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**ALLIANCE™**

# Algorithms, Processors and Tools for Visual AI: Analysis, Insights and Forecasts



Jeff Bier

Founder, Edge AI and Vision Alliance | President, BDTI

February 27, 2020



# Engineering Services for Computer Vision and Deep Learning



BDTI delivers competitive advantage to companies creating and using computer vision and deep learning technology.

BDTI specializes in—

Designing **custom algorithms** that meet unique customer requirements

Creating **efficient software** that executes demanding algorithms within tight cost and power budgets

Performing independent evaluation to **enable informed decisions** on technology selection



# What is the Edge AI and Vision Alliance?

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

The Alliance provides practical technical educational resources to inspire and empower **product creators** to incorporate visual intelligence into their products

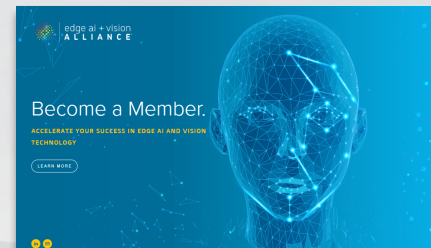
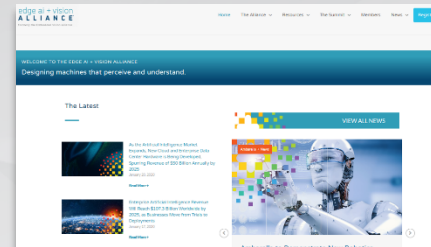
- For free educational resources, visit [www.edge-ai-vision.com](http://www.edge-ai-vision.com) and sign up for our newsletter

For **companies** providing and using edge or visual AI technology building blocks and solutions, the Alliance provides:

- Connections to customers, suppliers, partners, investors, start-ups
- Early insights on technology, markets, standards and applications
- Visit <https://membership.edge-ai-vision.com> to learn more



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# Edge AI and Vision Alliance Member Companies



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# The Computer Vision Developer Survey



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# What and Why



Annually, the Edge AI and Vision Alliance™ (formerly the Embedded Vision Alliance) surveys developers of vision-based products

Includes a broad cross section of developers of end-products and enabling technologies

We do this to gain insights into:

- Choices of techniques, languages, tools, processors, APIs
- Product development challenges
- Trends



# The Results



The information in this presentation is a subset of the results and analysis derived from the survey

Full results are provided for the internal use of Edge AI and Vision Alliance Member companies

If you wish to use an excerpt of this data in your own work, please contact Jeff Bier ([bier@edge-ai-vision.com](mailto:bier@edge-ai-vision.com)) for permission



# Focus on End-product Developers



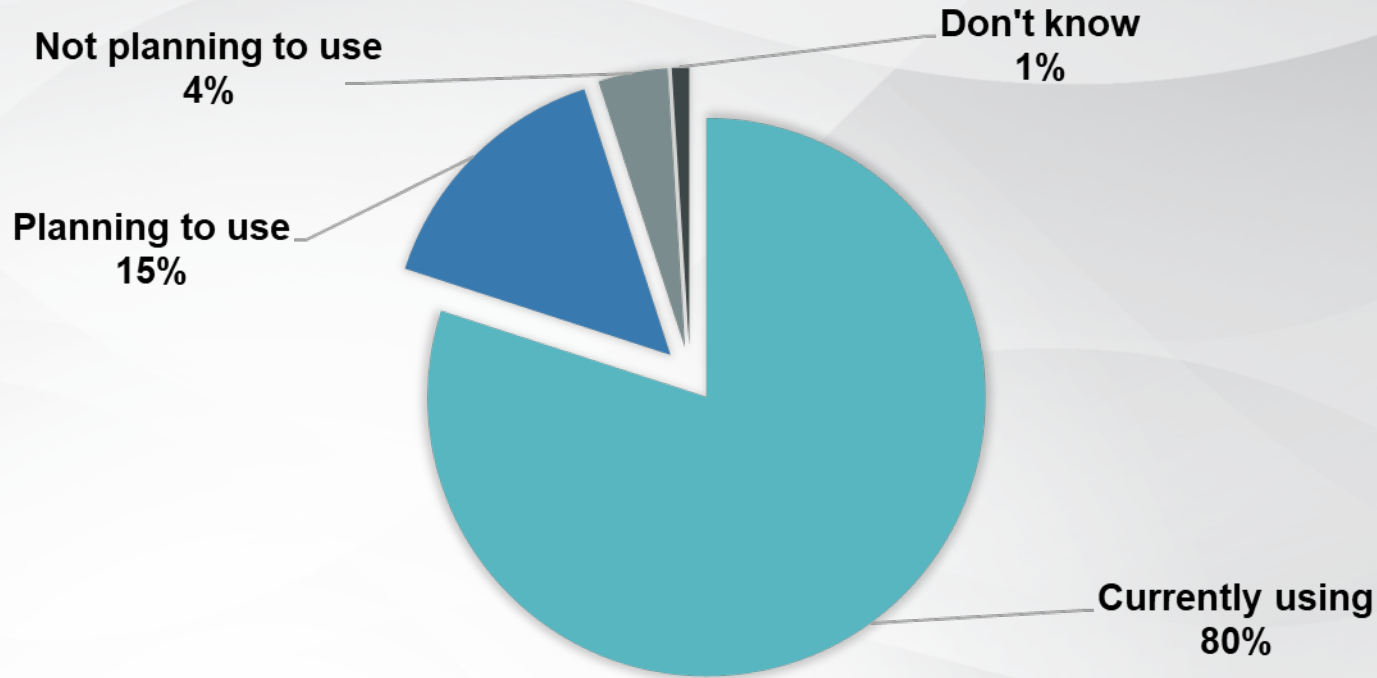
The survey generates a huge amount of data.

There are many ways to divide and analyze the survey data

In this presentation, we focus exclusively on responses from **end-product developers** working in industry (~400 responses)



# Using Computer Vision in Products

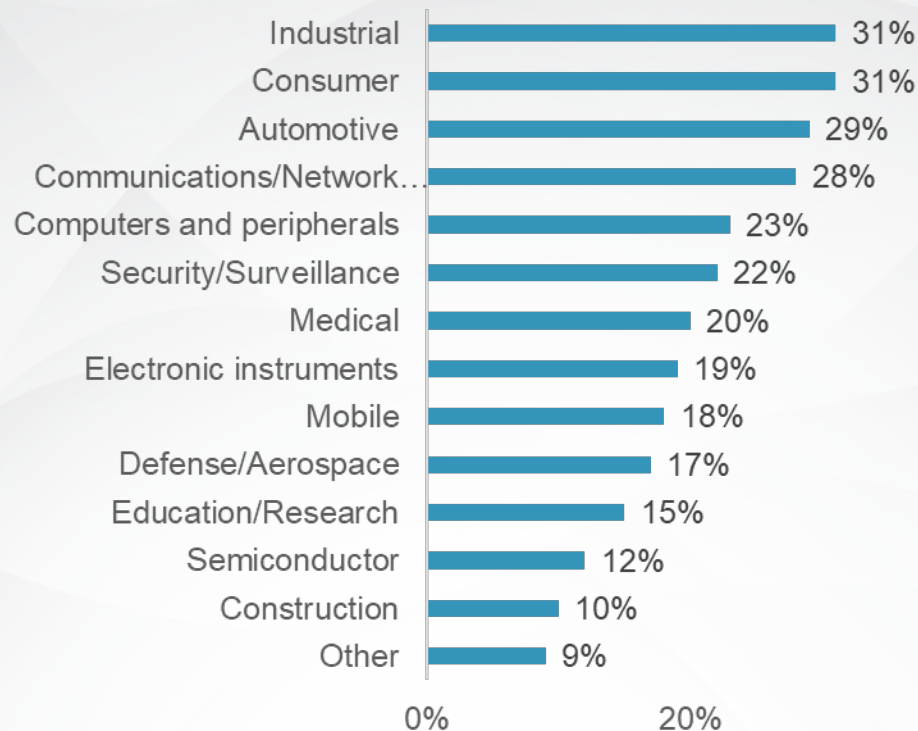


Source: Embedded Vision Alliance, *Computer Vision Developer Survey*, Nov. 2019





# Industry



Mark all that apply



# What's Changing?



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# What Can We Do with Deep Learning?

