edge ai + vision ALLIANCE™

Key Trends in the Deployment of Visual AI

Jeff Bier, Edge AI and Vision Alliance / BDTI

August 2020

What's Changing?

edge ai + vision ALLIANCE™
Inspiring + empowering innovators to design systems that **perceive + understand**

What Makes This a Unique Era for Computer Vision?

Deep Learning	• Algorithms that work • Ability to address diverse applications
Big Data	• Ability to train deep neural networks
Cheap, Energy- Efficient Hardware	• Widespread deployment
Cloud Compute	• Simplifies development, deployment and scaling
Capital, Talent	• Fuel innovation, development, deployment and scaling

Opportunity

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Opportunity

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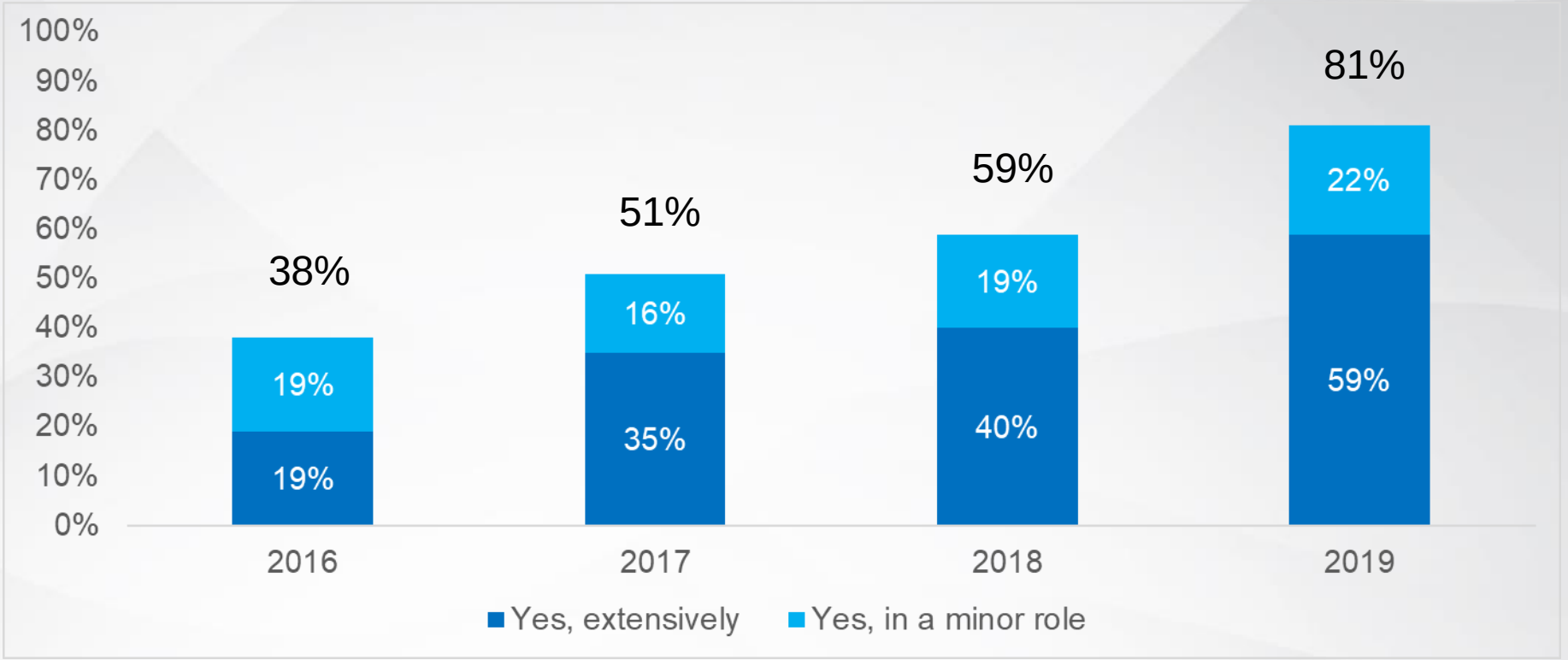
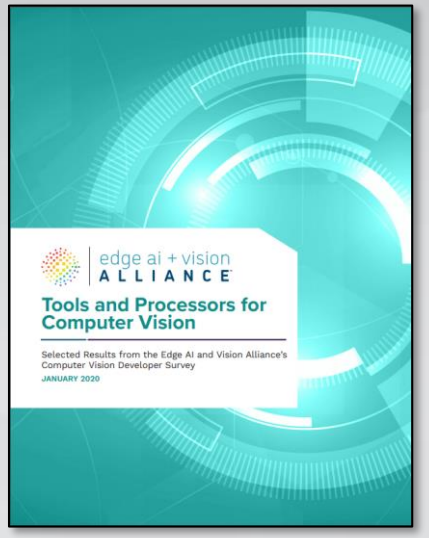
*** See rest of presentation…**

Use of Neural Networks in Vision Applications



Source: Edge AI and Vision Alliance, *Computer Vision Developer Survey, Oct. 2019*



bit.ly/DeveloperSurveyWhitePaper2020

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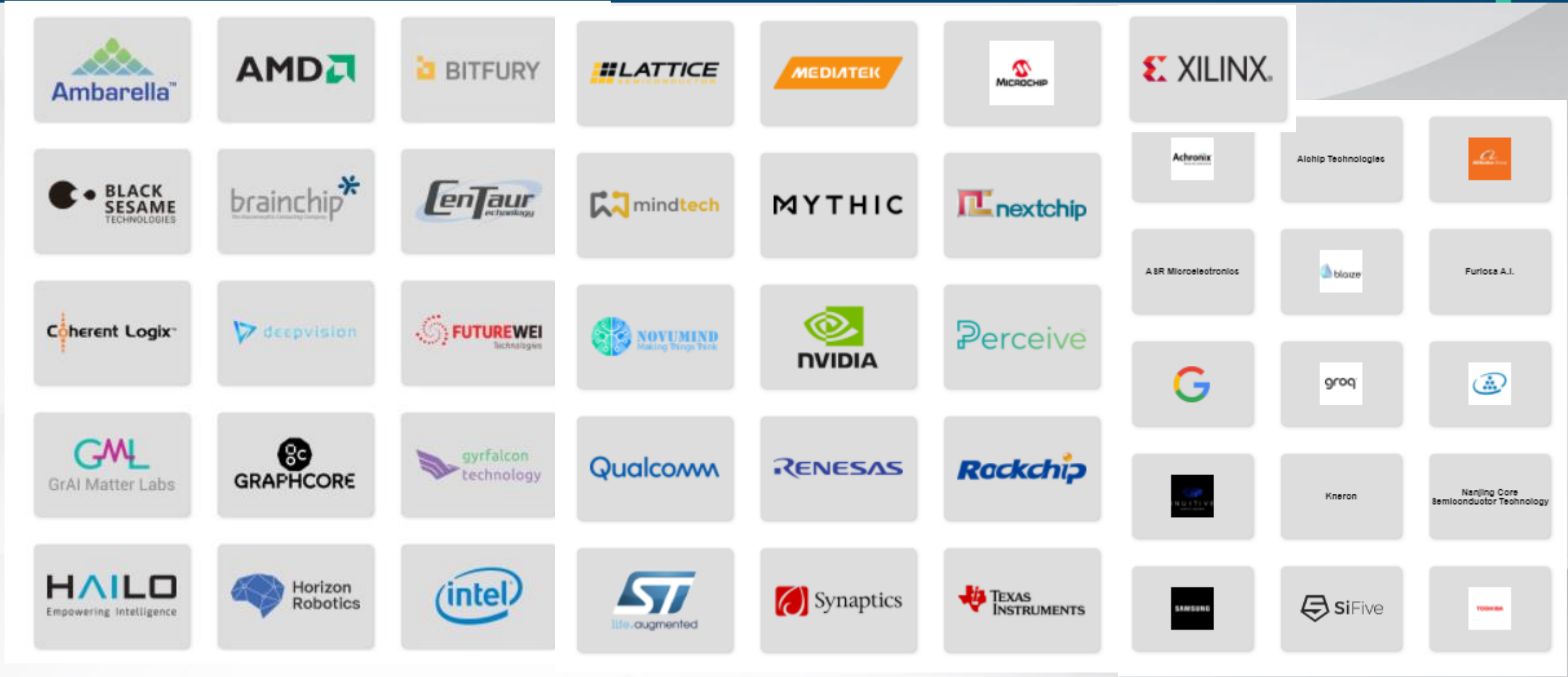
A Golden Era of Embedded AI Processors
(From the Embedded Vision and Visual AI Industry Map)



https://bit.ly/VisionIndustryMap

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Drivers of Trend Towards Edge Computing

Bandwidth

Latency

Economics

Reliability

Privacy

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Drivers of Trend Towards Edge Computing

Bandwidth

Latency

Economics

Reliability

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Drivers of Trend Towards Edge Computing

