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Amplifying Computer Vision With the power of Edge & Cloud

A WEBINAR BY HAPPIEST MINDS

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About Happiest Minds

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The Mindful IT Company
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Next Generation Digital Transformation, Infrastructure, Security and Product Engineering Services Company

IPO
In September 2020

- Completing 10 years of existence in Aug 2021
- Strong Management Team & Corporate governance
- 5.6 Lacs+ Investors
- Robust growth and profitability

97%
Digital

93%
Agile

'Born Digital. Born Agile'

186
Active clients

50 Fortune2000 / Forbes200 / Billion $ corporations

90% of repeat business

33.8%
RoCE[1]

27.5%
RoE

Mission Statement
Happiest People. Happiest Customers

SMILES Values
Sharing, Mindful, Integrity, Learning, Excellence, Social Responsibility

3,796 Happiest Minds

across **7 Countries**

Diversity 26.1%

Great Place To Work
- Ranked **#21 –** India's Best Companies to work for 2021
- Ranked **#63** Asia's Best Workplaces 2021
- Top **50** India's Best Workplaces for Women 2021

4.3
rating
on **Glassdoor**
#2 for Indian IT Services

Promoter

Ashok Soota

GOLDEN PEACOCK AWARDS
Winner of Business Excellence 2021

Great Place To Work.
Asia's Best Workplaces
2021

ISG
Digital Case Study Awards
2021
Standout
United Kingdom and Ireland

2021 IBM Geography Excellence Award for APAC

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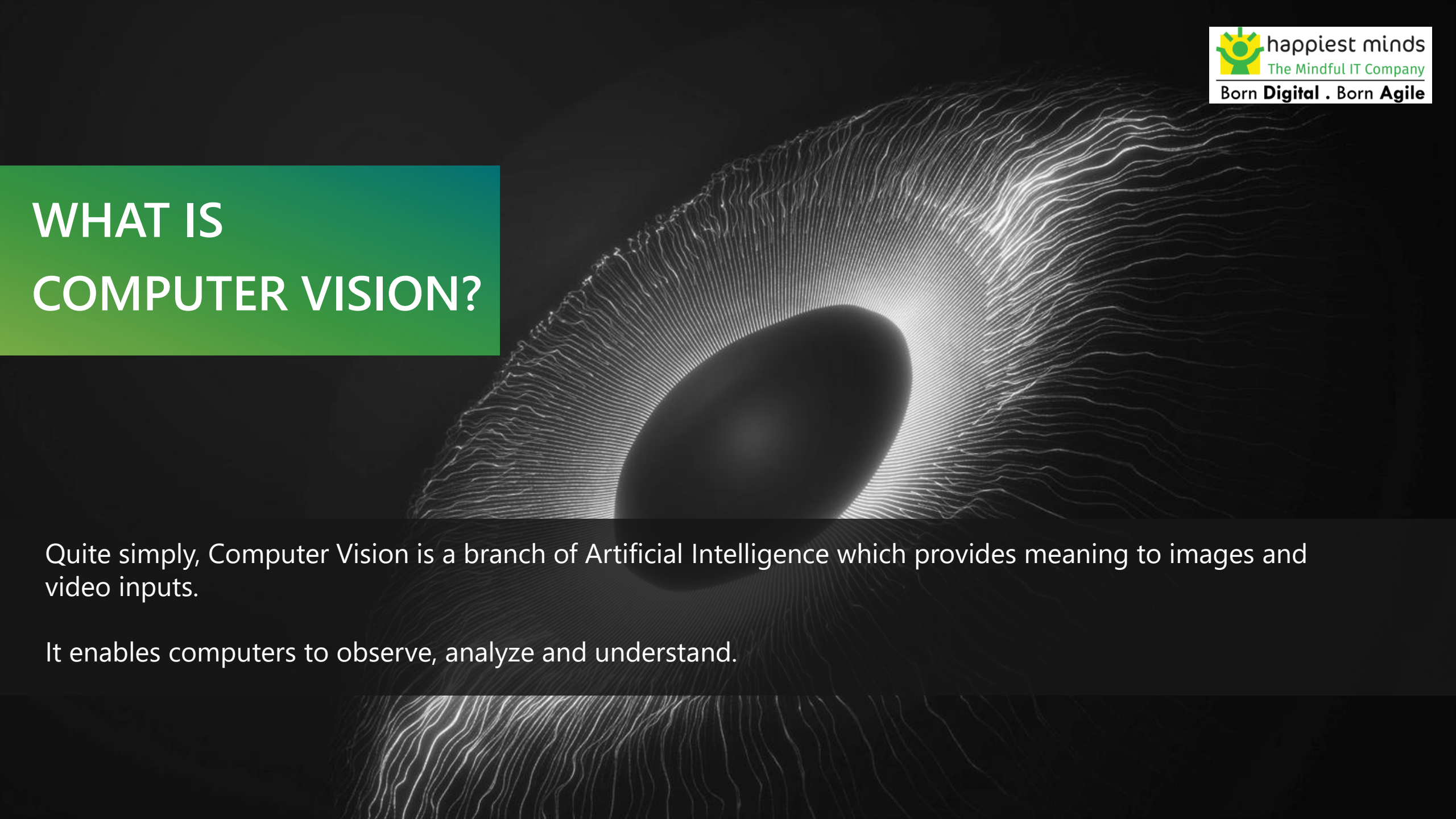
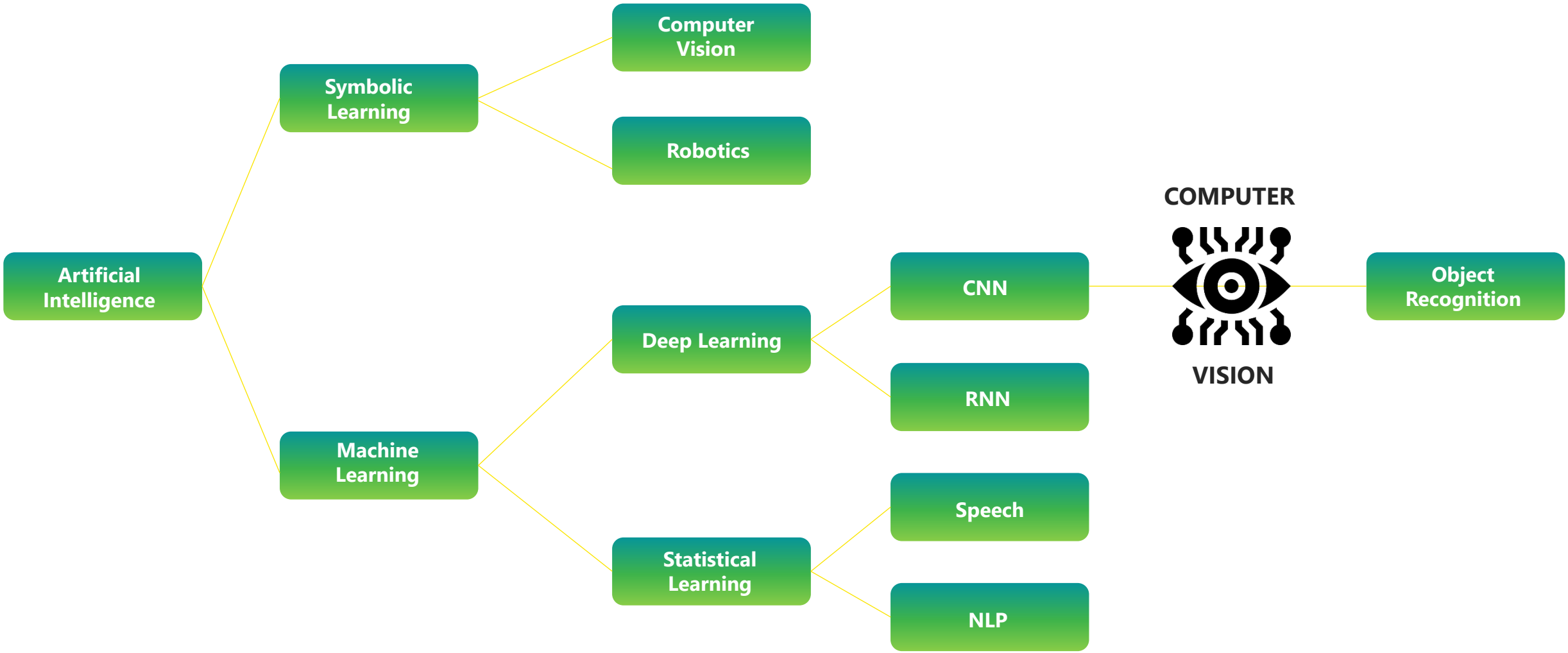
WHAT IS COMPUTER VISION?