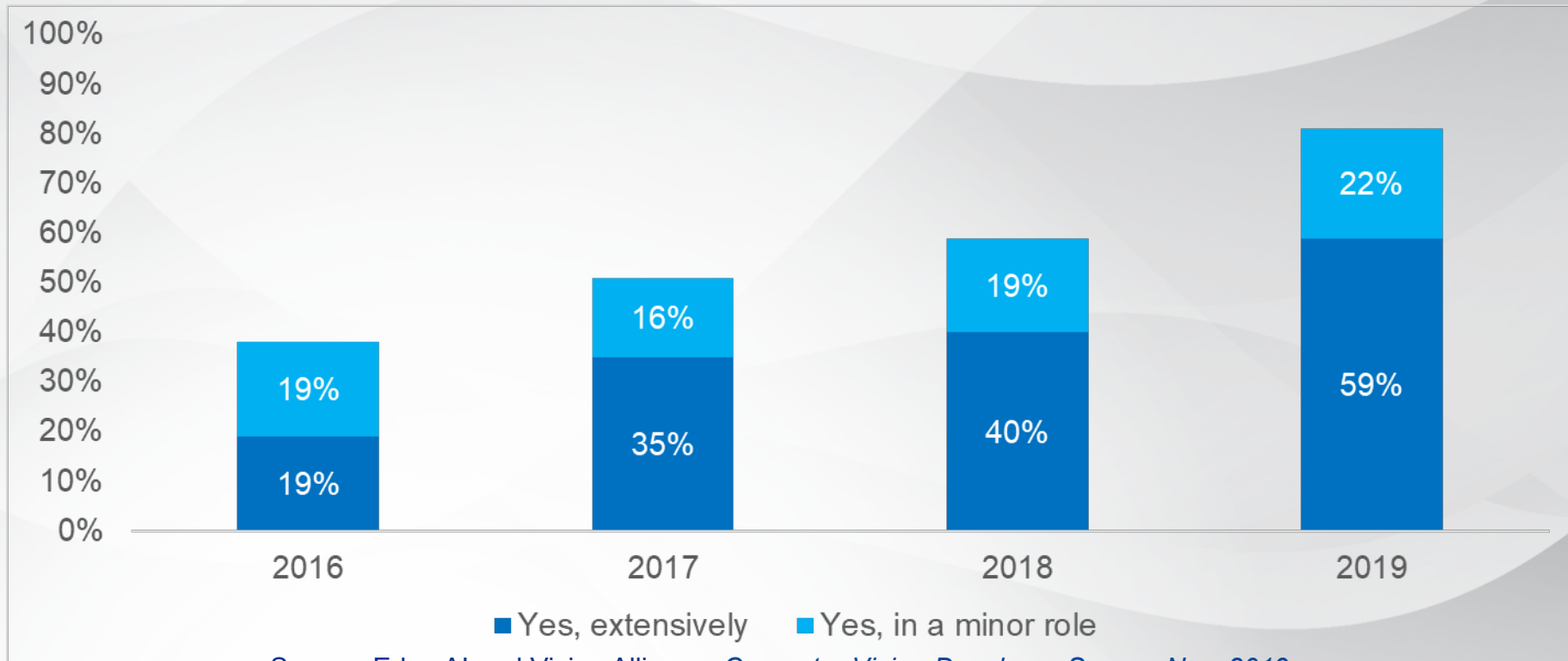


Watch the video: <https://www.youtube.com/watch?v=HXWR5h5vVYI>

Source: Bo Zhang, Microsoft



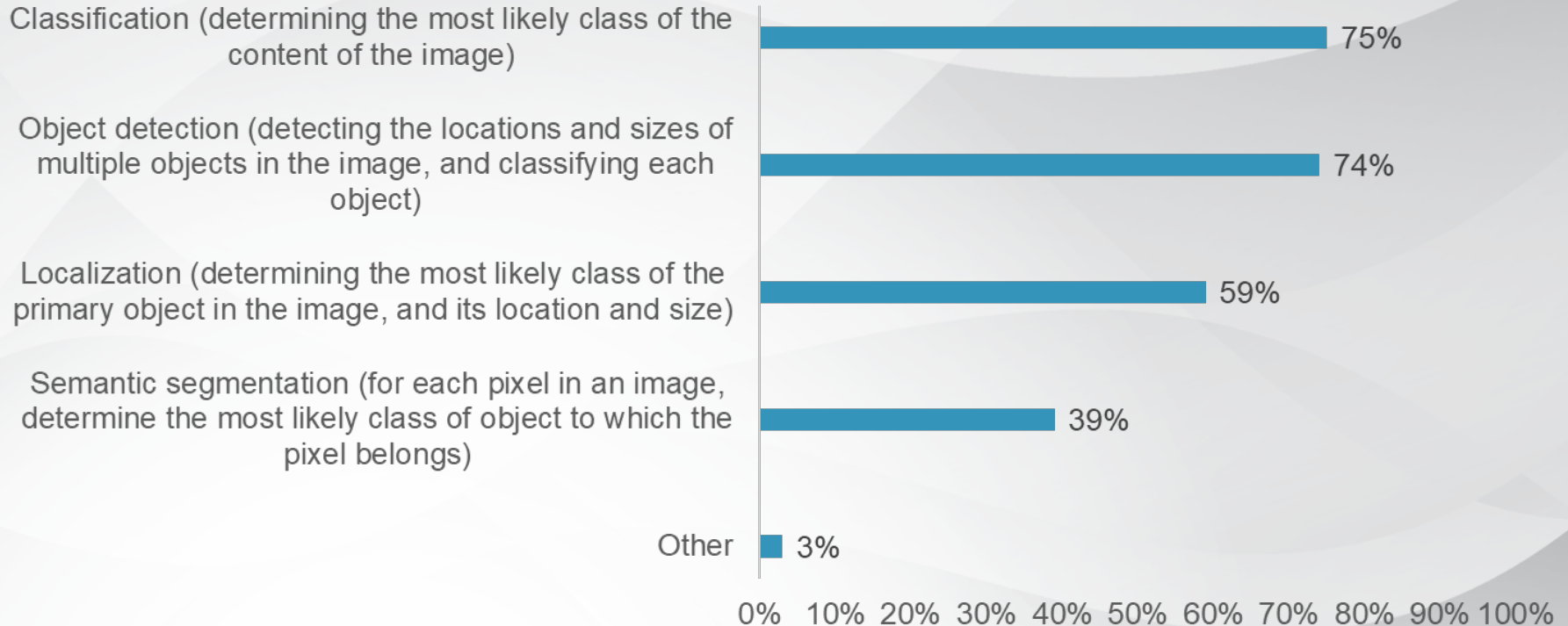
# Use of Neural Networks (Change Over Time)



