

Scaling ML for Visual Data w/ GIS



DATA SCIENCE



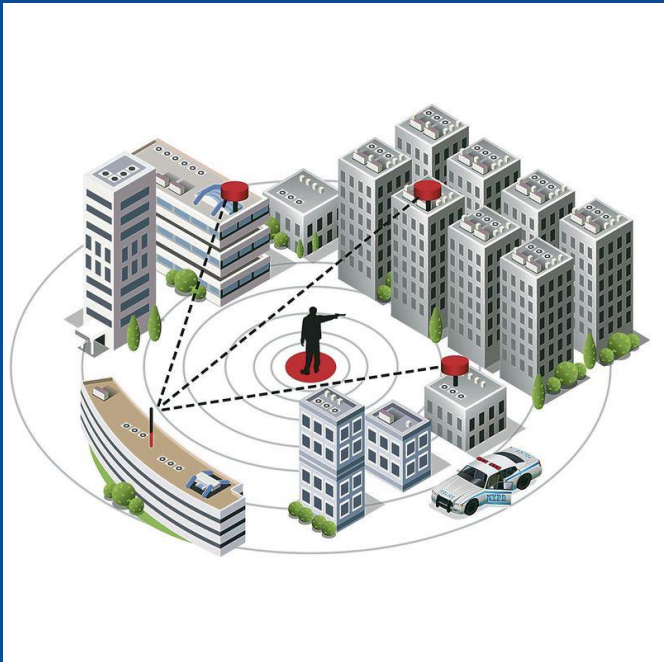
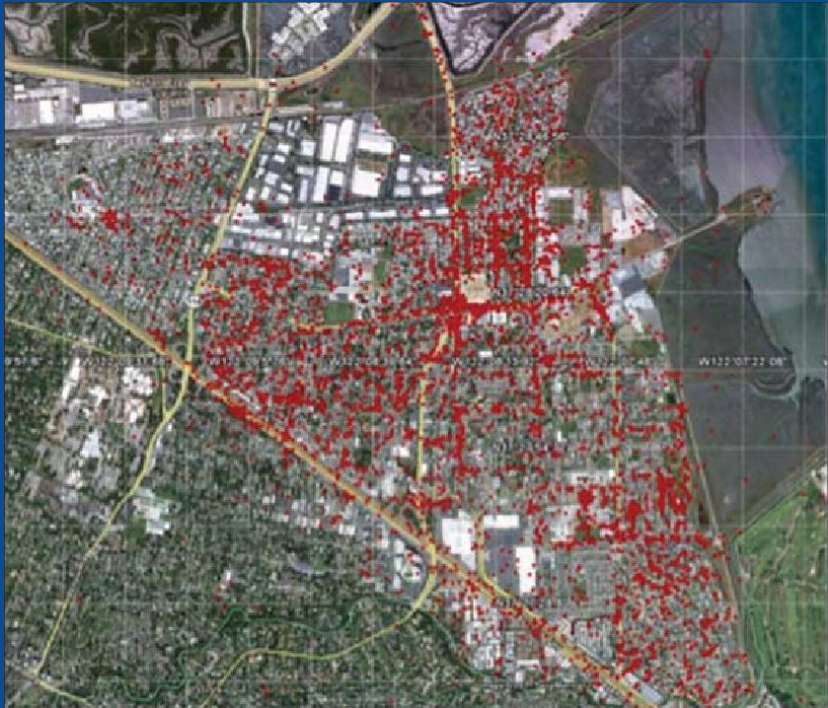
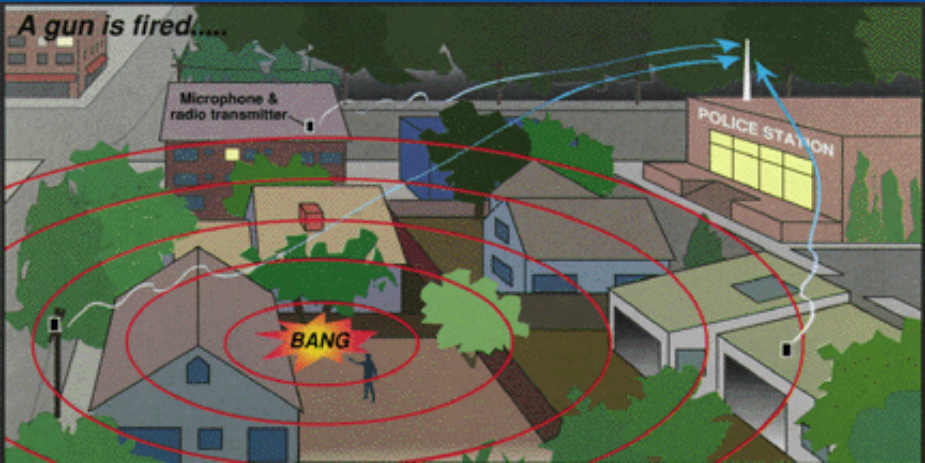
Orions Systems

