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THE ULTIMATE GUIDE TO MERGING COMPUTER VISION WITH CHECKLISTS

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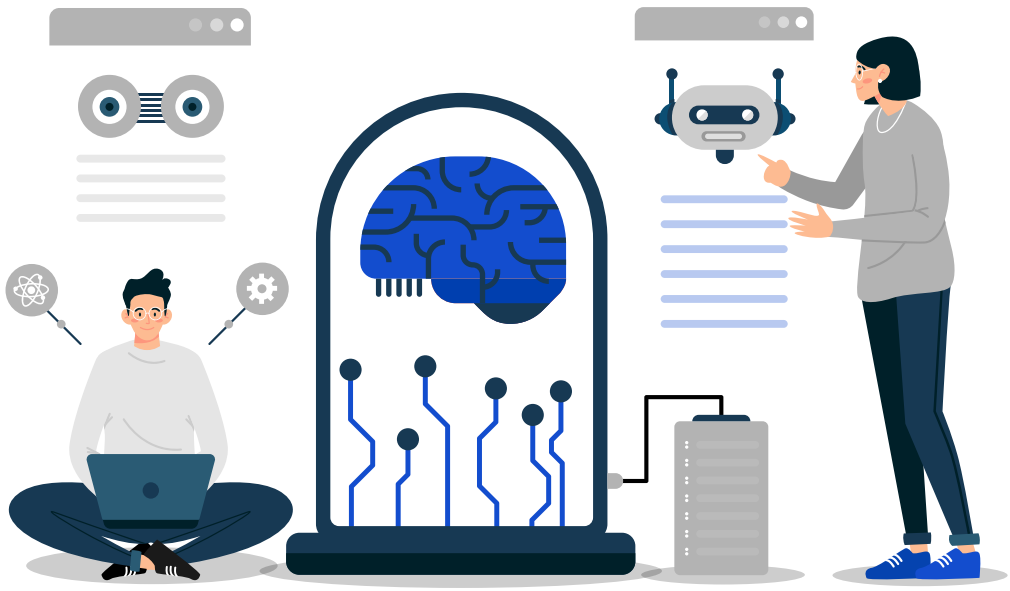
INTRODUCTION

AI is everywhere. Look around, and it won't take you long to find products that use AI to improve the user experience.

One such helpful innovation we often encounter on the internet is chatbots. Brands use chatbots as a critical part of their website, and they've been instrumental in streamlining the overall customer journey.

If you think chatbots don't personally affect you, how about something you use every day? Even if you're living under a rock, there's a high probability that you're tweeting from underneath it. If Twitter's not your favorite poison, maybe it's Facebook, Instagram, LinkedIn, or one of the many other social media apps out there. Well, if you're using social media, artificial intelligence has the ability to influence our decision -making. Be it your social media profile timeline or any notifications from these apps, AI curates everything. There are several other areas where the impact of Artificial Intelligence is not directly visible. Still, AI affects consumers' everyday lives all over the world and brings much-needed visibility to businesses.



In this eBook, we'll be talking about the checklists that businesses use in everyday processes. Then, imagine harnessing the power of AI to take the next leap into process execution and monitoring to get real-time insights, automatic detections, and on the go supervision of consumers and employees! The rapid evolution of AI has made this possible.

Businesses in retail, manufacturing, food services, hospitality, and banking, can benefit from this technology by deploying AI-powered checklists in their existing CCTV camera infrastructure without spending on extra hardware.

This eBook discusses the power of checklists, what makes them so important and how AI-enabled checklists can drive the next big thing in intelligent video analytics for businesses worldwide.

COMMON CHECKLISTS AND USE CASE CATEGORIES

Customer Engagement Checklist

- Customer standing but staff not available
- Customer wait-time alerts
- Queue busters

Food Hygiene Checklist

- Handwash detection
- Hairnet detection
- Kitchen gloves detection

Security Checklist

- Hand raised
- Camera tampering
- Gun detection
- Guard sleeping/not present
- Intrusion detection

Accident Safety Checklist

- Critical machinery station left unattented
- Person detection in the forklift area
- Zone-wise restriction based on uniform trigger

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Decoding Compliance

01

WHAT IS COMPLIANCE?

Policies and procedures form the backbone of the organization's operations. Hence, shaping them up and ensuring them with a set of rules and strategies are of utmost importance that do no good without compliance.

Compliance simply means complying with rules. It safeguards employees by adhering to law and standards and protects the organization’s data and valuable information.

For businesses to succeed, companies must comply with regulatory and standard requirements. Failure to do so could prove disastrous for all the stakeholders involved. Non-compliance costs 2.6 times the expenses incurred to meet compliance requirements for businesses worldwide.

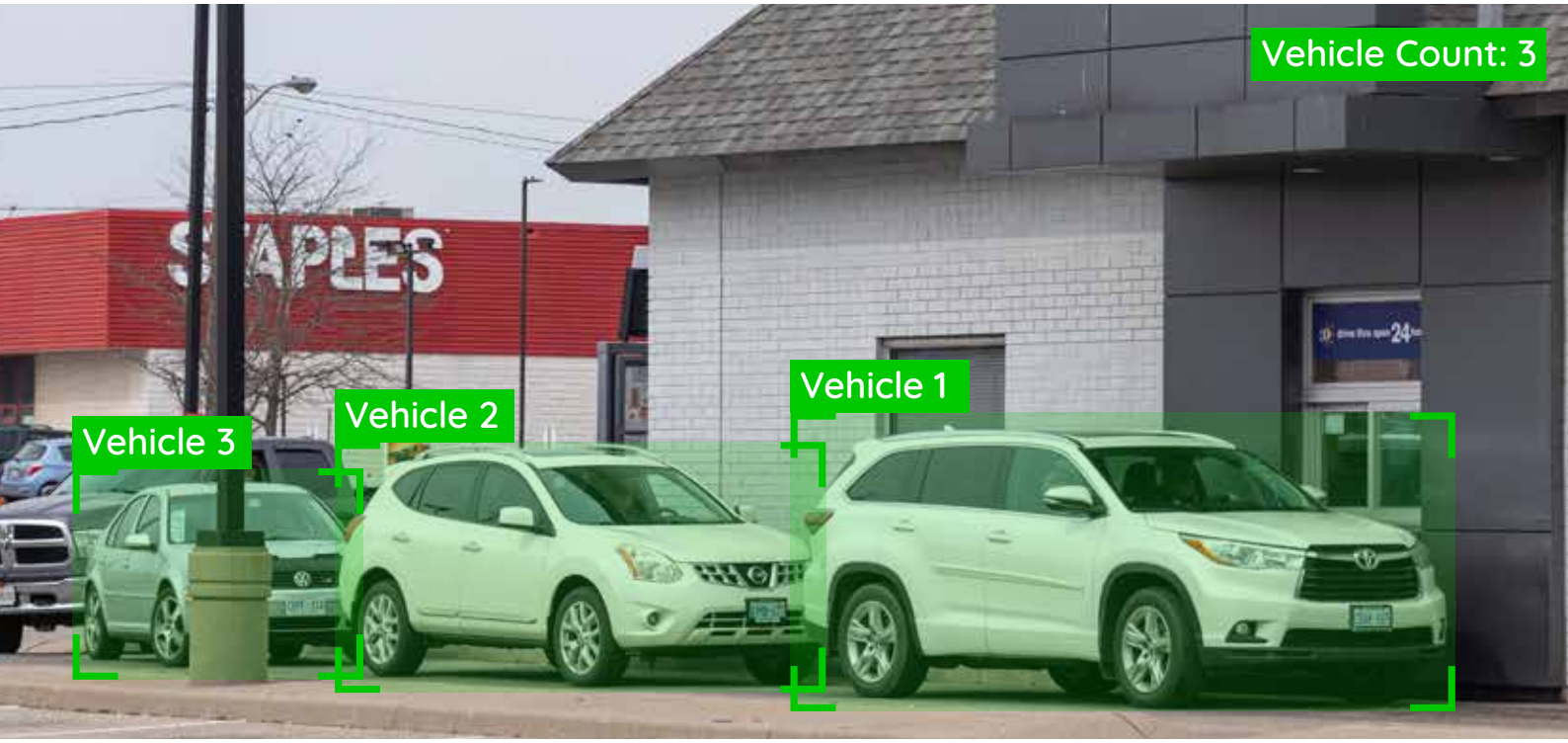
> **The cost of non-compliance is excellent. If you think compliance is expensive, try non-compliance.**
>
> ~ Former US Deputy Attorney General Paul McNulty

TYPES OF COMPLIANCE

For most businesses, 'the term 'compliance' means to conduct activities in a correct and orderly manner. We agree that this is the primary aim, but in today's age with increased scrutiny from both the authorities and customers, compliance should be more than just fulfilling the regulatory needs.

Compliance is mostly about doing the right things the right way throughout the value chain. Most businesses struggle to find the right way.

The common notion is that compliance with legal and regulatory frameworks is the only type of compliance you should care about. However, to adhere and excel, organizations should also focus on other elements of compliance. These elements are directly proportional to the type of business you're in, the sector you belong to, demographics, and other ancillary factors.



Compliance, whether government-imposed or external, includes the following:

Compliance with industry standards

Compliance with client specifications and other requirements

Compliance with licensing or certifications

Often, we come across businesses struggling to manage all the compliances. It's imperative to make compliance an integral part of your work culture and a ritual rather than consider it a burdensome additional task. Creating an operational framework that includes all aspects of submission will be more comfortable than handling each element separately.

The following section deals with the importance of checklists in achieving compliance and SOP adherence more effectively.

> **No wise pilot, no matter how great his talent and experience, fails to use his checklist.**
>
> ~ Charlie Munger, Investor and business partner of Warren Buffet

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Checklists

The Same Old Phenomenon but with an AI Twist

02

DEFINITION OF A CHECKLIST

Business processes involve a slew of tasks, often repetitive, that must be carried out regularly. A checklist is a format, a job aid that organizations use to reduce failure and compensate for probable loss of human memory and attention. Checklists reduce errors and augment consistency and completeness in carrying out regular operations efficiently. These checklists comprise a collection of various tasks and activities to enable the person in charge to perform all their duties.

WHAT MAKES CHECKLISTS CRUCIAL FOR YOUR BUSINESS?

