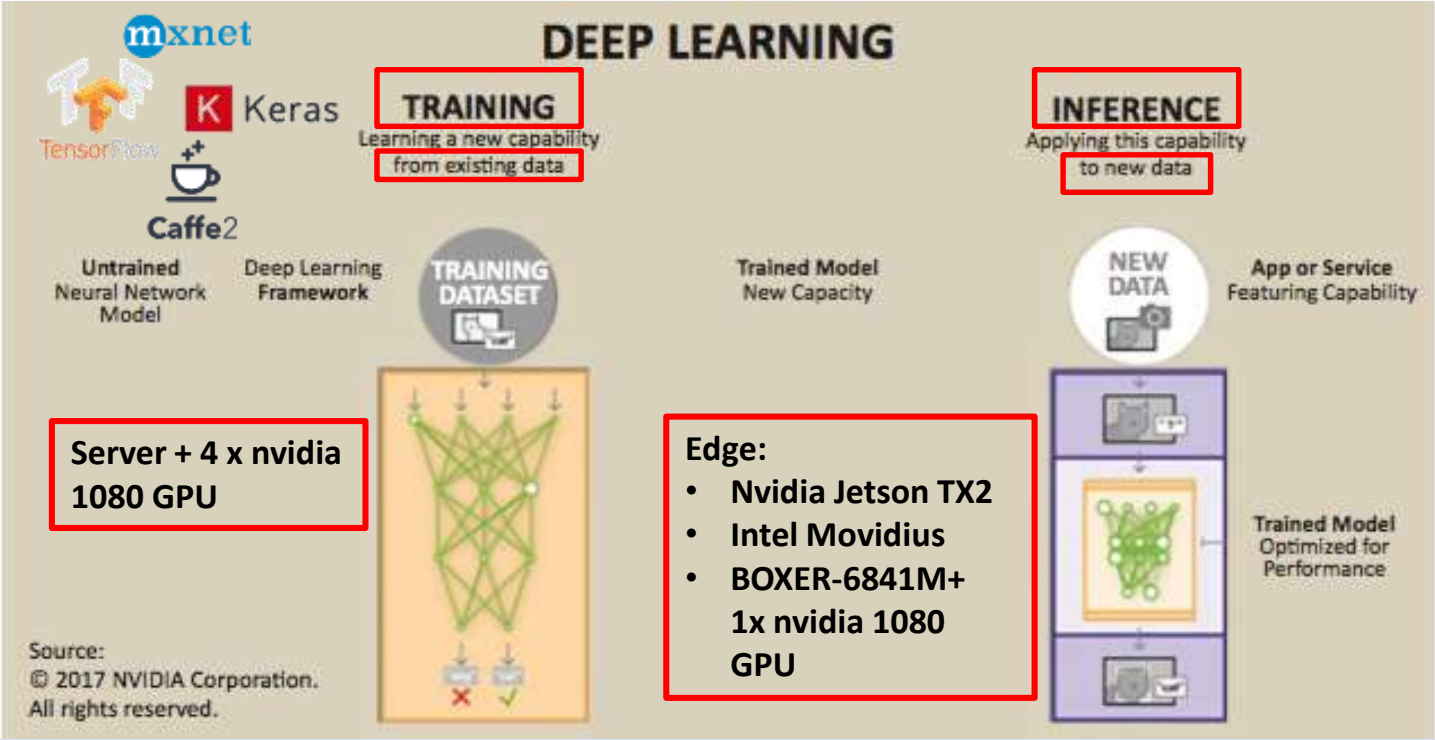
Screening for diabetic retinopathy

F-score

0.95	0.91
Algorithm	Ophthalmologist (median)



Two Stages: Training → Inference



Server + 4 x nvidia 1080 GPU

Edge:

- **Nvidia Jetson TX2**
- **Intel Movidius**
- **BOXER-6841M+ 1x nvidia 1080 GPU**