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



# Functions Served by Neural Networks

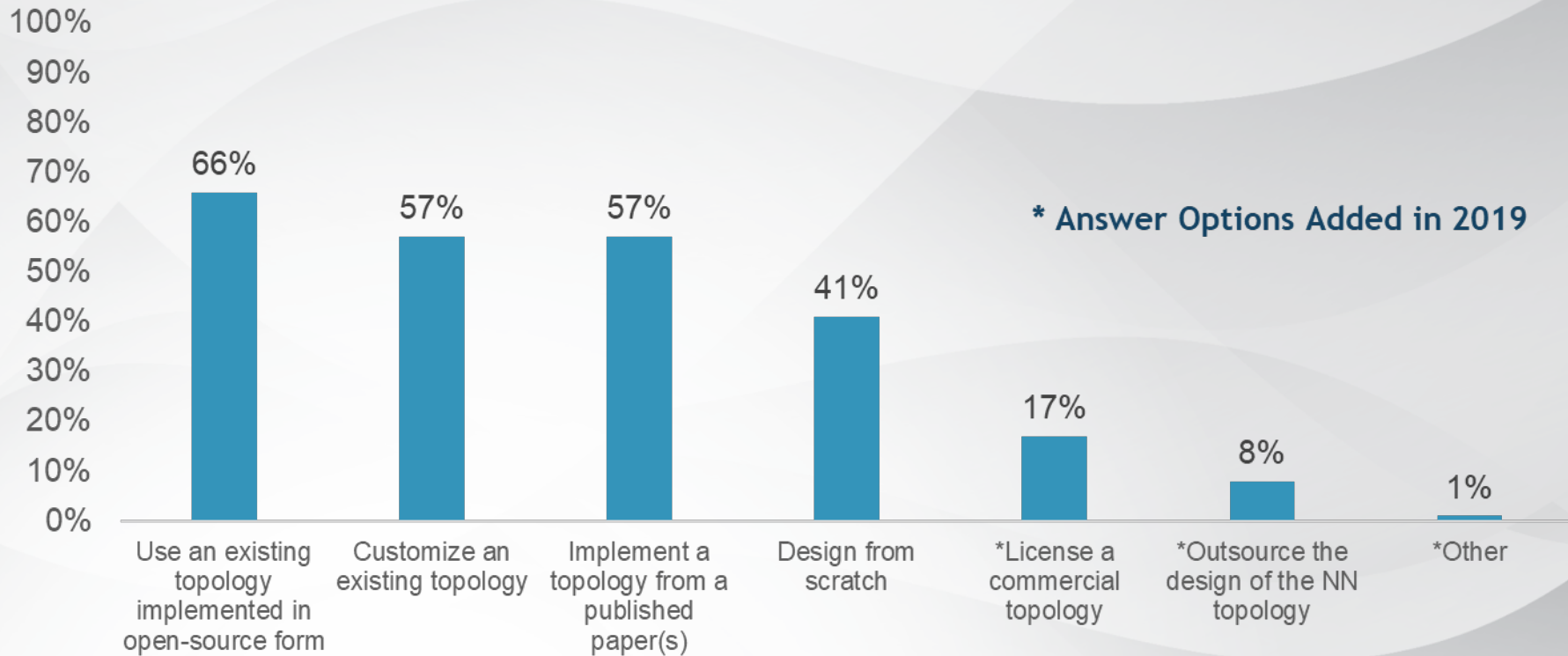


Source: Embedded Vision Alliance, *Computer Vision Developer Survey*, Nov. 2019





# Designing Neural Network Topologies



Source: Embedded Vision Alliance, *Computer Vision Developer Survey*, Nov. 2019



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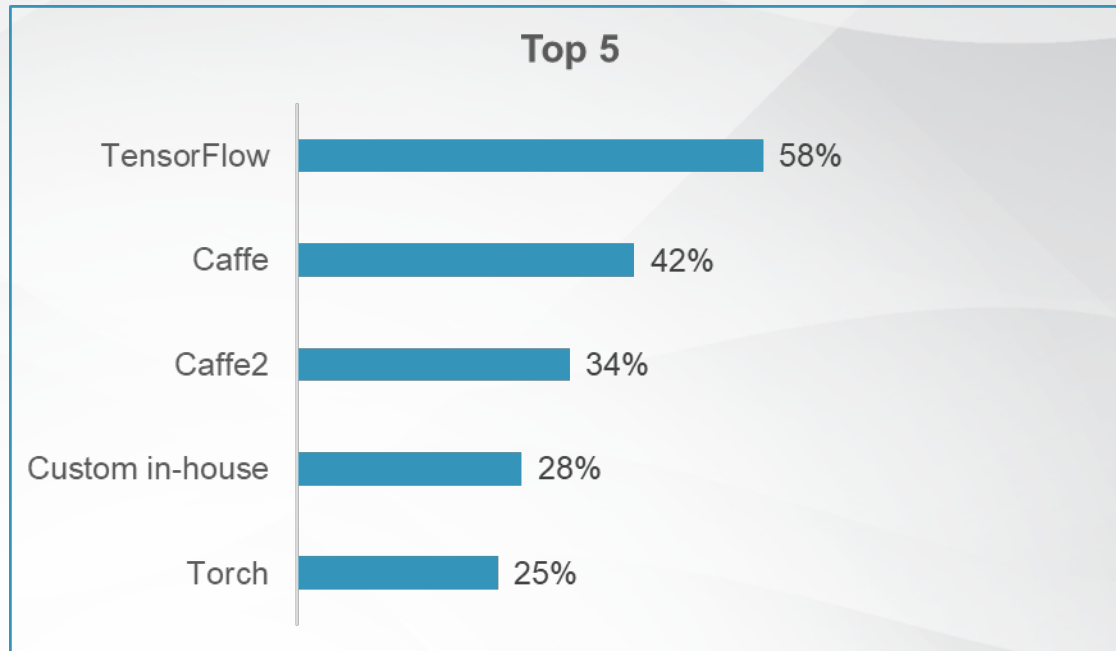
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# Machine Learning Framework Used For Designing, Training or Evaluating Neural Network Algorithms



Ranked as one of top three



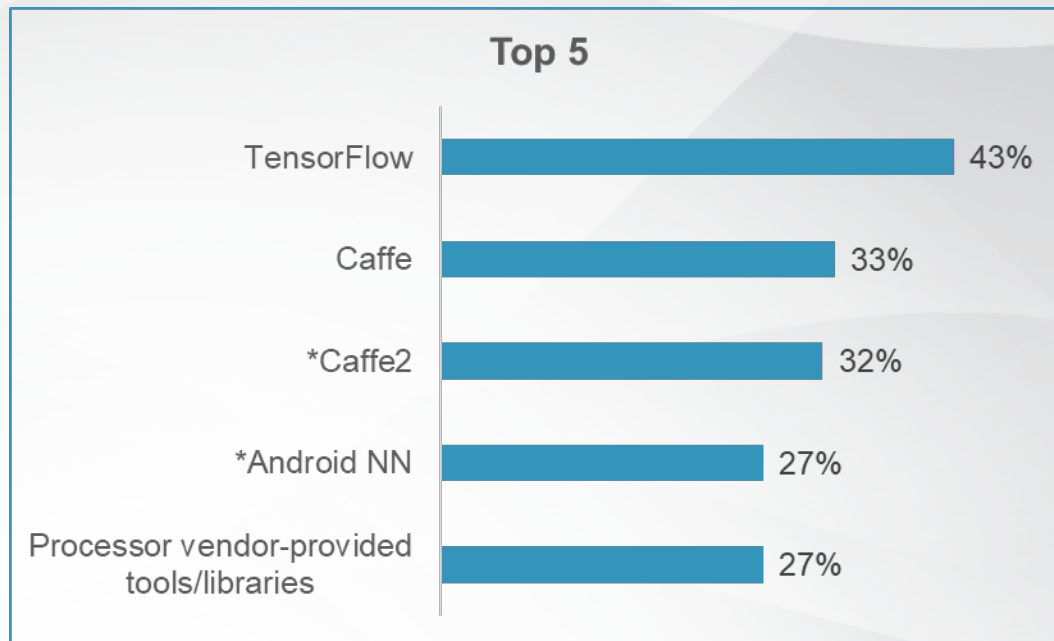
Source: Embedded Vision Alliance, *Computer Vision Developer Survey*, Nov. 2019