Due to short-term or limited memory, most humans can only remember a specific amount of information. Sometimes, people overlook critical information without knowing it.

Having handy checklists ensures that people will complete all the assigned tasks while adhering to the defined compliance. The practice also helps improve overall performance and productivity, resulting in more consistent results.

> **Under conditions of complexity, not only are checklists a help, they are required for success.**
>
> ~ Atul Gawande, author, The Checklist Manifesto

Envisage the concept of READ – DO – CONFIRM: An ideal task is when you read the instructions, follow them in real life, and then confirm you've done it. Then, you follow a step-by-step guide to ensure critical yet straightforward issues are not overlooked, and people communicate,

coordinate, collaborate, and accept responsibility. At the same time, they're allowed to manage nuances and unpredictable outcomes in the best way they know.

> **Good checklists are precise. They are efficient, to the point, and easy to use even in the most challenging situations. But they don't try to spell out everything. A checklist cannot fly a plane. Instead, they provide reminders of only the most critical steps, the ones that even a highly skilled professional could miss. Good checklists are, above all, practical.**
>
> - An excerpt from The Checklist Manifesto

According to Honeywell, process industries in the United States lose $20 billion annually, half of which is directly attributable to human error caused due to failure to follow a set of checklists.

Here's why checklists are an indispensable part of every organization:

They Result in Better Discipline and Consistency

Sometimes, losing information has less to do with forgetting and more to do with the fact that it never made it into your long-term memory in the first place. This leads to encountering human errors in tasks. A checklist can help you keep tabs on all your tasks and ensure optimum performance with minimal mistakes.

Task-based checklists make it easier for employees to complete all their tasks and escape the world of chaos and uncertainty. It also makes complex projects more accessible and more manageable.

They Augment Creativity

Having a checklist allows you to keep tabs on all your tasks in real-time. Checklists give you more time to focus on your most important tasks and do a better job of them.

They Save Time

With the help of a checklist, you can prioritize your tasks and break them down into manageable steps. These help you manage tasks better and curtail errors. In addition, they can help you perform your duties faster and save you from spending hours correcting mistakes.

They Improve the Training Process

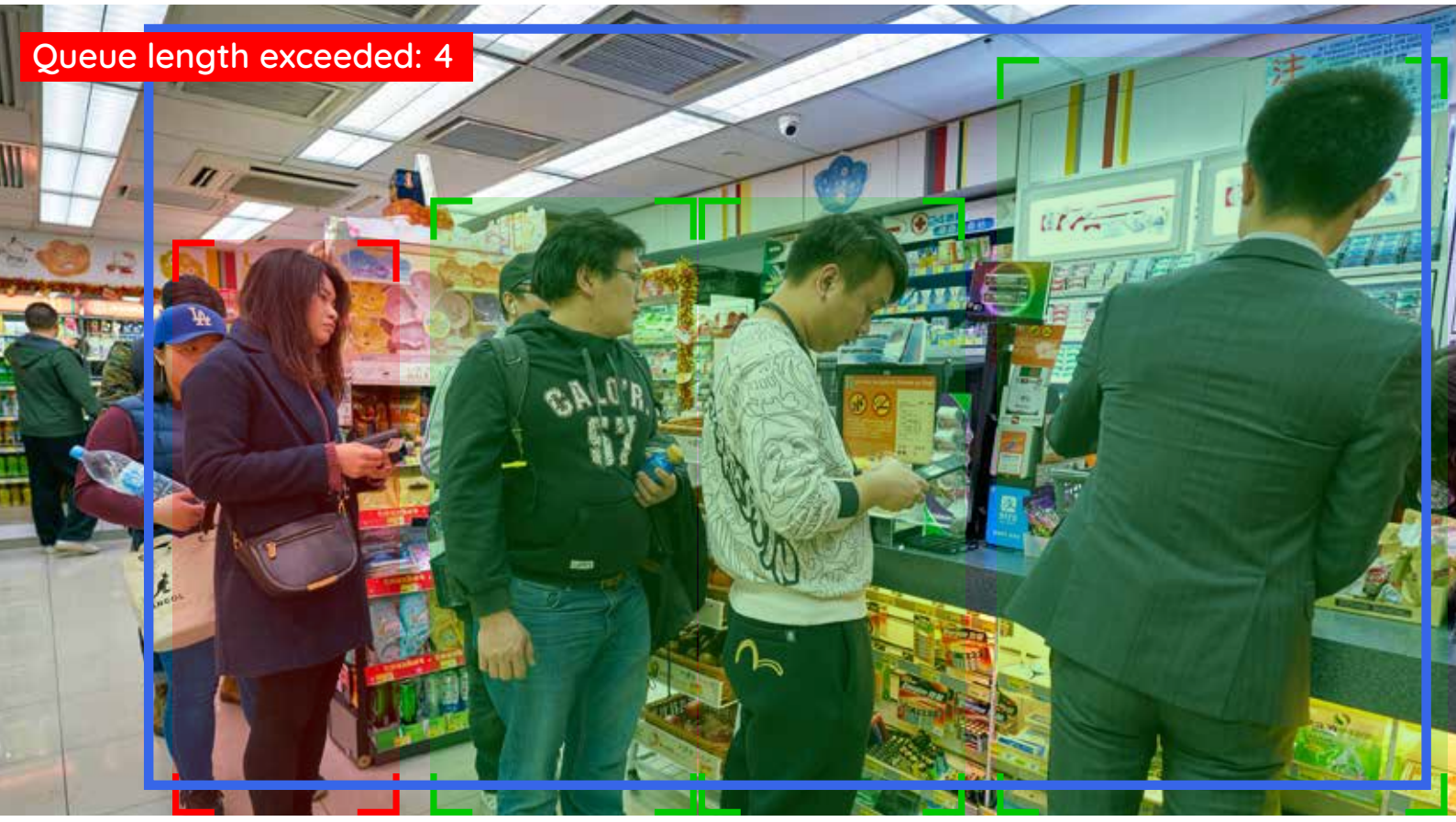
Checklists can help you delegate tasks and train recruits. A detailed list can serve as the foundation for the training and re-training of your employees. It enables standard procedures and allows you to monitor employees' growth.

The opportunity that checklists provide is huge. Undoubtedly, implementing a culture of checklists can save millions for any organization. Checklists help ensure goals are achieved, and at the same time, give field operators the freedom to use their knowledge and intuition by triggering analytical senses.

WHO USES CHECKLISTS?

We've talked about the benefits of checklists for an organization. But checklists are helpful in our daily lives, too. In his book, Atul Gawande, the author of the book - 'The Checklist Manifesto', discusses the difference between errors of ignorance and errors of ineptitude. The former occurs because of a lack of sufficient knowledge; the latter surfaces because of an inability to make the most of what you know. Errors of ineptitude are the ones that take a heavy toll on any organization and should be prevented at all costs.

Routine tasks in most fields are cumbersome and lead to higher error percentages. Unless you have a checklist in place, it can be tough to perform every task correctly. If you're prone to forgetting and making errors, equip yourself with a more detailed checklist.



For example, Boeing and the US military introduced checklists for pilots in 1935. These pointed out the boundaries of operation for each aircraft type. It also allowed pilots to seamlessly co-pilot with a pilot they'd never flown with. In addition, it let them execute complex tasks using a set process instead of relying on memory alone. Plus, checklists have methods and tasks conveniently listed in a way that makes them more understandable.

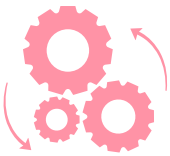
A good checklist is precise and easy to use. It allows you to practically review, practice, and master your job.

WHEN TO USE A CHECKLIST?

Now you know that a checklist can be helpful for one and all, the next question that might pop up in your mind is, “When can I use a checklist?”

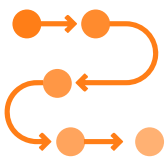
You can use a checklist whenever you’re performing a task that involves multiple and complex steps.

Here are a few instances when your business can use a checklist:



Performing SOPs (Standard Operating Procedures) and compliance tasks

Completing tasks with a specific order of operations



Carrying out activities where every step is crucial or must be followed in a particular manner

Getting actionable insights to drive revenue growth, boost profitability, and build a healthy brand equity by ensuring consistency across your units

Verifying and analyzing operational processes

It is imperative to understand that you must customize your checklist to cater to different situations and tasks.

The following section discusses regulatory bodies, their functions, and how checklists can help perform SOPs with strict compliance adherence.

WHO PRESCRIBES CHECKLISTS?

Checklists are helpful in a variety of use cases. For example, they're employed by internal and external regulatory officials, auditors, and others to ascertain compliance with industry standards, government regulations, and defined internal benchmarks. In addition, checklists help them audit and standardize processes, set up an early warning system, and identify potential gaps.

Apart from routine tasks, regulatory bodies like FDA, SFA, FSSAI, OSHA, CDC and EPA require regular inspections. The following section lists some prominent regulatory bodies and their areas of specialization in the US, India, SEA and Middle East.

A. Industrial Regulatory Bodies

Most regulatory bodies control specific areas such as health, safety, worker welfare, and function in a supervisor capacity. Some function globally, whereas the rest are primarily country-specific.

Here are some regulatory authorities that supervise and enforce laws on food safety, health, and worker safety:

FDA (Food and Drug Administration) - USA

A federal agency of the Department of Health and Human Services, the FDA works to protect public health. It's responsible for the safety of human and veterinary drugs, biological products, and medical devices and ensures its country's food supply, cosmetics, and radiation-emitting products.

Here are its primary functions:

- Ensuring that establishments have written procedures for production and process control designed to assure the identity, strength, quality, and purity of food
- Monitoring food storage, handling, packing, and serving practices for their adherence to the defined sanitary procedures
- Defining standards or specifications, methods of testing, and methods of cleaning sterilizing, and processing in restaurants and hotels
- Ensuring proactive approach of hotels and restaurants to food contamination or objectionable events

- Inspecting that food companies, restaurants and hotels have defined receipt, identification, storage, handling, sampling, examination and/or testing of labelling and packaging materials

Hazard Analysis and Critical Control Point (HACCP) - USA

Hazard Analysis and Critical Control Point is a systematic procedure to prevent biological, chemical, or physical hazards from food products. Such a system is an internationally recognized framework aimed at reducing safety hazards in food. It requires potential risks to be identified and controlled at specific points in the production process. As a result, any organization involved in the manufacturing, processing, or handling of food products can minimize or eliminate these potential risks in their products.