Bandwidth

Latency

BLERP

Economics

Reliability

Privacy

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Processors

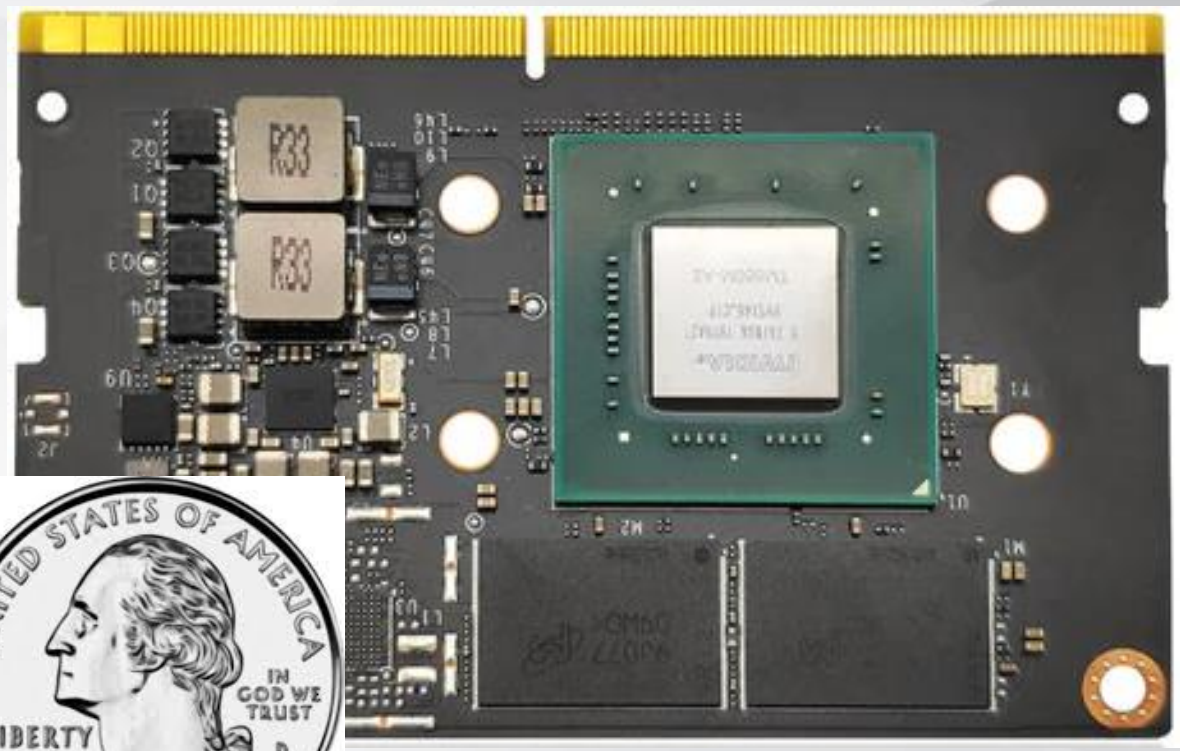

Image: iconspng.com

Image: aliexpress.com

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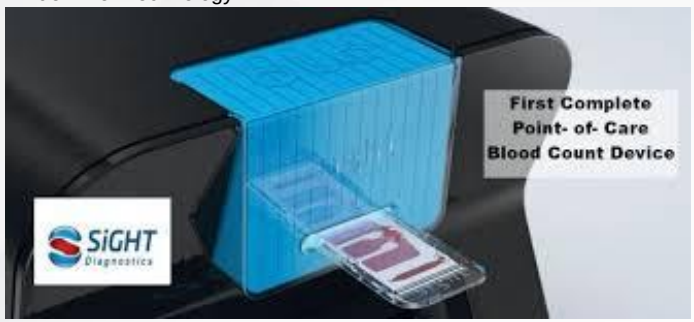
Extremely Diverse Applications

Blue River Technology

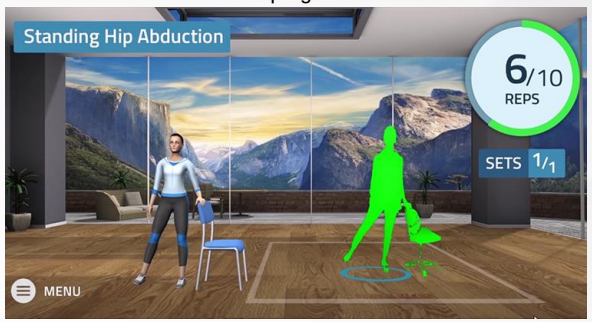
cpb.gov

OrCam

Compology



Sight Diagnostics



iRobot

ultrasoundtechnicalschools.com

Ringdoorbell.eu

Amazon

Hortdaily.com

Skydio via Medium

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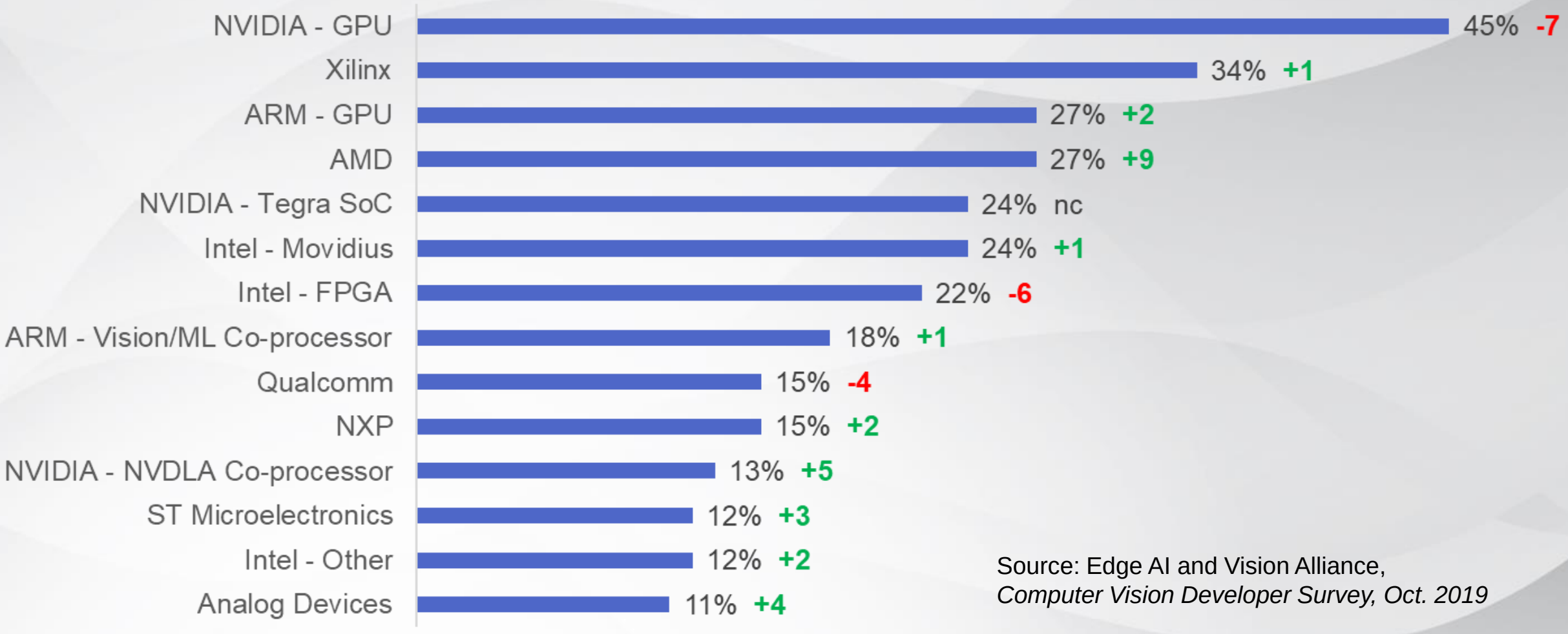
Processors Used for Industrial Vision Applications
(Excluding CPUs)



Source: Edge AI and Vision Alliance,
Computer Vision Developer Survey, Oct. 2019

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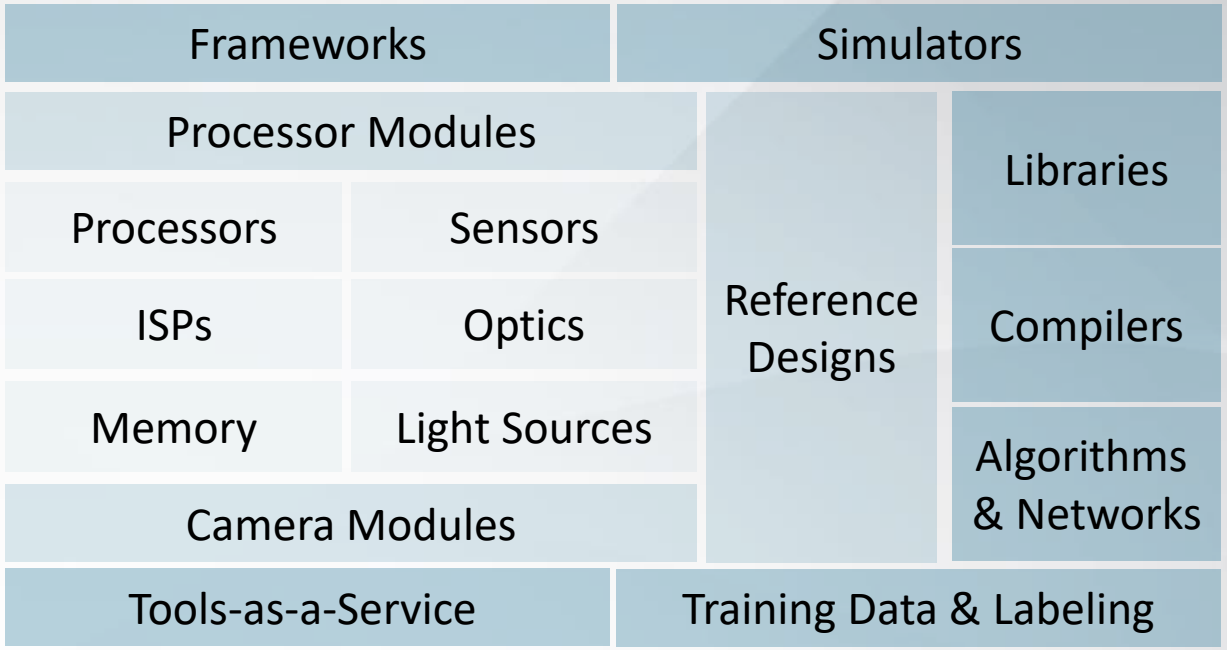
Building Blocks