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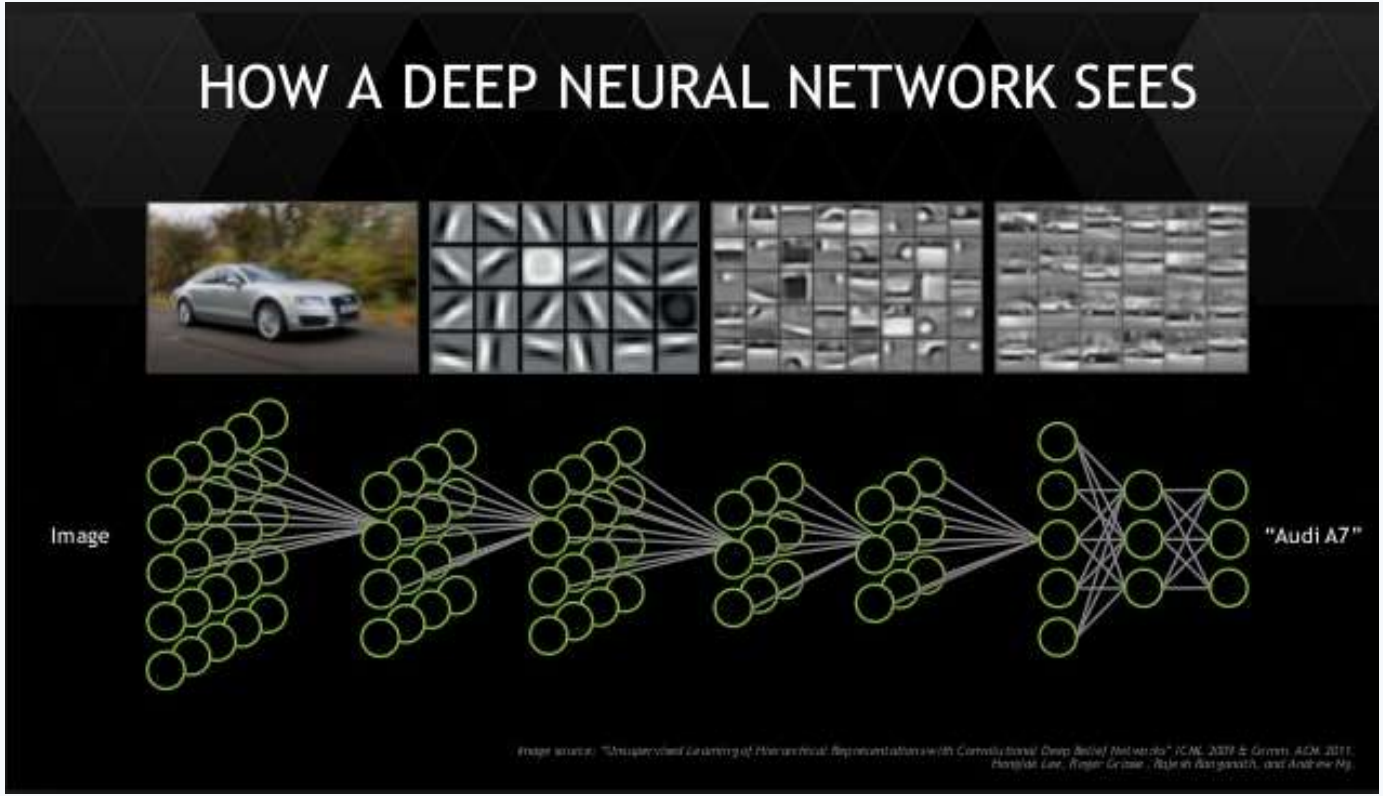

CNN: **C**onventional **N**eural **N**etwork

Artificial Intelligence on the Edge

Axis Experience Centre PPE Demo

personal protective equipment

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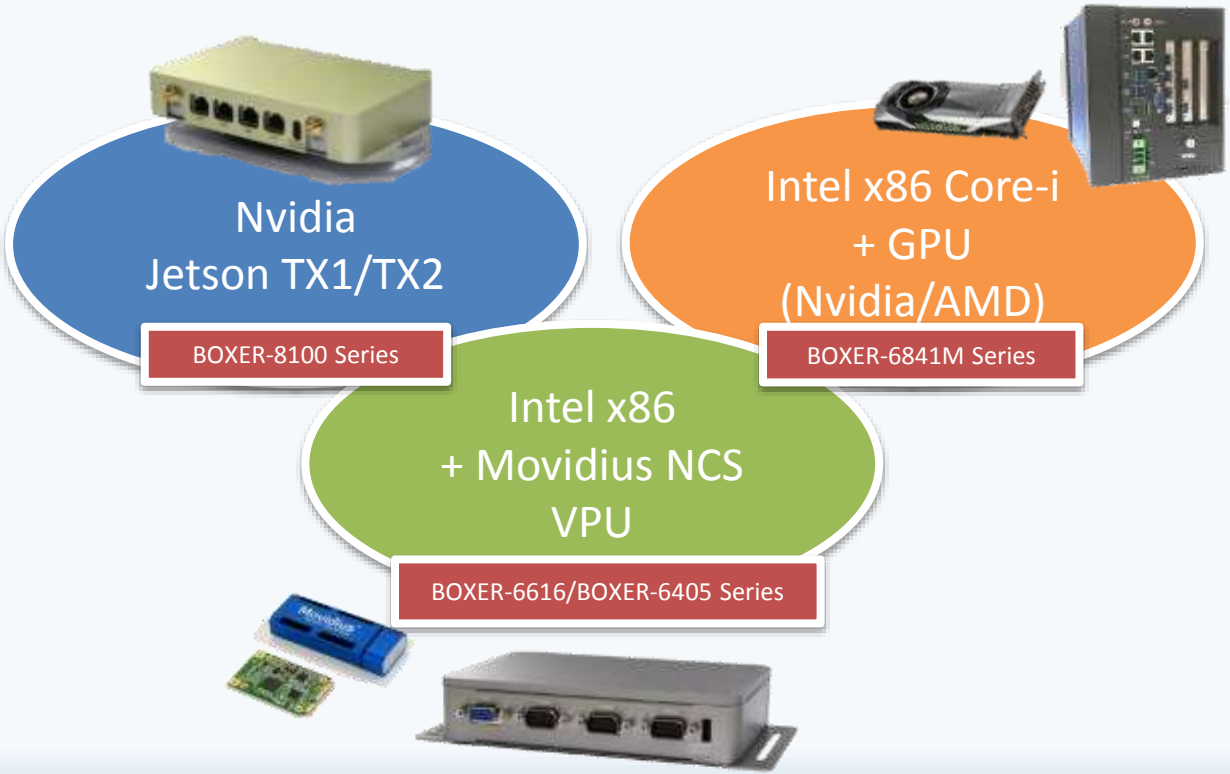
CORTEXICA
AI SOLUTIONS FOR BUSINESS