# Software Frameworks, Tools or Libraries Used for Deploying Neural Network Inference



Ranked as one of top three

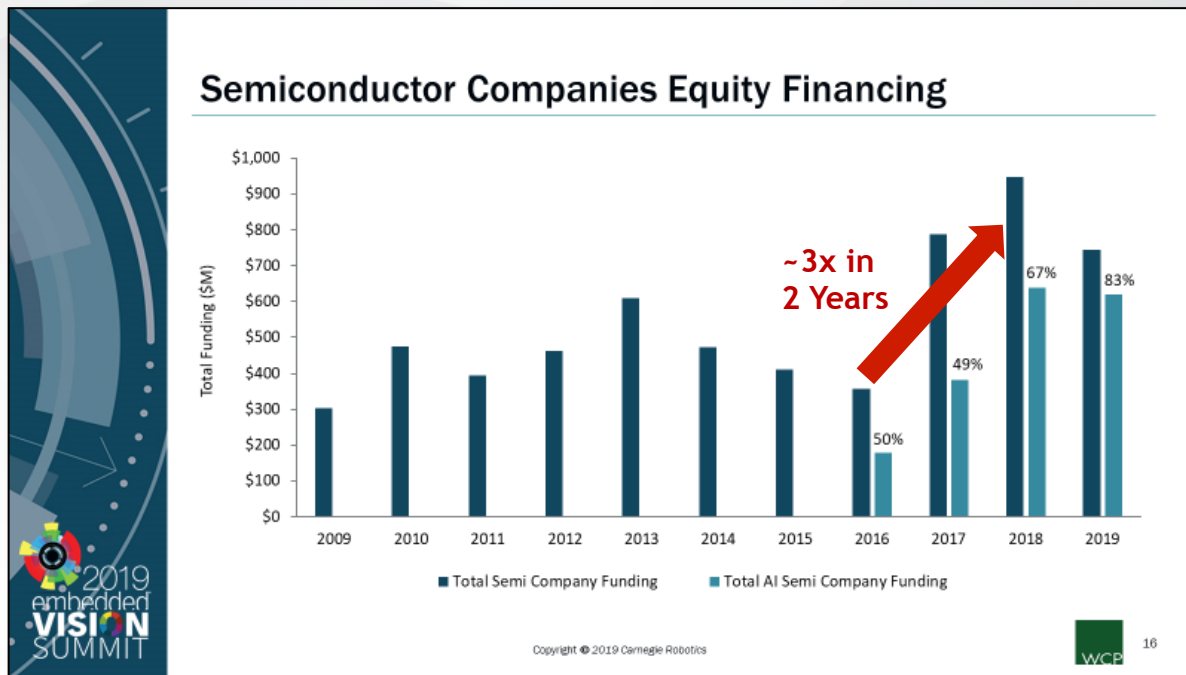


\*Answer Options Added in 2019

Source: Embedded Vision Alliance, *Computer Vision Developer Survey*, Nov. 2019



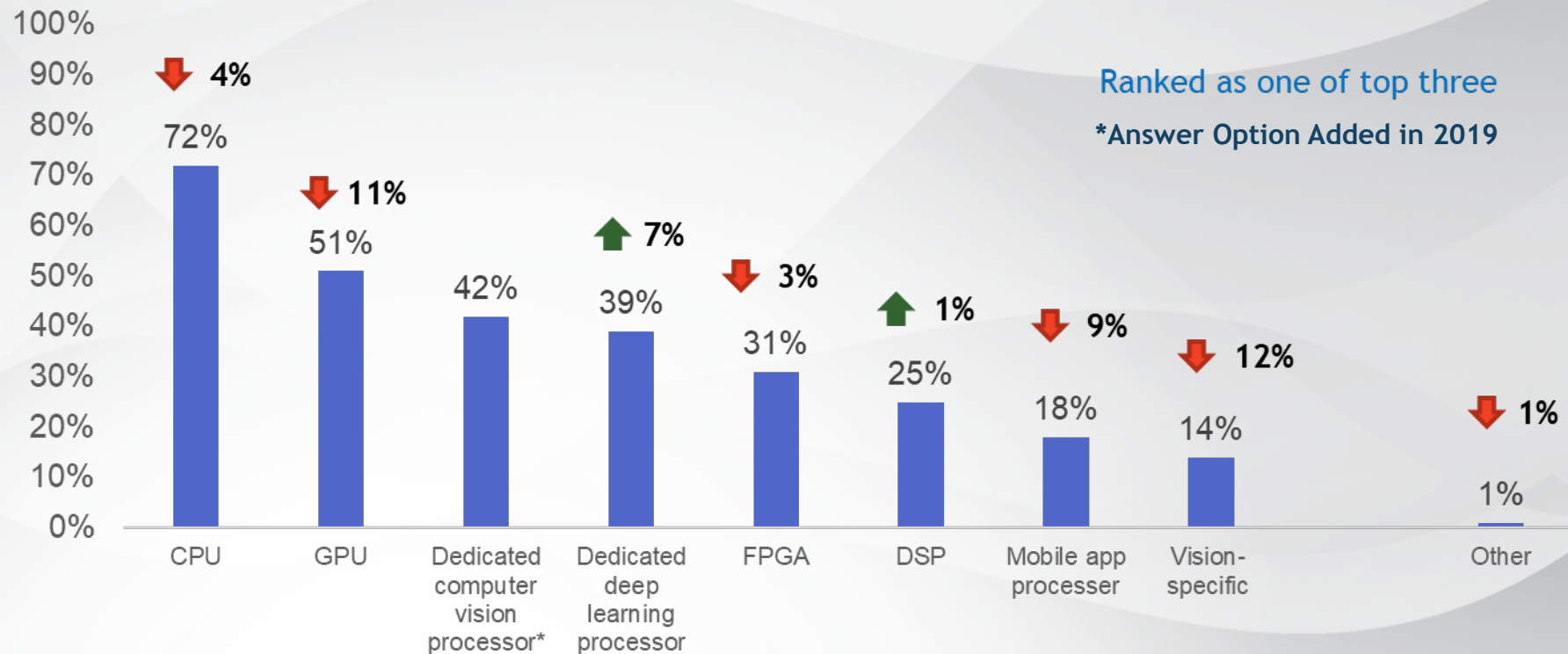
# Deep Learning Catalyzes Acceleration in Innovation and Applications