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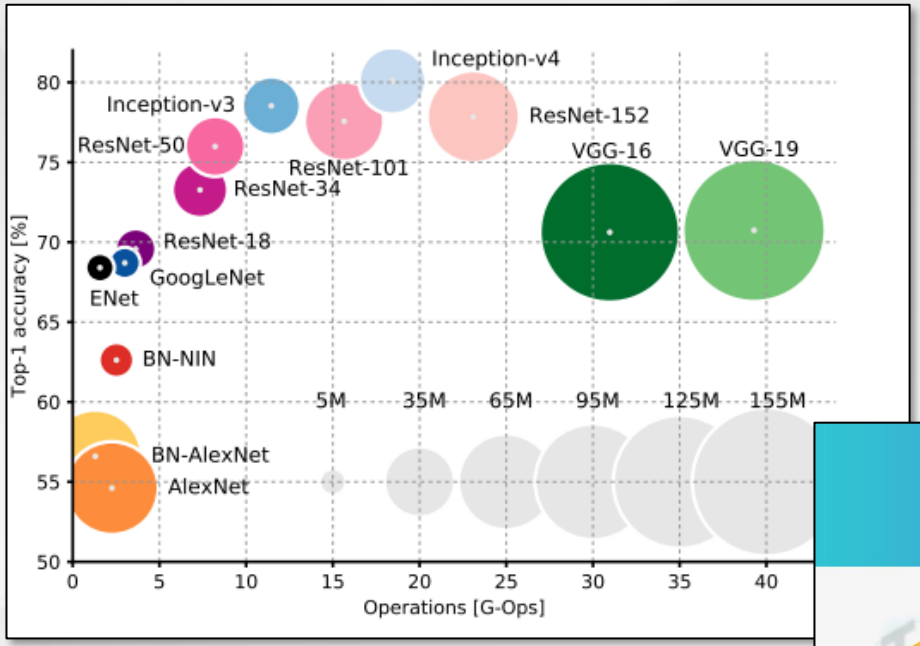
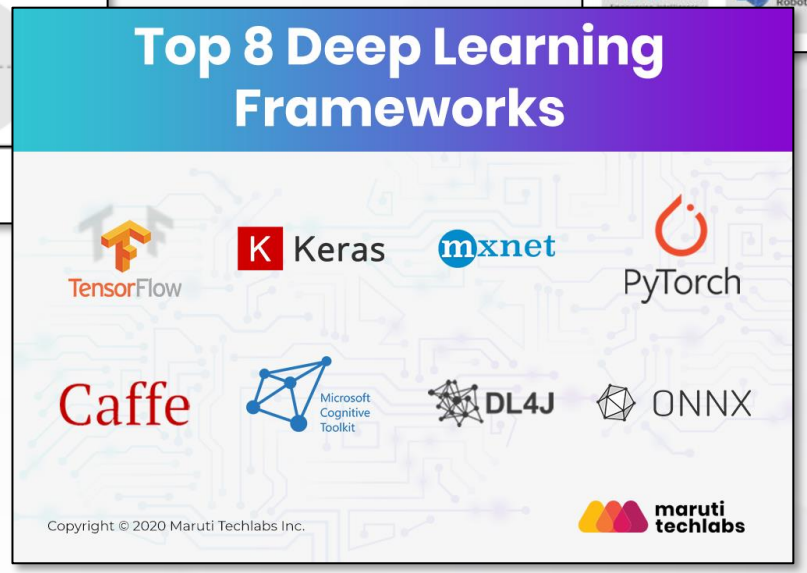
Challenge: Many Technology Choices





Images: Canziani, Culurciello, Paszke; Maruti Techlabs; Edge AI and Vision Alliance