1. Personal Journey with Location Data

2. Video Takes Main Stage (With big challenges...)

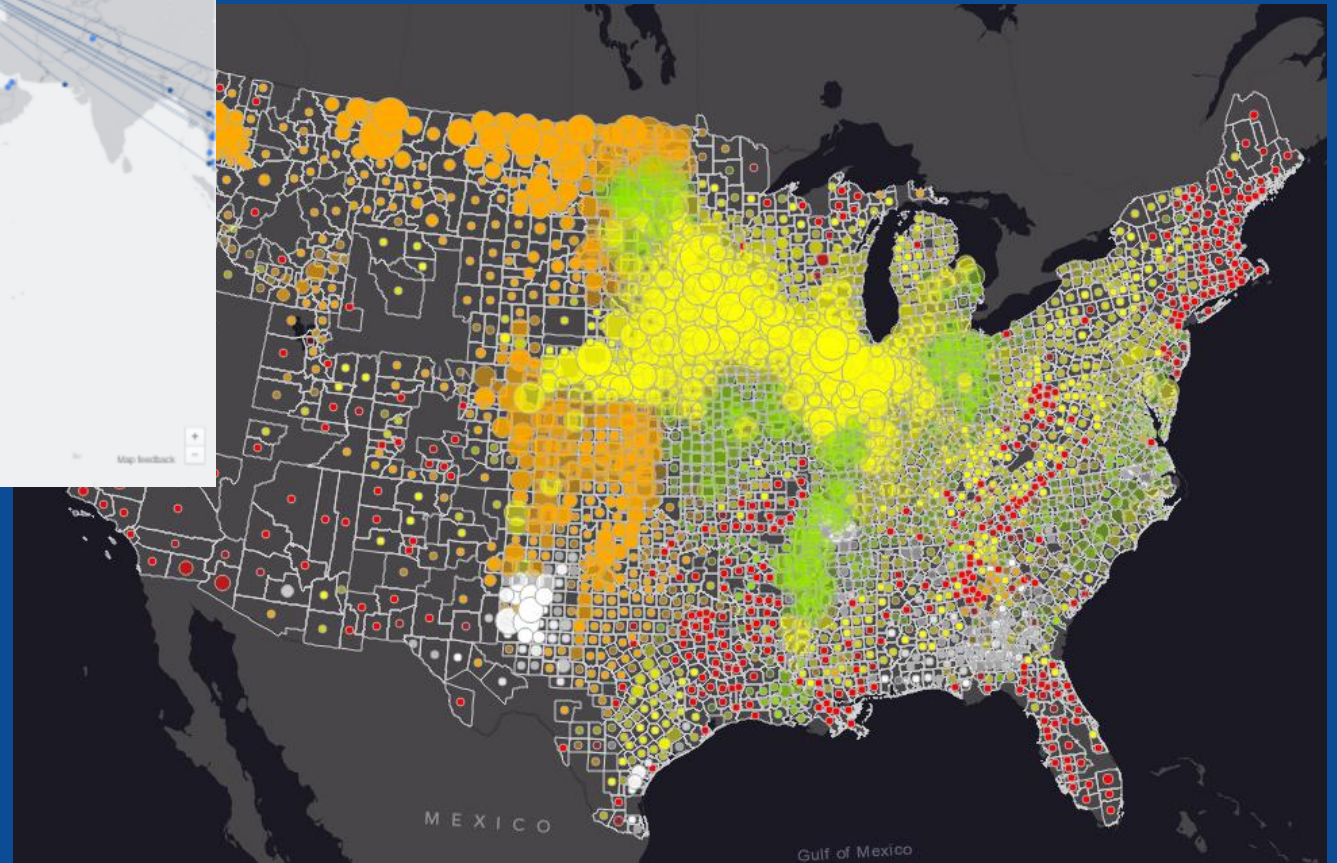
3. Looking to the future

GIS Flashbacks... 1990 Sensors Save Lives



Late 90's – Analog to Digital Video Chapter

Early 2000's – Internet Video Demographics



Looking Ahead – Challenges & Opportunities

Exponential growth of video as a sensor...