Quite simply, Computer Vision is a branch of Artificial Intelligence which provides meaning to images and video inputs.

It enables computers to observe, analyze and understand.

Tracing the roots of Computer Vision



Computer Vision is all around you…

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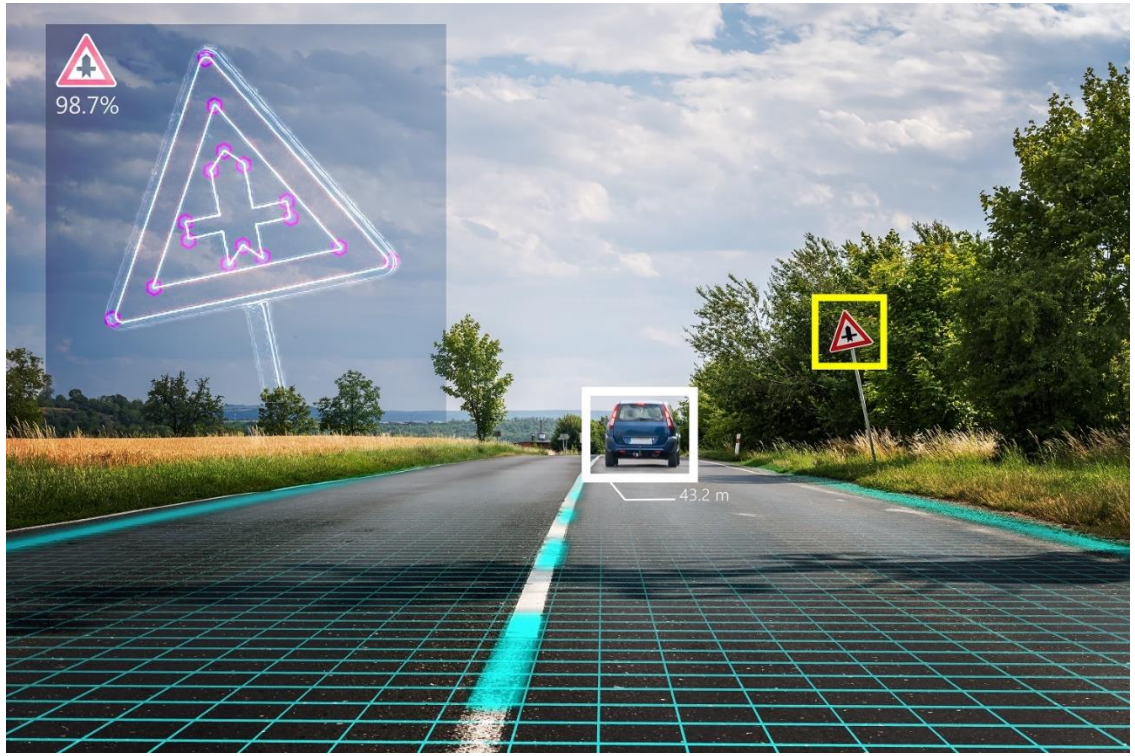
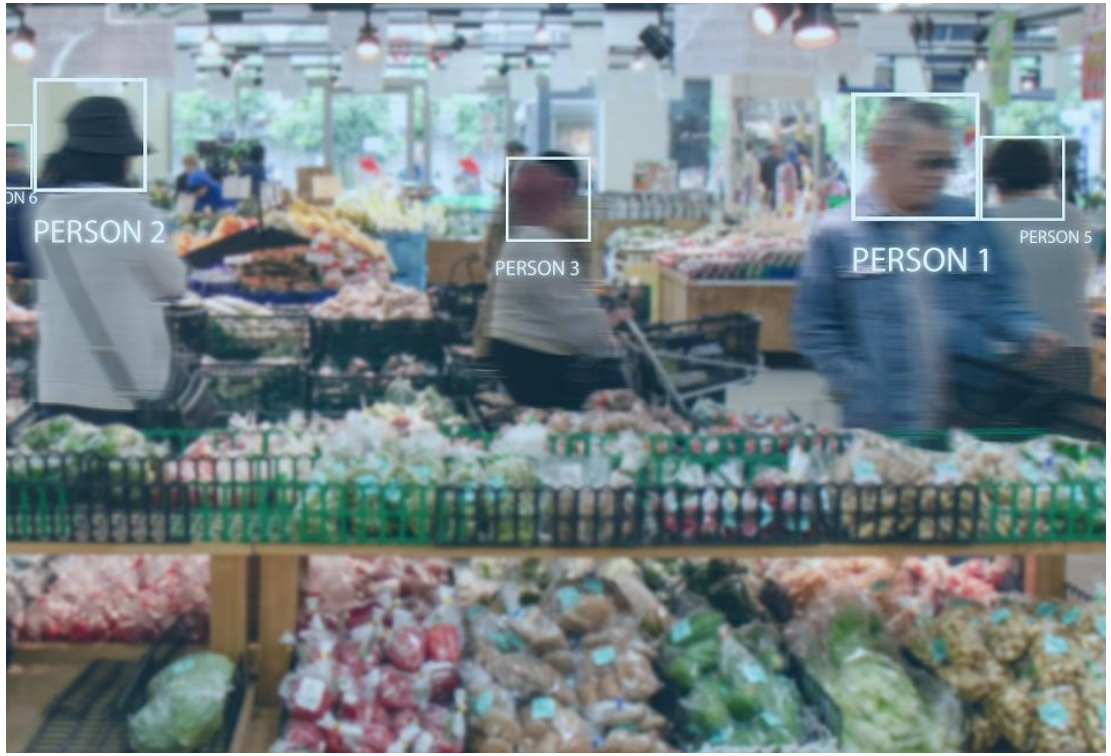
Recognition of Road Signs & Traffic by Computer Vision



Smart Retail enabled by Computer Vision & IoT



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WHAT IS DRIVING THE EMERGENCE OF COMPUTER VISION?

