



**AI ON
INTEL**

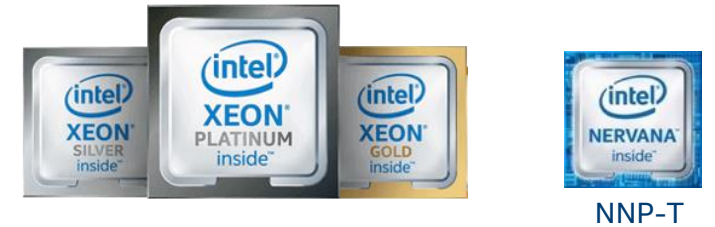
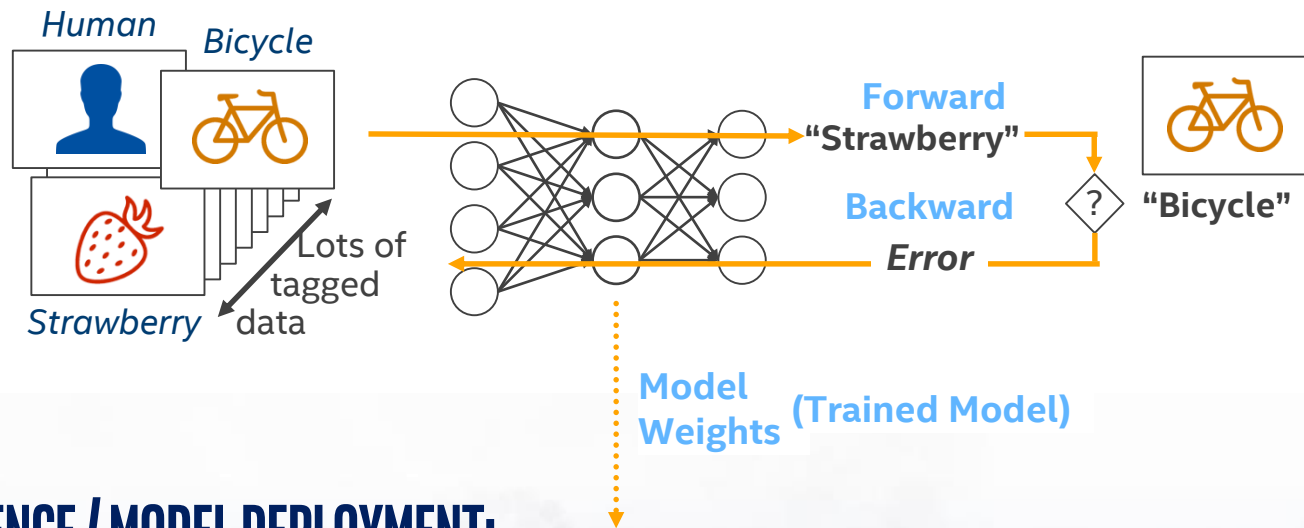
INTEL NEURAL COMPUTE STICK

SETTING UP THE VM

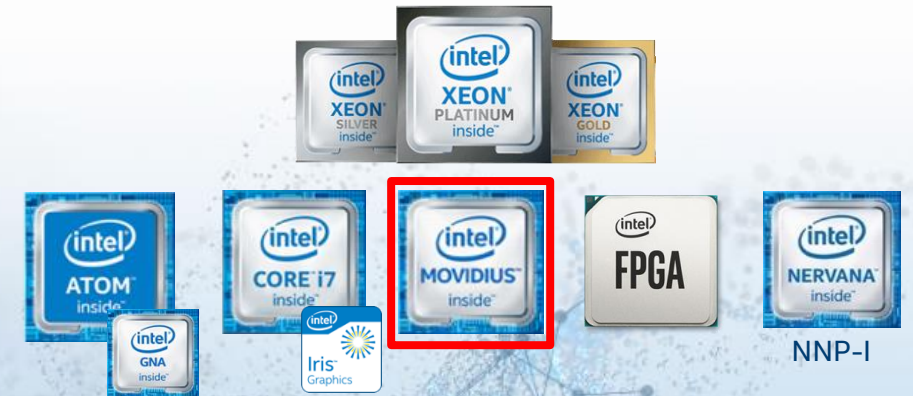
- Install VirtualBox and Extension pack
- Double click OVA file and import with default settings
- Once imported, follow the steps provided in the Readme file
- Common issues faced :
 - Error related to vt-x/vt-d
 - Check and enable virtualization in BIOS
 - NCS2 stick not detected in VM
 - Try running the labs on CPU