Only machine learning can help scale data gathering...

2020 Challenges - What Nobody Tells You About Machine Learning

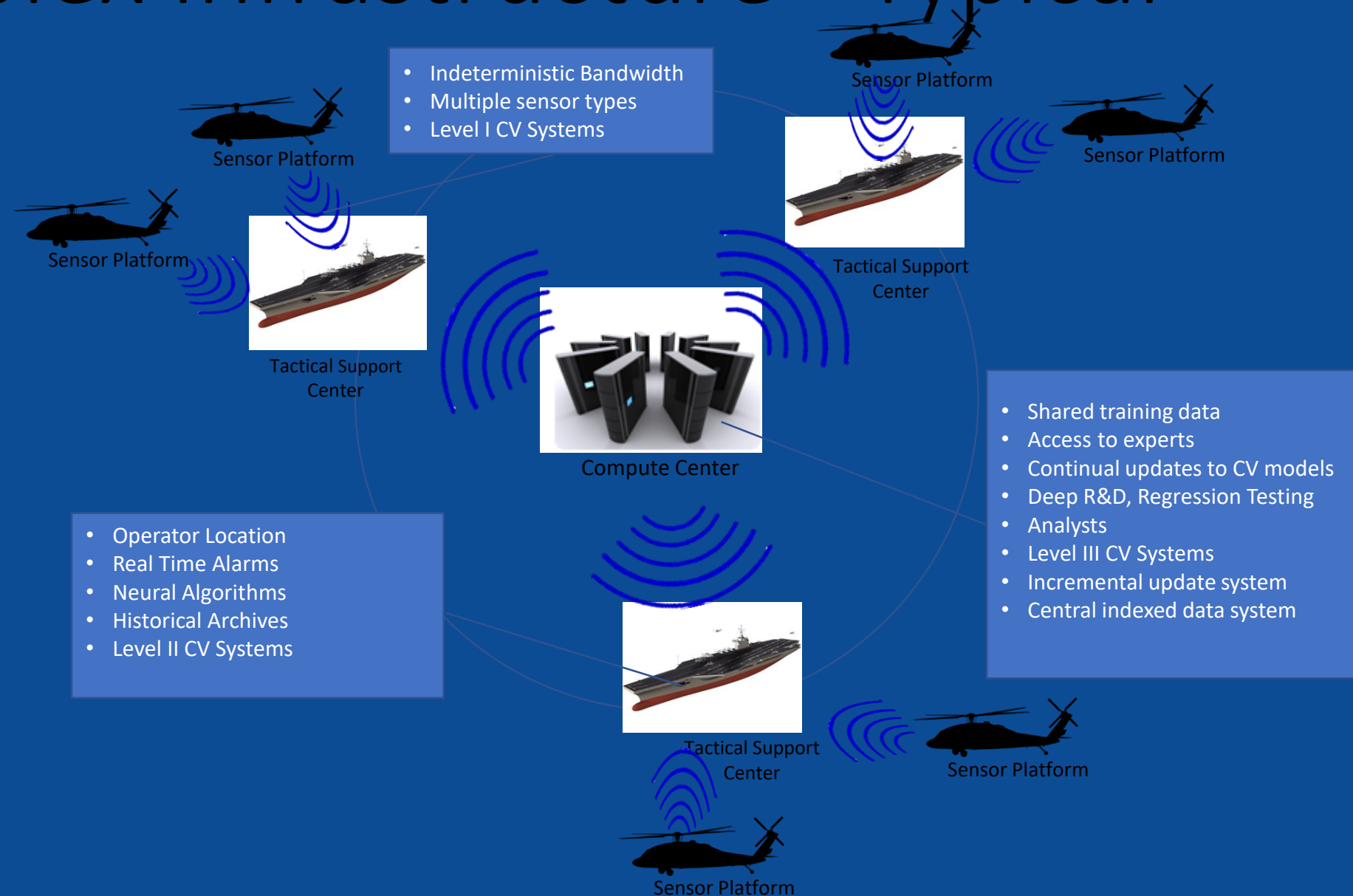
“Less than 10% of funded ML development efforts ever make it to production**”

Why??

