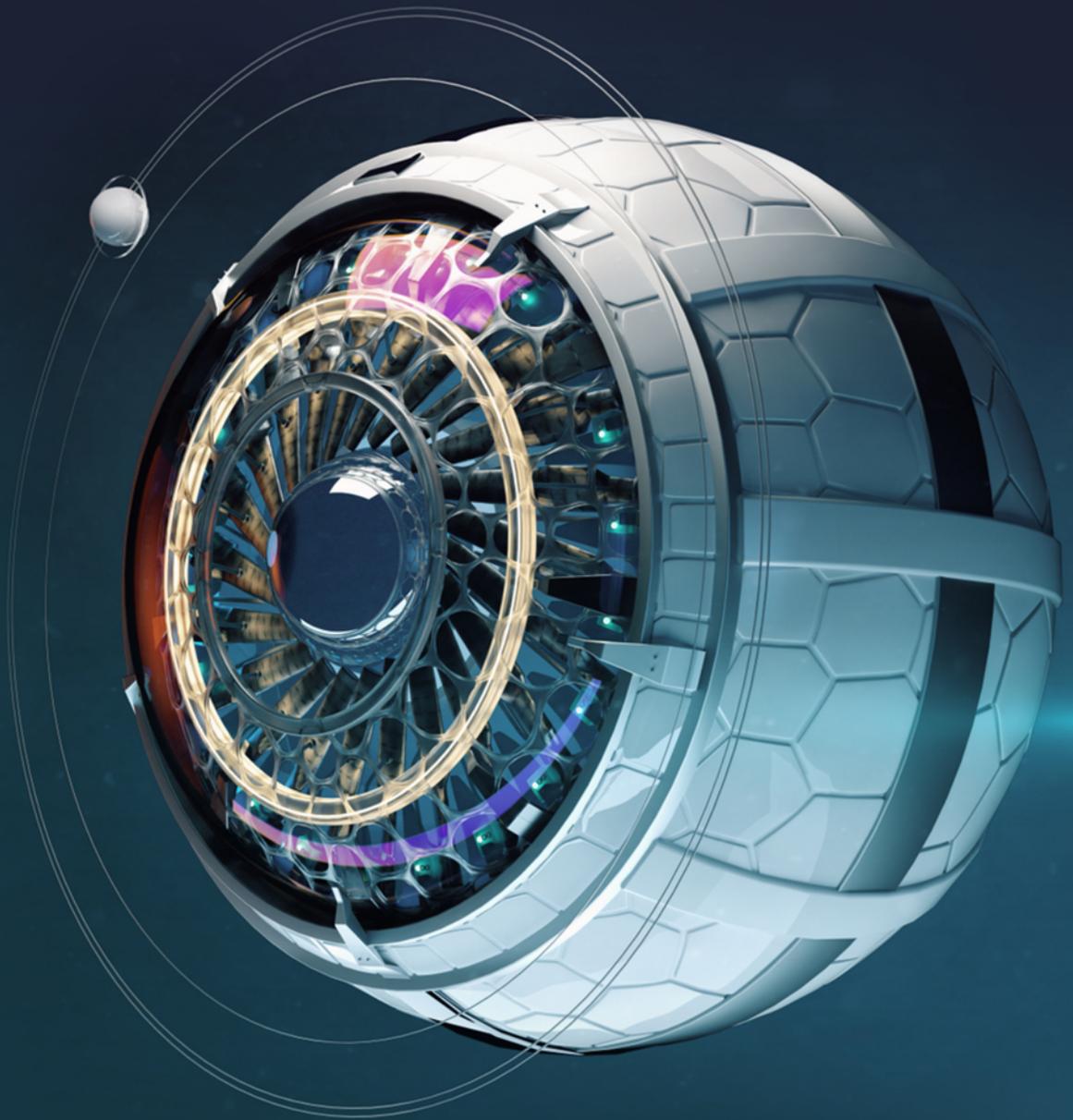


The Age of the Eye?

Looking at the future of AI Vision



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ABSTRACT

Artificial Intelligence (AI) is now widely recognized as one of the main drivers of digital transformation in a variety of businesses. In fact, AI has become critical for the success of an organization's efforts to transform business processes and to improve customer experiences. What it basically does is a form of imitation of human intellect to identify certain patterns in events or behavior, create insights gained with Machine Learning (ML) and then react as per built-in algorithms and programs.