OSHA (Occupational Safety and Health Administration) - USA

Established in 1970 via the Occupational Safety and Health Act, OSHA, created by Congress, ensures safe and healthy working conditions for workers and employees. Being a part of the United States Department of Labor, its primary goal is to prevent occupational health and illness. It covers most private-sector organizations while occasionally overseeing the public sector in the 50 states and some territories under the federal authority.

The main functions of OSHA include the following:

- Setting and enforcing standards
- Providing outreach, education, and assistance
- Issuing permits, licenses, certifications, registrations, and approvals

Centers for Disease Control and Prevention- USA

The United States Centers for Disease Control and Prevention is a federal agency established under the Department of Health and Human Services. Its central focus is to administer and regulate public health activities that the mass communities must undertake.

Here are its core functions:

- Ensuring best health practices across establishments and organizations
- Investigating foodborne illnesses and outbreaks through surveillance systems such as PulseNet, the Foodborne Diseases

Active Surveillance Network (FoodNet), the System for Enteric Disease Response, Investigation, and Coordination (SEDRIC), the Foodborne Disease Outbreak Surveillance System, and other programs

- Analyzing and studying the data gather from surveillance systems to prevent foodborne diseases
- Ensuring establishments, veterinarians, and livestock and poultry producers defined checklists in place and have tools, information, and training on antibiotic use
- Developing the public health workforce
- Supporting food establishments to adhere to the ever-changing food safety compliance to ensure safe and efficient food production and supply, including central processing and widespread distribution

FSSAI (Food Safety and Standards Authority of India) - India

An autonomous body established under the Ministry of Health and Family Welfare, the Government of India, the FSSAI is responsible for protecting and promoting public health. Established in 2006, the organization lays down science-based standards for food items and their safekeeping.

Here are its primary functions:

- Acting as a one-stop provider of all food safety and standards requirements
- Framing regulations and guidelines related to food and enforcing standards
- Establishing a mechanism and criteria for the accreditation of laboratories
- Supporting Indian government in laying down rules and policies regarding areas directly related to food safety and nutrition
- Collecting data related to food consumption and identifying potential risks
- Setting up an early warning system to mitigate the impact of emerging threats

SFA (Singapore Food Agency) - Singapore

The Singapore Food Agency (SFA) was formed as a statutory board under the Ministry of the Environment and Water Resources (MEWR) on April 1, 2019, to oversee food safety and food security from farm-to-fork.

Here are some of its core functions:

- Overseeing food safety regulations across the entire chain in restaurants, hotels and food retail shops
- Ensuring tighter coordination of responses to food-related issues and engagement with various stakeholders of the establishments
- Ensuring safety in handling or supply of food so as to minimize risks in Singapore's restaurants, hotels and retail food shops
- Supporting regulation of the construction, hygiene and operating procedures of premises, vehicles and equipment used for the handling or supply of food in establishments

- Developing a set of educational materials for restaurants, hotels and food operators to define and implement their standard operating procedures and ensure that the food served to the public is wholesome and safe for consumption

Abu Dhabi Agriculture & Food Safety Authority- Abu Dhabi

Abu Dhabi Agriculture & Food Safety Authority is the local authority in charge of agriculture, food safety, food security, and biosecurity in the Emirate of Abu Dhabi. The authority is assigned to control and inspect the Emirate's food and agriculture establishments, farms, agricultural inputs, imported and exported food, and agricultural items or those produced in the country and circulated in the Emirate to ensure safe food access to the community.

Here are its primary functions:

- Monitoring food establishments to ensure food safety in the emirate of Abu Dhabi and guarantees that the food is fit for human consumption
- Conducting the necessary research and studies on safe food and issue rules, regulations, and standards on food items sold or offered for human consumption
- Conducting random inspections across all foodstuff stores and restaurants to ensure the quality of food supplied and to ensure that it is suitable for people to eat
- Supervising the food establishment and management of emergency food reserves in cooperation with the competent authorities

- Controlling and inspecting the Emirate's food and agriculture establishments, farms, agricultural inputs, imported and exported food, and agricultural items or those produced in the country and circulated in the Emirate, to ensure the access of safe food to the community

B. Companies

While it's good to observe that most organizations adhere to various external compliances, it is also equally important to have a list of internal standard operating procedures (SOPs) to ensure that employees carry out their routine processes efficiently. Having a checklist ensures consistent performance, improves productivity and communication, and reduces the chances of industry regulations being violated. In addition, access to information boosts productivity and reduces risk. Undoubtedly, businesses make more money and have fewer accidents if their employees have the correct information when they need it.

For example, a checklist is an efficient way to impart the importance of time management to your employees. It can also help higher executives by letting them schedule activities and ensure they have everything covered. A well-crafted checklist also augments productivity by providing repetitive tasks are taken care of with fewer mistakes.

We've come across several brands that benefit from checklists and how they have incorporated them seamlessly into their business routine. For example, McDonald's introduced a 42-point checklist for all of its outlets in India to ensure safety from the coronavirus. It covered scenarios such as dine-in, takeaway, and delivery.

We'll discuss checklists and their implementation in the next section.

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Checklists

Today & Tomorrow

03

How Checklists are Implemented Currently?

Setting up a compliance infrastructure is an intrinsic part of every organization, but many managers miss following it up with a sound monitoring system. Brands should closely monitor compliance trends and make it a part of their post - evaluation programs. Doing so, gives them insights into how their compliance framework performs and whether there is a sizable gap between set standards and the actuals achieved.

An organization should engage a third party to leverage risk assessment procedures and curate an annual monitoring and internal reporting program. The results can help find gaps, identify trends, support quality reviews, and provide crucial information on several other fronts.

As for the auditing process, most brands resort to a mix of physical and manual remote inspections to ensure the effectiveness of their checklists for compliance and SOPs adherence.

A. Physical Inspection

In physical inspection, an auditor periodically audits and inspects an area in person. Meaning thereby, assessments can be performed on all tangible assets, namely, machinery, cash and others. Such methods will enable the auditor to follow a routine checklist containing the items to cover and specific intricate tasks that he should perform while inspecting them.

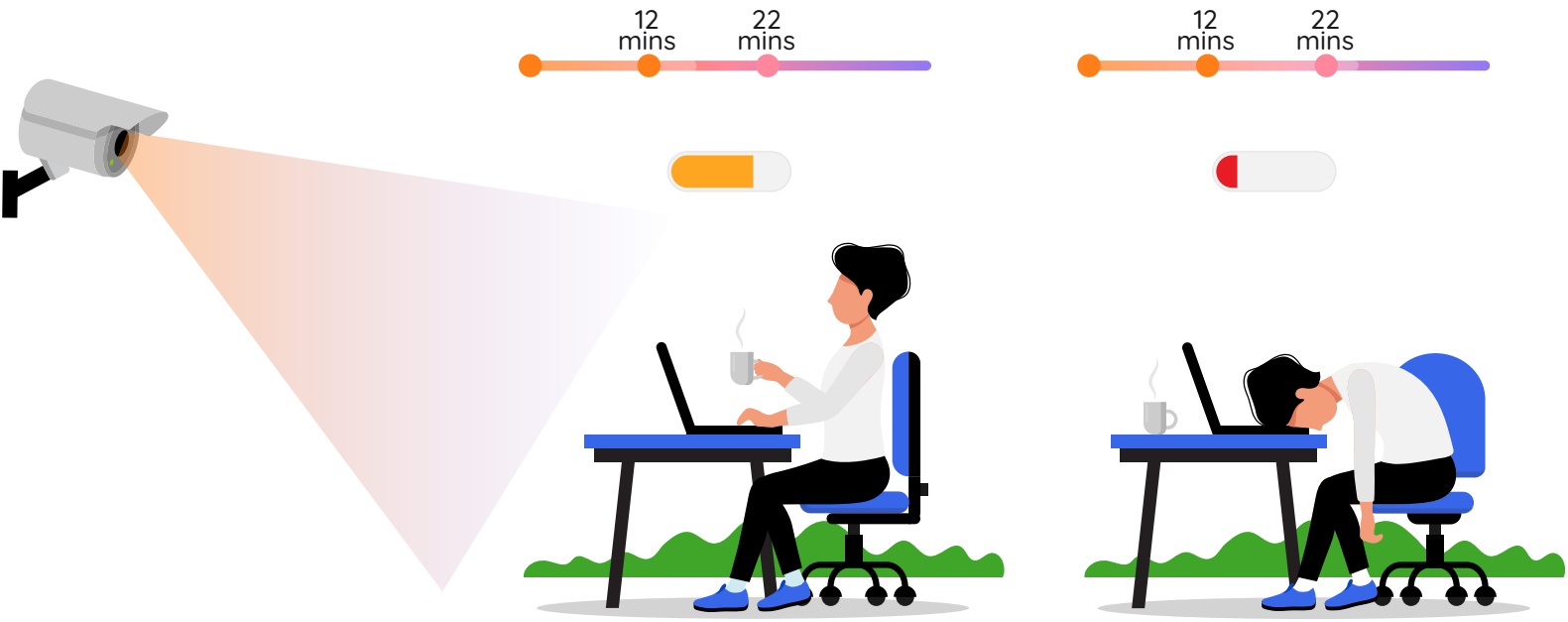
Physical verification is an intrinsic part of monitoring and ensures that you keep track of all your assets, locations, and their condition. But as it involves manual intervention, the process is prone to human error and biases that can affect the final result.

B. Manual Remote Inspection

In manual remote inspection, an auditor uses a CCTV infrastructure setup to look at compliance. This can be both proactive or reactive and it helps detect and report unusual behaviors. But it necessitates close attention and consistency and places a higher workload on the controllers and auditors. It may be monotonous because of the need for constant monitoring and result in lapses in concentration on the auditor's part.

CCTV sessions of up to 40 minutes can cause video blindness, which means that human beings cannot recognize what they see on the video screen. Furthermore, 12 minutes of continuous video monitoring can

cause an operator to miss 45% of screen activity. The number rises to a staggering 95% once the person crosses the 22-minute mark.