- Data science talent lack deployment and scaling experience
- Public ground truth data sets don't fit specific business realities
- Alphabet soup of home-grown tools leads to huge tech debt
 - Databases, image and video systems, data science tools, Python, C++, spit and glue



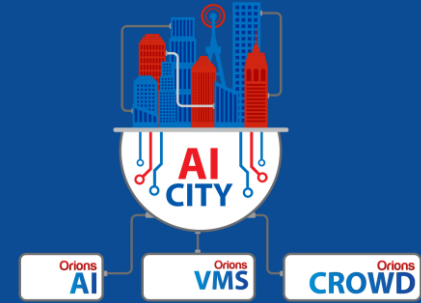
Complex Infrastructure - Typical



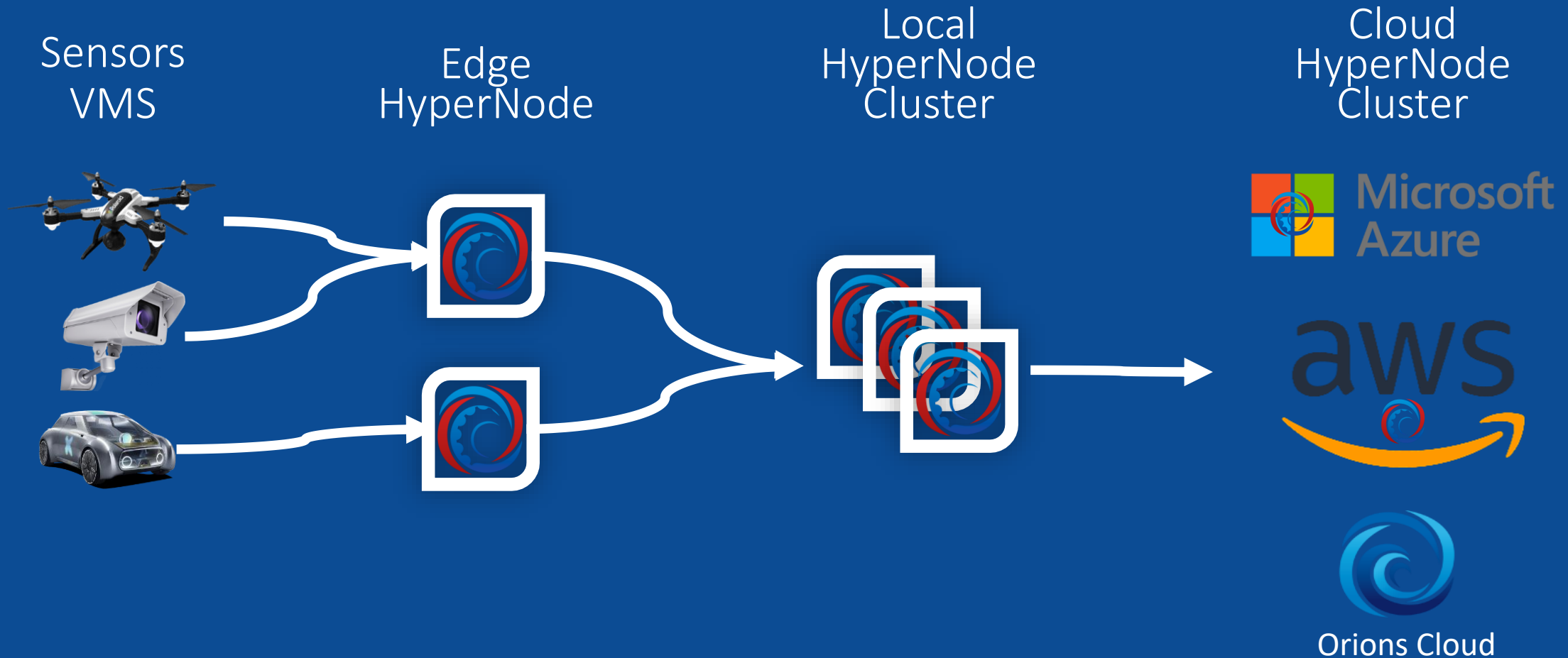
Orions Systems – Video AI at Scale

Leading to new opportunities around location data

The Only Way to Scale – Full end-to-end platform

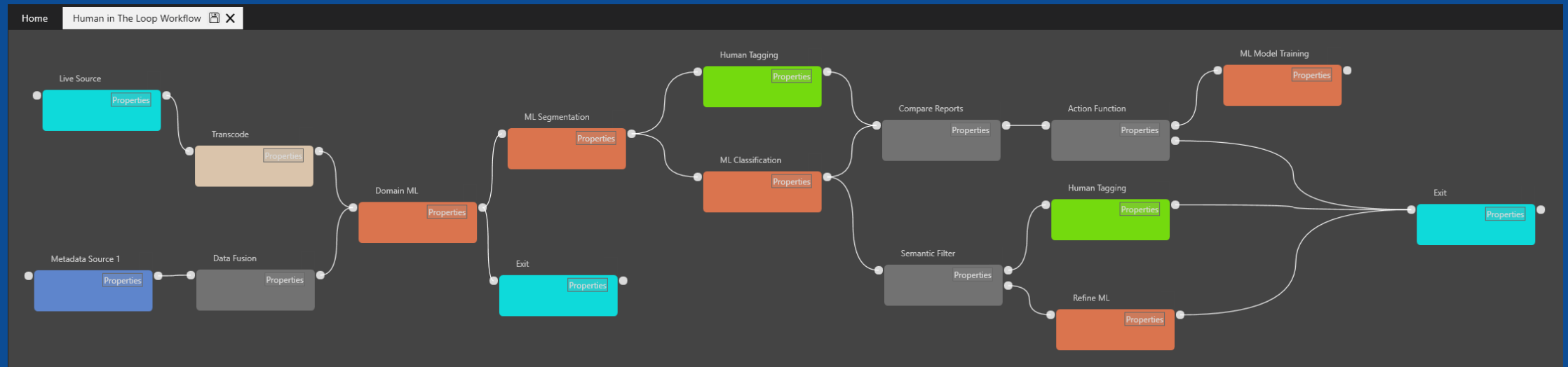


It Must Scale From Sensor to Cloud



All live video, storage, data fusion, network communication & analytics are deeply integrated and deployable from edge to cloud

Dynamic workflows address varying needs...



So how are we using these new advancements?

Video Analytics & Sports

Batch time left: 01:32:44

Basketball Court, Core Objects T...
Operational
Started at: 10/26/2019 5:43:22
max

Frame NP: 86
Task NP: 1

Edit Remove

Basketball Objects
Frame NP: 86
Task NP: 1

Edit Remove

Basketball Objects
Frame NP: 86
Task NP: 1

Edit Remove

Frame NP: 86
Task NP: 1

Edit Remove

Save & Exit

Prev Task 1 00:05 Next

Frame 86 of 150 (00:02.88600)

MAVERICKS 20 SPURS

1x 00:02

2018-19 Boston Celtics

Team Selection
Players
Play Type / Drive Direction
Derived From / After Pass Play Type
Shot Result
Shot Distance
Shot Type
Game
Opponent
Primary Defender
Game Situations
Shots From
Assisted By
Period/Time
Spread
Field Goal %