AI is changing our world, without a doubt. By capturing and understanding the environment in real-time an AI system can analyze multiple inputs of data and make an optimal decision within a fraction of a second. As businesses move towards enhanced digital capabilities, AI will become more prominent in simplifying and automating basic business processes.

The speed and accuracy that AI brings to business processes enable manufacturing business owners to accelerate production without compromising quality. Efficiency in organizations increases significantly as AI detects problems and challenges at the earliest stages of production, eliminating iterations and wastage.

AI has been evolving all the time. Businesses are now turning their attention to Computer Vision or Vision Intelligence or AI Vision, to bring newer, more visual capabilities to their processes. Many sectors like satellite geo-analytics, food safety, and processing, agriculture operations, augmented reality, human emotion analysis, medical diagnostics, robotic guidance, quality control, transportation coordination, utilities, security surveillance, and more have derived new benefits from the visual context introduced by AI Vision.

The technology has matured a great deal in recent times and its adoption is expected to peak very shortly. Thanks to Vision, machines are developing greater perception than ever before. The result is that humans are capable now of making more accurate, reliable, and intelligent decisions, making it a technology that is very essential for today's business world.

What is Computer Vision? How it was a catalyst for the AI revolution

Computer Vision (CV) is a field of artificial intelligence that enables computers to interpret and understand the visual world. With Computer Vision, machines can accurately identify, locate, and react to what they “see” using digital images from cameras, videos, and deep learning models. To make it sound very simple, CV is a software solution that works with a camera to analyze pictures and videos taken by it and extract meaningful data from the images that will solve a variety of problems.

From the perspective of engineering, it seeks to understand and automate tasks that the human visual system can do. It may also involve the use of specialized methods and make use of general learning algorithms to further enhance capabilities.

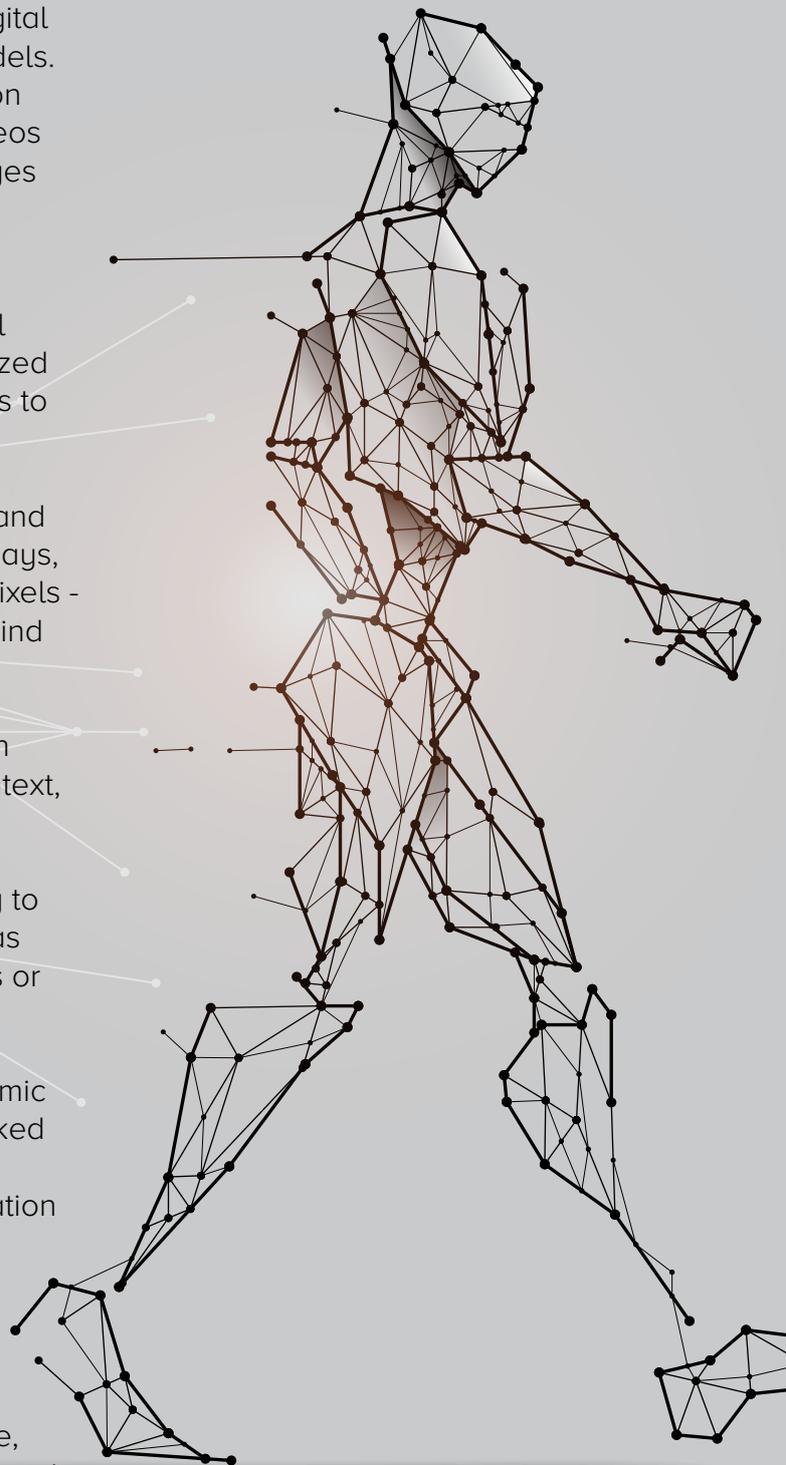
Computer Vision has one important purpose - derive and interpret content from images or videos. In the early days, machines looked at an image as just a collection of pixels - they could not understand the semantic meaning behind an image. Computer Vision changed that, it filled the gaping hole that was plaguing AI - semantic understanding, namely the art of giving meaning to an image and analyzing it. It helped AI get the visual context, in addition to the pixels in an image, or video.