Let's consider an example. Suppose an operator must interpret whether a pattern of crowd behavior visible on their screen is suspicious. After analyzing the information, operators must decide whether to send someone on-site to check and handle the situation or leave the event because it doesn't seem critical.

Owing to the complex nature of this situation, the whole process becomes subjective. Furthermore, the operator must observe the complexity of human behavior and many cameras which make the entire monitoring process more challenging.

Regardless of the type of inspection a business undertakes, these methods are inefficient, costly, biased, lack immediate results, and collect zero data for future reference or generating insights.

GAPS IN CURRENT TRACKING

Physical Inspection

No Comprehensive Data Analysis

Delayed Resolutions

Delayed Feedback on Resolved Issues

No Real-Time Alert

Manual Remote Inspection

Reduced Attention Span

Human Fatigue

Complex Multi-Store Surveillance

The good news is that the shortcomings inherent to manual monitoring can easily be overcome with technology. In the next section, we'll discuss how computer vision can make the monitoring process more efficient and how it's a game-changer in terms of monitoring checklists.

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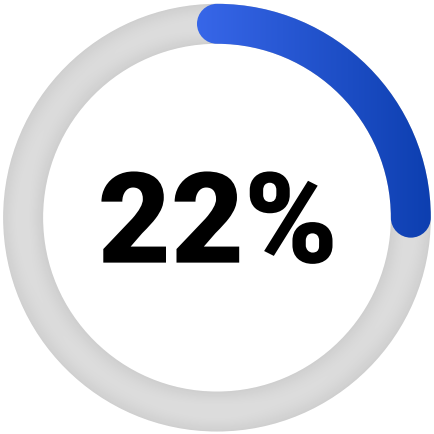
Powering Checklists with

Computer Vision

04

Manual feedback on business processes has it's limitations. It can miss events and is highly prone to errors. This is where feedback through video intelligence comes into play. Since the CCTV infrastructure has the ability to connect to internet, and is available 24X7, the feedback process becomes very robust and can be set up to generate real-time insights. Moreover, it can be partnered with checklists to improve operational efficiency. Undoubtedly it is a clear winner over manual feedback.

A survey by McKinsey Global stated that in 2019, around 58% of companies had adopted AI in at least one function or business unit. Thanks to advancements in technology, AI is gaining more traction. Over 67% of responders in the survey reported a growth in revenue because of it. In addition, roughly 22% of them attributed over 5% of their EBIT in 2019-20 to their usage of AI.

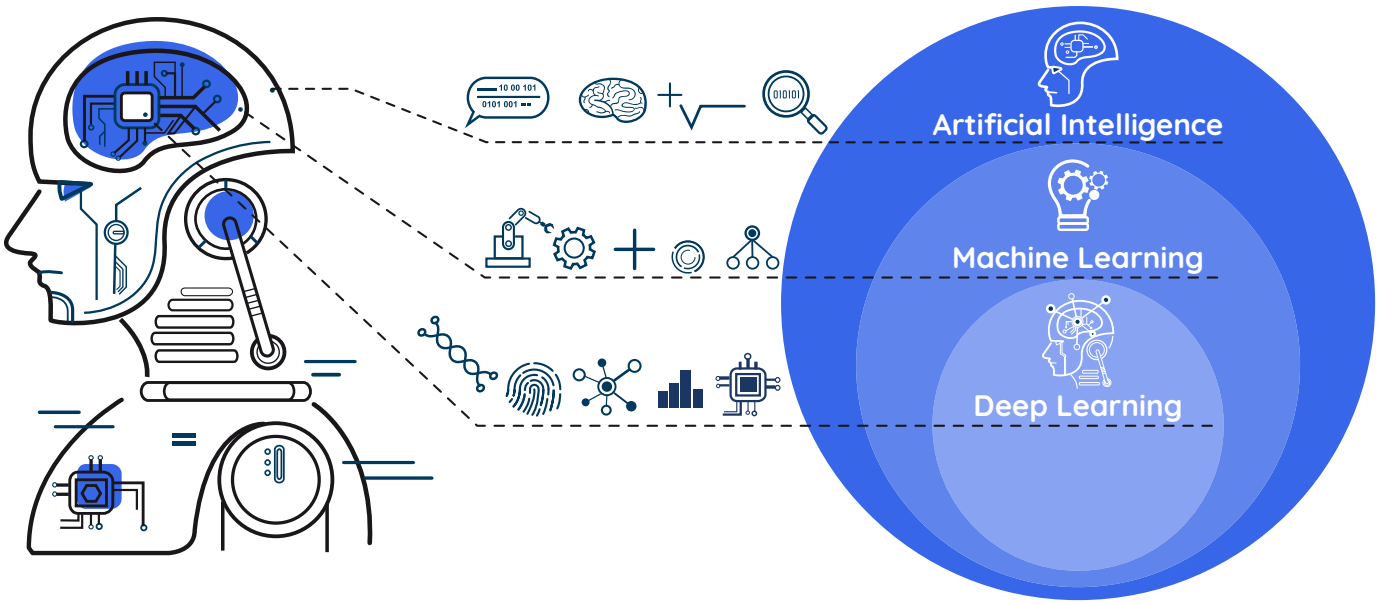


of Mckinsey Global survey's key respondents report at least 5% of EBIT attributes of AI

Deep tech has seen many positive strides, especially when we consider the high adoption rates. With the successful integration of both computer vision and checklists, brands have now observed improved leadership performance. In addition, the inherent benefits of a computer vision-laden checklist have led to a greater emphasis on development by the brands. Thus, enabling checklists to be used across more sectors and functionalities.

TECHNOLOGIES USED TO CURATE CHECKLISTS

Artificial Intelligence plays a significant role in powering checklists. However, before we dive deeper into this topic, let's first look at AI and its different components.



Understanding AI

Even though the terms like Artificial Intelligence, Machine Learning, and Deep Learning are used interchangeably, they're not the same. The best way to describe their relationship is to think of them as concentric circles, where AI, which came first, is the enormous circle, followed by Machine Learning, and finally Deep Learning – which is driving today's AI explosion – fitting inside both the processes.

A. What is Artificial Intelligence?

In simple terms, Artificial Intelligence or AI is the ability of a machine or a computer program to think and learn. It is an umbrella term comprising different technologies that make machines more intelligent. The idea of AI is to build devices capable of thinking, acting, and eventually, learning like humans.

For example, think of image classification on a service like Pinterest or a simple chatbot on a website. All the possible queries a visitor could ask are fed into it when it comes to a chatbot. It decides what to reply to and where to redirect the user. Therefore, it's trying to replicate human capabilities in terms of intelligence and decision-making.

A technology like Pinterest or a chatbot exhibits some characteristics of human intelligence. But how? This question brings us to Machine Learning, the next circle in our set of concentric circles.

B. What is Machine Learning?

When AI was introduced, machines could only make decisions from set data and instructions. However, the data and instructions were endless and hard to predict, making it difficult for the devices to learn like humans. Therefore, the machines needed an extra edge, that Machine Learning extends.

Machine learning, or ML, teaches computers (or models) how to perform specific tasks using data. Here, algorithms and models are crafted to allow the machine to learn by itself.

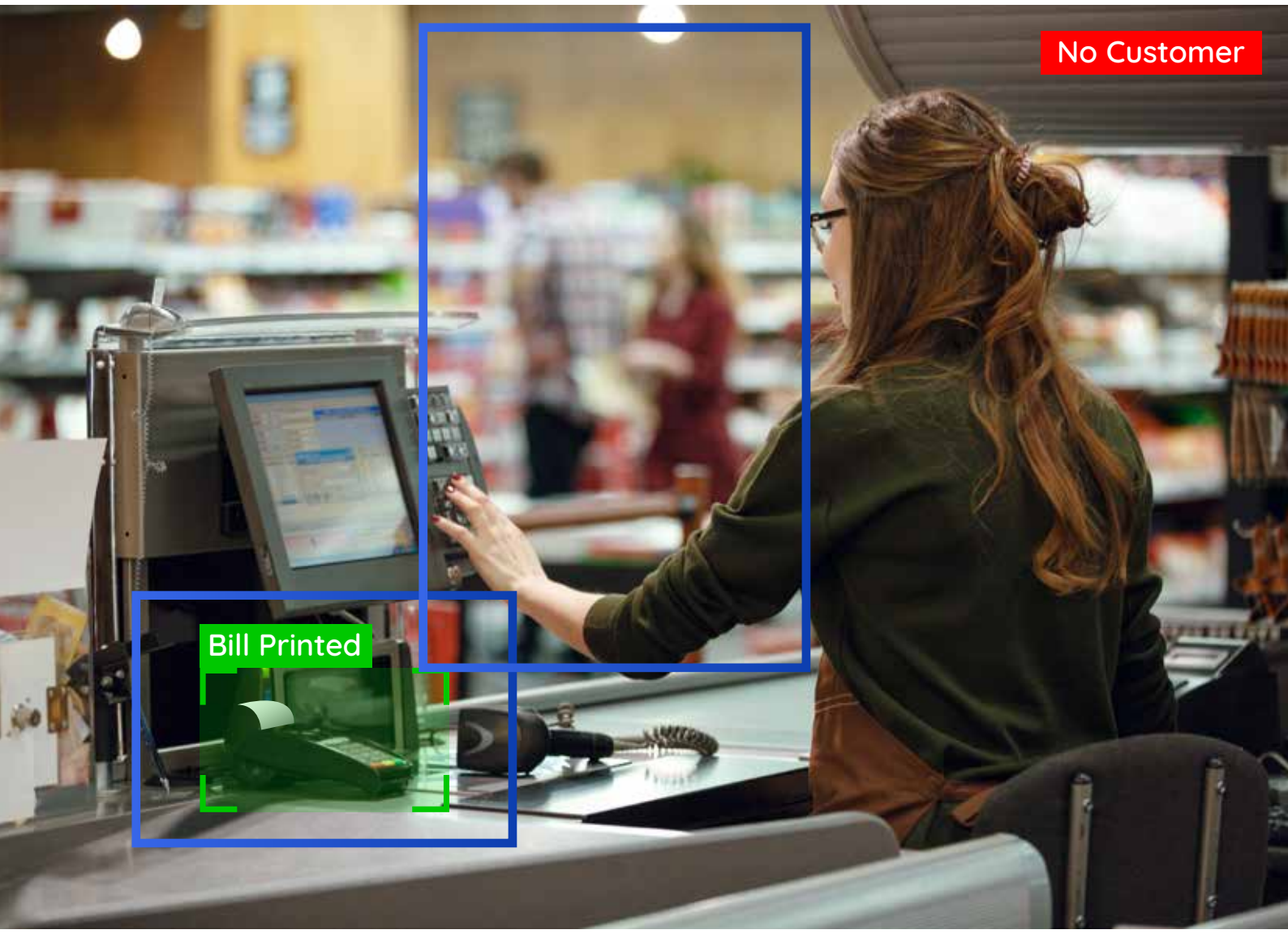
A machine-learning developer first starts a task they want the computer to complete, based on which they teach the computer how to perform the task using examples called training data. Rather than coding software routines by hand to accomplish a job, the machine is 'trained' using large amounts of data and algorithms that give the machine the ability to learn how to perform a task. In our earlier chatbox-related example, if the chatbox is enabled with Machine Learning, then every time there is a new unknown query, the chatbox will take the feed and learn how to respond to it with the help of the data. If the same question is repeated in the future, the chatbox can handle the respective question efficiently.