AI@Edge Product Segment



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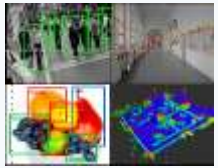
Intel Movidius VPU

Mini-PCIe expansion board

MOVIDIUS™ Myriad X
Video Processing Unit

Optimized for Deep Learning



Ultra Low Power

- Object recognition
- People recognition

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Vertical Focus & Applications

Retail & Fiscal

- Mobile POS & Online Payment
- Smart Retail / Vending
- Fiscal & Tax-collection
- **Self-service store**
- **Self-service shelves**

Smart Manufacturing

- Robot
- Machine vision
- Digital Factory
- Logistics & Warehousing
- **Sorting machine**
- **Robot 3D Vision**

Intelligent Transportation

- Fleet Management
- Rolling Stock
- Passenger Information System
- In-vehicle Signage & Security
- **Parking Lot**
- **Public Security**
- **Highway Surveillance**

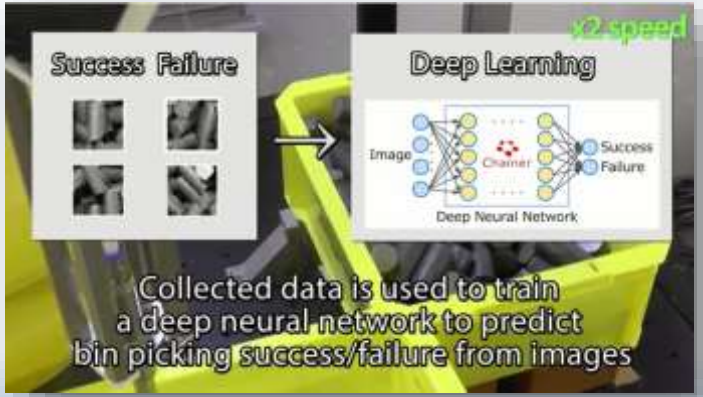
Network Security

- Firewall / UTM
- Network appliance
- Video Surveillance
- **Community / Oil / Military / Prison Security**
- **Access Controller**

Successful Stories

Bin-Picking Robot : Deep Learning

- Robotic + 3D Camera + AI
  = High efficiency & accuracy
- Robot manufacture is our target.
- BOXER-8110AI or BOXER-6405



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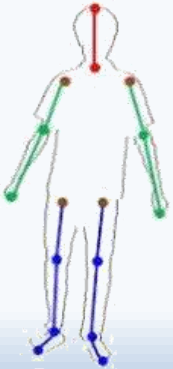
Critical Facility Surveillance

How AI works?

- For critical facility, people might enter in and damage it. The system will monitor people's behavior. If there is abnormal behavior such as over the fence, jump to the wall. It will send alarm to the central. Identify abnormal human behavior is key factor, not human face.