RECAP ON DL

TRAINING:

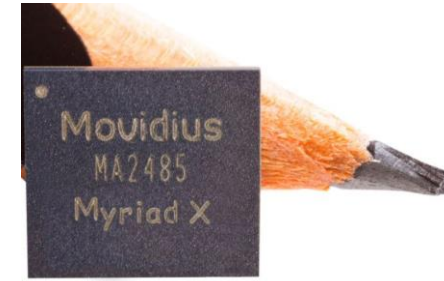


INFERENCE / MODEL DEPLOYMENT:



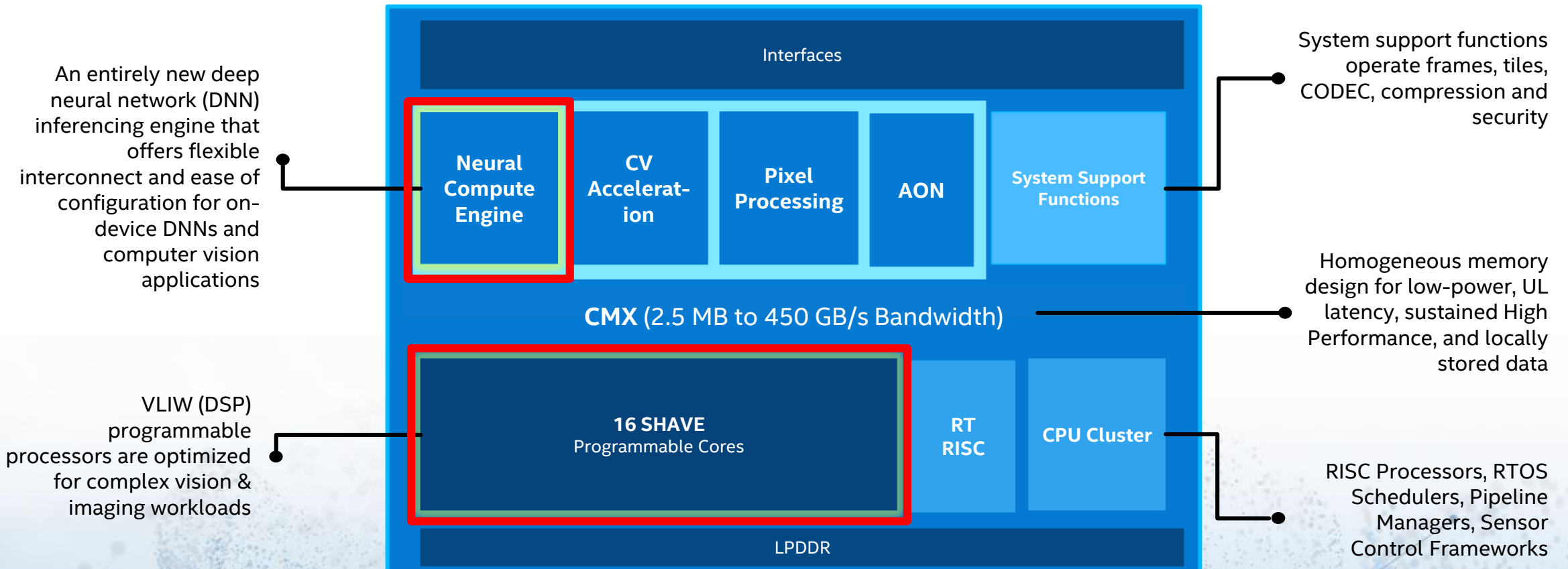
BACKGROUND

- Intel acquires Movidius (based in Ireland) in Sept 2016
- July 2017 : Myriad2 chip -> Fathom NCS*
-> Intel Movidius NCS
- Sept 2018 : MyriadX chip -> Intel Movidius NCS2
- NCS – USB Form factor -> Prototyping of AI Vision solutions