Even though machine learning might seem more complex than traditional programming, machine learning certainly works well when tackling complex issues. It is important to note that the more valuable the results are in real-time, the more complicated the issues become. Software programs might be more prominent, but they are saddled with issues related to the high cost and difficulties in modifications. When we factor in such instances, machine learning then becomes a more effective solution.

One of the best applications of Machine Learning is said to be Computer Vision. With time and suitable learning algorithms, Computer Vision applications have become better with each passing day.

The above explanation aids in understanding how different technologies have evolved to make machines intelligent and more innovative. The ability to make decisions with the help of AI came first, followed by Machine Learning algorithms that supported the models to learn from experience. However, there was still a missing connection.

If you consider humans, they not only learn from experience but also synthesize knowledge. For example, as toddlers, we were taught the differences between objects, but as we grew up, if we were shown a new thing, we would instantly know that it was different from the ones we were previously offered. This process is taught to machines via Deep Learning algorithms.



C. What is Deep Learning?

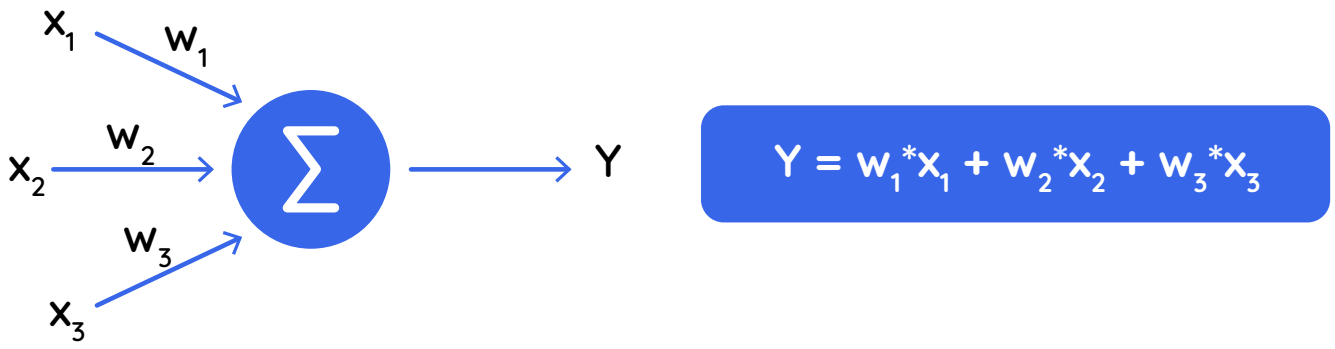
Deep Learning is a sub-field of Machine Learning. It uses Artificial Neural Networks (ANN), which mimic the structure and functioning of the brain.

For example, a chatbot augmented with Artificial Intelligence, Machine Learning, and Deep Learning can send correct replies, learn from new data, and adapt to give the best and precise responses for unique circumstances or queries.

Deep learning is characterized by neural networks, specialized computers known as graphical processing units, and large datasets.

Neural Networks

The concept of neural networks is loosely based on neurons and how the brain works. In machine learning, a neural network is an algorithm of many connected neurons. Each neuron is an independent mathematical function. The output is Y, weights are given as W, and the neurons' inputs are given as X. The neuron generates an output by multiplying the inputs by weights. The main work lies in identifying the consequences that will best predict the outcome based on the information.



Graphical Processing Units (GPUs)

Regular CPUs are too slow when it comes to training large neural networks. For this, specialized hardware called Graphical Processing Units (GPUs) are used. GPUs make processing faster, cheaper, and more powerful.

Large Datasets

Large neural networks require more data than traditional machine learning algorithms. Computer Vision and Natural Language Processing use millions of training data examples that have allowed researchers to achieve Deep Learning breakthroughs in these areas.

Neural Networks require more data and are more complex to train than traditional machine learning algorithms. However, by building deep neural networks, training them on faster GPUs, and adding more data, the performance of deep learning models can continue to improve. Thus, it's beneficial to use deep learning to achieve a higher level of development in many computer vision problems.

D. What are AI Product Patterns?

Whenever there is an AI breakthrough, many opportunities are created for new products and services. However, for each breakthrough, its connection to specific problems is not always obvious. This is where the concept of AI product patterns becomes essential. Product patterns are applications of AI technology that solve recurring business problems.

Today, we can say that there are four basic AI product patterns. They include collaborative filters, next-in-sequence predictions, natural language processing, and computer vision.

In this eBook, we will talk about Computer Vision, what it is, how it works, and how it's beneficial and effective for powering checklists.

E. What is Computer Vision?

How do we tell a computer to describe what it is seeing? For example, how does it differentiate between a cat and a dog? This is where Computer Vision as a product pattern of AI becomes essential. Computer Vision applications use software to generate a high-level understanding of digital images and videos. As we continue to develop a large amount of visual data every day, the payoff of interpreting this data becomes relatively large. Over time, Computer Vision has made significant advancements in applications such as:

- Classifying images and videos
- Identifying an object in an image
- Retrieving a specific image from a large data set
- Biometrics (facial recognition)
- Anomaly detection

In the following example, we can see a Computer Vision model identifying specific objects in an image. Next to the identification, the confidence score of the prediction is displayed.

In the world we live in right now, we have a vast amount of data in the forms of videos, images, sounds, and multispectral images. Moreover, we can also use multiple cameras placed at different angles to power

the Deep Learning algorithms. In such situations, the image detection capacity of a model becomes extraordinary. Therefore, Computer Vision has become the most advanced product pattern of AI.

Upon taking a closer look, you will find that some kites and people are easy to identify in the image. But what about the ones on the far right? The computer can predict a person on the right with 87% accuracy and a kite with 96% accuracy. This is because the Deep Learning algorithm learned that humans do not hover in the sky, and kites do not float on water.

In the next section, we'll discuss how business processes involving compliance and SOP checklists can benefit from using Computer Vision to analyze visual data.

THE FUTURE OF REMOTE AUDITS: AI-POWERED CHECKLISTS

For those resorting to manual audits & inspections, there's hardly any scope to be proactive. Instead, bring in AI-powered checklists and watch the game turn on its head! Any traditional supervision system often determines how swiftly an issue is to be escalated to the relevant managers. It also impacts budgetary spending in most cases.

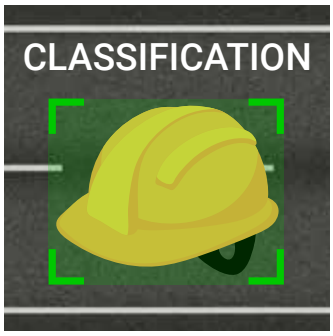
In order to have a proactive approach, the implementation of checklists needs to be automated. This will help in identifying a potential problem or even generate compliance events & role models (among employees) within the organization.

Automation through artificial intelligence gives supervisors a true picture of on-ground operations. It also helps improve productivity and performance by giving them access to checklists powered by video intelligence.

Checklists are a compilation of tasks or use cases. Now that we know what Computer Vision is and how it works let’s look at how it helps build and automate tasks in checklists. To make a checklist, we first need to develop various use cases. Therefore, let’s first look at how a use case is built.

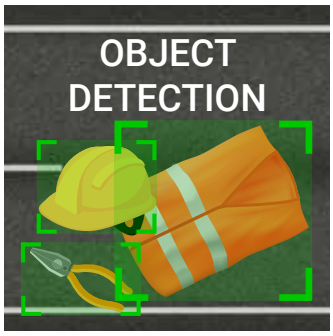
A. The Journey of a Use Case

To understand the journey of a use case or a task, let's use an example of a manufacturing SOP, i.e., hardhat/helmet detection.



The first step in the process of building a use case is to classify the images. Classification refers to assigning pictures and videos to models to answer the question 'What is in the image/video?' Of course, you can easily recognize that this is a hardhat. But, in simple terms, this is image classification.

Now, what if we have both a hardhat and a safety jacket next to each other in an image? In this instance, we can train a multi-label classifier. The issue now is that we don't know the location of either the hardhat or the safety jacket in the image. This is where the concept of Image Localization comes into play. It helps identify the location of an object in a picture.



However, we must rely on object detection when it comes to pictures that include multiple objects. With the help of object detection, we can predict the location and the class of different things. However, before classifying an image or detecting objects, we need to understand what the image consists of. This is where Image Segmentation becomes helpful.

We can divide an image into various parts called segments. We don't need to process the entire image simultaneously because regions in the picture don't contain any information. When we divide the image into segments, we can use the crucial components to process the image.

When we use object detection, we can just build bounding boxes around each class in the image. But it wouldn't be able to tell us anything about the shape of the objects. So instead, image segmentation creates a pixel-wise mask for each object in the image and gives us a better understanding of the images' objects.

B. How are Compliance Events/Violations detected?

Computer Vision allows cameras to identify and capture information from images and videos and process it into useful information. Based on the business size, single or multiple video cameras provide monitoring data about various processes or activities.

To understand the process behind the various detections, let's look at some examples -

Facemask Detection

Suppose a company wants to check adherence to facemask compliance. In that case, it will follow these steps to monitor the SOPs and report any event of compliance or non-compliance if it occurs.