Attempts 10 25 50 100 101+ Efficiency: Low High

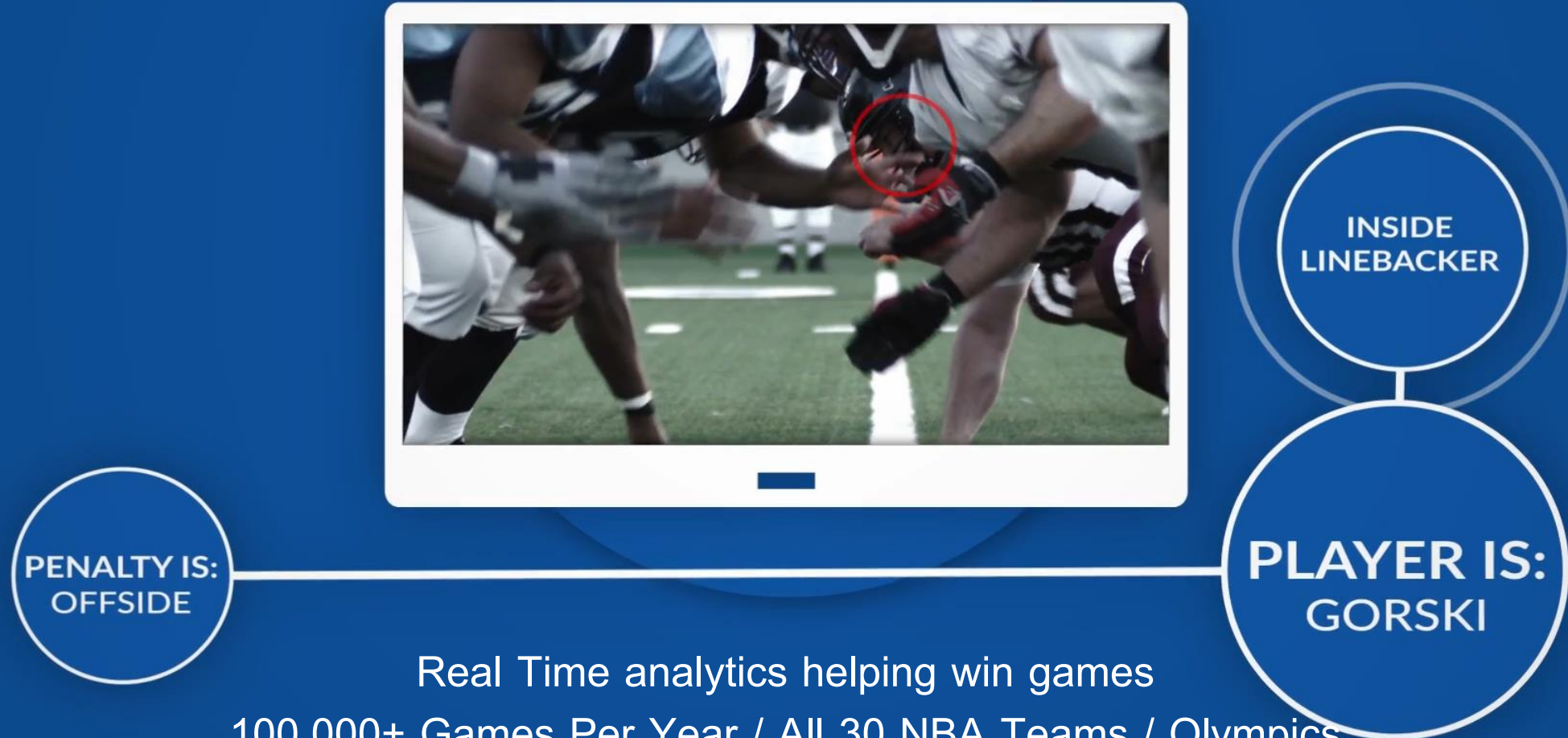
Selection Preview

SHOTS SELECTION: All Shots Zoom Shots Selected Shots

VIEWS: Players Defenders Play Types Shot List

#	Name	Points	FGm	FGA	FG%	aFG%	2FGm	
1	Boston Celtics Total	9173	3977	3449	7426	46.4	56.5	2183
2	#11 K. Irving	1577	636	604	1240	48.7	58.9	376
3	#0 J. Tatum	1236	572	466	1038	44.9	53.9	377
4	#13 M. Morris	1043	467	377	844	44.7	56.8	224
5	#7 J. Brown	964	424	368	792	46.5	55.1	244
6	#42 A. Horford	923	335	387	722	53.6	60.4	206
7	#12 T. Rozier III	700	408	257	665	38.6	49.6	191
8	#20 G. Hayward	825	339	296	635	46.6	57.6	187
9	#36 M. Smart	706	330	238	568	41.9	56.4	109
10	#27 D. Theis	374	121	146	267	54.7	62.7	79
11	#46 A. Baynes	284	118	105	223	47.1	56.3	78
12	#37 S. Ojeleye	186	92	67	159	42.1	52.8	32
13	#9 B. Wanamaker	140	56	50	106	47.2	59	32
14	#30 G. Yabusele	94	42	35	77	45.5	54.5	23
15	#44 R. Williams III	79	16	36	52	69.2	71.2	16
16	#50 P. Dozier	19	12	8	20	40	45	6
17	#28 R. Hunter	17	7	6	13	46.2	61.5	1