Source: Rudy Burger, Woodside Capital



# Type of Processor Used for Deployment of Vision Tasks



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



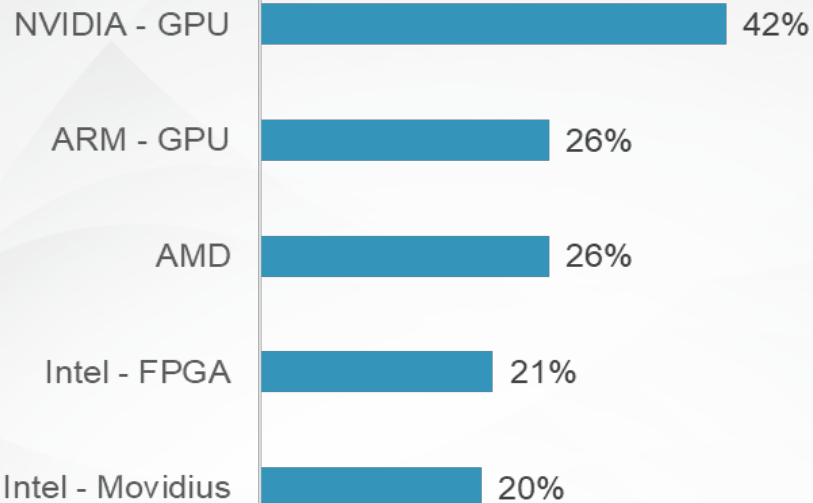


# Processor Suppliers Used (Excluding CPUs)

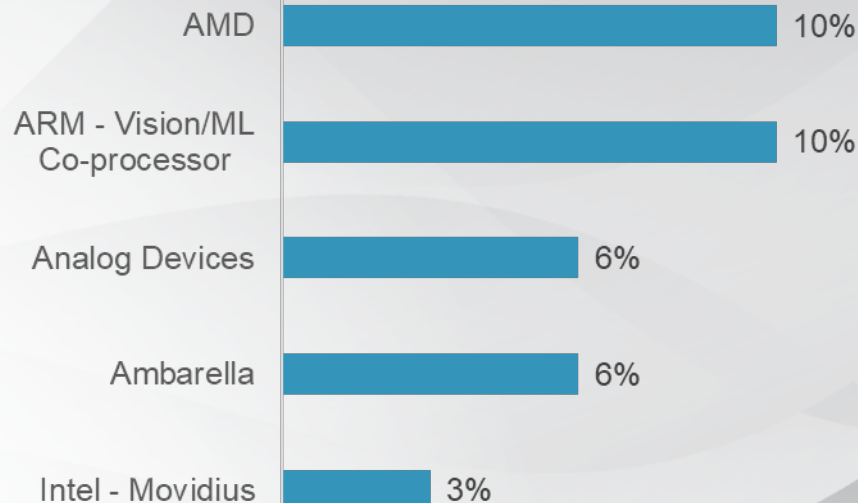


Ranked as one of top three

## Top 5



## Largest Increase



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

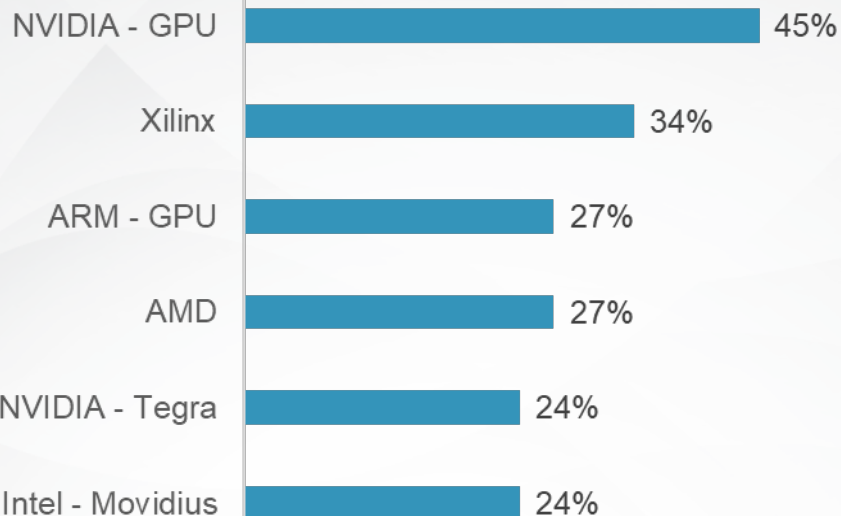


# Processor Suppliers – Industrial (Excluding CPUs)

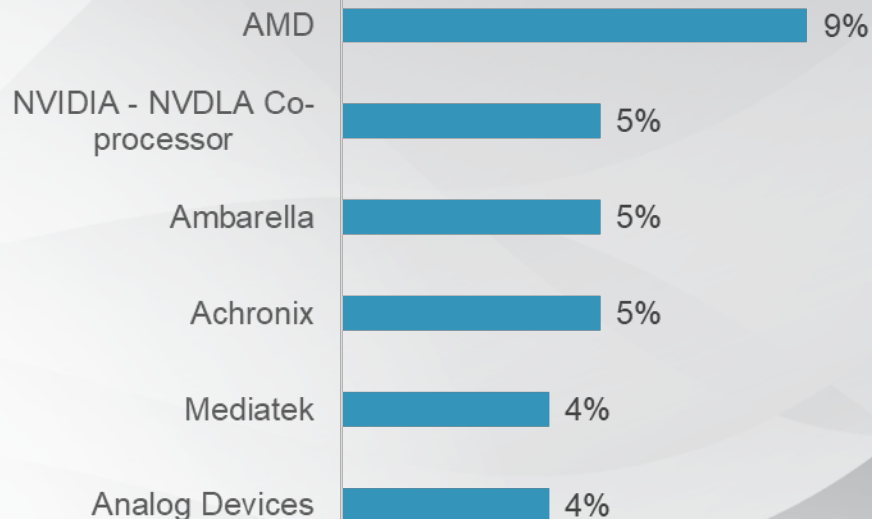


Ranked as one of top three

## Top 5 Scores



## Largest Increase



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

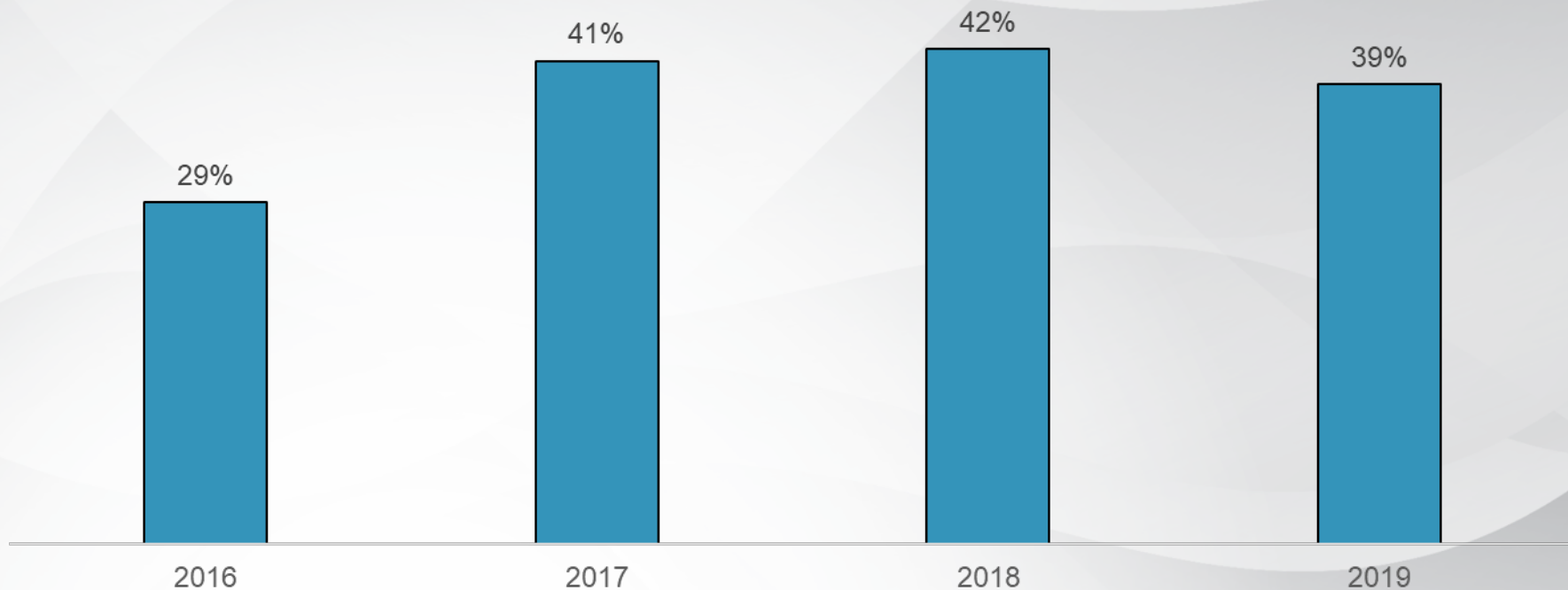


# How is Your Neural Network Deployed?

(Change over time)