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Developer Tools

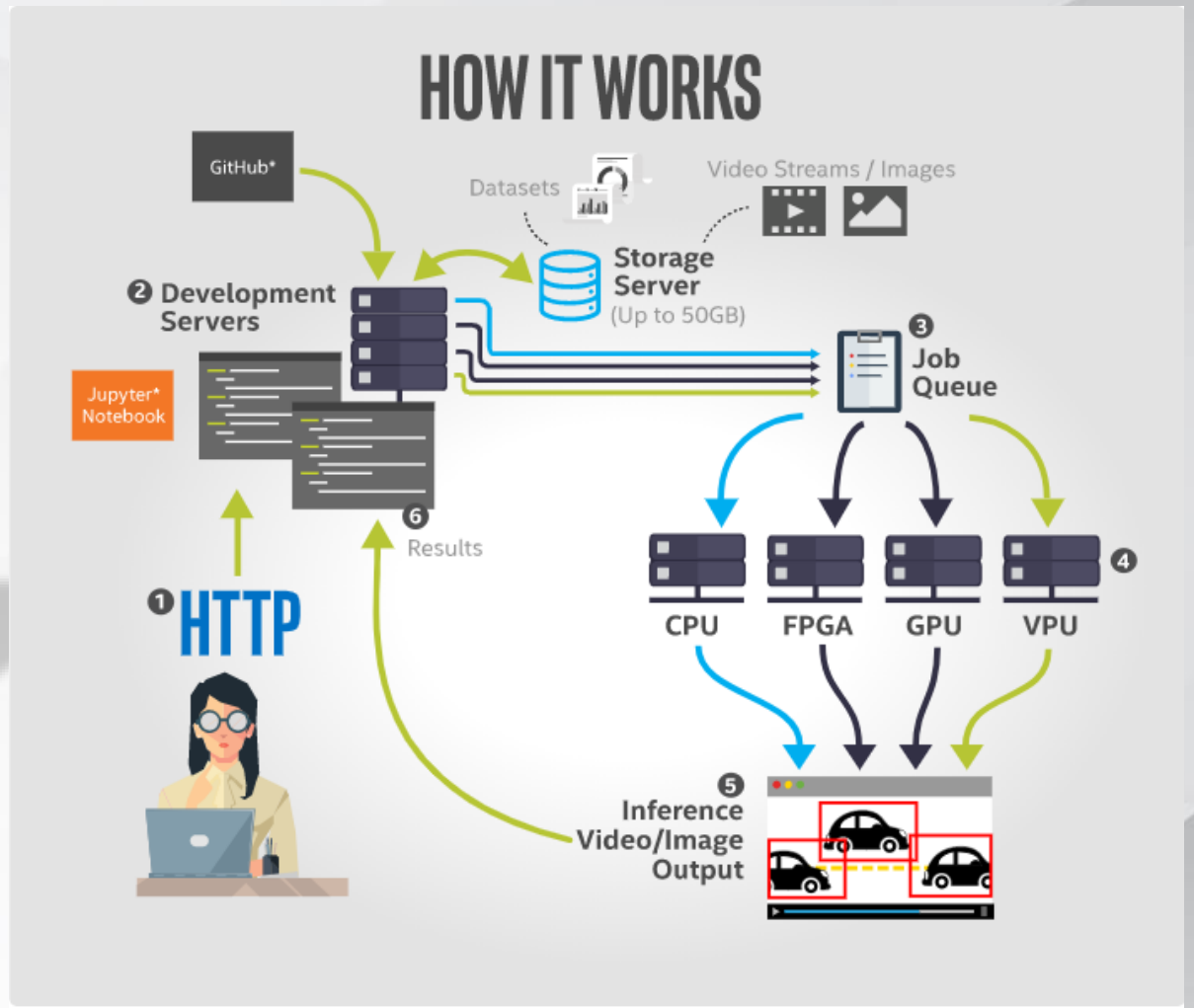

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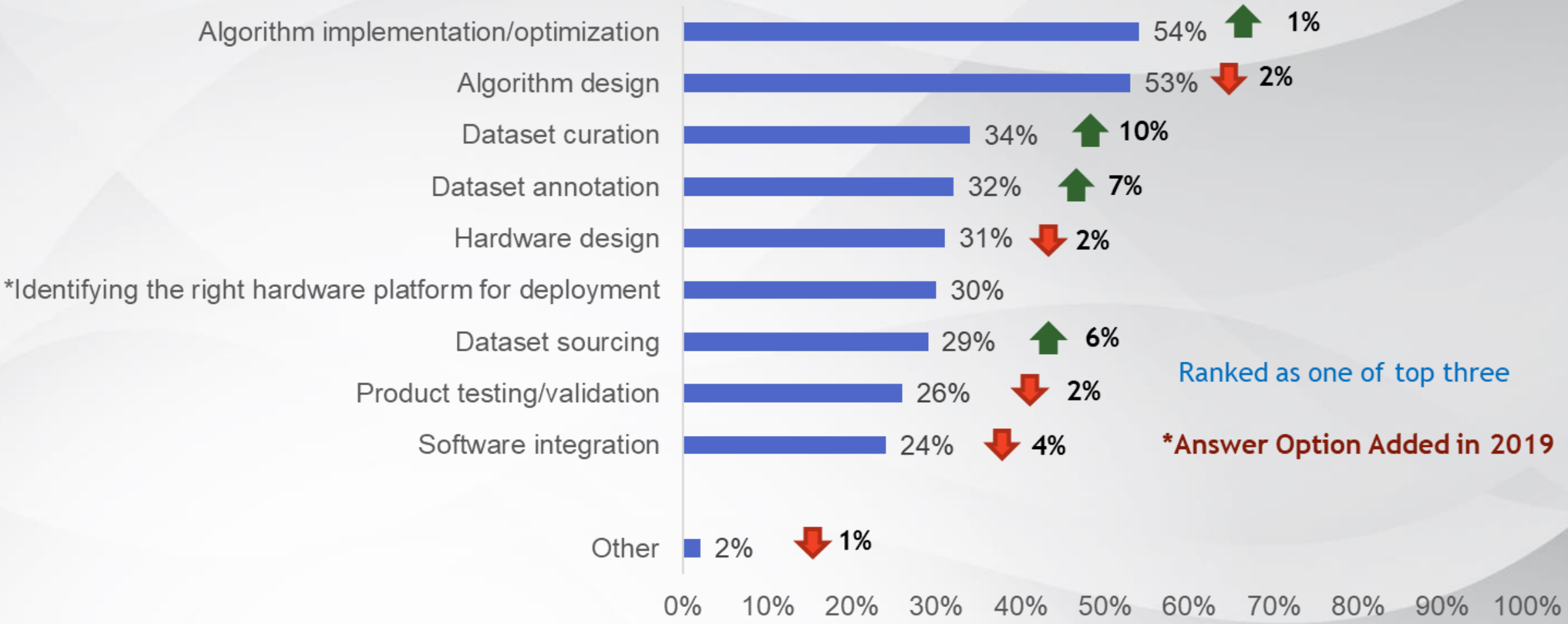
Image: intel.com

Most Challenging Areas of Computer Vision Product Development



Source: Edge AI and Vision Alliance, *Computer Vision Developer Survey, Nov. 2019*

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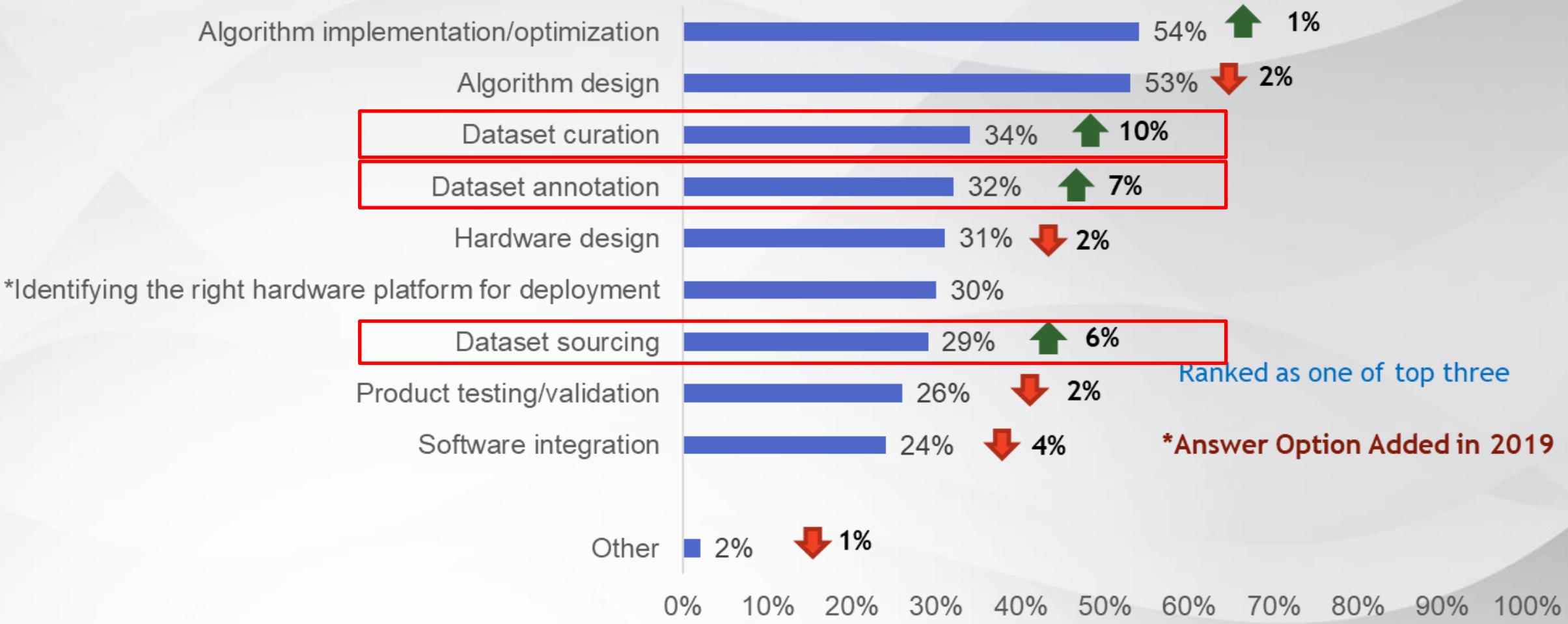
Most Challenging Areas of Computer Vision Product Development



Source: Edge AI and Vision Alliance, *Computer Vision Developer Survey, Nov. 2019*

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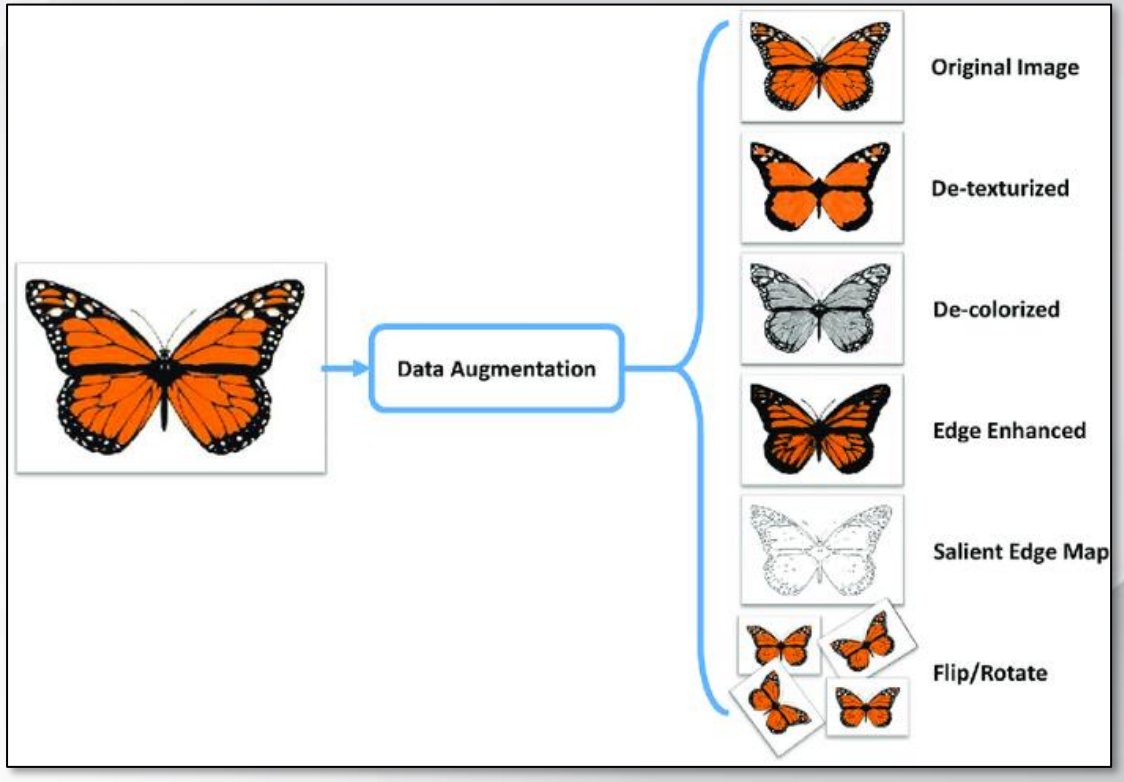
Synthetic Data and Data Augmentation