AI City Platform is Used by over 50 Professional Leagues and 12,000 Teams



Real Time analytics helping win games
100,000+ Games Per Year / All 30 NBA Teams / Olympics
4,000+ Hours Processed Per Day Globally

Walmart / Hedge Funds



Fusing Video + GPS Data Enables Georectification

BUILDING

MEASURES
357 x 1556

LOCATION IS
Lat: 25.1279484
Long: 55.3862638005



In use for over 5 years / KLV metadata compliant & fused
Many papers written by the government about the system

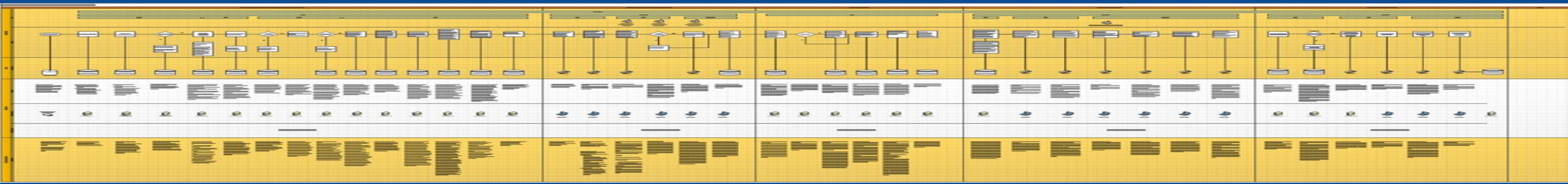
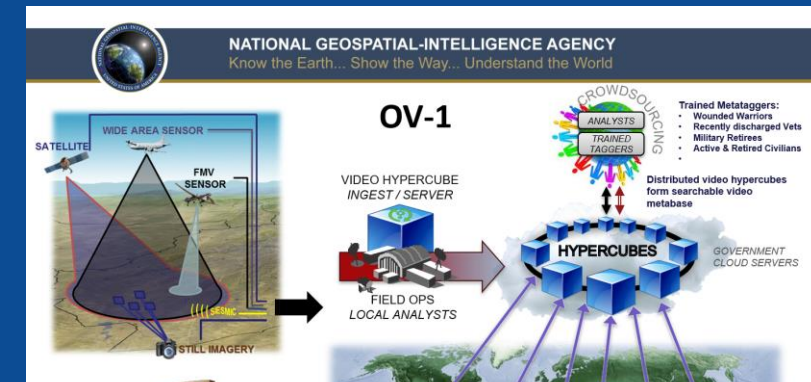
National Geospatial Agency