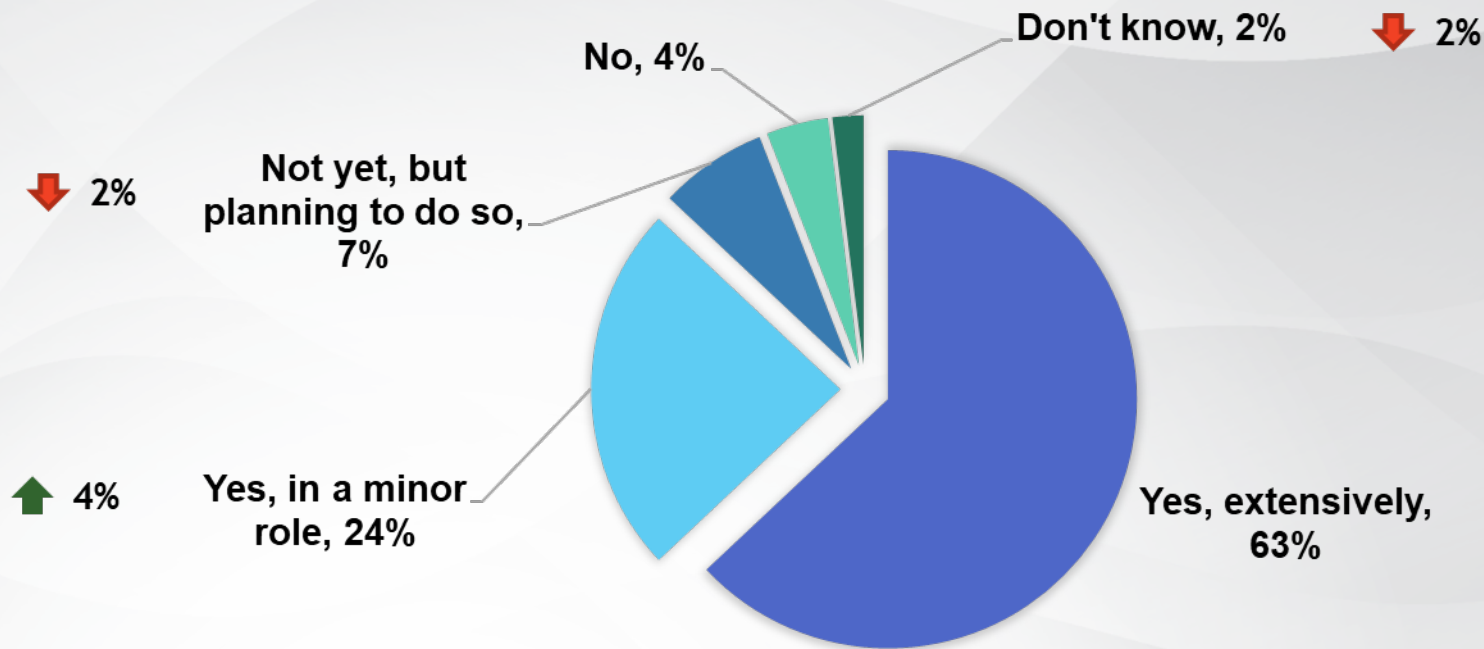
Inference in datacenter



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



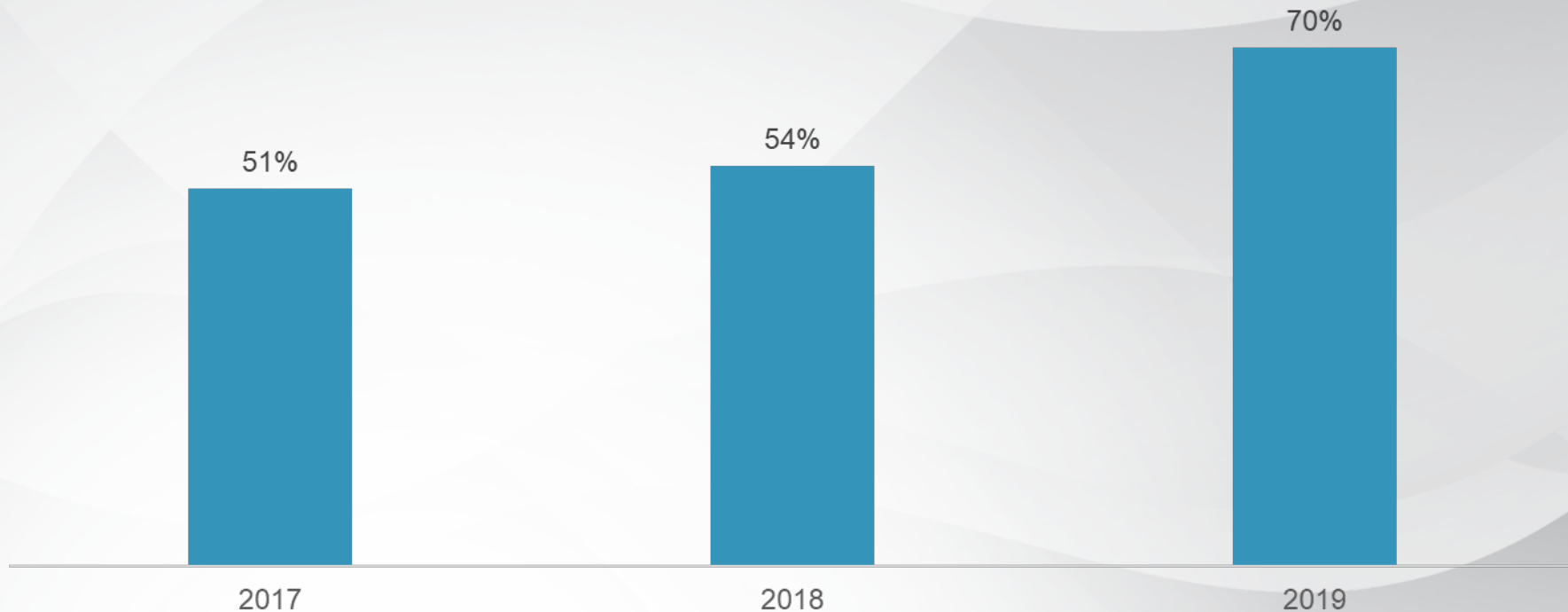
# Using Non-Neural Network Algorithms to Perform Computer Vision Functions



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



# Use of 3D Perception in Your Products (Change over time)

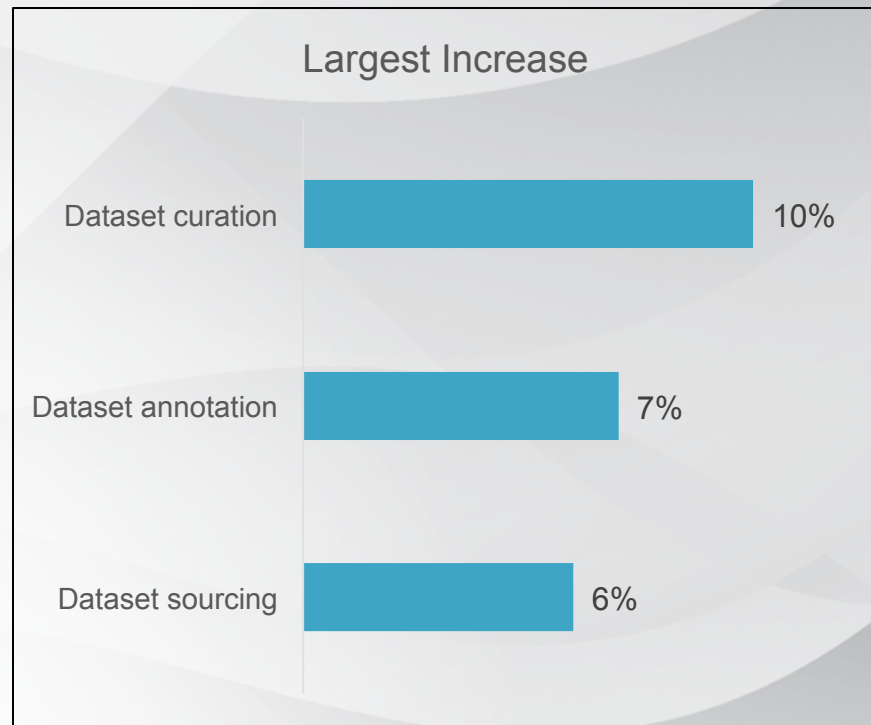
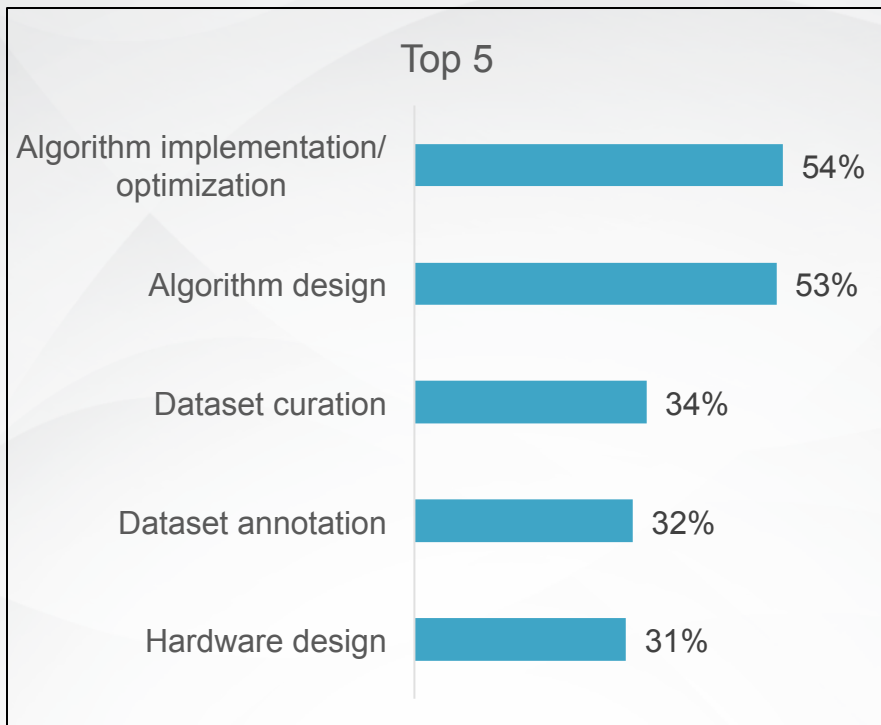


Source: Edge AI and Vision Alliance, *Computer Vision Developer Survey, Nov. 2019*





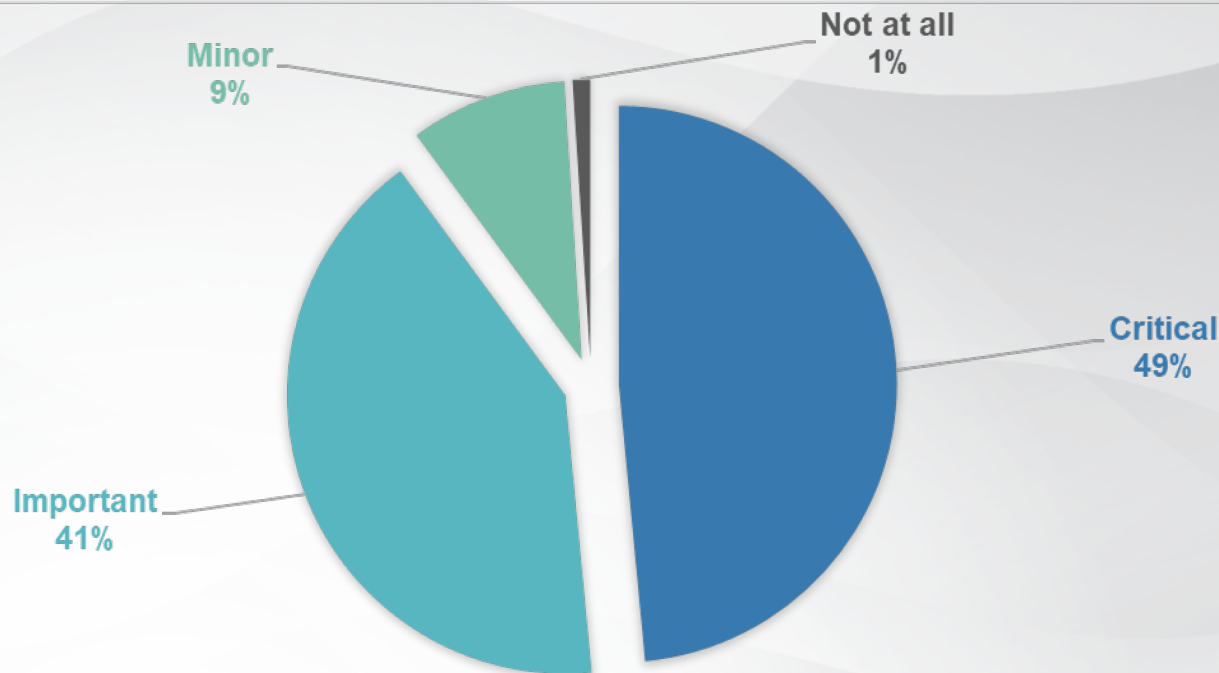
# Most Challenging Areas of Computer Vision Product Development