- Hardware is getting smaller and more powerful - GPU based edge hardware, Jetson Nano, Intel Movidius.
- Availability of large Data Sets for Training & improvements in Deep Learning.
- Proliferation of cameras (CCTVs, Drones) which necessitates an automated approach to manage large data sets.
- Increased demand for Computer Vision (CV) applications.

SURGE IN THE USE OF DRONES AND UAVs

- As of August 2021, there were 869,428 drones registered in the US. Sale of consumer drones alone in the US exceeded $1.25 billion in 2020.
- Drones can make consumer deliveries in less than 30 minutes and 79% customers would agree to receive a delivery by a drone.
- As per Fortune, almost 25% of all construction sites in the US are covered with drones.
- The application drones in various commercial sectors like agriculture, construction and others is worth $127 billion.
- The FAA predicts the number of commercial drones will double by 2024.

WHAT ARE THE CHALLENGES OF COMPUTER VISION?

Computer Vision and its Challenges

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It needs to be pointed out that Computer Vision needs considerably higher computing power to observe, analyze and derive meaning from data.

As a result, it would be prudent to choose a cloud-based infrastructure.

Real time interferences can be challenging due to network latency arising from a cloud-environment

Without the Edge, the volume of data can overwhelm the cloud infrastructure

The increasing need for GPUs can substantially drive-up costs related to the Cloud

When video content is stored on the cloud, data privacy and security can be a concern

Limited availability of quality data sets to be utilized for training

Lack in maturity of MLOps to create quality models for proper inferences

Cloud based Computer Vision

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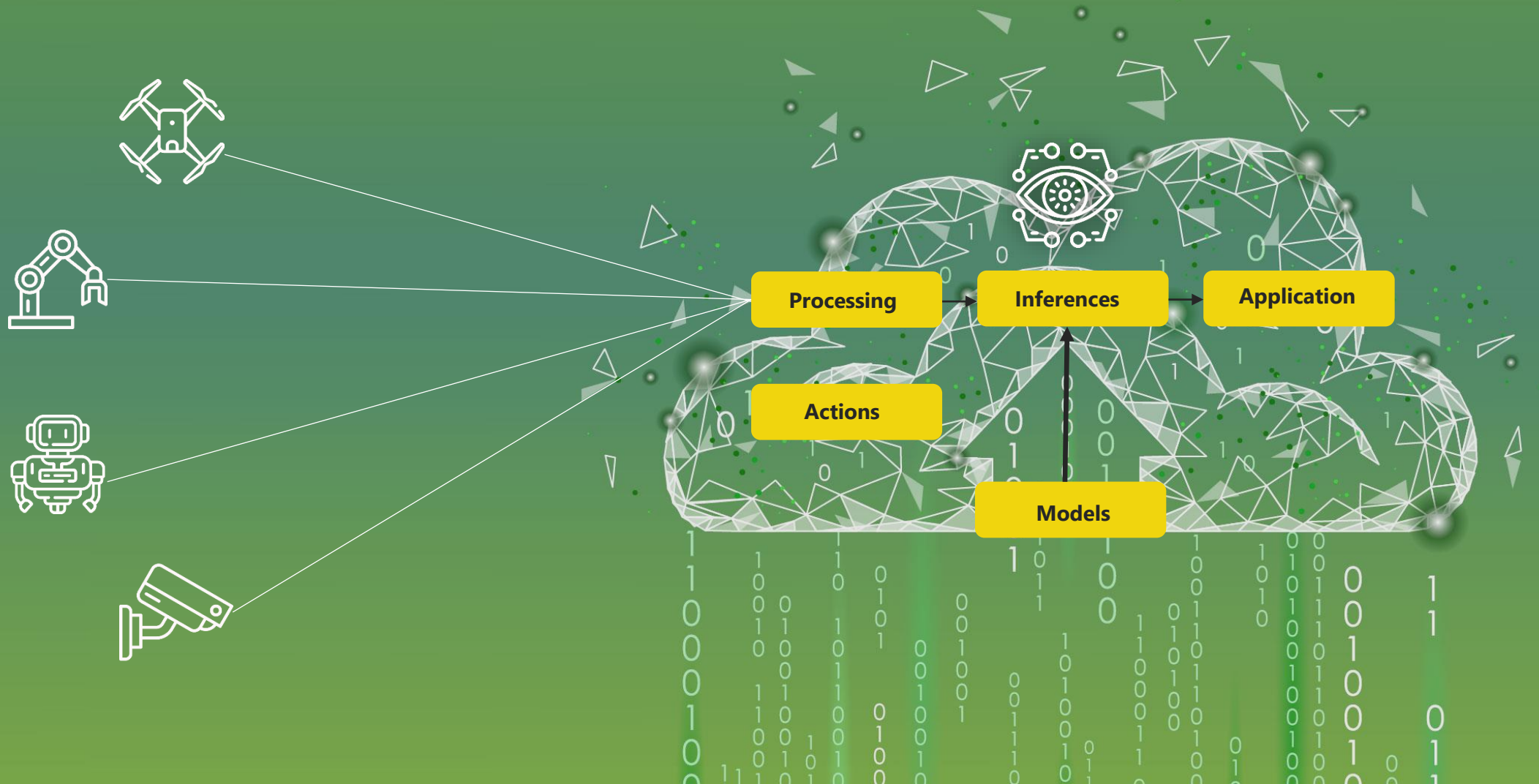


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CAN DISTRIBUTED COMPUTING HELP?