The first step is data collection, in which we extract frames from a live RTSP, a highly secure stream.

The next step is to annotate these images (frames). In this stage, we draw bounding boxes around the object of interest (a face mask, in this case).

The next step in the process is to do face detection.

Face detection becomes vital because a face mask could be lying around anywhere in the image – for example, on a counter or the floor. Therefore, we want to take account of only those instances where a person is wearing or not wearing a facemask.

Now, the concept of padding and region of interest extraction comes into play. Padding means pre-defining the number of pixels added to an image when it is being processed for a facemask. For example, a facemask starts at the ears; therefore, we need to incorporate this area when considering whether a person is wearing or not wearing a facemask.

Once the face-detection model detects a face, we extend the detected bounding box to get the Region of Interest (ROI).

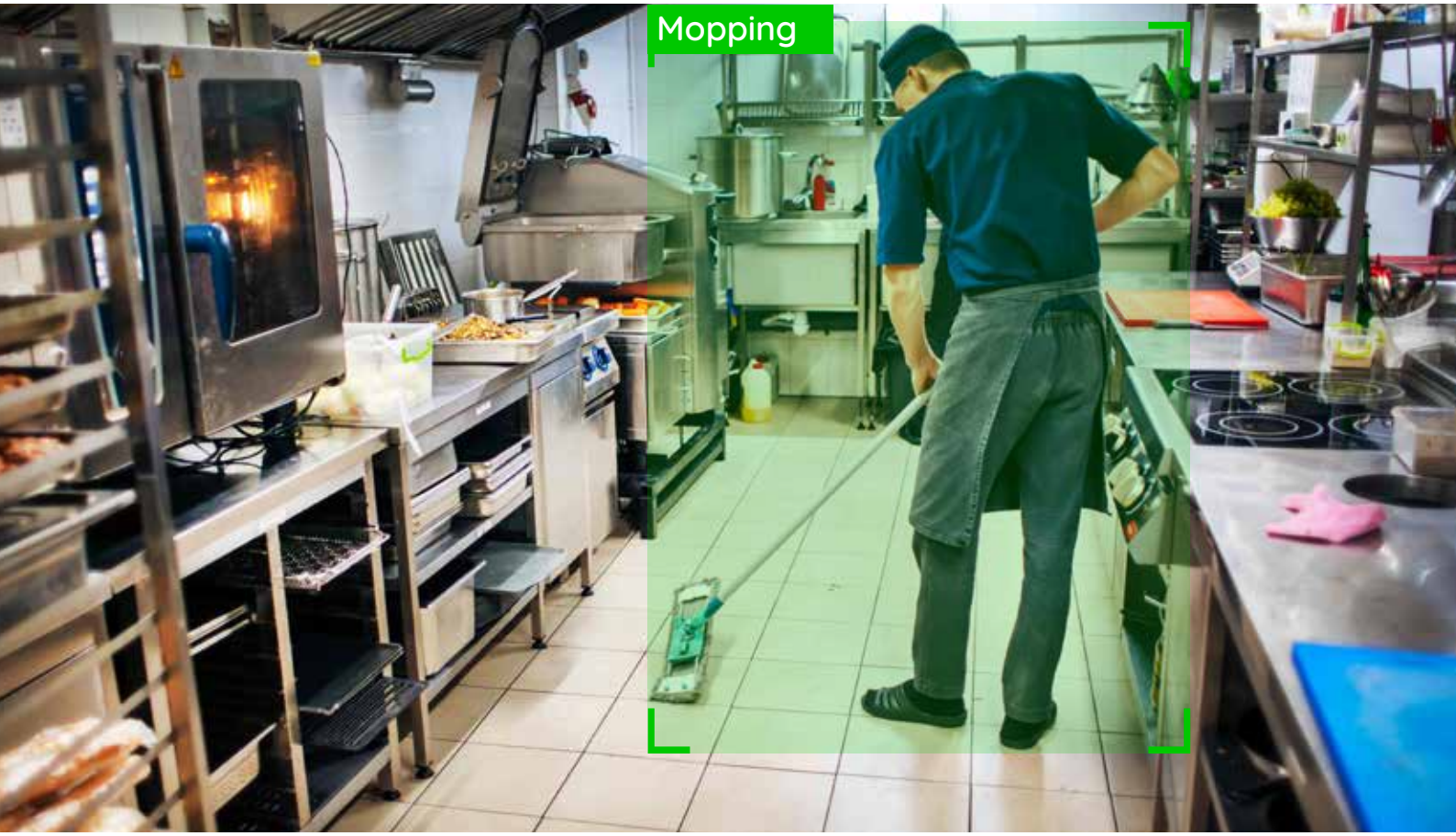
After this, the images are classified as mask or no-mask images, i.e., the image is interpreted as a person wearing or not wearing a facemask. Based on this analysis, the AI classifies the event into compliance or non-compliance.

Mopping Detection

Mopping is one of the essential tasks in a cleaning checklist. While it ensures safety and hygiene in both public and domestic infrastructures, it's mostly left unmonitored. Whether it's in hospitals, schools, public places like shopping malls, arenas, restaurants, or offices, mopping is expected to be done every day in the interest of the health of the employees and customers. AI-powered checklists can be put to the job to monitor the accomplishment of mopping.

We first collect mopping data (images) from video. These images are then annotated to denote whether they contain the activity of mopping or not. This data is then fed to the Activity Recognition model, which learns a generalized representation of the mopping activity.

The model would be trained with a dataset having a high variance, involving different scenarios like a person holding a mop stick, a person carrying away a mop stick, or detection of the mopping brush. Then, this model will evaluate the RTSP feeds to ensure that all the scenarios are covered with a set accuracy and precision.



Gun Detection

The ongoing epidemic of gun violence worldwide has compelled banks, schools, and other institutions to use Computer Vision algorithms to combat this issue. CCTVs equipped with a gun detection model detect potential firearms on the premises of various institutions.

To do this, a large dataset of guns of different sizes and types is created. To incorporate variance in the dataset, images are collected from both indoor and outdoor settings. These images are then

annotated, i.e., a bounding box is drawn around the gun in each image. Thus, one embodiment can contain multiple instances of the object (gun). This dataset is then fed to the deep learning-powered object detection model, which learns a generalized representation of a gun.

The trained model is then used to validate frames taken from the RTSP of various institutions. Finally, if any activity involving an unauthorized person with a gun is detected, a real-time alert is sent to the authorities. This process takes seconds, compared to the traditional dispatch process.

Gloves Detection

Similar to the case of detecting a face mask, organizations want to ensure compliance, especially where safety and hygiene are of utmost importance. The company's personnel will first like to identify all the areas where gloves are mandated. If it's a food production-based

company, then areas of contact with food products, packaging, and sophisticated equipment – and under COVID-19 scenarios – areas of communication such as elevator switches, staircases, entry/exit doors, etc. would be a priority. Once a location for surveillance or monitoring is affirmed, the next step is to extract information from the RTSP considering the region of interest.

We will annotate the frames where a person is wearing gloves. First, we will use a hand-detection model to reduce false positives, i.e., when a glove is lying on a surface and is not worn by anyone. The hand-detection model will return a bounding box containing a hand. Then, we will run a gloves classifier on top of that to classify whether the image includes gloves or not.

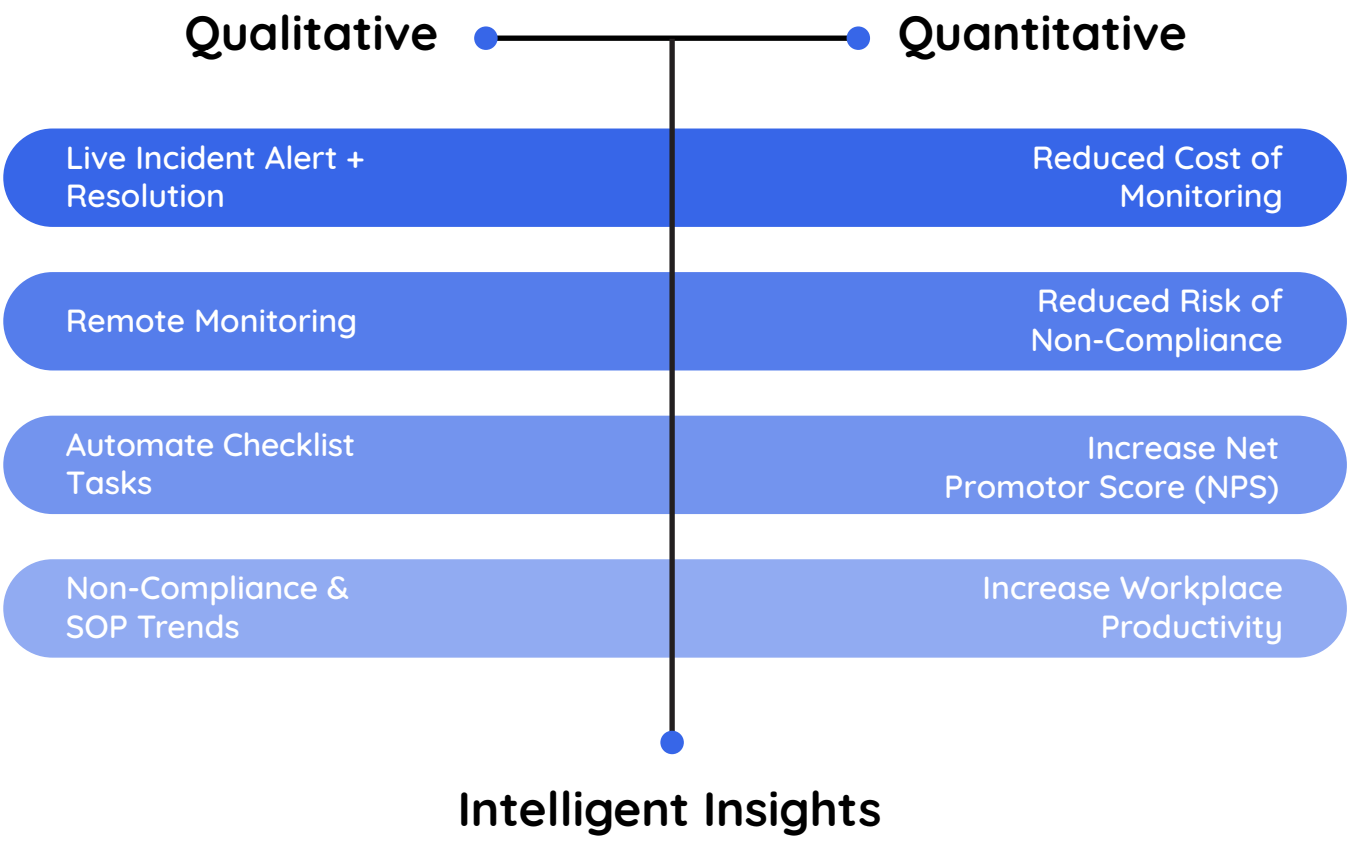
An Image Processing layer can be added on top of the classifier if gloves of a particular color are detected. This model can be deployed to monitor real-time streams and check whether the conditions are met or not and thereby classify whether the gloves compliance is being adhered to by the employees or not.