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



# Importance of Vision Capabilities to Your Products or Services – in Five Years



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



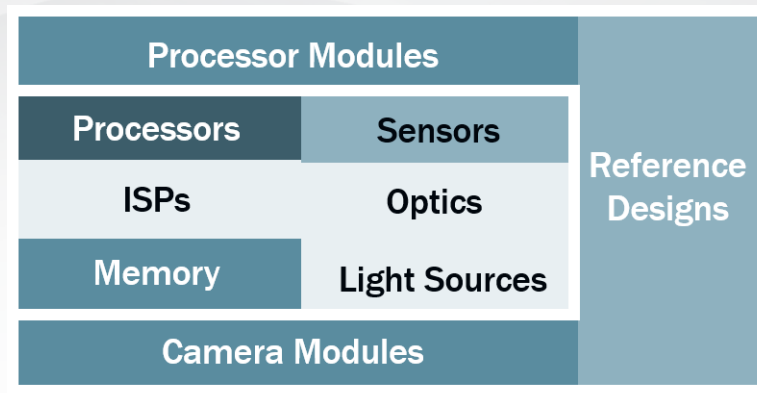
# Hot Spots: Innovation and Opportunity



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# Current Activity



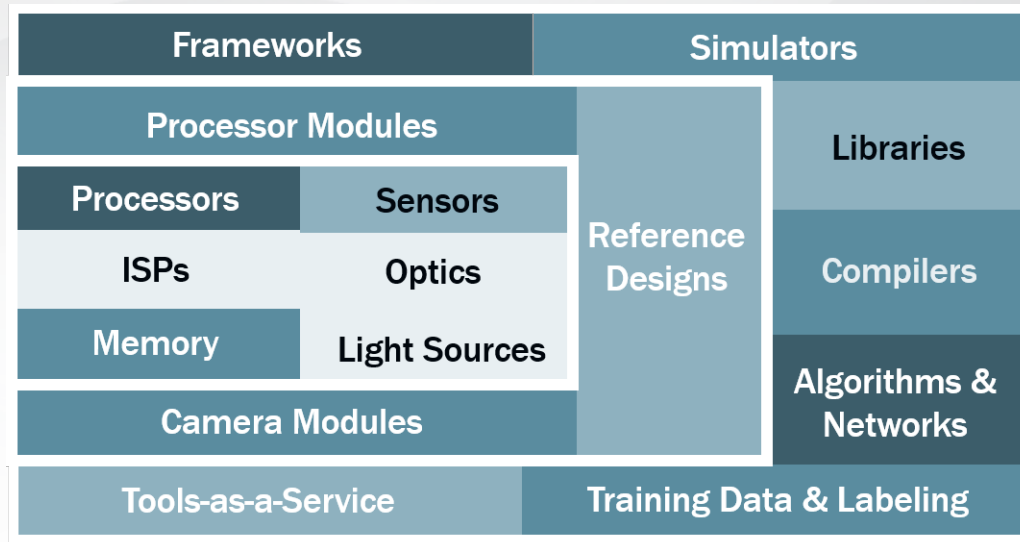
Less



More



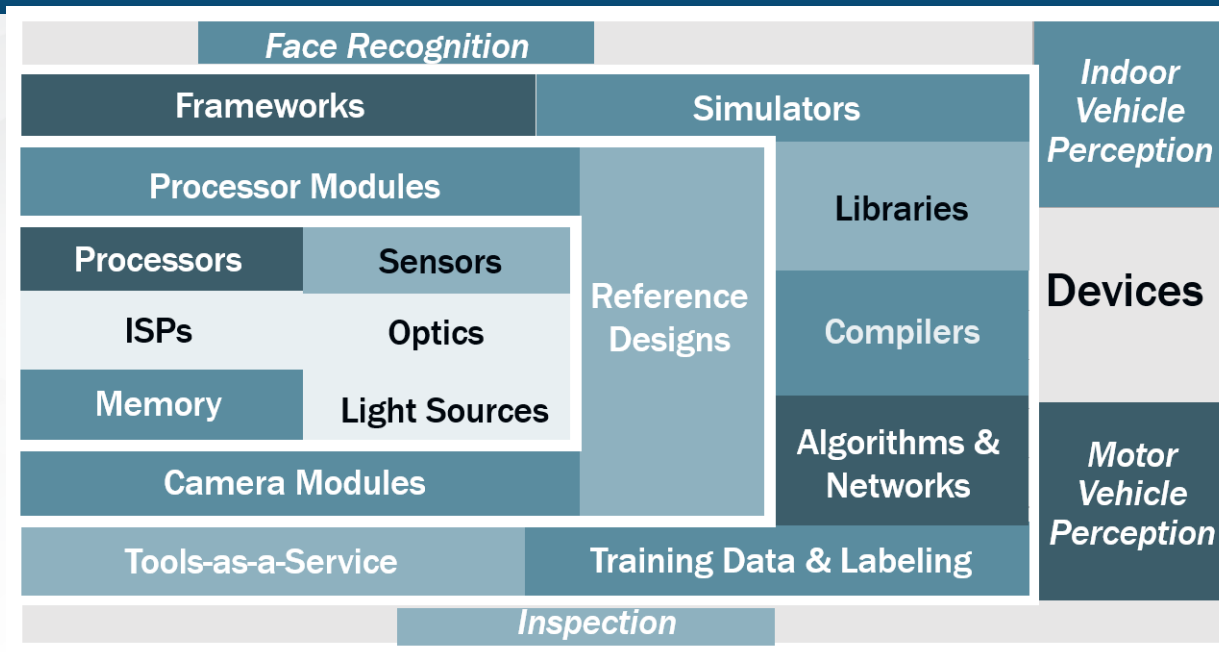
# Current Activity



Less     More



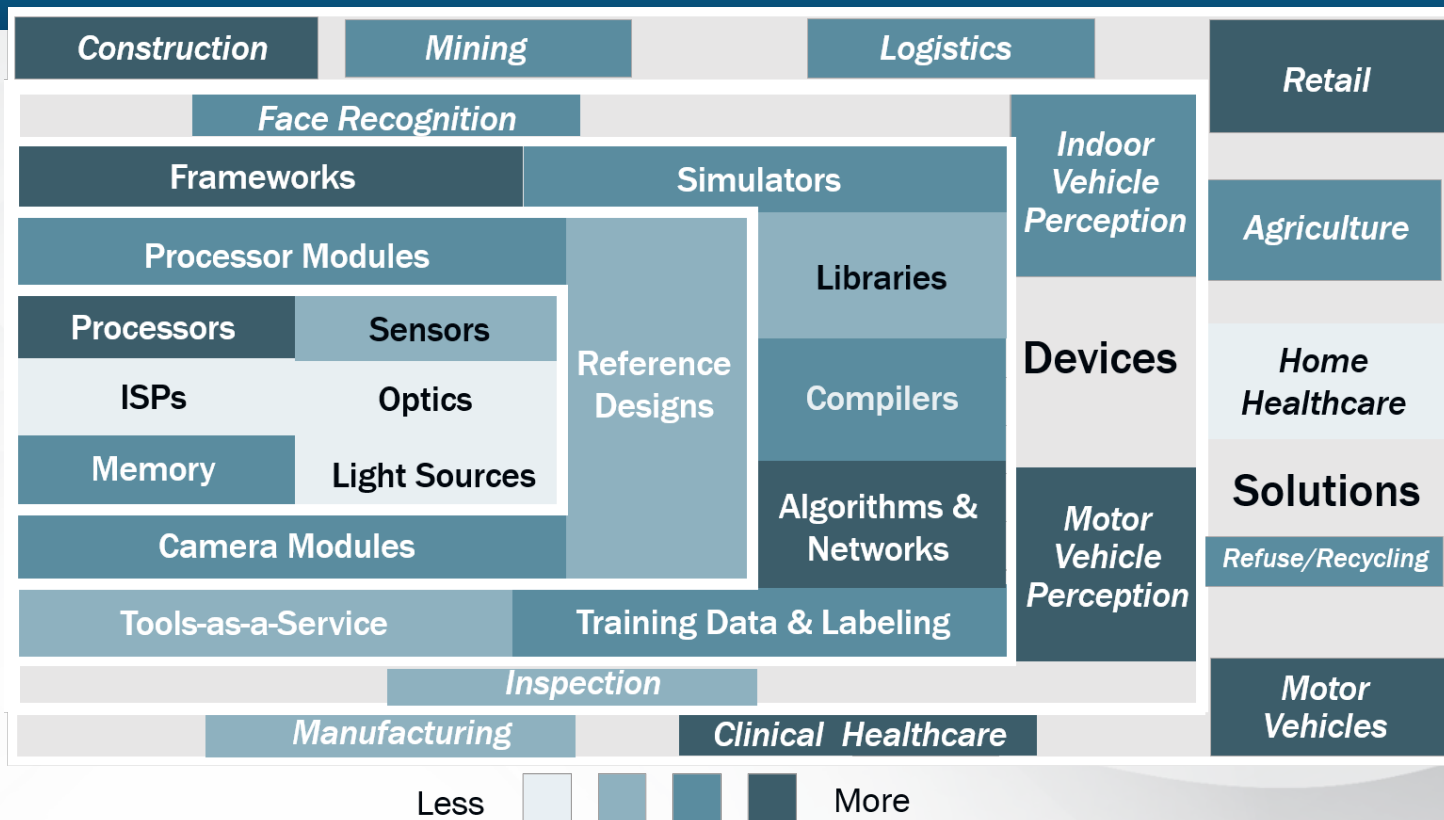
# Current Activity



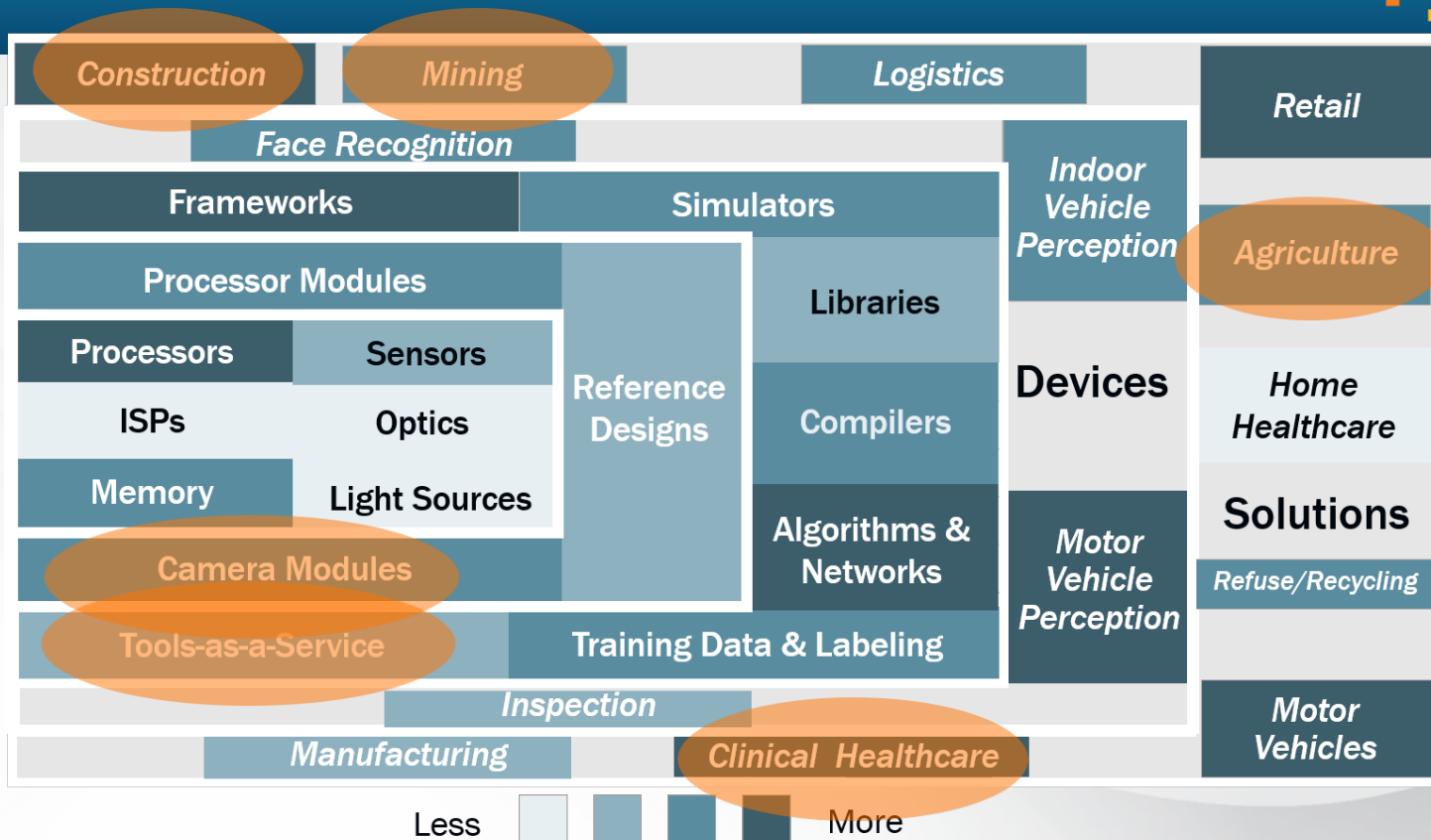
Less     More



# Current Activity



# Opportunities





# Precision Agriculture



See & Spray

*Spot spray herbicide only on weeds*

*July, 2017 near Lubbock, Texas*

 **BLUE RIVER**  
TECHNOLOGY

Source: Blue River Technology



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# We Are Entering a Golden Era



- Computer vision/visual AI deployment is accelerating rapidly
  - Fueled by deep learning, better processors, improved tools, growing investment
- Big challenges remain
  - Data sets -- accuracy
  - Security
  - Reducing cost
  - Reducing power
  - Simplifying product development
- There are numerous huge opportunities
  - At the solutions level – thousands of applications
  - At the software level – especially tools-as-a-service
  - At the module level
- We are entering a golden era of commercial computer vision
  - Take advantage of it! Go out and make something!



# 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!”*

**Embedded Vision Summit 2020 will include:**

- **100 expert technical, business and product talks**
- **Hands-on** full day technical trainings
- **100+ demos** by more than 60 exhibitors
- Visit [www.embeddedvisionsummit.com](http://www.embeddedvisionsummit.com) for details!



**Use discount code  
EARLYBIRD20  
for 15% off  
conference tickets  
and Monday trainings**