Distributed Computing between the Edge & Cloud

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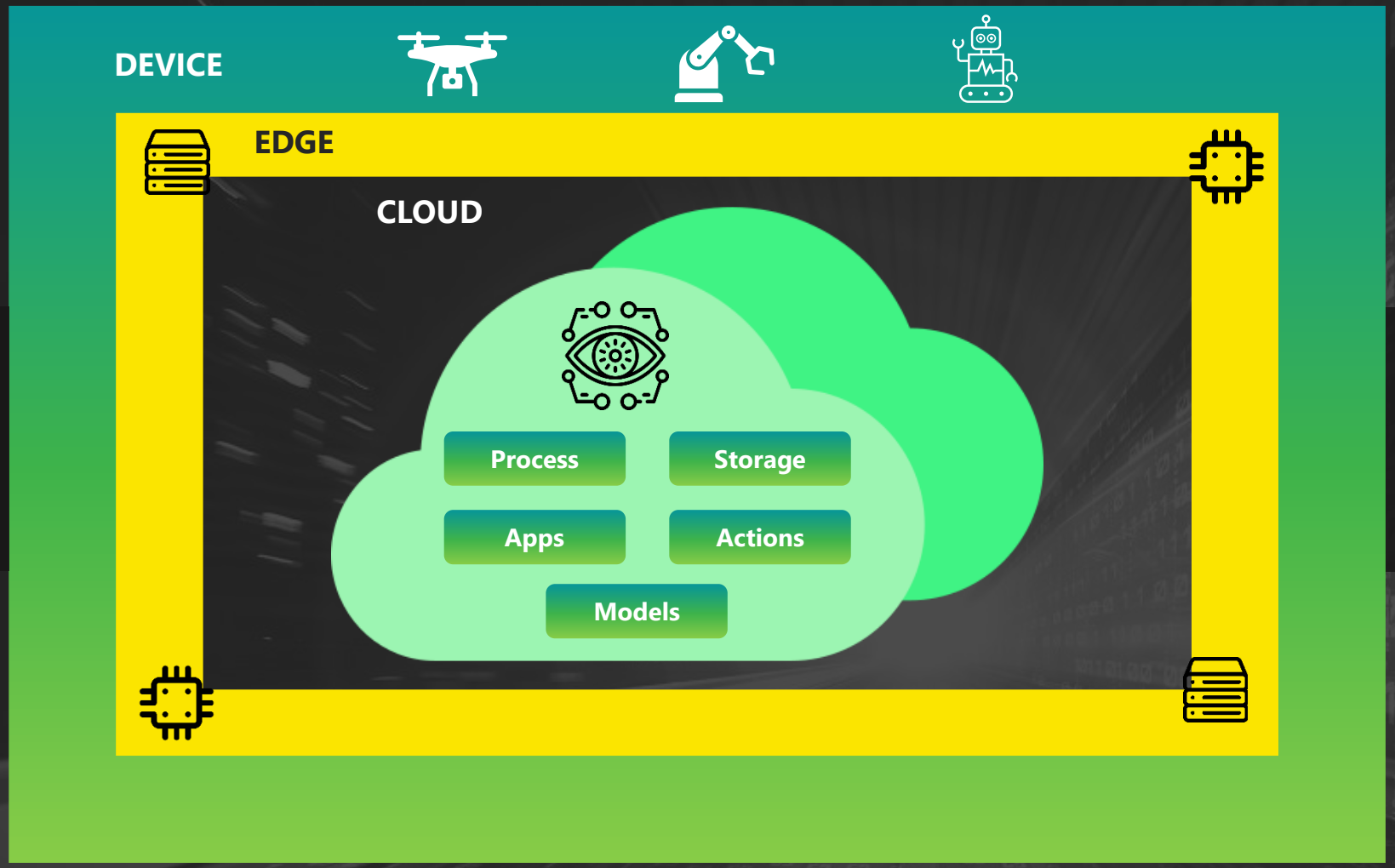
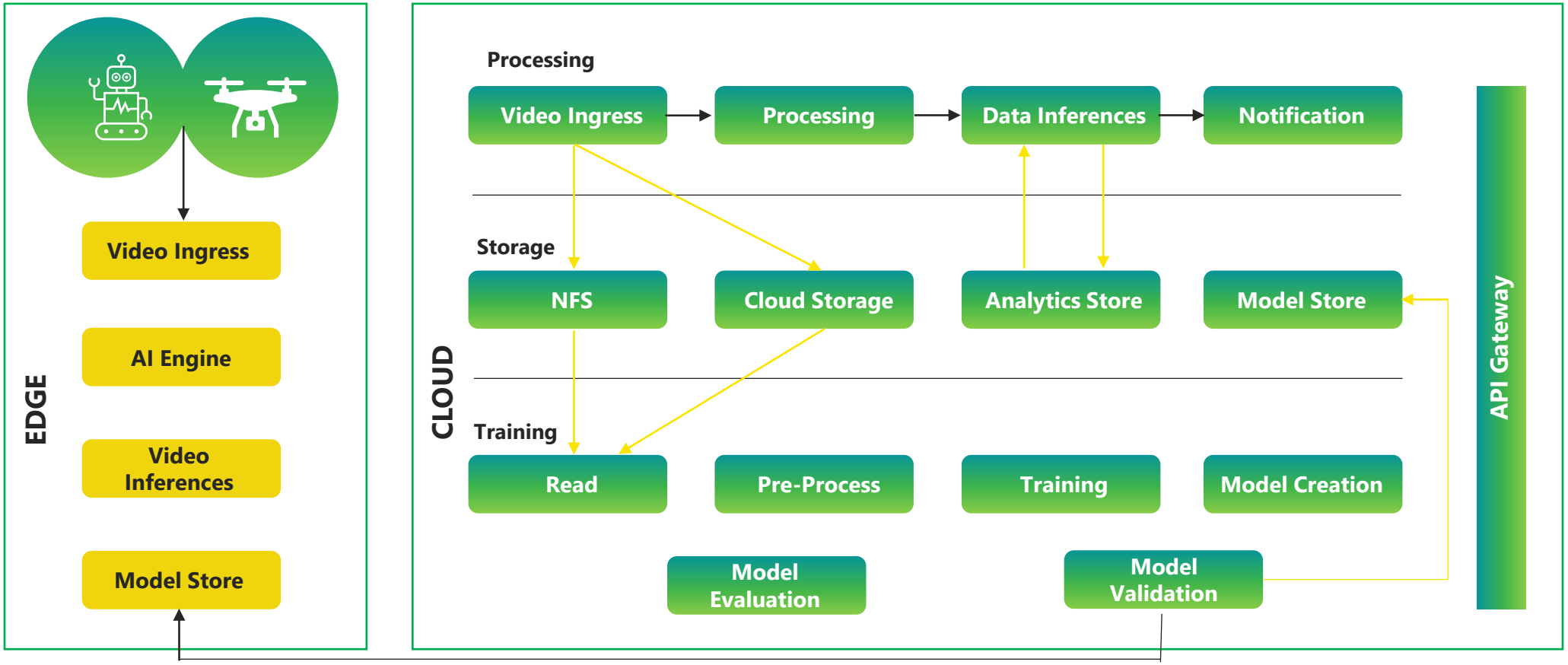


Distributed Computing between device, edge and cloud is key for Computer Vision to succeed at scale.