In short, CV helped cameras become smarter, helping to collect insights about your business and operations, as well as generating notifications when an event occurs or when an anomaly is spotted.

Although Computer Vision had been a topic of academic interest for years, it was only when deep learning picked up pace that it saw some tremendous momentum. Algorithms capable of mimicking the brain’s interpretation of visual information were being worked upon and practical applications in the areas of surveillance and security, among others, were obvious early on.

With time, a diverse range of sectors and industries adopted Computer Vision as well including agriculture, aviation, retail, manufacturing, etc. This led to a significant improvement in how organizations worked, introducing ease of use and simplicity to the monitoring of processes.

This led to an exponentially increased interest in AI across industries.



Where we are today with AI Vision

It was the integration of Machine Learning with Computer Vision that resulted in the development of applications critical to solving real-life problems.

Machine Learning, a subset of Artificial Intelligence, uses historical data to improve algorithms and predict outcomes more accurately. In simple terms, it trains the computer to associate an object with the desired output. AI Vision can be classified as CV broadened by ML through the adoption of effective methods for acquisition, image processing, and analysis, and object focus.

AI Vision today is powered by deep learning algorithms with a special type of neural network known as convolutional neural network (CNN), to make better sense of visual information. Trained with thousands of sample images, these neural networks empower the algorithm to understand the image in precise and accurate ways.

The neural networks scan each pixel of a visual image to identify patterns for memorizing them. If the machine learning model is supervised, the neural networks also memorize the ideal output that it should provide for the specific input image. Moreover, these neural networks also classify components of images by scanning characteristics like contours and colors. All this information is then used by the computer as a reference while it continues to scan more and more images. With every iteration of image processing, the AI becomes better at providing the right output.

Some of the most prominent applications of AI Vision in the current market trends include:



Image Data Capture

As deep learning algorithms deepen their roots in social media, AI Vision extracts any relevant information from the images that users post. The algorithms used by social media platforms have become so intelligent that they can easily distinguish between a person and an animal or an inanimate object. That is not all, these algorithms can also identify individuals based on their facial features.



Secure ID Recognition

Using facial recognition and biometric scanning, AI Vision can identify individuals for security purposes, like smartphone locks. Moreover, such facial recognition applications can also be found in business or residential buildings to verify the identities of individuals for allowing access into the facility. These systems use unique physiological characteristics of individuals to be certain of their identity.