• Requirements

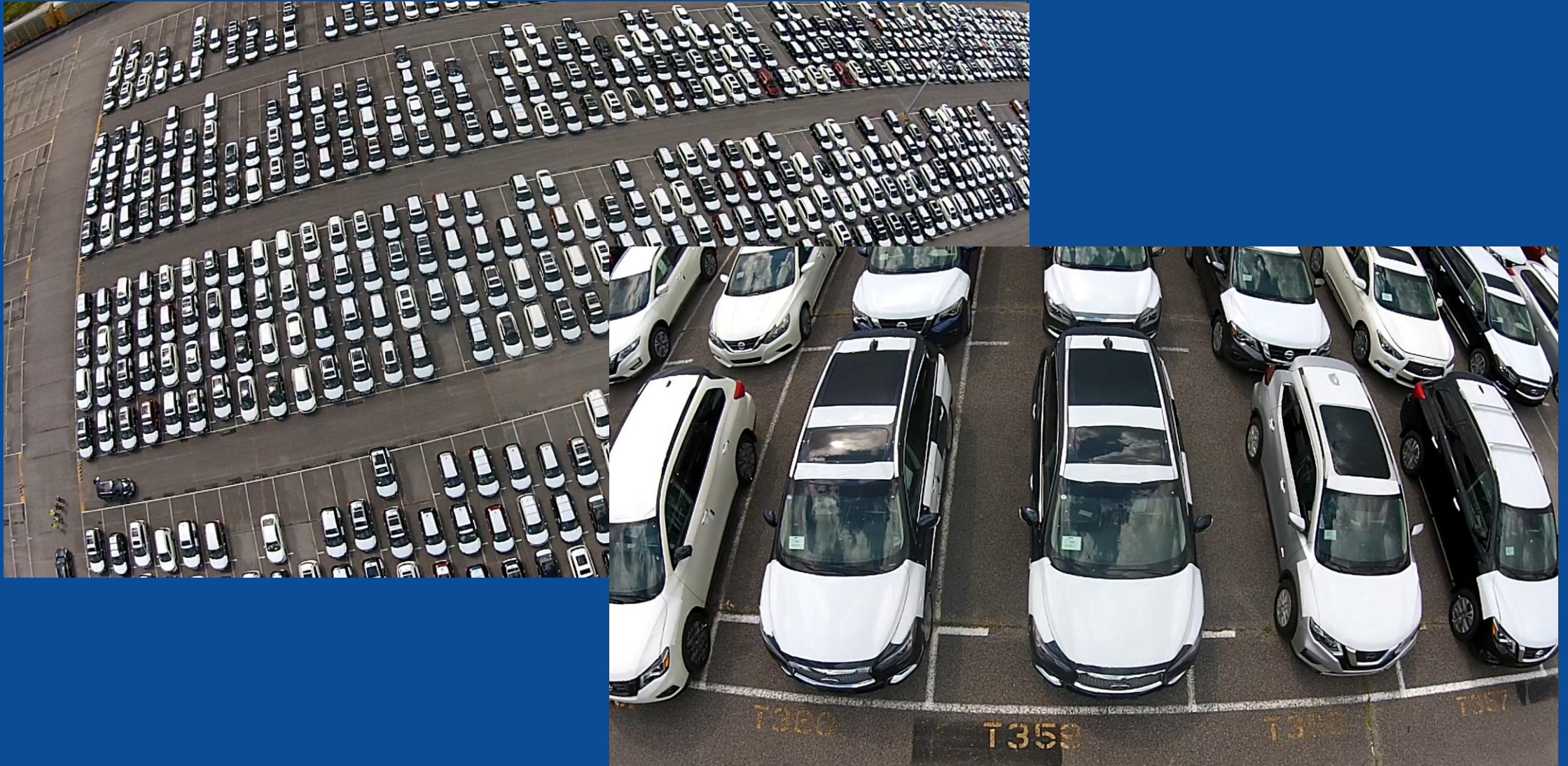
- Real-time, semantic/structured tagging, complex-video-ingestion systems, highly distributed workforce and networking requirements, intelligence grows from bottom up, self-healing / self-scaling / connected and disconnected modes, runs on secret side network (No Internet)

• Location Powers

- UAVs – Georeferencing / rectification
- Metadata / tags/ objects – All accurate GPS
- Leading to 'pattern of life' opportunities



Wilhelmsen – Logistics Nightmare



National Ski Team... location, speed, time

Deu

Batch time left: 00:08:53

Skating Domain Mission, New Pha...
Operational
Started at: 10/26/2019 11:44:56

Frame Nr: 40
Task Nr: 2

Frame Nr: 190
Task Nr: 2

Frame Nr: 347
Task Nr: 2

Frame Nr: 490
Task Nr: 2

Save & Exit

Prev Task 2

00:07 Next

Frame 490 of 500 (00:08:17599)

Home Lot Analytics Bag Check YOLO (View) Car Tracking/Counting 2 131 DenseOpticalFlow 140 SuperPixels

[+1] Asset Source

Video Decoding

Metadata Source

Dense Optical Flow Image Signal

[+1] Metadata Renderer

Metadata Sink

Image Display

Job mode

USBELLODS01 ver 2.32.0.0

Home Lot Analytics Bag Check YOLO (View) Car Tracking/Counting 2 140 SuperPixels

[+1] Asset Source

Video Decoding

Metadata Source

Super Pixel Image Signal Proces

SLICSuperpixels

[+1] Metadata Renderer

Image Display

Metadata Sink

Job mode

640x360

USBELLODS01 ver 2.32.0.0

Camp Roberts – Fish and Game



Q&A



Orions Systems

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