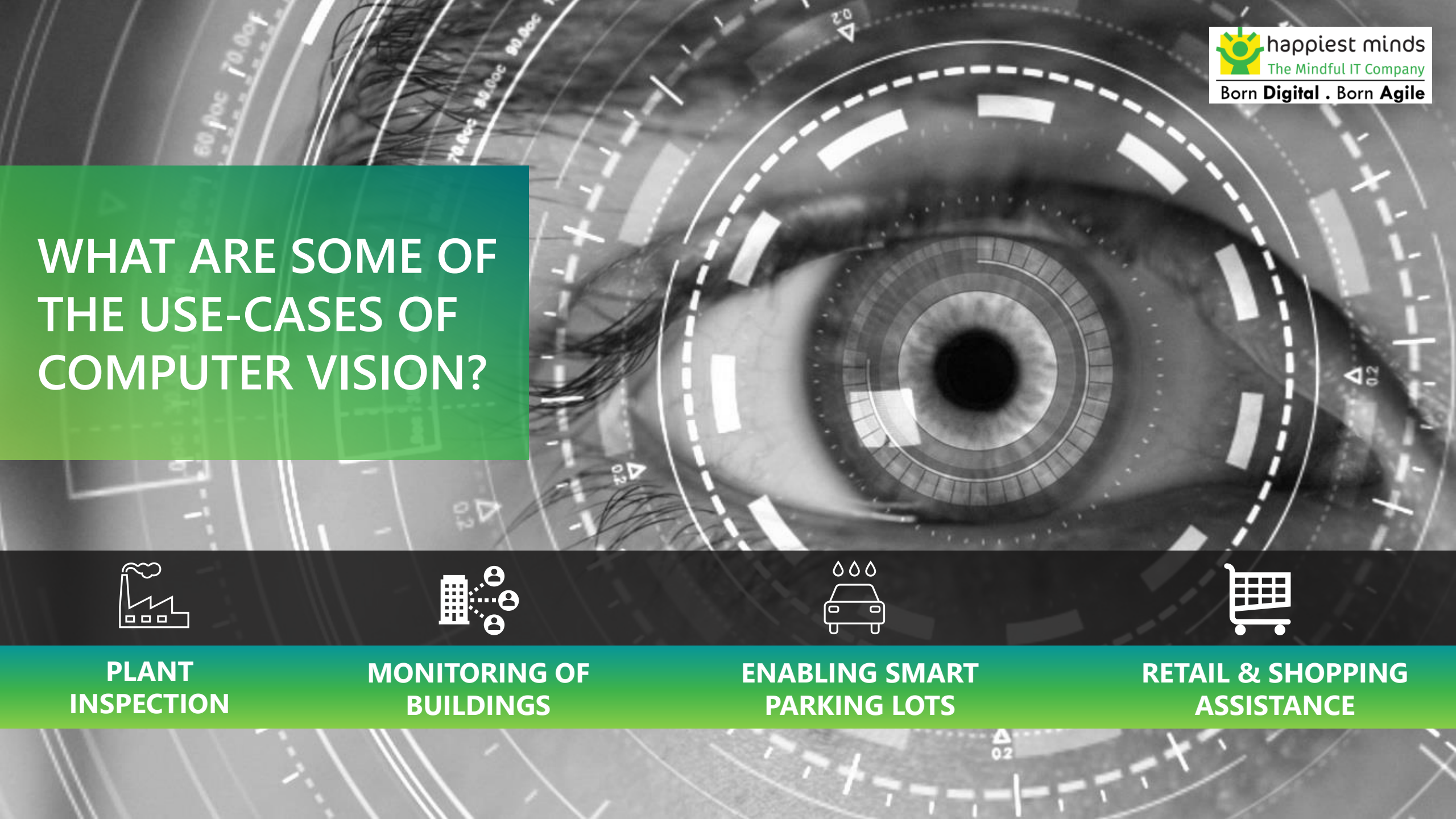
Components of Distributed Computing



OpenVINO

aws

Azure



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WHAT ARE SOME OF THE USE-CASES OF COMPUTER VISION?

PLANT INSPECTION

MONITORING OF BUILDINGS

ENABLING SMART PARKING LOTS

RETAIL & SHOPPING ASSISTANCE

PLANT INSPECTION

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USE CASES

- Drones can be used to efficiently conduct inspection of hard-to-reach areas of plants and critical equipment such as flare stacks and large processing vessels.
- Drones can fly inside equipment structures and execute visual inspections, or even non-destructive testing (NDT), eliminating the need for confined-space entry.
- Daily Inspection of large areas like oil and gas fields can be carried out thoroughly in lesser time which enables workers to carry out actual maintenance activities.
- Easily identifying a variety of issues such as deformation (through 3D measurement), hot spots or failed insulation material, pipe congestion, and cracks or corrosion.
- Future extensibility to address use cases like thermal analysis and identification of unsafe areas.

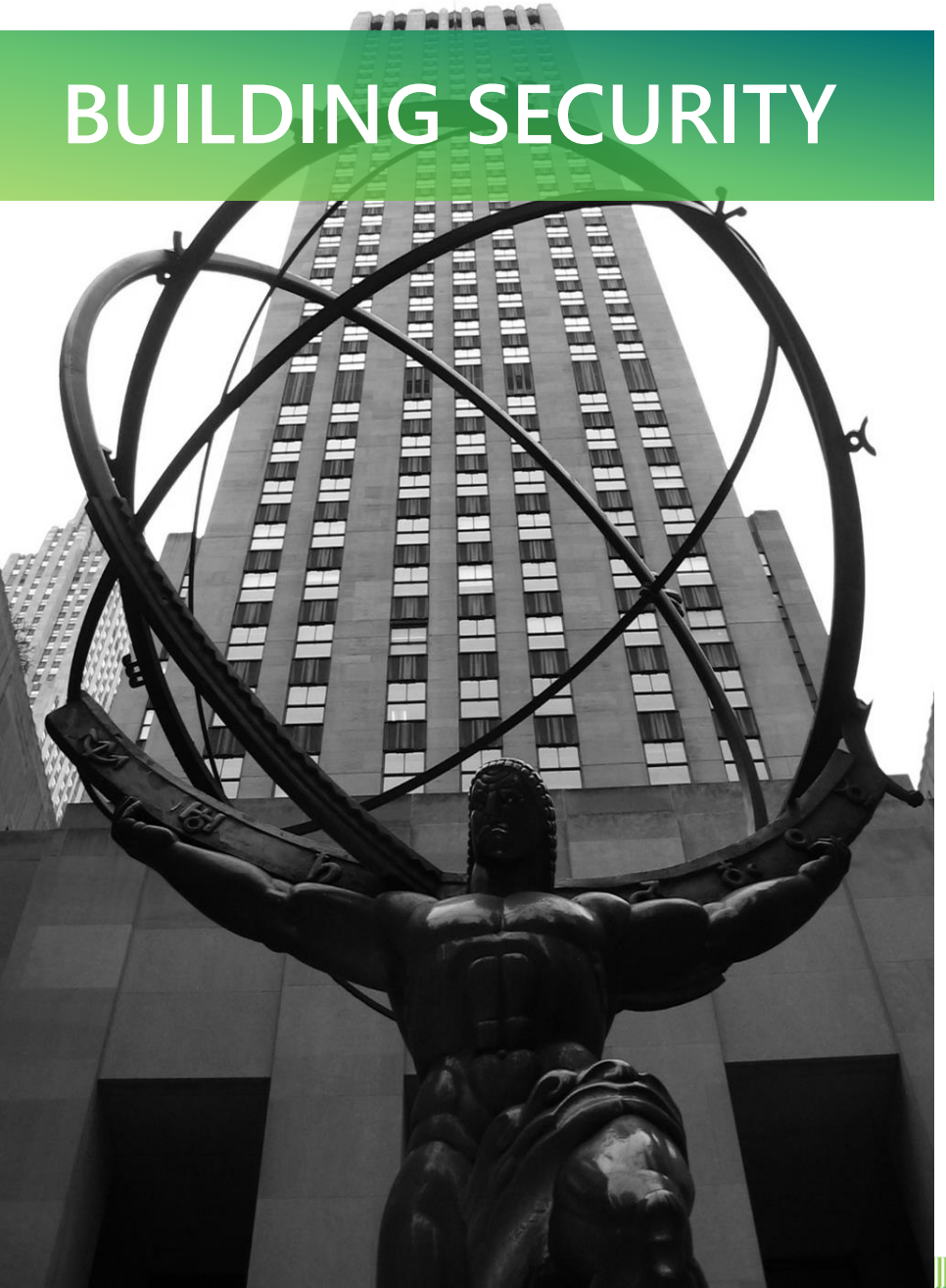
BENEFITS

- This helps prevent human exposure to dangerous situations.
- Greater time available for carrying out maintenance activities as time is freed up from regular inspection work.
- Reduced downtime and lower operation costs from more accurate and frequent inspections along with better data quality for predictive maintenance activities.

AREAS OF APPLICATION

Manufacturing, Chemical Processing | Factory Floors | Oil & Gas Rigs

BUILDING SECURITY



USE CASES

- Drones can augment existing CCTVs for patrolling activities over large areas.
- Detect unidentified or unauthorized personnel on the premises.
- Detect unsafe spaces – combining sensor data with video streams.
- Surveillance in inaccessible parts where human reach is difficult.