Need

- Wide temp. / high-performance AI@Edge BOXER
- High-resolution & High FPS Camera
- AI software



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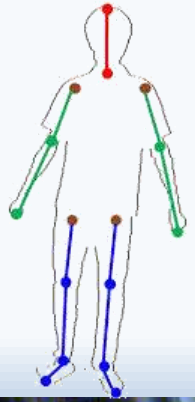
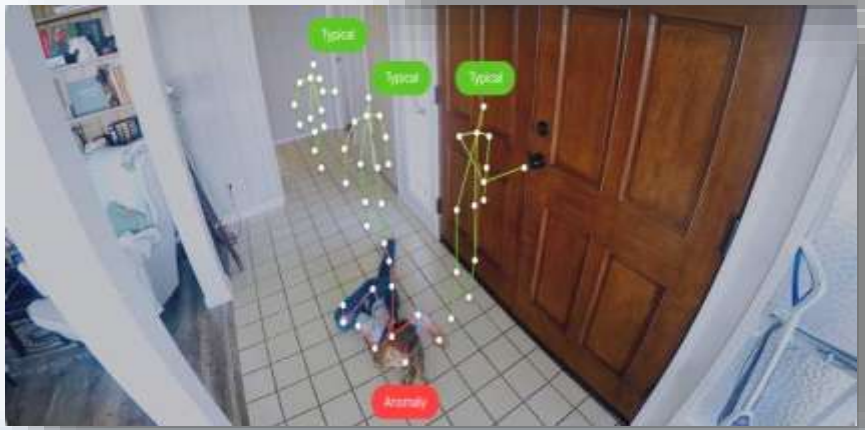
Smart HomeCare

- Old / young people fall-down detection.
- Dangerous behavior detection.

  Human jumps to the wall.
- Save the computing power.
- Privacy issue.





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Self-service Store / Shelves

- New Trend is self-service shelves. Install it inside company. Users can open it and take food out. Then credit card.
- The cost of unmanned shelves is low. Occupy small space.

How AI works?

- Four cameras will get images and AI software analyze if food exists or not. .

Need

- 3x USB cameras + 4G LTE
- 24/7 BOXER

Camera's

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Parking Lot – Government (2)

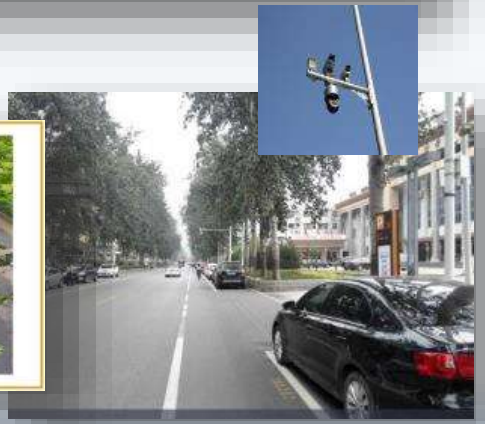
- Install camera in 6 M high Pole
- One camera covers 4~6 parking lots

How AI works?

- Identify the car, human, motorcycle
- To learn in different scenarios, the photo of license plate might be distorted when captured by the camera on the pole, the parking angle and light might be different
- Increase the Recognition rate gradually

Need

- Rugged AI@Edge BOXER
- Remotely power on/off
- BOXER for debugging
- Lightning surge protection
- High resolution but low FPS camera



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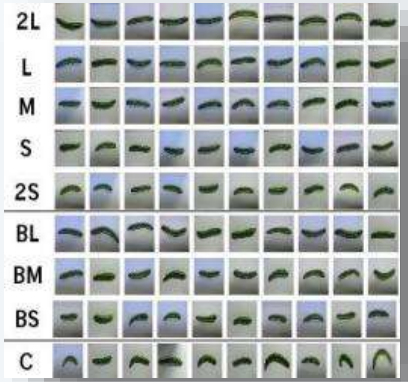
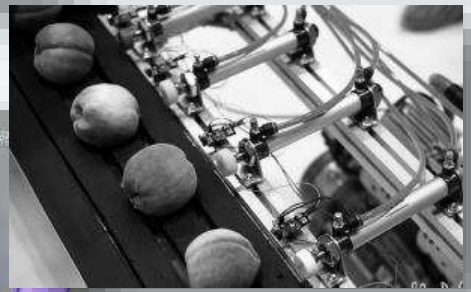
Sorting Machine

- User uses 6000 photos to “Train” sorting machine to identify A/B/C.
- Initially, the accuracy is 70%. By training AI software, the accuracy is 90%. Save huge human effort.

Need

- Rugged AI@Edge BOXER
- One 3D high-resolution camera
- AI software





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Access Control

- Gate machine in subway / airport/ building / factory / school would be upgraded to “see” and “identify” passengers instantly. Powerful GPU/CPU is needed to run AI software.
- White list database is built in gate machine.

Need

- AI@Edge BOXER inside machine
- One high-resolution camera
- Facial iden. AI software

Subway

Airport

Building

School

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Texim Europe B.V.

Computer Vision:
Machine Vision / Vision/AI

Thank You

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