Images: Aimotive; Sourav Kumar via Medium

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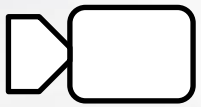
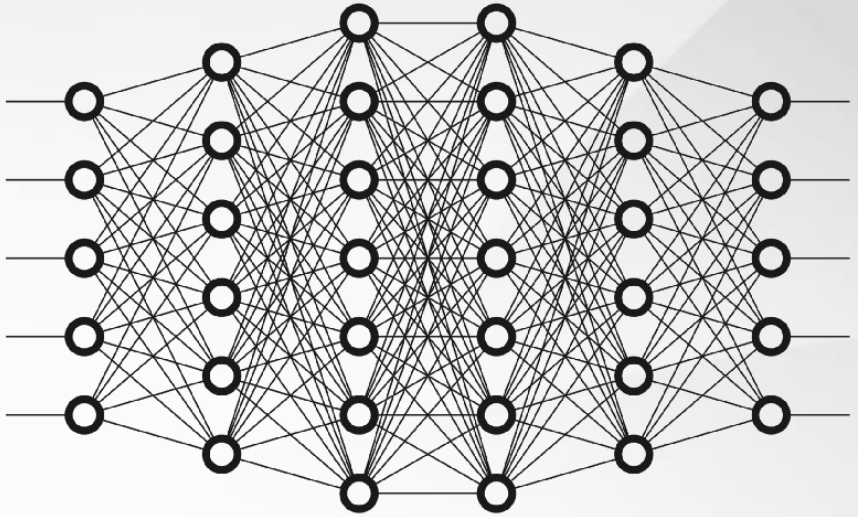
Algorithms — What We Imagine



Camera



Trained Deep Neural Network

Command: Engage emergency braking

Useful Information

Image: freeCodeCamp.org

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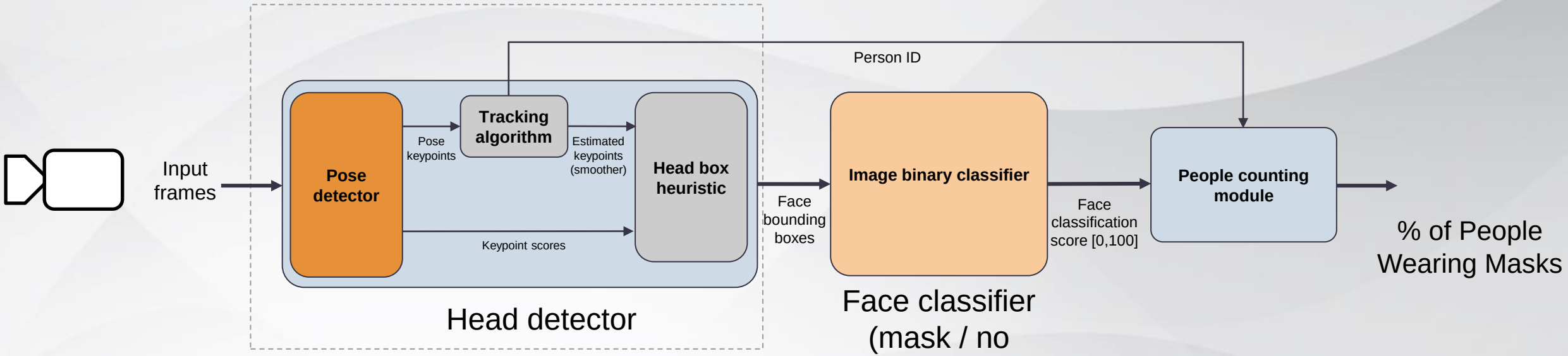
Typical Composite Real-World Algorithm

Estimating % of People Wearing Masks



tryo·labs

Source: Tryolabs (diagram modified)

Commercially Licensed Algorithms

Semantic Segmentation Filter

Image: Morpho

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Components to Solutions

Frameworks		Simulators	
Processor Modules		Reference Designs	Libraries
Processors	Sensors		Compilers
ISPs	Optics		Algorithms & Networks
Memory	Light Sources		
Camera Modules			
Tools-as-a-Service		Training Data & Labeling	

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Components to Solutions

Construction | Mining | Logistics

Retail

Frameworks | Simulators

Processor Modules

Processors | Sensors

ISPs | Optics

Memory | Light Sources

Camera Modules

Reference Designs

Libraries

Compilers

Algorithms & Networks

Agriculture

Home Healthcare

Tools-as-a-Service | Training Data & Labeling

Refuse/ Recycling

Manufacturing | Clinical Healthcare | Motor Vehicles

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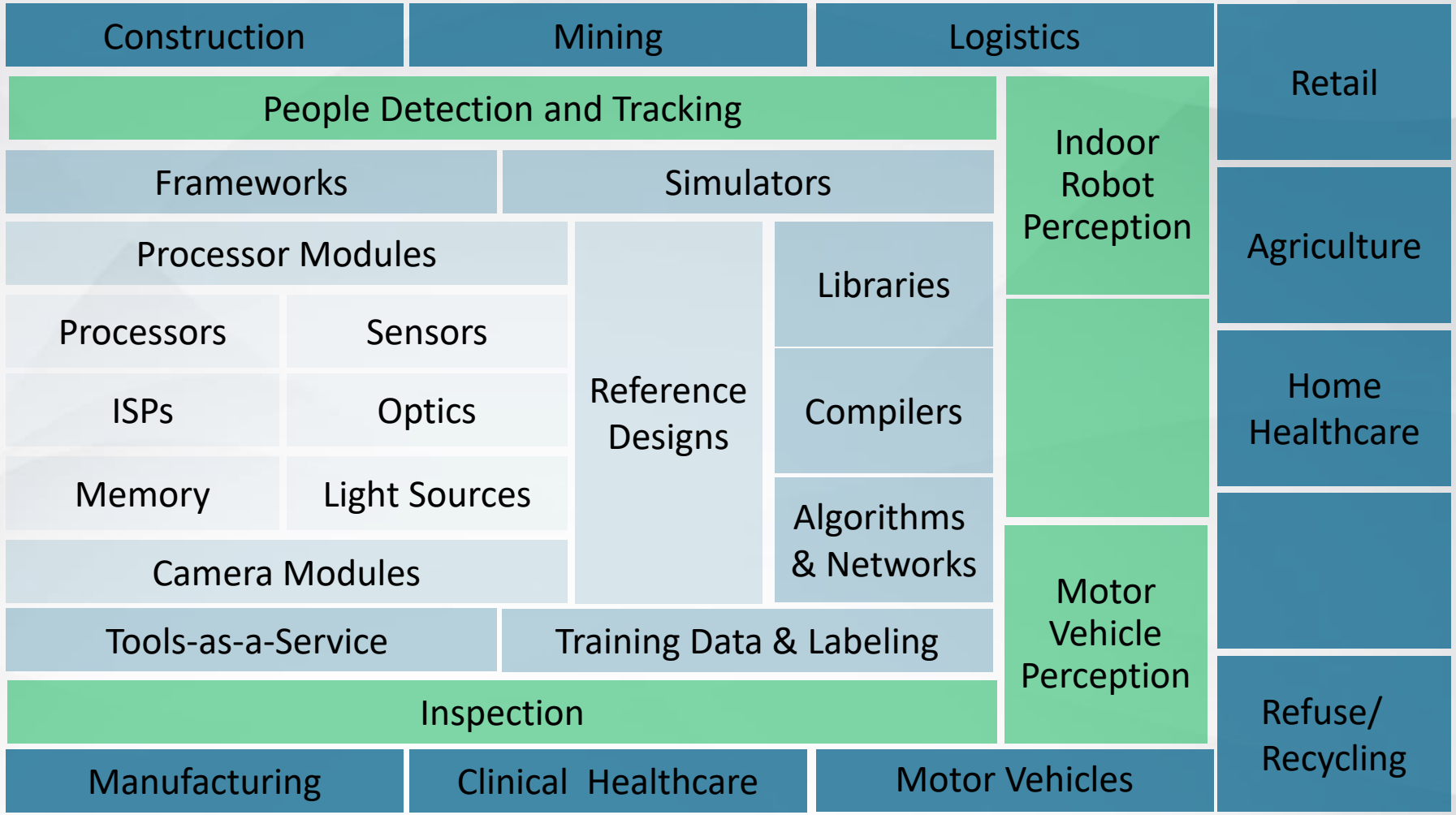
Components to Solutions