The promise of AI Vision and why it can be a game-changer

The possibilities that AI Vision presents are boundless. As we move further and research continues to find more insights into the technology, we will see it perform across a wider range of functions. We will also see innovations that refine the technology for increased precision and efficiency as training machines become easier and the number of images being processed increases.

Moreover, with more integrations and collaborations with other progressive technologies, new and improved applications can be built that solve complex problems. In time, AI Vision will also contribute to the development of Artificial General Intelligence (AGI) and Artificial Superintelligence (ASI), providing them advanced capabilities to process information just like the human eye, or maybe, even better.

This transcendental shift towards advanced artificial intelligence will pave the way for artificial intelligence that is not only cognitive but sentient and intuitive as well. In a way, artificially intelligent machines would become much closer to humans, at least as close as they can get. All this might seem far-fetched now considering the state of affairs in the technology in today's context but there are a lot of possibilities that are yet to be explored.



Sectors in which AI Vision can give real value

AI Vision is a versatile technology with a varied set of applications across industries. Whether it is implemented at the back-end or at the forefront of a product or a process, AI Vision can provide immense value to businesses across sectors, be it healthcare, automotive, retail, manufacturing, or more.

Insights gained from an AI Vision-based system can provide business owners with key learning opportunities to make decisions that can have a profound impact on the way they do business.

Let us look at some of the sectors benefiting from the value of AI Vision:

Automotive

Self-driving cars have been in people's imaginations for decades. With AI Vision, their reality has become safer and more reliable. Self-driving cars today use Vision intelligence to not only center the vehicle or park itself but also empower them with total automation without compromising the security of the people. They generate precise, accurate, and a diversified set of annotations on datasets to help train, validate, and test self-driving algorithms.

Surveillance

Securing public places is a pressing concern for governments around the world. AI Vision helps massively to enhance and improve crowd control, unusual activity detection, spotting of weapons and suspicious items, non-compliance, and non-adherence to rules and regulations, all through real-time monitoring. Companies and other organizations are also able to supercharge their camera networks to predict and prevent unsavory incidents like remote perimeter breaches or unauthorized entry and thus protect their valuable assets.

Manufacturing

Critical equipment in manufacturing has already been using sensors for safety and predictive maintenance. AI Vision has added the benefit of visual interpretation to identify and alert about anomalies or faulty equipment - something that human supervisors can miss. As it monitors and reports the health and efficiency of the infrastructure, accidents pertaining to machine failure can be significantly reduced. AI Vision has also contributed significantly to boosting productivity and efficiency on the shop floor. Intelligent automation at scale has resulted in traditional shop floors literally turning into smart facilities.

Retail

AI Vision has helped retail stores prevent inventory shrink, theft, and checkout losses including Bottom of the Basket scan errors and "buddy billing". It eliminates the need to continuously eyeball CCTV monitors and is also adaptable to ever-changing vulnerabilities that can otherwise escape detection. It can also help them improve the efficiency and productivity of their employees, as well as enhanced monitoring of product aisles for stock-out situations in real-time.



The future of brick and mortar stores is eyes without people

The retail industry has had a rough few years, especially the brick and mortar stores. First, they faced competition from eCommerce giants, and then, the onset of a global pandemic led to lockdowns worldwide. This resulted in a large decline in footfall across the many subsets of stores and other retail.

However, the industry is not at its end still. Innovation in retail is working towards creating retail experiences that will create more effective and integrated offline store ecosystems. This is evident by the fact that Amazon, one of the largest players in the eCommerce market, is building its own chain of retail stores.

This is because the retail experience brings in the entire visual exposure that humans desire. People do not want to just check the products on a website, they want to look at it in person, feel it, try it, and make sure they want it before they go ahead and pay for it. The only problem is that the offline retail experience is not optimized for customer satisfaction which is presented in abundance on online stores.

Computer Vision can help store owners optimize their store experience for customer satisfaction. Here are a few ways they can do it:



Facial Recognition

Computer Vision can help create effortless access gateways to employees based on their authorization. This could help improve processing times and eliminate approval delays to focus on serving customers. Moreover, it can help them create a point of sale solution that allows touchless payments using facial recognition.