- NCS – Neural Compute Stick
- images from public domain

MYRIADX CHIP



* Slide courtesy : Intel IoTG

MOVIDIUS USP

- Used for deploying DL based Computer vision solutions at the edge
- Operates within an extremely-low power envelope of ~1.5W
- Very high 'Performance(FPS) per Power(Watt)'
- Suits embedded solutions that has strict Thermal Design Power considerations
- Users can leverage the prebuilt models and applications from OpenVINO toolkit
- In comparison,

Processor	Avg Power (W)	FPS on DL inference	Performance per Watt
Core i5	40	10	0.25
Xeon Platinum	120	30	0.25
GPGPU	250	85	0.34
Movidius NCS2 + Raspberry Pi 3	5	7	1.4

* Disclaimer : Performance numbers are used for conveying the concept and might not be very accurate

Movidius Stick needs a Host Platform



Raspberry Pi Host



Laptop Host

INTEL® MOVIDIUS™ VISION PROCESSING UNIT (VPU)

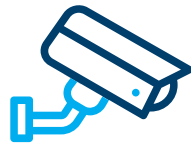
SERVICE ROBOTS

- Navigation
- 3D Vol. mapping
- Multimodal sensing



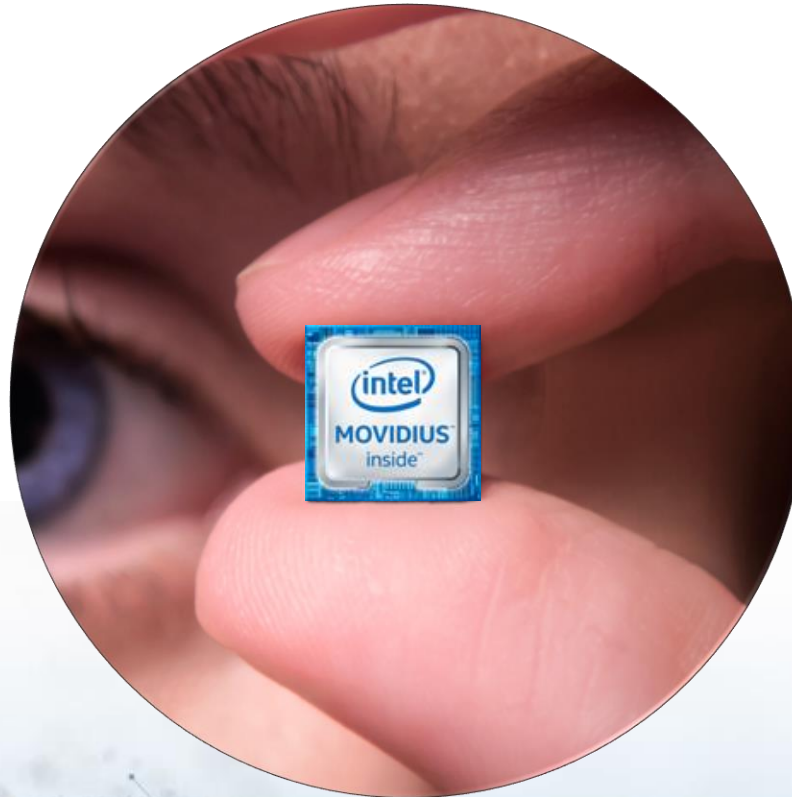
SURVEILLANCE

- Detection/classification
- Identification
- Multi-nodal systems
- Multimodal sensing
- Video, image capture



WEARABLES

- Detection, tracking
- Recognition
- Video, image, session capture



DRONES

- Sense and avoid
- GPS denied hovering
- Pixel labeling
- Video, image capture



AR-VR HMD

- 6DOF pose, position, mapping
- Gaze, eye tracking
- Gesture tracking, recognition
- See-through camera



SMART HOME

- Detection, tracking
- Perimeter, presence monitoring
- Recognition, classification
- Multi-nodal systems
- Multimodal sensing
- Video, image capture