These are just a few examples of how a task or SOP can be monitored using AI. Hundreds of other SOPs or tasks could be built and observed with the use of AI.

COMPARISON OF CURRENT TRACKING

	Efficiency Level	Data Aggregation	Analytics	Decisions & Automations
Manual Tracking	Reduced Efficiency with Time	Logbook/Audit Reports	Manual Interpretation of Feeds	Experience-based Decisions
Low-Value Typical IoT	Efficient with Set SOPs	Binary Data	Linear Algorithm	Single-Variable and Linear Decision Models
High Value Deep Video Analytics	High Efficiency with Intelligent Insights	Complex Visual-Data Feeds	Advanced Pattern Recognition	Multidimensional Decisions and Multiple Variations

KEY BENEFITS



Wobot.ai

Checklists

Offered by Wobot.ai and Their Benefits

05

OUR PRODUCTS

Ensuring SOPs are being followed in day-to-day operations and to have real time visibility of KPIs impacting customer experience is of utmost importance to organizations. This is easier said than done as the pandemic brought with it the challenges of labor shortage, remote workforce and increased demand on reopening. By powering existing CCTV cameras with video intelligence, Wobot.ai empowers organizations to autonomously look at processes through various checklists across safety, security, hygiene, and customer experience scenarios.

- Onboard existing CCTV cameras or integrate with current VMS
- Select from pre-defined industry checklists
- Assign users
- Track events and tickets using our mobile app and web dashboard

There's no need for any new hardware, as the application plugs into your existing CCTV equipment to analyze, capture, and report your processes and create notifications of SOP-related events.

Wobot.ai's video intelligence platform employs state-of-the-art neural networks and models that are trained to learn and adapt continually. These models, ranging from object and activity detectors to classifiers, can train various use cases across different checklists in industries such as food services, drive-thrus, QSRs, hospitality, retail, and manufacturing. In addition, Wobot.ai can quickly identify, document, and distribute visual insights to stakeholders and decision-makers through real-time notifications via its app and user-friendly dashboards, thanks to this backbone.

INDUSTRIES WE CATER TO

Food Services

A. Food Hygiene Checklist

According to WHO, estimations demonstrate that over 33 million years of lives are lost every year globally due to the consumption of unsafe food. However, it is believed that this number is an underestimation, and the actual figures could very well be much higher.

Ensuring the quality of food supply has become an intricate task for several reasons. The biggest is the multiple sources of procurement. It also involves a slew of on-farm production, harvesting, processing, storage, transport, and distribution.

Due to the complexities regarding food procurement, organizations should emphasize adequate safety and hygiene protocols. A food hygiene checklist from Wobot.ai can help you evaluate whether several critical operations such as food preparation, handling, and storage guidelines are being followed by employees. Plus, checklists can also help examine foods with higher risk and ensure they are appropriately labeled and data-coded.

B. Personal Hygiene Checklist

If you’re in the food department, hygiene must be synonymous with everything you do. Good personal hygiene ensures a safer work environment, minimizes food contamination risks, and prevents food-borne diseases.

Conversely, if you miss your mark on personal hygiene, it can negatively impact your brand's image and cause irreparable loss of the trust that people have bestowed on you. With the help of Wobot.ai's customizable personal hygiene checklist, you can better understand whether your employees are following all hygiene-related norms. In addition, it can also help you understand the duration of handwashing and Personal Protective Equipment (PPE) adherence and point out any gaps - all in real-time!

C. Waste Management Checklist

Waste management is a critical issue among industries that find it hard to deal with waste segregation and disposal. In such cases, a waste management checklist helps with sorting, removing, and segregating waste. Moreover, it also enables facility teams to evaluate whether the process is being carried out as per regulatory standards. Thus, following a waste management checklist can significantly help an organization prevent environmental issues and avoid regulatory penalties without any hassles.

D. Food Preparation Checklist

For any business in the food industry, it's critical to manage the plethora of operations that constitute the food preparation process. Overseeing these procedures is vital to ensure standard food quality and compliance with hygiene regulations. However, this process is often fraught with challenges; therefore, it becomes crucial to take adequate measures.

To keep things on track, a food preparation checklist helps you keep tabs on cooking times, temperatures, sanitization, cleaning of utensils, and other parts of the food preparation process. There's no scope for non-compliance or mishandling of a task when carried out as per the proper checklist.

E. Delivery Checklist

Given the extraordinary circumstances of COVID 19, ensuring that the entire delivery process follows compliance regulations and hygiene standards is a significant priority among various sectors. Wobot.ai's delivery checklist can help you divide the delivery procedure into

manageable steps and monitor your delivery people's activities. This comprehensive set of tasks enables you to keep delivery activities on track without headaches.

F. COVID-19 Checklist

The ongoing pandemic has posed many challenges to the global markets and businesses. It has pushed governments to impose strict lockdowns. However, in various geographies where lockdown restrictions are slowly being lifted, regulatory bodies have implemented strict COVID-19 protocols.

Ensuring compliance with these protocols is a significant concern among businesses. A COVID-19 checklist helps you to supervise tasks such as cleaning, sanitizing, and disinfecting premises. In addition, it ensures you do not skip any compliance steps you need to consider.

G. Billing Checklist

A smooth and safe billing process is one of the keys to efficient business management. Be it a retail store or a restaurant outlet, billing is a regular part of every business that performs day-to-day transactions and direct interactions with customers.

Nevertheless, there are times when security issues may hinder the billing process and cause significant losses to a business. It can be anything from a money drawer left open without a staff member being present or any other discrepancy in the process.

However, you can avoid these irregularities and security issues by following a billing checklist. It helps ensure no discrepancy in the billing process and gives the customer the best possible billing experience.

H. Drive-thru Checklist

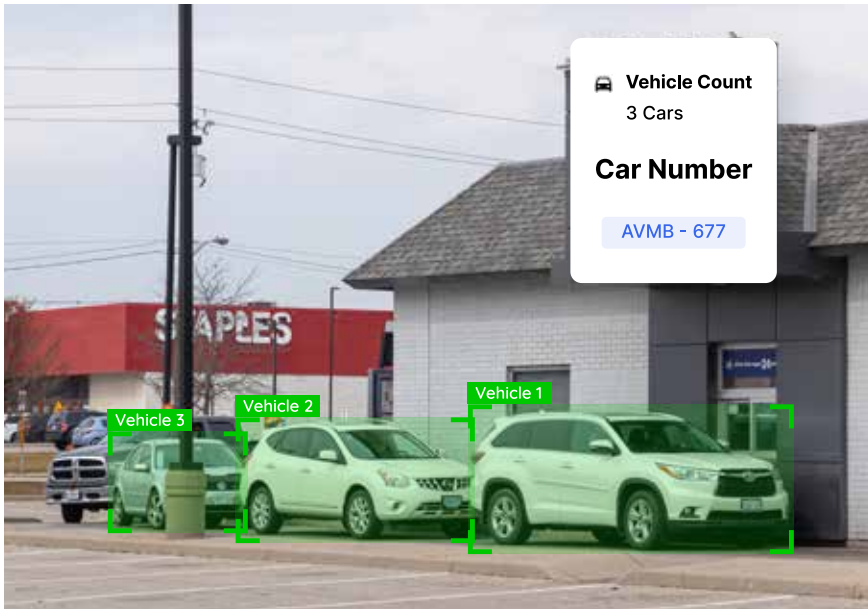
Fast-food drive-thru service has seen rapid growth as restaurants have recognized its increased convenience, capacity, and new revenue streams. In the age of social distancing, drive-thrus are seen as an essential feature due to their pandemic-friendly nature. Major fast-food restaurants across the US attribute 70% of their total revenue to drive-thru services.

On the other hand, the average wait-time at a drive-thru has increased from 190 seconds in 2013 to 234 seconds in 2018. This figure has further increased by 30 seconds due to the pandemic, which has led to substantial revenue losses for the drive-thru industry.

Wobot.ai's checklist for drive-thru restaurants can help the QSR market with its everyday operations. We firmly believe that drive-thru services are the way to go in the new normal, and our drive-thru checklists are designed to deliver operational efficiency and customer satisfaction.

Some of our use cases for drive-thrus include:

- Queue length detection
- Vehicle wait-time detection
- Vehicle Identity detection



Retail

A. Open/Close Checklist

A retail business has a fixed set of opening and closing activities that are essential for the smooth functioning of a store. This checklist helps you ensure that none of the critical activities are missed on a day-to-day basis. It also lets you ascertain potential gaps and the reasons for them through the audit trail feature in the Tickets.

B. Customer Engagement Checklist

For retail businesses, engaging with customers is of primary importance. It requires establishing a set of activities that will improve the overall customer experience. With this checklist, you can aim to achieve a high degree of customer engagement by reducing wait-time, managing customer traffic through queue busters, and immediately attending customers on the billing counter. Through the platform, you can also generate heatmaps for lean and peak hours and accordingly optimize store layout.

C. Customer Walk-in Checklist

Since customers are of supreme importance, the retail business cares a lot about the foot traffic it receives. With Wobot.ai's customer walk-in checklist, you can keep tabs on the hourly, daily, weekly, and other periodic customer footfalls in your showrooms. It can help you extract critical insights such as peak hours, workforce efficiency, and others. Utilizing these metrics can optimize the overall customer experience and improve conversion rates and store performance.