Shopper Analysis

With Computer Vision, retailers can accurately count and monitor the behavior of shoppers. It can help them gain true data about conversion, footfall, and behavior of buyers. For instance, a group of five people who make one purchase will be counted as a group, not individuals which could falsify the conversion rate.



Improved Operations

Retailers can also track interactions of customers with products, monitor effective placements of products, analyze the performance of staff, increase productivity, and ensure that the store is following health and safety protocols like maximum occupancy.



Safety Regulations

With the intelligence of Computer Vision, retailers can judge situations more accurately to avoid risks and maximize safety for customers and employees. In any area where safety equipment is required and people do not follow instructions, real-time alerts are sent to the concerned authorities.



How computer vision will transform the way we look at Manufacturing & Warehousing

Manufacturing depends a lot on its workforce. Unlike most other industries, manufacturing requires a hard-skilled, physically fit workforce on the floor always. These people put a lot of risk working on or with the machines in the factory. For that reason, any model in manufacturing requires employee safety at its forefront.

With AI-enabled smart cameras, automation of monitoring and inspection becomes easier. With compliance and safety checks integrated into the system, Computer Vision can ensure that the workforce adheres to it, for their own safety. This helps manufacturers protect employees, contractors, or third-party operators working in potentially unsafe environments.

Traditional machine vision uses IP cameras along with flexible AI modules which are easy to deploy. However, they also experience significant latency and cannot contribute to real-time alerts and responses. On the other hand, an AI-based vision intelligence system can empower manufacturers with just that, minimizing delays, reducing space and bandwidth requirements, and enabling easy installation and maintenance.

Moreover, real-time Computer Vision enables manufacturing units to alert users if they enter risky surroundings. In addition to all this, Computer Vision can also help in:

Defect Reduction | Warehouse Inventory Management | Automated Assembly Line Inspection |
Reduced Machine downtime | increased safety and security

A Look At Successful Cogniphi AI Vision Implementations

Cogniphi has seen impressive results in AI Vision implementation for clients across industries, namely in manufacturing and retail. Cogniphi AI Vision has delivered on the promise of vision intelligence, and even more.

Let us look at how Cogniphi's AI Vision transformed processes for some of its clients.

Case Study 1 Manufacturing



A leading automobile parts manufacturer, with an almost eight-decade-long legacy in the industry, wanted to address challenges pertaining to production loss, inventory management, and material wastage. These challenges were affecting their throughput and efficiency across the factory floor.

Cogniphi's team of AI experts visited their plant to understand the 'why' and 'how' of their problems. With a clear understanding of the exact nature of their problem, the team integrated AI Vision with the 500 legacy cameras and 1100 sensors inside two of the manufacturing plants (factory floors) with an area of 300 acres.

This enabled the detection or prediction of instances that can cause productivity loss, wastage, inappropriate handling of inventory, missed inventory, NCM movement, and operator availability with over 99% accuracy achieved in visual detection models.

Here's how it helped the client:

- 16% increase in productivity
- 26% decrease in losses due to unmet production targets
- 35% reduction in unscheduled stoppages in the production
- 80% increase in material movement and handling compliance
- Enhanced quality check processes powered by advanced texture detection
- Reduced instances of raw material wastage

Case Study 2 Retail



A top US-based grocery retail chain with over 300 stores across the country was facing revenue shrinkage due to bottom-of-the-basket (BOB) losses. Cogniphi's AI experts visited their department stores and evaluated the scope of their problem - millions of dollars of lost revenue.

Cogniphi designed an AI Vision solution framework to enhance their checkout processes and help tap into the opportunities they missed out to the mismanagement they were facing. The implementation helped them:

- Reduce over-the-counter losses by 70%.
- Detect and alert anomalies in real-time through existing CCTV networks.
- Enhance decision-making dashboard, reports, and notifications for real-time inference, alerts, and action.
- Reduce BOB instances by 80%
- Increase daily per-lane profits
- Boost profits per lane, per day by up to 10%
- Improve the throughput and front-end efficiency
- Identify cashier compliance problems
- Capitalize on flexible, cost-effective scalability



Typical Pitfalls in AI Vision Implementation

With so many possibilities and promises offered by AI Vision, there's still a lot of industries and applications that have not yet been fully developed or realized. A lot of companies that have tested the waters of vision intelligence have had bad experiences with it and a lot of it has to do with how it was implemented.