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Domain-specific Platforms

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Depth Sensing Proliferates

Image: appleinsider.com

Image: Skydio via highways.today

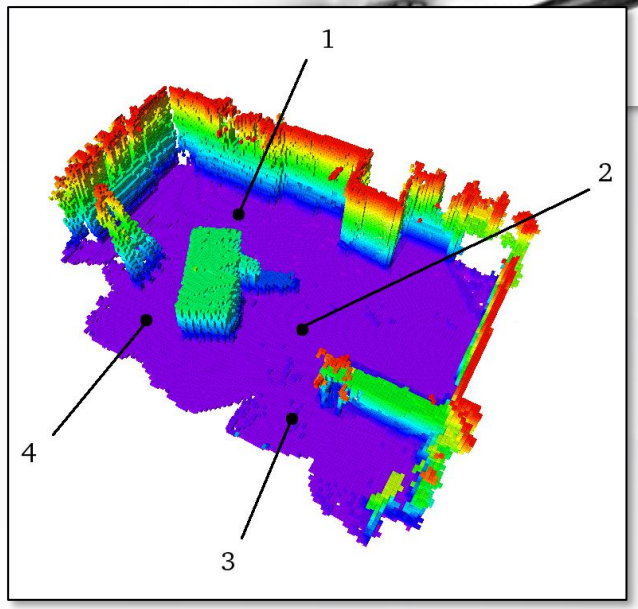

Image: pcc.disam.etsii.upm.es

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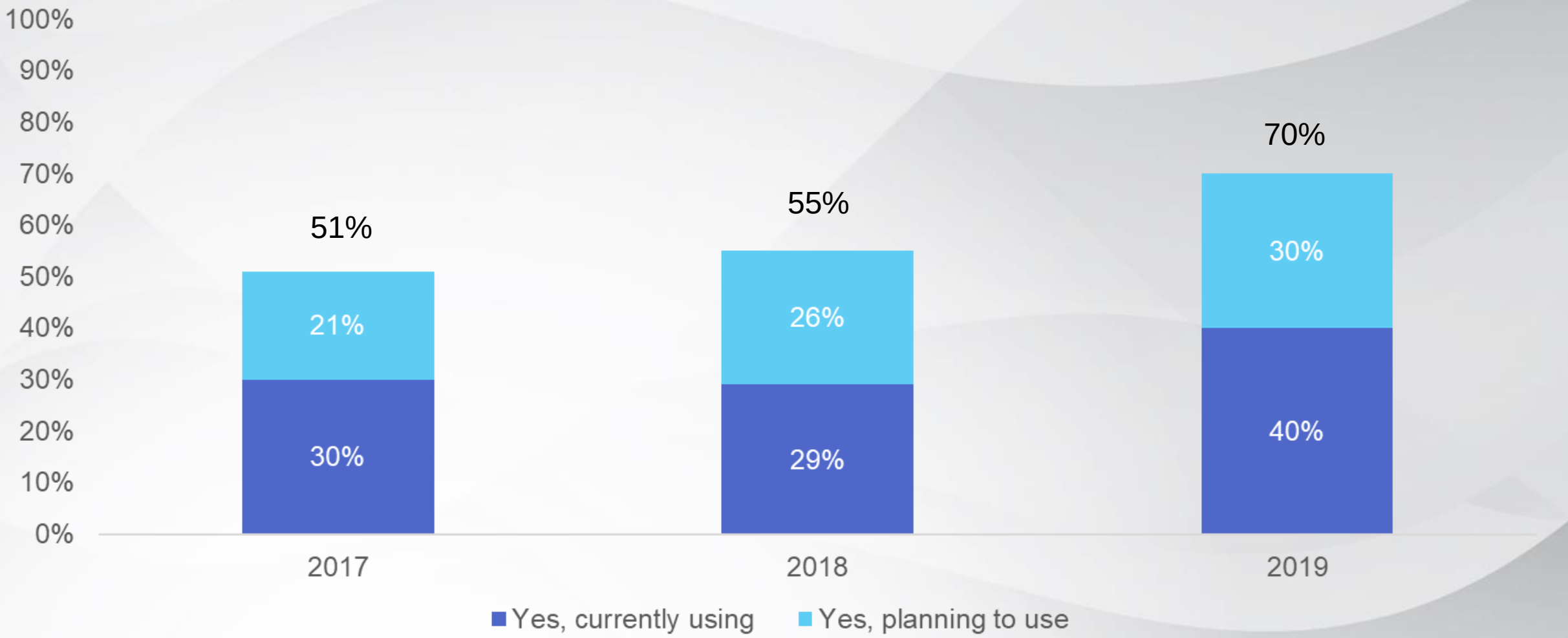
Use of 3D Perception in Products



Source: Edge AI and Vision Alliance, *Computer Vision Developer Survey, Nov. 2019*

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Sensor Innovation

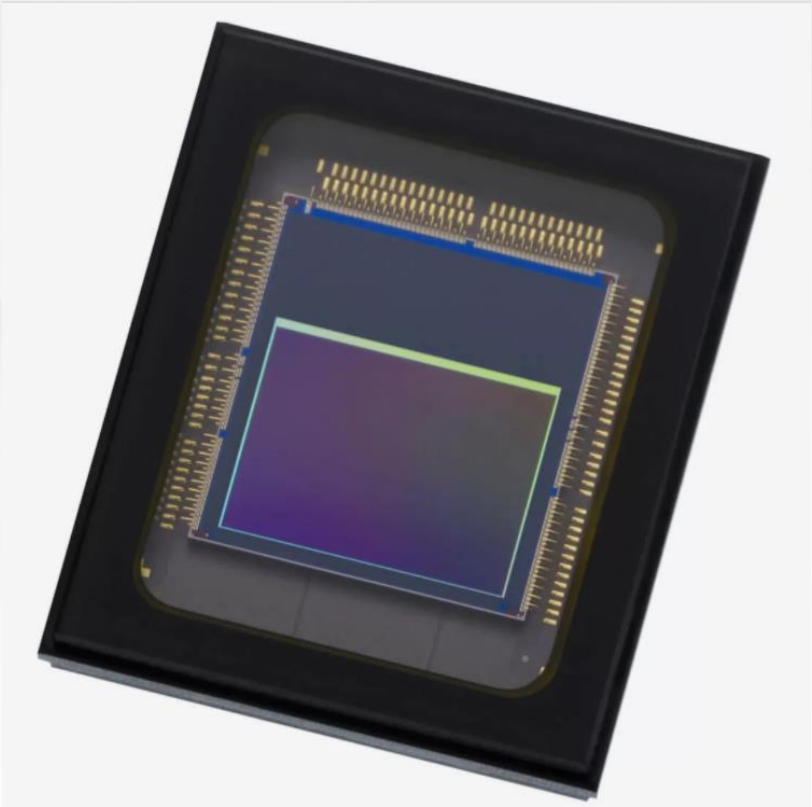

Image: techspot.com

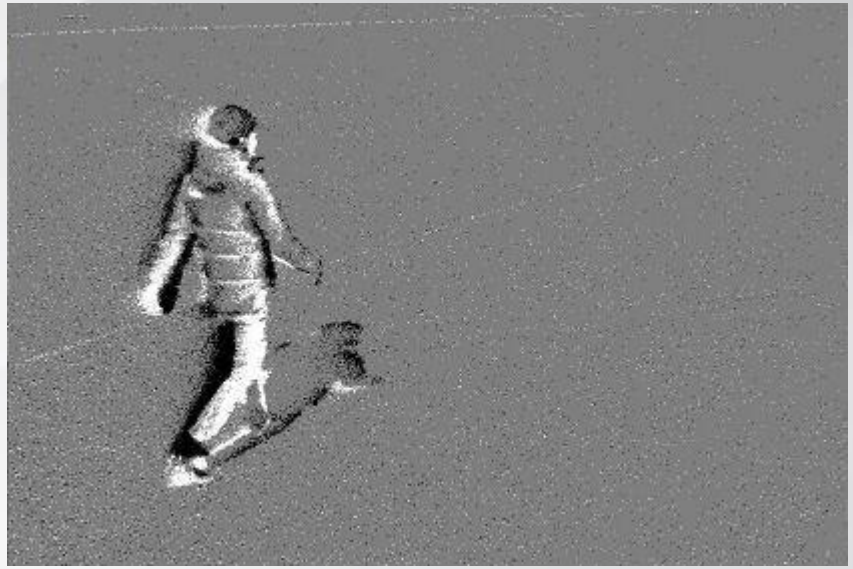

Image: imveurope.com

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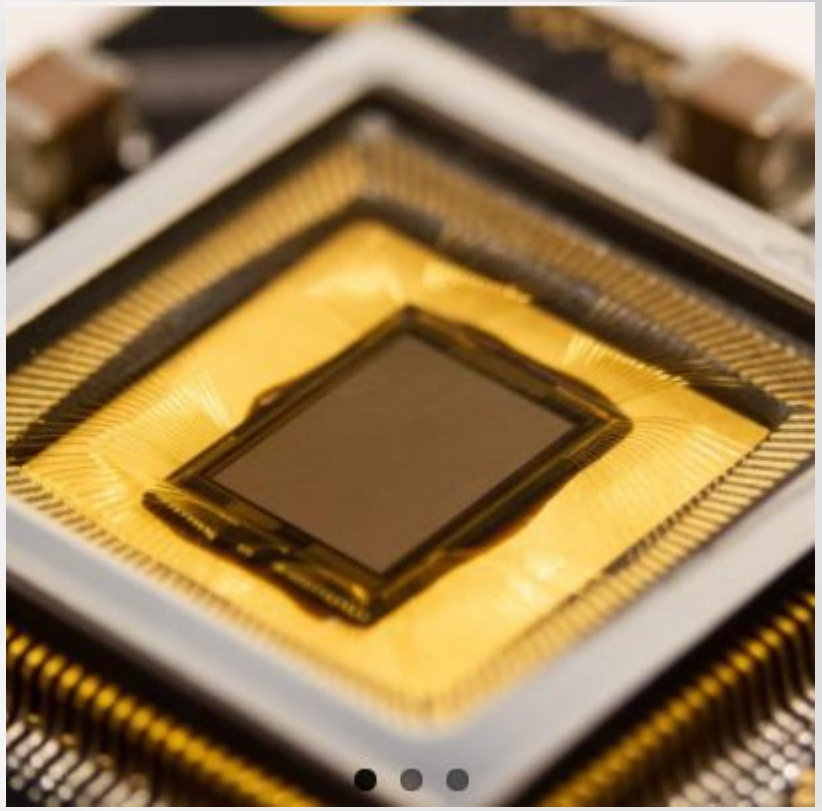
Event-Based Image Sensors