# Sneak Peek: Embedded Vision Summit Keynote



**Prof. David Patterson, U.C. Berkeley**

*Winner of the 2017 Turing Award*

***A New Golden Age for Computer Architecture:  
Processor Innovation to Enable Ubiquitous AI***



# Sneak Peek: 2020 Summit Program



**Evan Juras**

Computer Vision Engineer  
EJ Technology Consultants

**Practical Image Data Augmentation  
Methods for Training Deep Learning  
Object Detection Models**



**Vini Jolly**

Executive Director  
Woodside Capital

**Vision Opportunities  
in Healthcare**



**Andrew Richards**

Founder and CEO  
Codeplay

**Deploying AI Software to Embedded  
Devices Using Open Standards**



**Raghuraman Krishnamoorthi**

Software Engineer  
Facebook

**Practical DNN Quantization  
Techniques and Tools**





# Embedded Vision Summit – Monday Training Classes



## Deep Learning for Computer Vision with TensorFlow 2.0 and Keras

Instructor: Doug Perry

## Computer Vision Applications in OpenCV

Instructor: Dr. Matt Flagg

## Deep Learning for Computer Vision with PyTorch

Instructor: Dr. Satya Mallick

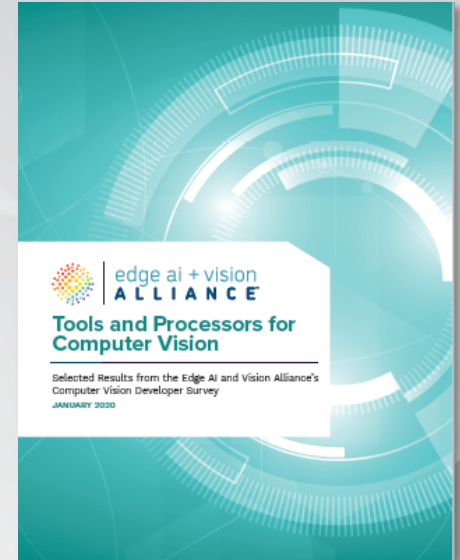


# Computer Vision Developer Survey White Paper



Download and share our public white paper with highlights from the survey:

- Download here:  
<http://bit.ly/DeveloperSurveyWhitePaper2020>



# Edge AI and Vision Alliance Member Companies



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# Questions?



Email me for:

- Questions about my presentation
- Info about the Embedded Vision Summit (May 18-21, 2020 in Santa Clara, California)
  - Use discount code EARLYBIRD20 for 15% off conference tickets and Monday trainings
- Information about how your company can become a Member of the Edge AI and Vision Alliance

## Jeff Bier

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Chairman, Embedded Vision Summit  
President, BDTI

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