Here are a few typical pitfalls in AI Vision implementation

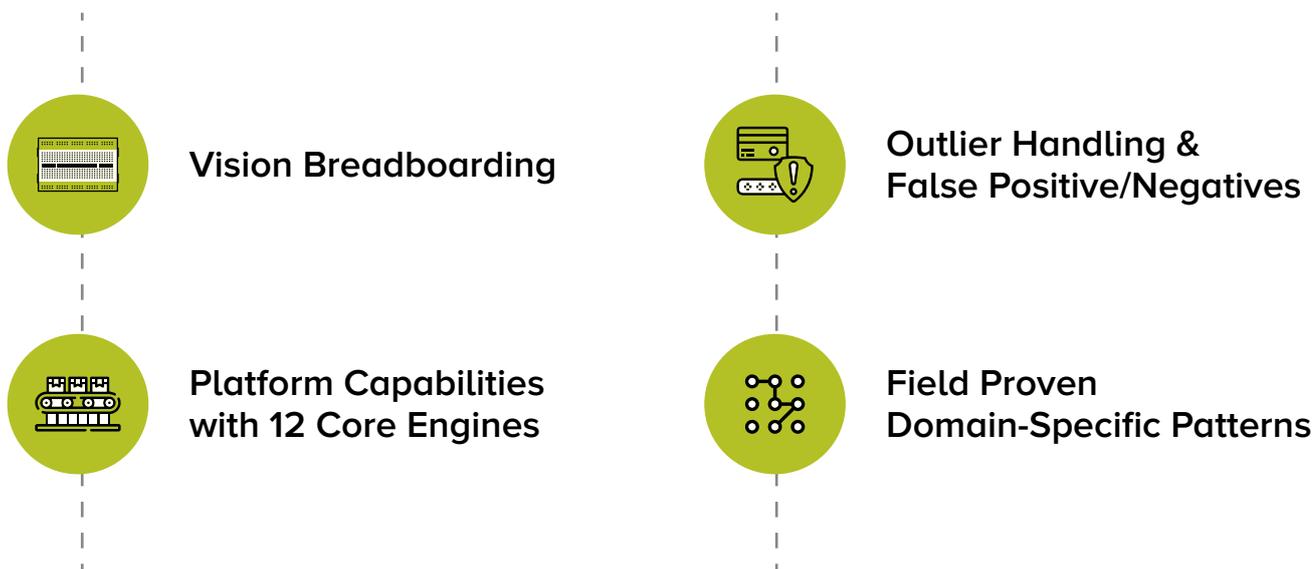
- Less focus on actual business outcomes, delivering low value after significant investment from customers
- Lack of expertise in AI governance and unaddressed process issues
- Expecting actual live implementation to perform exactly as lab implementation or POC
- Lack of a supporting ecosystem for the implementation to thrive
- Neglecting outliers
- Overreliance on open-source knowledge without a clear-cut understanding of business contexts, accuracy, and deep learning

Bridging The Gap: How Cogniphi Helps

Cogniphi is bringing a change in Computer Vision through its proprietary solution - AI Vision. With insights gained from years of experience in hands-on Computer Vision, Cogniphi brought together a team of diverse experts in different fields in AI to build a comprehensive solution that serves a lot more than traditional Computer Vision models like:

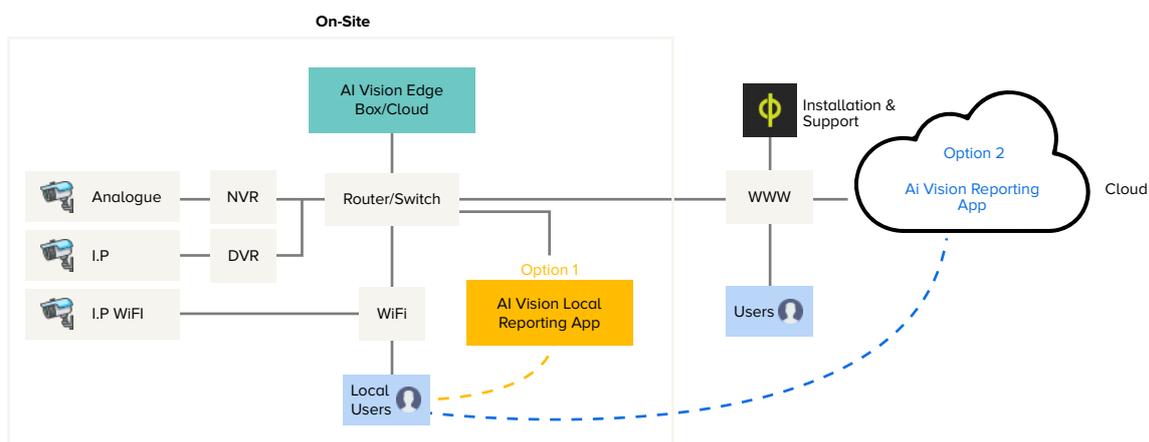
- Outcome-driven Solutions
- Technology-driven & Business-focused Use Cases
- Non-intrusive, On-premise Deployment with GDPR Compliance and Data Privacy
- System Integrator Support (UST Global) for Scaled Implementations Across the Globe
- Prebuilt Domain-specific Patterns
- Platform and Vision Breadboarding Capabilities for Fast Deployment

Key features of Cogniphi's AI Vision:



Here's why Cogniphi's AI Vision stands out from other Computer Vision solutions.

- Faster Go Live at a fraction of the cost
- 10X Reduction in Control Room Effort
- Rapid and large scale rollout
- Freedom to change lighting & layout
- Continuous Improvement in Accuracy
- Improvement in workplace discipline and culture
- Ensures continuous and rapid response till closures
- Needs extremely low data
- Ensures data privacy, legal compliance, and cost savings
- Guaranteed Results
- Integrates easily with legacy IT systems
- Flexibility to experiment and innovate for increasing ROI



- Connecting Edge Device to the premise of inference to securely ingest visual data from all cameras in the premise. (* Edge Device - an onsite device where AI processing occurs. It means no footage leaves the site and all processing happens at the site).
- AI Vision engines analyse the visual data, derive meaningful information, identify anomalies, patterns and valuable correlations that are further used to automate, recommend, predict and optimise applications and use cases.
- The recommendations are made available to users as real-time alerts via mobile dashboards, mobile apps, heat maps.
- Predictive and Prescriptive analytics in the form of reports and recommendations.

Here's how Cogniphi implements AI Vision

1. Discovery Phase:

- First, we will meet to understand your business, have a walkthrough of your facilities and make sure we are clear on the challenges you are facing and opportunities you could take advantage of. The walkthrough can be physical or virtual.
- We will need to speak to other stakeholders within your organizations that will be involved in this project to ensure a smooth transition and 'change acceptance' as part of our change management. This means we want their feedback and involvement in the design of the solution to tackle the challenges they experience.
- After our first meeting, we typically request video footage from your existing cameras for our team to process to give you a taste of the kind of data you will see.