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Applications and Opportunities

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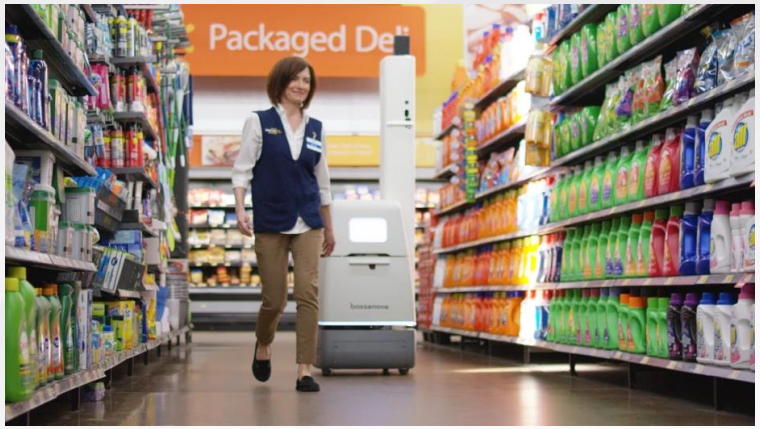
Inspiring + empowering innovators to design systems that **perceive + understand**

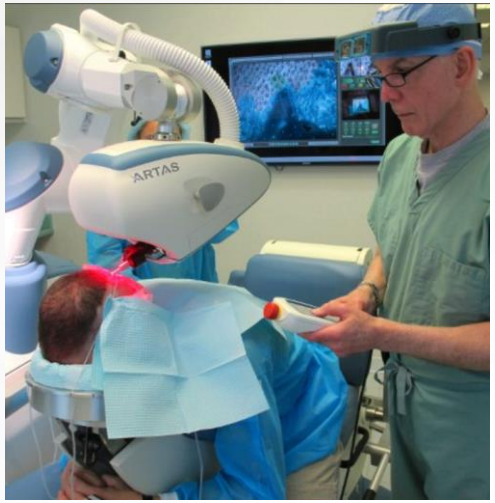
Applications: Autonomous Machines



Source: Bossa Nova Robotics

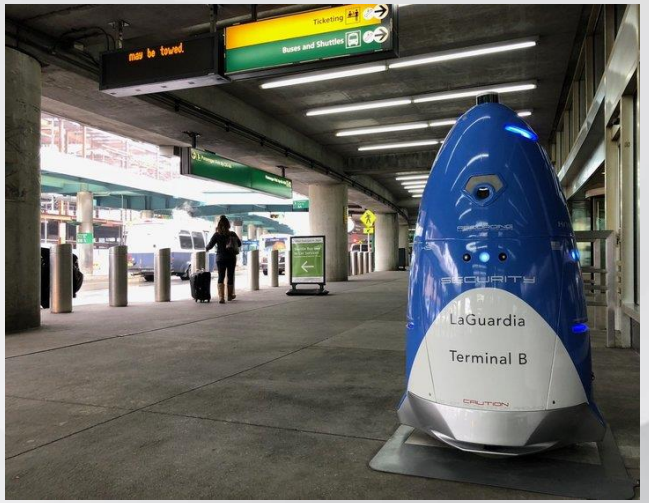
Source: Seegrid

Source: iRobot



Source: Restoration Robotics

Source: Blue River Technology



Source: Knightscope

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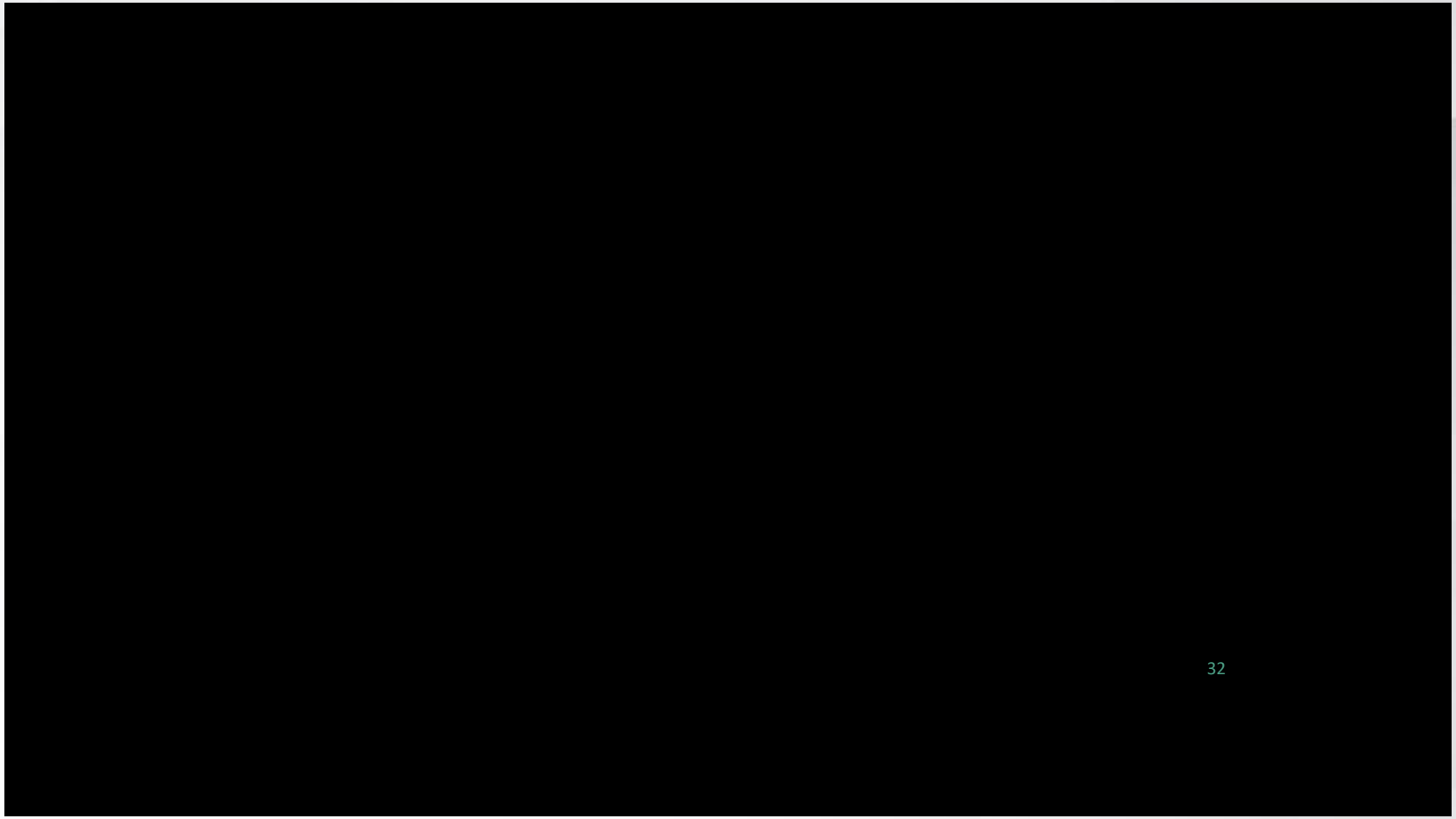
Skydio Self-Piloting Drone Surveys Roofs



https://www.youtube.com/watch?v=MSy_06aOBzg

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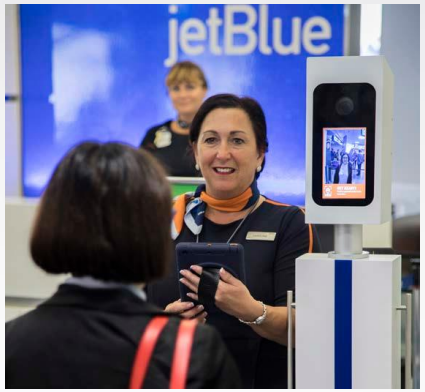
Applications: Smart Spaces