BENEFITS

- Improved worker safety.
- Heightened security combined with alarms for intrusions.
- Increase in productivity due to automation of surveillance activities.
- Anti-poaching.
- Greater event security with better crowd control and safety.

AREAS OF APPLICATION

Buildings – offices, hotels & resorts | Outdoor areas of a factory

SMART PARKING LOTS

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USE CASES

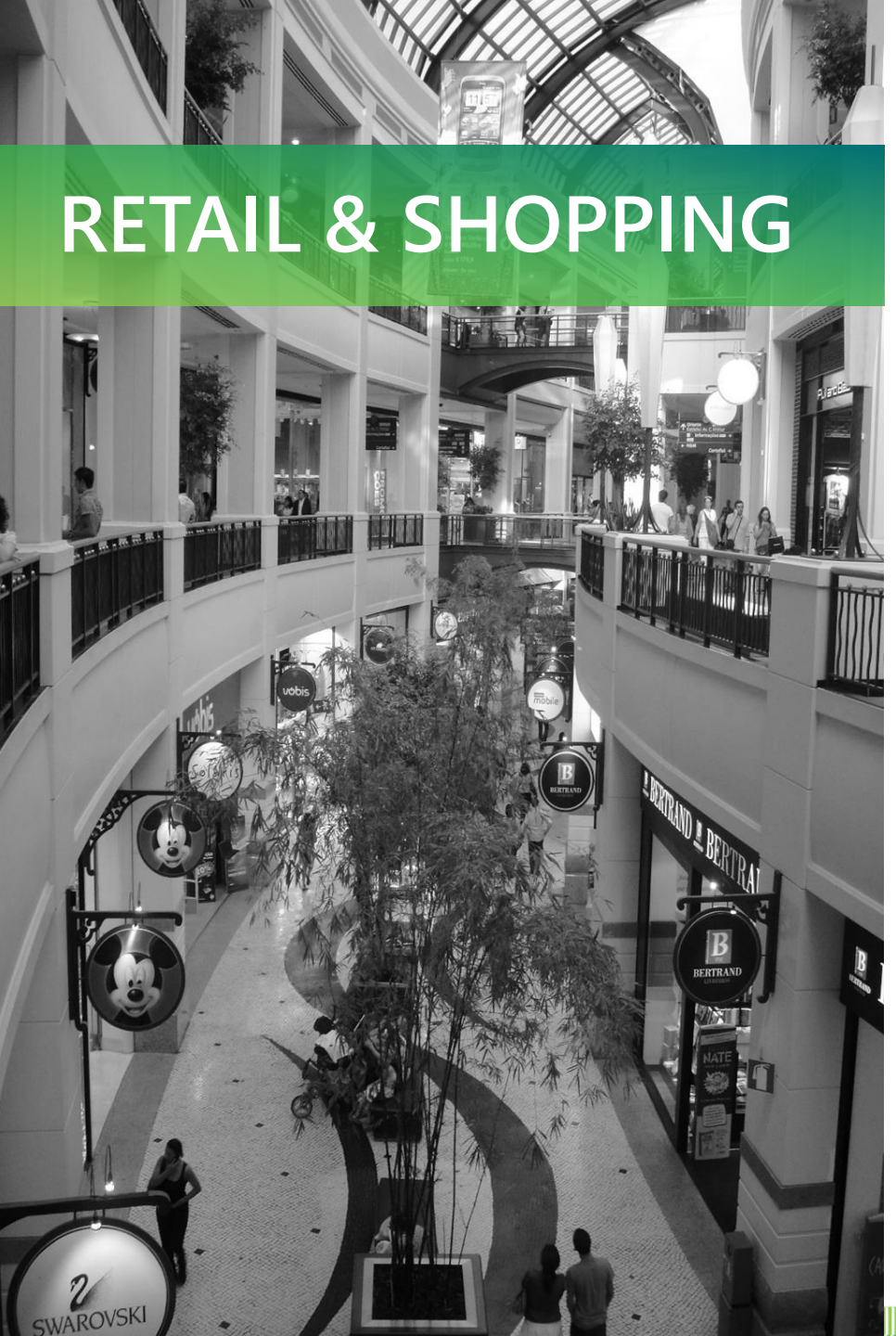
- Surveillance of large parking lots – both open and closed.
- Identify wrongly parked or damaged vehicles.
- Detect unauthorized people to prevent loitering.
- Parking lot gate and kiosk monitoring.
- Better traffic management in parking spaces.
- Car counting at entry and exit points.
- Indoor/outdoor based systems.
- LPR (License Plate Recognition) for surveillance.
- People safety in parking areas.

BENEFITS

- Improved parking operations and safety of vehicles and humans.
- Automated space management with monitoring & counting of cars going in or out.
- Greater safety of people and their cars.
- Safety and maintenance of parking lot equipment.
- Automated metering depending upon in and out time by LPR.

AREAS OF APPLICATION

Parking spaces in retail stores, malls & hotels | Rent-a-car businesses | Car Dealerships



RETAIL & SHOPPING

USE CASES

Fixed CCTVs can be used for carrying out surveillance within Store to identify –

- Areas where shoppers need assistance.
- Product Stock levels in shelves.
- Automated product tagging.
- Identify and mitigate shoplifting.

BENEFITS

- Helps in improving store operations.
- Better customer service.
- Auto replenishment of stock to avoid “No Stock” scenarios.
- Better security.

AREAS OF APPLICATION

Retail stores | Shopping Complexes | Malls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ANALYSIS
SEARCH
SCANNING
CASE STUDIES

Case Study

Drone based platform for real time surveillance in different business areas

The client is a South Korean multinational conglomerate with businesses in food products, shopping, finance, construction, amusement parks, hotels, trade, oil and sports.

Client Requirements

Building a real time multi-object tracking and localization system of humans in different areas like parks and construction locations while supporting single RGB cameras from the drones.

Happiest Minds' Solution

- Drones based real time multi-object tracking and localization system of humans in different areas like parks, construction, roads etc.
- Video streaming at 30-40 FPS, algorithm to detect the right images to be analyzed.
- Algorithm for object detection and tracking using RetinaNet & Faster RCNN.
- Image processing, managing noises and occlusions in videos or images.
- 3D localization after consolidating data from GPS, cameras and calculating the location of objects.
- Multiple object tracking using drone camera pose, barometer and distance data after 3D localization.
- Dashboards to show real time object tracking.

Types of Assets / Technologies

- Drone with single RGB camera
- FlytOS, ROS
- RetinaNet50 & Faster RCNN - Object detection & tracker
- Tracklnet – Multi-Object Tracking
- DSP & Kalman Filter
- mAP and Mean localization error

Outcomes

- Providing a platform for real time human detection and tracking using drone-based cameras.
- Algorithms built using RetinaNet and Faster RCNN that currently tracks humans but can be extended to other surveillance needs.