2. Solution Design:

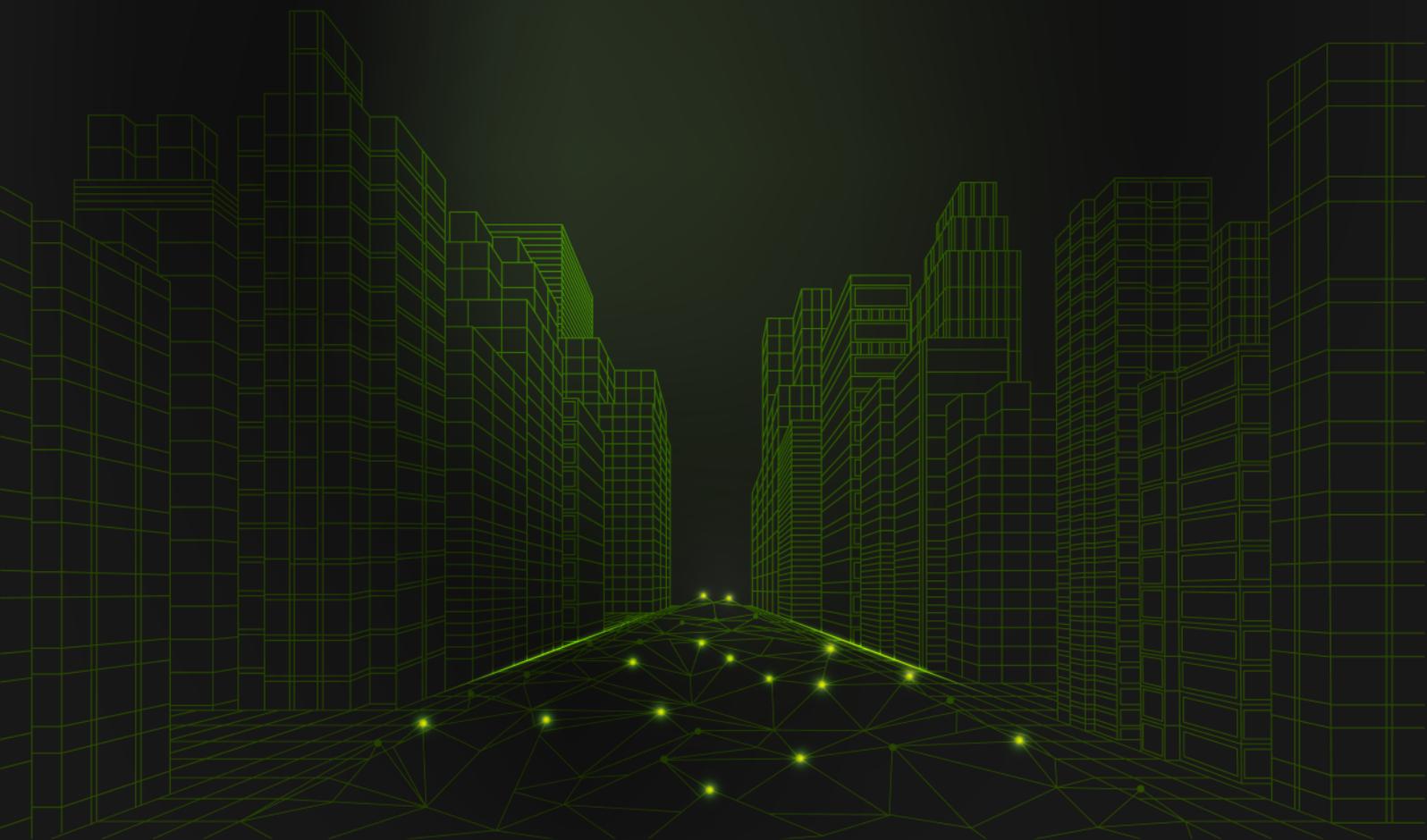
- After understanding your business and technology, and receiving feedback on your biggest priorities, we will present a proposal to conduct a Pilot.
- The proposal will be based on the key areas identified by you and your team, combined with our input on what is possible with our technology.
- At the end of this stage, we agree on the success criteria of the Pilot and the costing of both the Pilot and Scaled Rollout, should the Pilot be successful.
- Pilots are success-based trials where we spend 2-3 months implementing our technology on a small scale within your business (typically 1-2 sites if you have multiple locations). If after this time, we achieve the targets set out, we then move to a scaled rollout across the rest of your business.

3. Pilot Implementation:

- During the Pilot, we will be all hands on deck, making sure everything is working correctly, and the insights you are receiving are delivering a tangible Return on Investment (ROI).
- This is where we validate the solution and prove its ROI within your organization.
- Pilots are billed as a one-off fee that depends on the size and complexity of the solution.

4. Implementation at scale:

- Upon the success of the Pilot, we can start to scale the rollout across the rest of your business.
- From here, there is a fee to set up each premise as well as a monthly SaaS fee to license our software which was agreed to at stage 2, Solution Design.



About Cogniphi

Cogniphi is a technology company that enables customers to achieve transformational outcomes through cognitive digital solutions. Cogniphi's AI

Vision is a proprietary technology framework that's built to provide organizations with actionable alerts on the go along with insights into productivity and operational inefficiencies.



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