Power-efficient image processing, computer vision & deep learning for devices

EDGE EXAMPLE USE - THE DJI SPARK DRONE



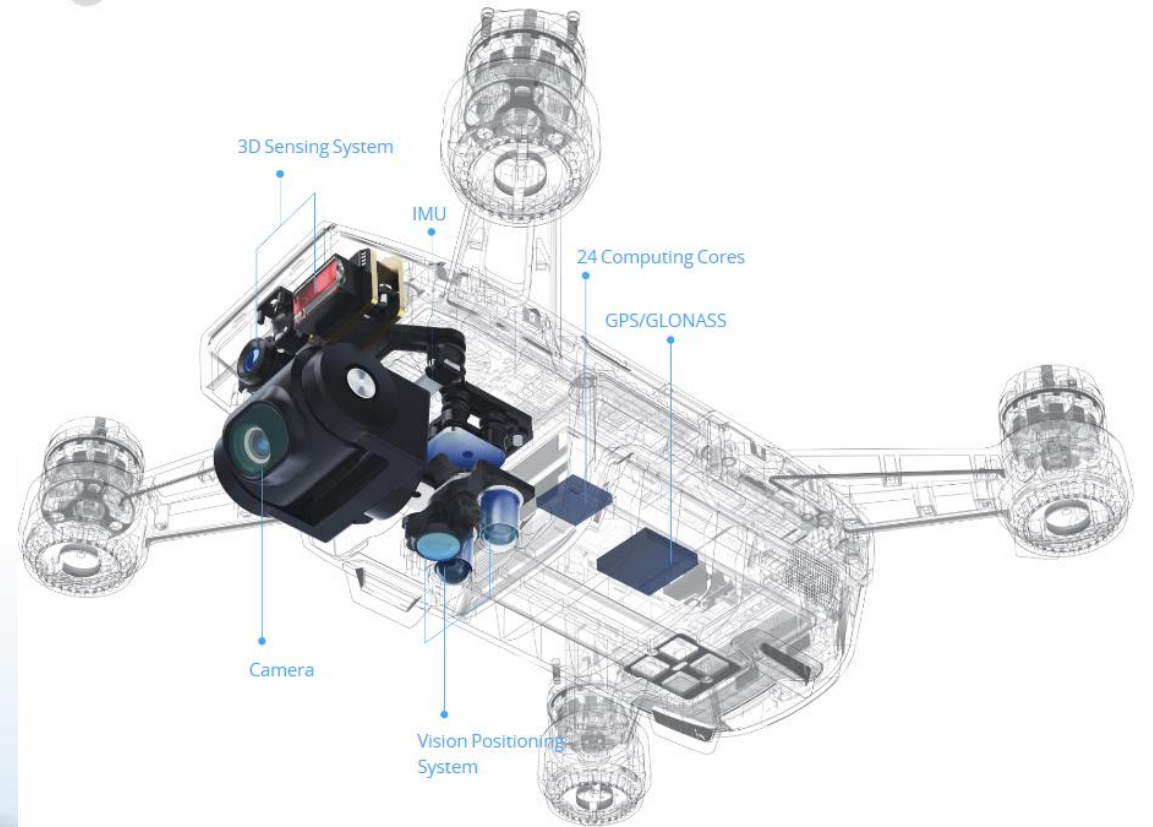
Face Aware



Gesture Mode

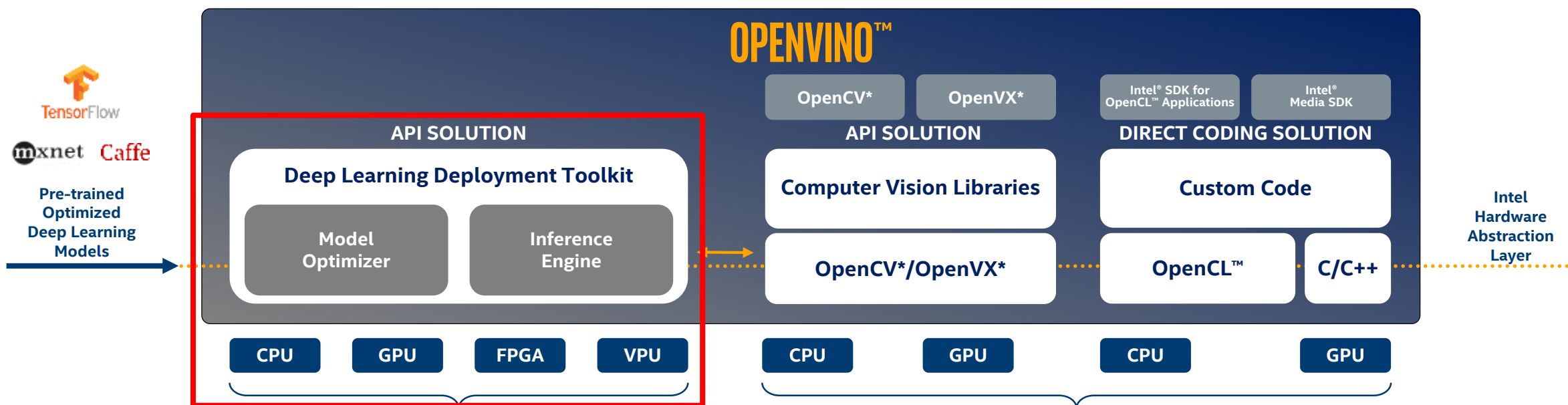


Safe Landing



See: <https://www.dji.com/spark>

INTEL OPENVINO TOOLKIT



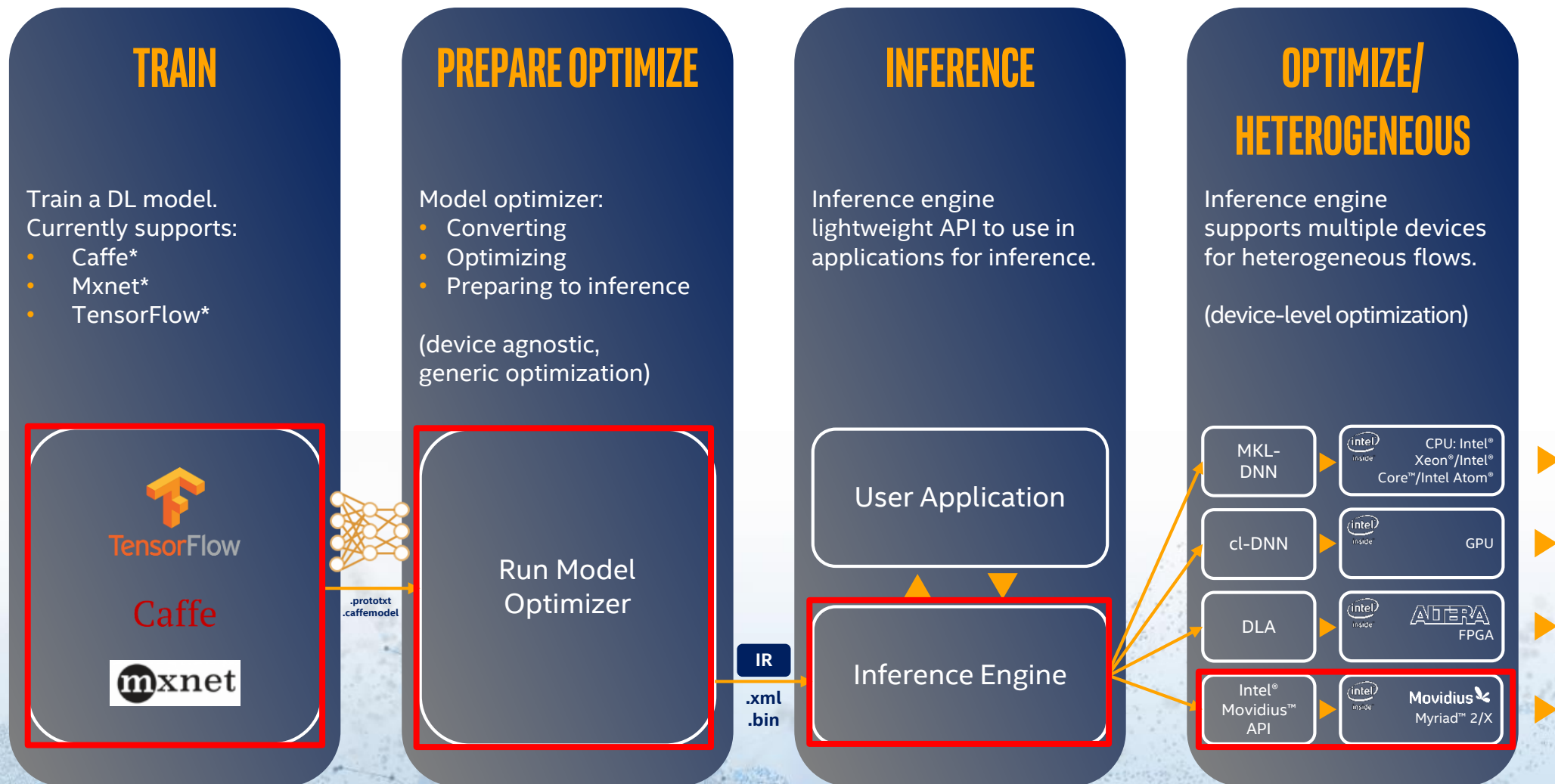
DEEP LEARNING COMPUTER VISION

- Based on application of a large number of filters to an image to extract features.
- Features in the object(s) are analyzed with the goal of associating each input image with an output node for each type of object.
- Values are assigned to output node representing the probability that the image is the object associated with the output node.

TRADITIONAL COMPUTER VISION

- Based on selection and connections of computational filters to abstract key features and correlating them to an object