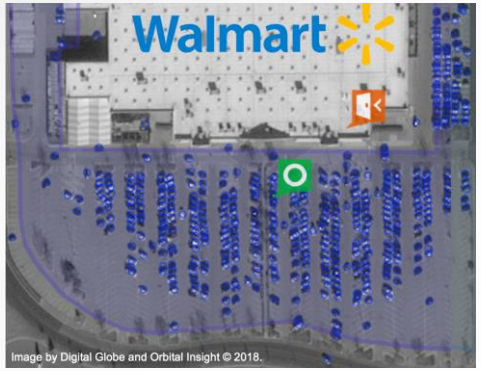
Source: Petcube



Source: cpb.gov

Source: Compology

Source: Ringdoorbell.eu



Source: Orbital Insight

Source: Identified Technologies

Source: Amazon

Source: Hortdaily.com

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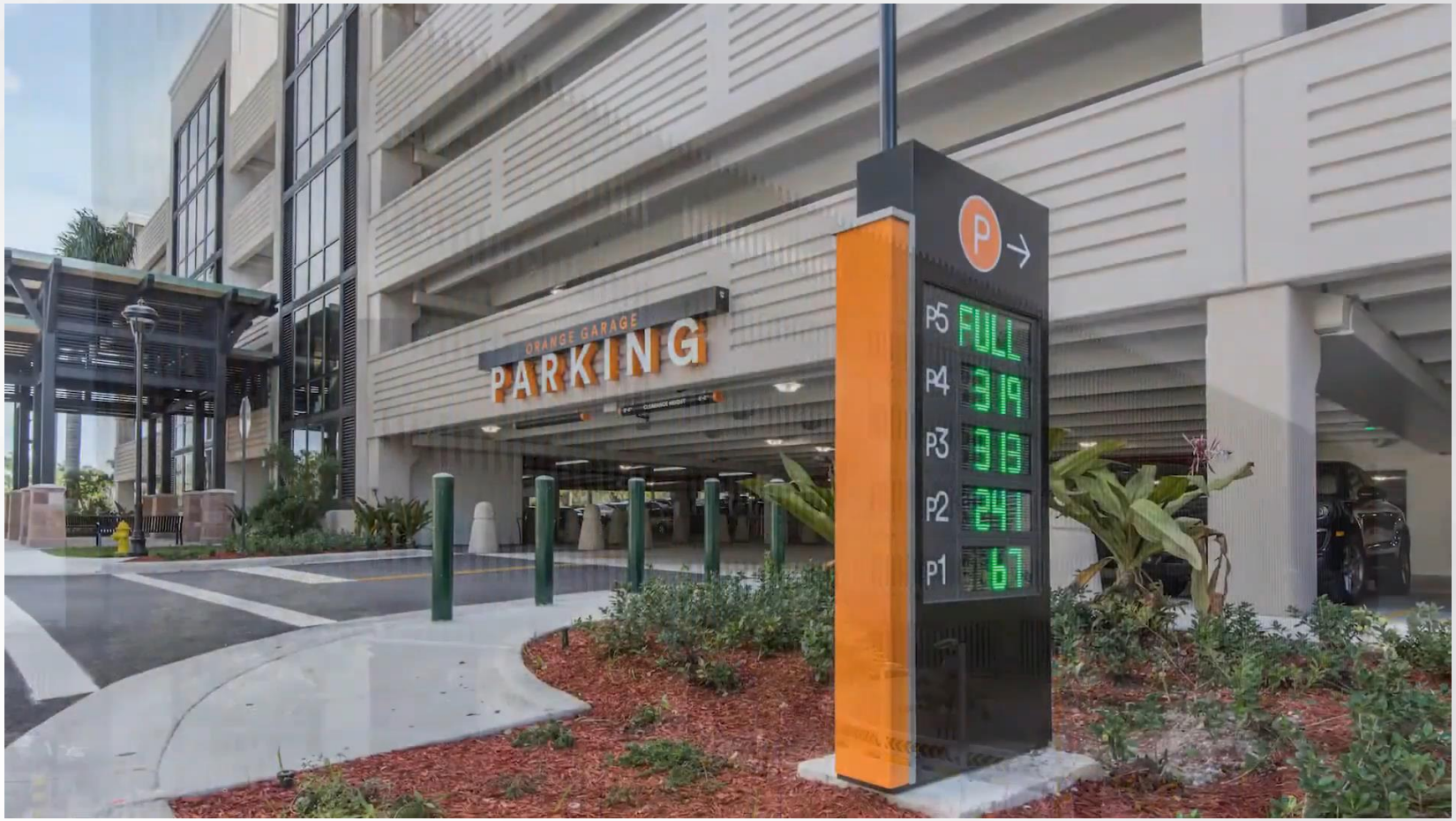
Park Assist: Find an Open Spot; Find Your Car



https://www.youtube.com/watch?v=mQ6wN0pUsVY

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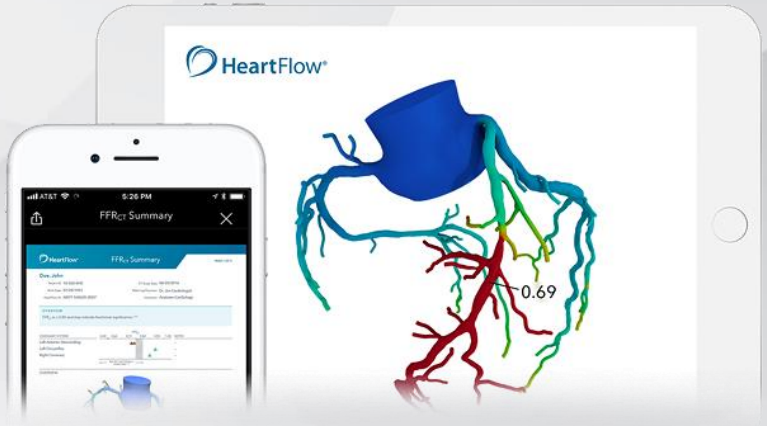
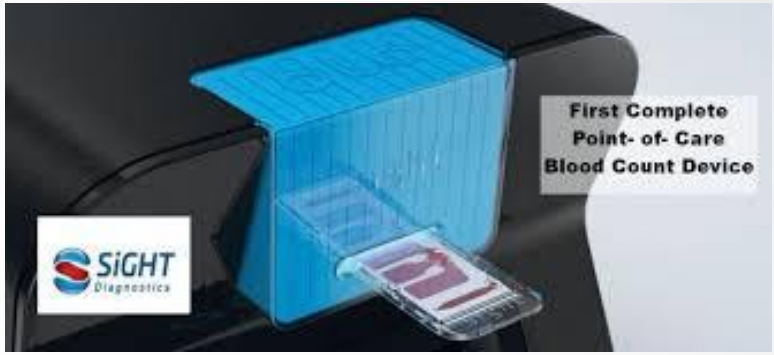
Applications: Health and Safety

Source: VirtuSense

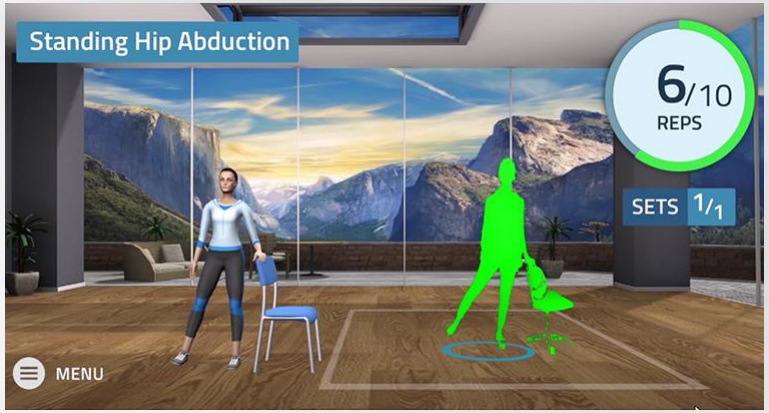
Source: Opternative



Source: HeartFlow



Source: Sight Diagnostics



Source: Reflexion Health

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Millie Fit: Your AI Pilates Trainer

https://www.youtube.com/watch?v=RYhWvJgIcsE

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Join Us At the Embedded Vision Summit

The only industry event focused on practical computer vision and visual AI

- *95% of attendees would recommend the Summit to their colleagues building vision products.*
  - *"Fantastic. Learned a lot and met great people."*
  - *"Wonderful speakers and informative exhibits!"*

2020 embedded VISION summit
VIRTUAL | SEPT 15-25

During the Embedded Vision Summit 2020:

- Gain insights from **100+ expert speakers** covering technical, business and product talks
- **Connect directly** with speakers in follow up Q&A, Expert Bar and Over-the-Shoulder sessions
- Get hands-on, in-depth **technical training**
- See **live demos** of the latest building-block technologies and talk with supplier technical experts
- For attending the webinar, enjoy 15%-off by using code: **WEBINAREVS20-V** (before Sept. 9)
- Visit www.embeddedvisionsummit.com for more details
- For questions, email summit@edge-ai-vision.com

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The Edge AI and Vision Alliance

The **Edge AI and Vision Alliance** is a partnership of 100+ leading technology and systems companies

We inspire and empower product developers to create better products using computer vision and edge AI

- For free educational resources, visit www.edge-ai-vision.com and sign up for our newsletter

We help companies find their best opportunities in this burgeoning industry

- For membership info, contact us: info@edge-ai-vision.com

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Take-Aways

- Computer **vision**/visual AI deployment at the **edge** is accelerating rapidly
  - Fueled by deep learning and rapid improvements in processors, sensors, tools, platforms
- There are numerous huge opportunities to improve lives and industries, and build businesses
  - At the solution, platform and component levels
- There are many serious challenges:
  - Data
  - Overwhelming range of choice in components
  - Assembling robust solutions—not just trained DNNs
  - Avoiding reinventing the wheel
- We are entering a golden era of practical computer vision
  - Take advantage of it! Go out and make something!

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Edge AI and Vision Alliance Members

edge ai + vision ALLIANCE
Inspiring + empowering innovators to design systems that perceive + understand

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Questions?

We'll email you a link to these slides, and to a recording of the webinar.

Email me for:

- Questions
- Information about the Embedded Vision Summit (online September 15-25, 2020)
- Information about how your company can become a Member of the Edge AI and Vision Alliance

Jeff Bier
Founder, Edge AI and Vision Alliance
Chairman, Embedded Vision Summit
President, BDTI

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