Dashboard

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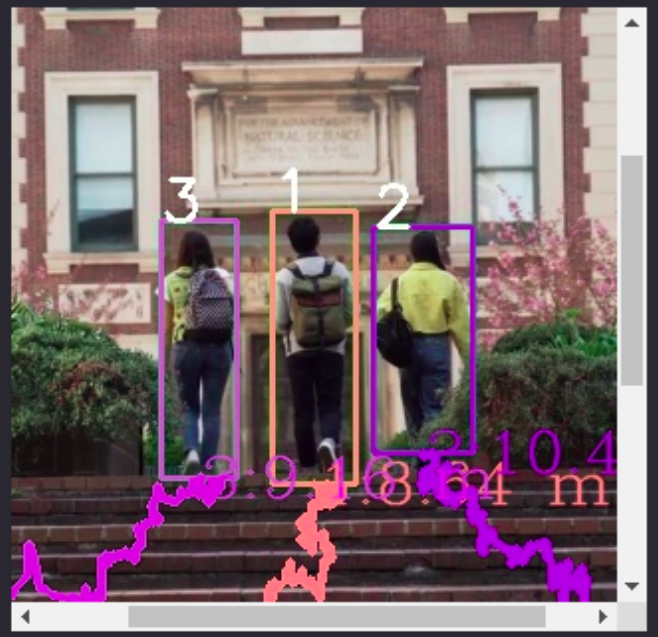
Drone Surveillance

John Doe

Camera view

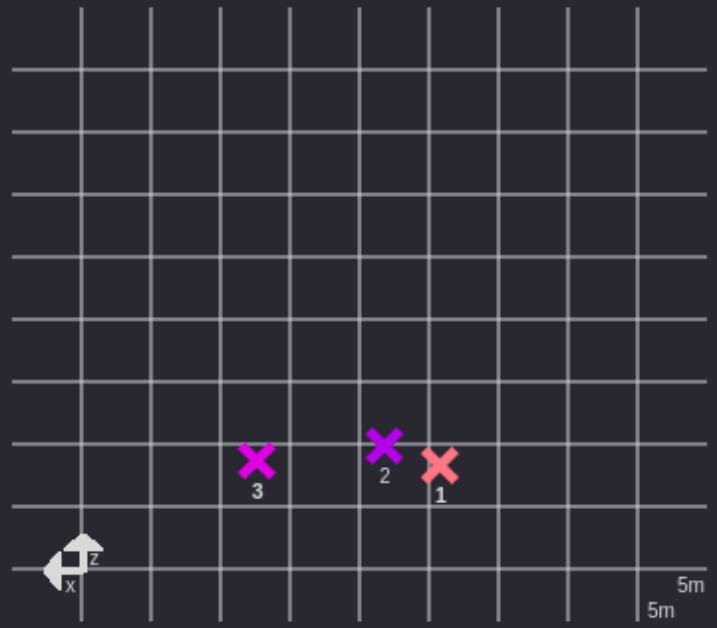


Camera Height: 2.97 m

Detecting objects: 3

Trajectories

GPS view



Drone

Our system

Logs

20210825,09:24:45.Obj3.115.83.290.0:
9.16: 2.47
20210825,09:24:45.Obj2.180.12.230.0:
10.42: 2.47
20210825,09:24:45.Obj3.113.78.290.0:
9.16: 2.47
20210825,09:24:45.Obj2.180.12.230.0:
10.42: 2.47
20210825,09:24:45.Obj3.113.78.290.0:
9.16: 2.47
20210825,09:24:45.Obj2.180.12.230.0:
10.42: 2.47
20210825,09:24:45.Obj3.114.55.290.0:
9.02: 2.47
20210825,09:24:45.Obj2.181.09.230.0:
10.25: 2.47
20210825,09:24:45.Obj3.109.31.290.0:
9.3: 2.47
20210825,09:24:45.Obj2.205.54.290.0:

Case Study

Smart Robots – Intelli-Planogram Solution

Background

A lot of time is spent by staff at Retail stores in checking inventory levels to ensure availability across multiple SKUs.

It is also important to ensure that best selling products are arranged at line of sight to further maximize sales. In addition, ensuring that the price tags on shelves match the current promotional offers can often turn out to be challenging.

Requirements

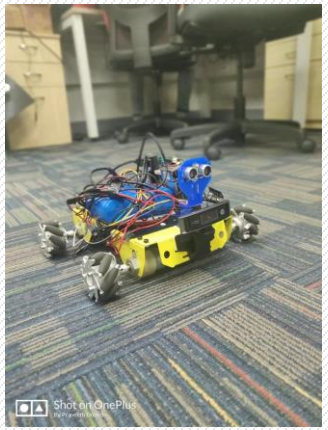
Employees of retail stores should ideally be able to focus on:

- Customer happiness
- Assisting customers
- Business Analysis

Inventory Associates should know the exact stock status of each product in each shelf and replenish it on time.

Happiest Minds' Solution

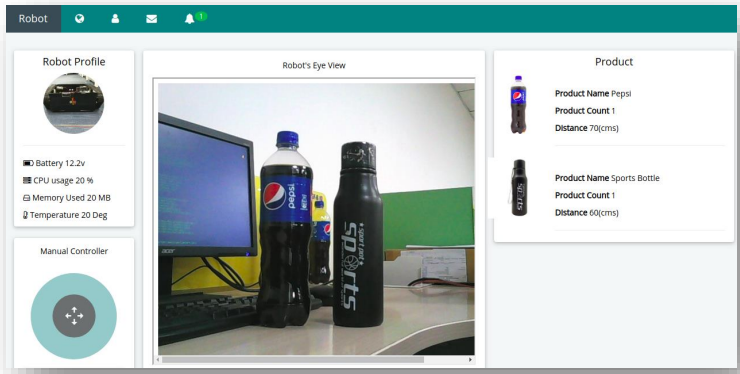
- Camera & Rotating LIDAR placed on Robot to create 2D/3D point cloud for autonomous movement and scanning of product on shelves.
- The images sent to the cloud infrastructure for product detection either with heavy-weight YOLO or light-weight DLIB.
- After detection, the application analyses these images and tracks each product.
- The product count and distance between product and camera is updated in cloud storage.
- 360/180 degree LIDAR based point cloud formation along with mecanum wheels to move the vehicle in any direction.