- Works well with well defined objects and controlled scene
- Difficult to predict critical features in larger number of objects or varying scenes

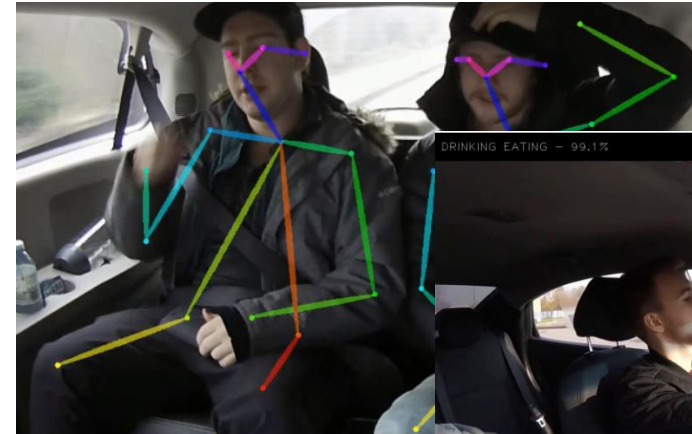
STEPS TO DEPLOY



MOVIDIUS RESEARCH GRANT

- Providing initial technical guidance to professors
- Professors could include Movidius based inference in a bigger research project involving computer vision modules (reuse samples from OpenVINO toolkit)
 - Vision module for robotics
 - Vehicle/Lane/Pedestrian/Traffic Sign... detection for Autonomous driving
 - Consumer behavior analysis for Smart Retail
 -

Human Pose Estimation



Driver Action Recognition



Vehicle Attribute Extraction



Type: car
Color: black

COMMON MISCONCEPTIONS

- Can I train a DL model using NCS ?
 - ✓ NCS cannot be used for training DL models, it only supports inferencing of already trained CNN based DL models
- Can I use NCS for inferring on language translation / classical ML (SVM/Regression) / Reinforcement learning models ... ?
 - ✓ NCS supports only CNN based DL models (used mostly for Computer Vision)
- Is the NCS faster than a GPGPU (or an x86 CPU) ?
 - ✓ Short answer : No, NCS is not faster than a GPGPU (in general)
 - ✓ NCS helps extend the compute capacity of a system, and is designed to balance power consumption with performance.

* The usage of the term NCS refers to Intel Movidius NCS and NCS2, and its device capabilities as of July 2019

COMMON MISCONCEPTIONS

- Can I save my CV model in an NCS and ship it to my customer ?
 - ✓ No, the NCS doesn't have persistent memory modules and hence the models cannot be saved



QUESTIONS ?