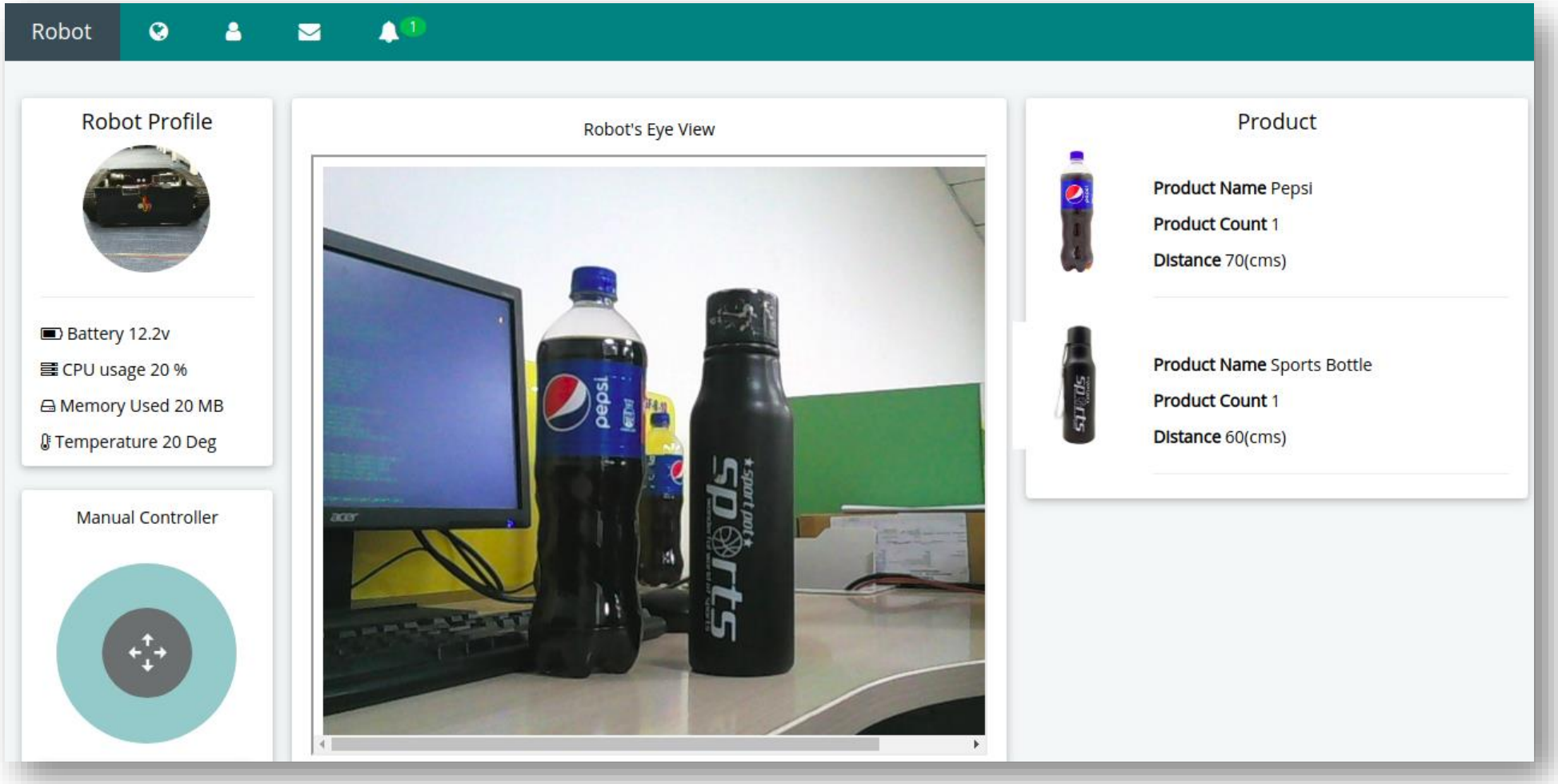
Types of Assets / Technologies

- ROS2
- ReactJS User Interface, NodeJS backend
- Camera, Mecanum Wheels
- Web-Sockets
- Kafka
- YOLO, dlib

Object Detection (Click to Expand)



Object Detection



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ENSURING SUCCESS WITH COMPUTER VISION...

Recommendations to Succeed with Computer Vision

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There are certainly some best practices that can be followed in order to ensure that you are taking the right steps in maximizing the value you derive from Computer Vision.

Provided below are some of the most important ones that you can consider –

Closer to the Edge

Have inferences closer to the device (on the device or edge).

Containerize

Containerize the Edge piece for ease of deployment.

Cloud to extract extra

Use cloud as complimentary infra for further processing.

AI Engineering

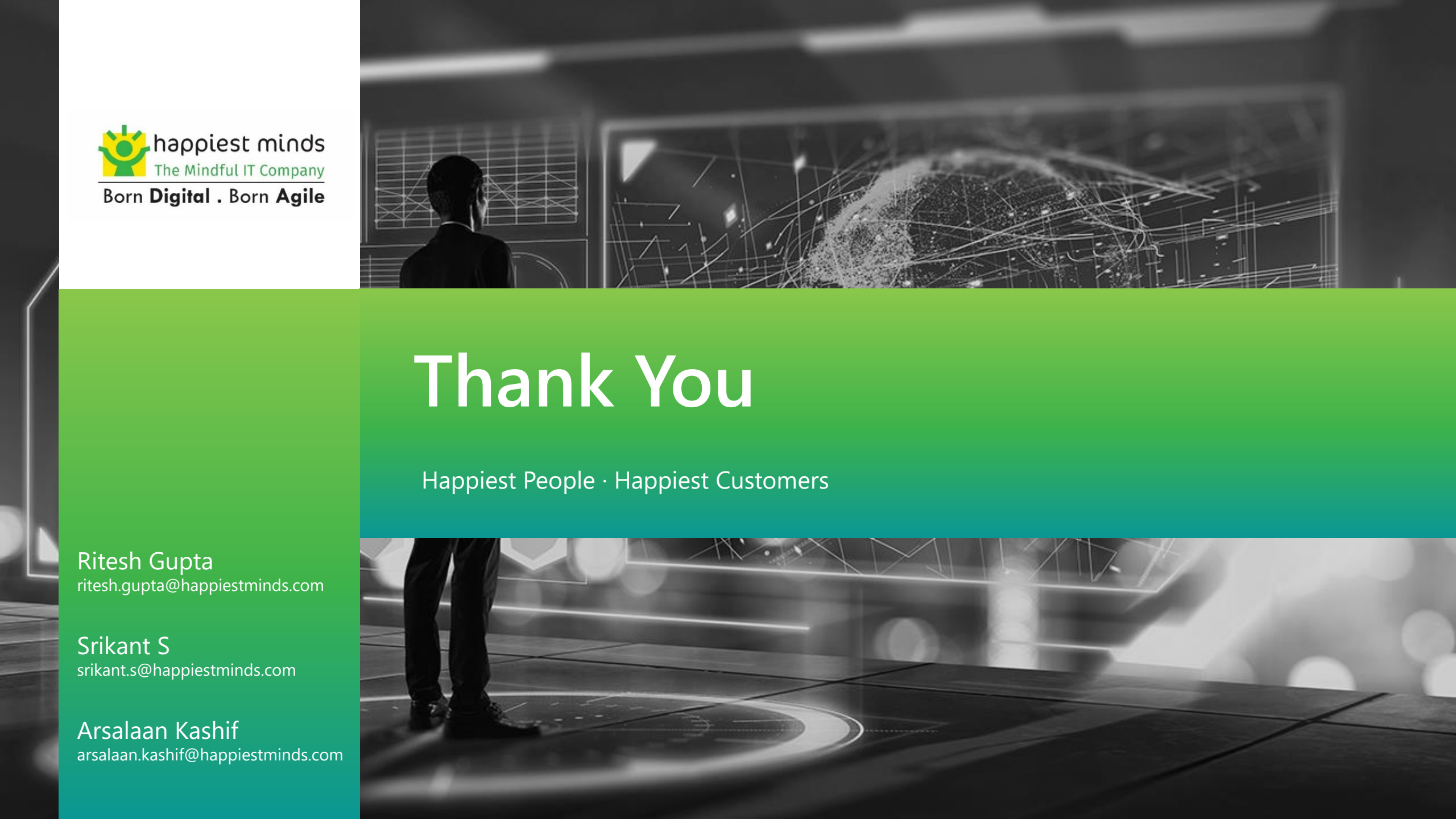
Use AI Engineering MLOps to automate processes.

Security

Secure Data on Edge & Cloud.

Algorithm

Choose right CNN algo and keep it simple.



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Thank You

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