D. Fire Protection Checklist

The worst losses a business can bear are often the consequence of a fire. No matter which industry your business belongs to, there's always a particular risk of fire. However, following a fire protection checklist can ensure fire extinguishers are present at designated, easy-to-access places during such emergencies. Wobot.ai's fire protection checklist helps you manage your work efficiently, curb unnecessary activities, give your staff higher control, and reduce the chances of interruptions due to fire.

E. COVID-19 Checklist

With a COVID-19 checklist, you can complete routine tasks more efficiently and conveniently set up basic hygiene requirements. Get alerts for instances where face mask compliance is not followed or for crowding incidents. It also ensures your workforce is paying attention to set SOPs and alerts you about gaps, in real-time.

Manufacturing & Infrastructure

A. Safety Gear Checklist

A manufacturing and infrastructure unit employs thousands of people. Managing everyone's safety can be a real chore unless you have a set standard. Plus, heavy operating equipment makes workers vulnerable to injury and can result in irreparable damage. In 2019, 5,333 workers died on the job in the USA. Workplace safety regulatory authorities have also made it mandatory to wear PPE such as gloves, helmets, and more. With Wobot.ai's safety gear checklist, you can manage it more efficiently and get real-time alerts about irregularities.

B. Accident Safety Checklist

A manufacturing and infrastructure site can often be unstructured and disorganized. They usually have wet floors, cords lying around, and other hazards that often lead to workplace mishaps. The ILO estimates that about 340 million men and women succumb to work-related accidents, and 160 million suffer from diseases annually worldwide. To prevent them and minimize their impact, you need to set up an environment conducive to work and train all your employees to make safety their top priority. It's a wise practice to formulate an accident safety checklist to help your workforce keep tabs on all the activities they perform to minimize risk.

Wobot.ai

Better Decision-making with

Video Intelligence

06

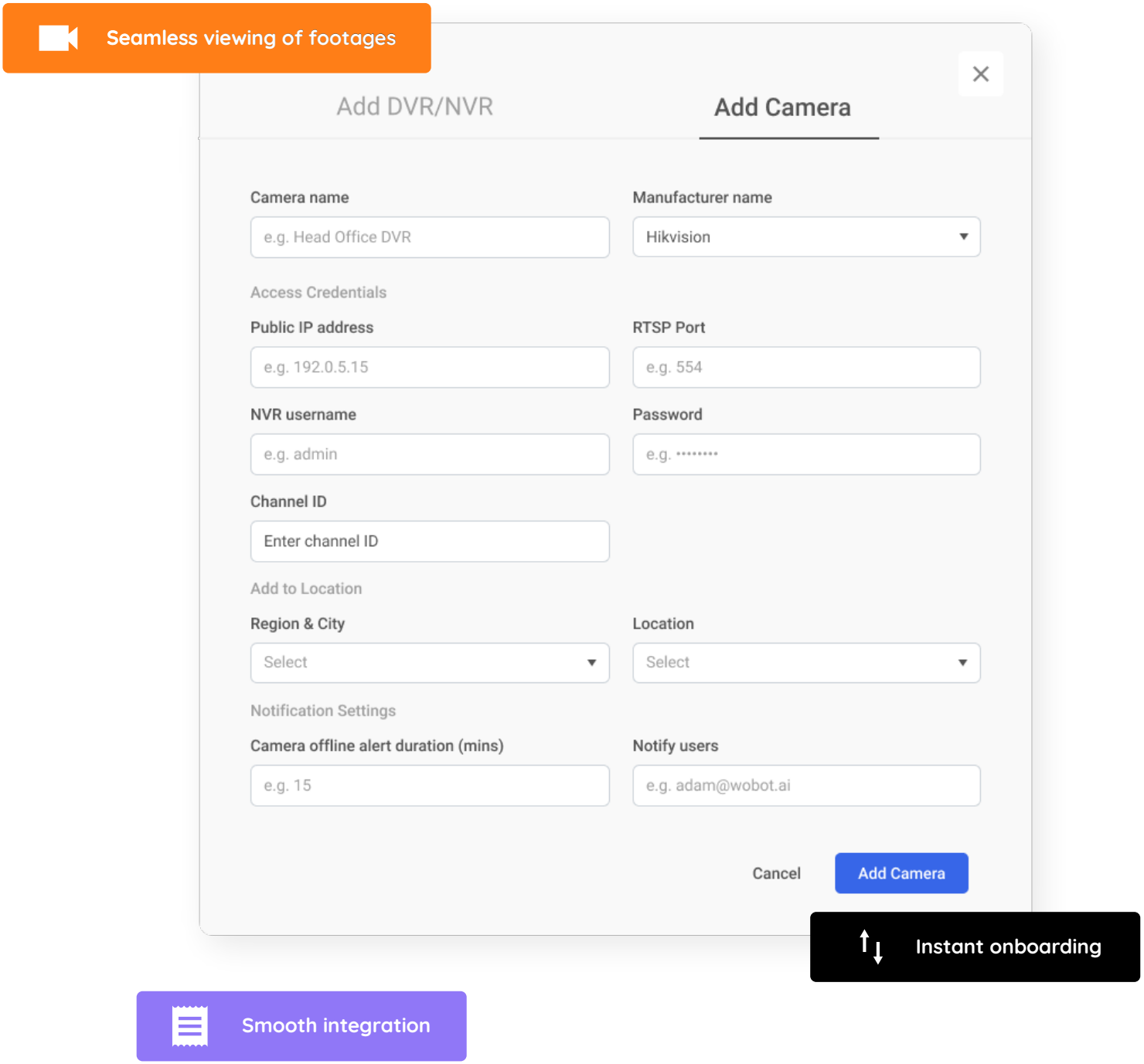
Checklists are an intrinsic part of every business operation. Be it food-service, retail, or manufacturing, businesses across all three sectors use checklists as an integral part of their audits and inspections processes. The benefits of checklists include:

- Ensuring no task is missed when performing an audit
- Reduction in human errors
- Completing the audit process with higher productivity
- Tracking compliance scores across different tasks

With AI-powered checklists, Wobot.ai helps you leverage video intelligence without the need for additional hardware. With a plug-and-play mechanism, these checklists supercharge your CCTV cameras with AI and help generate real-time and actionable insights, into on-ground operations.

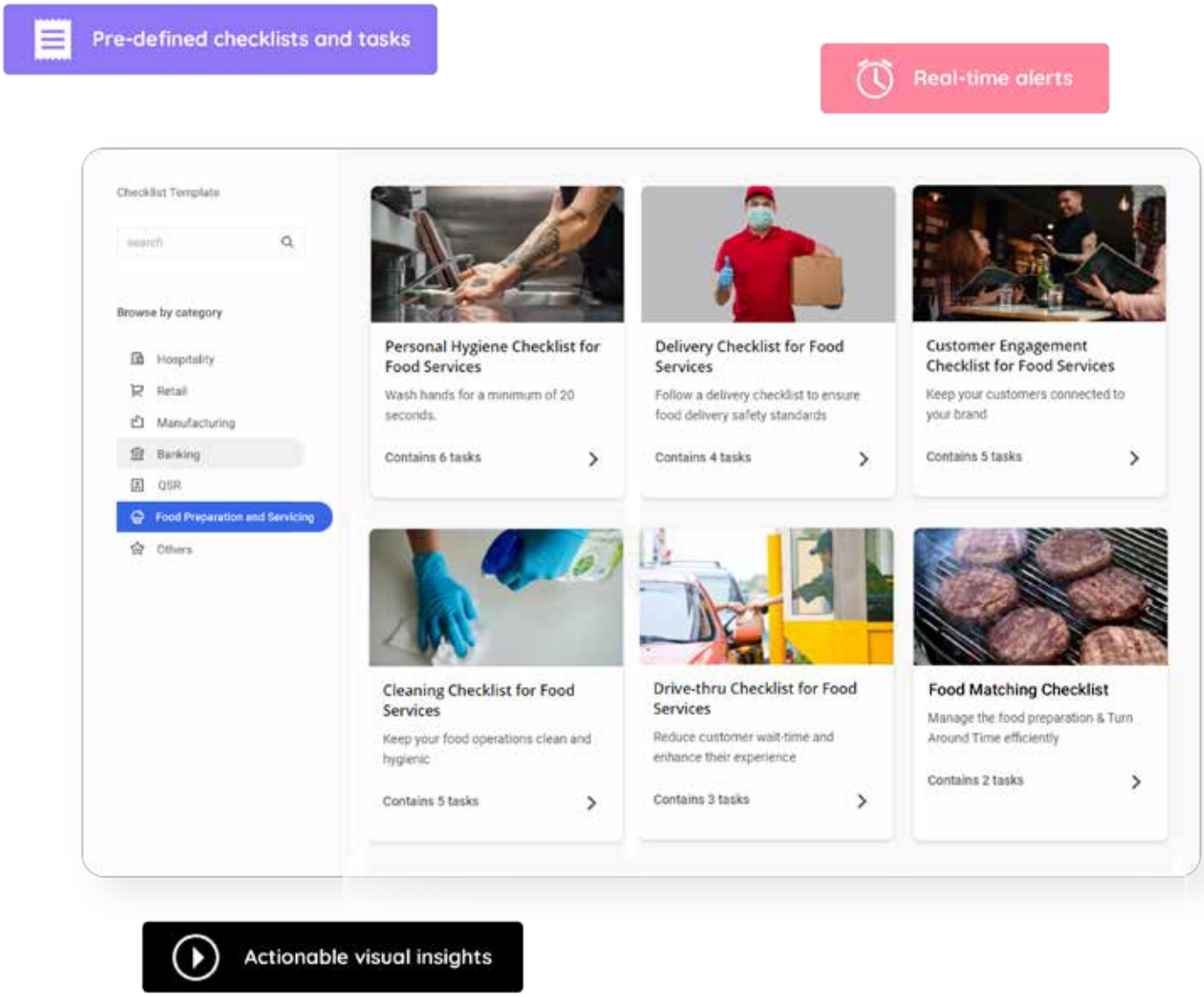
The data generated from the platform can then be used to augment the training needs of employees as well as help in correcting certain types of behaviors - leading to measurable gains in compliance of safety and hygiene norms as well as NPS scores.

HERE'S HOW IT WORKS



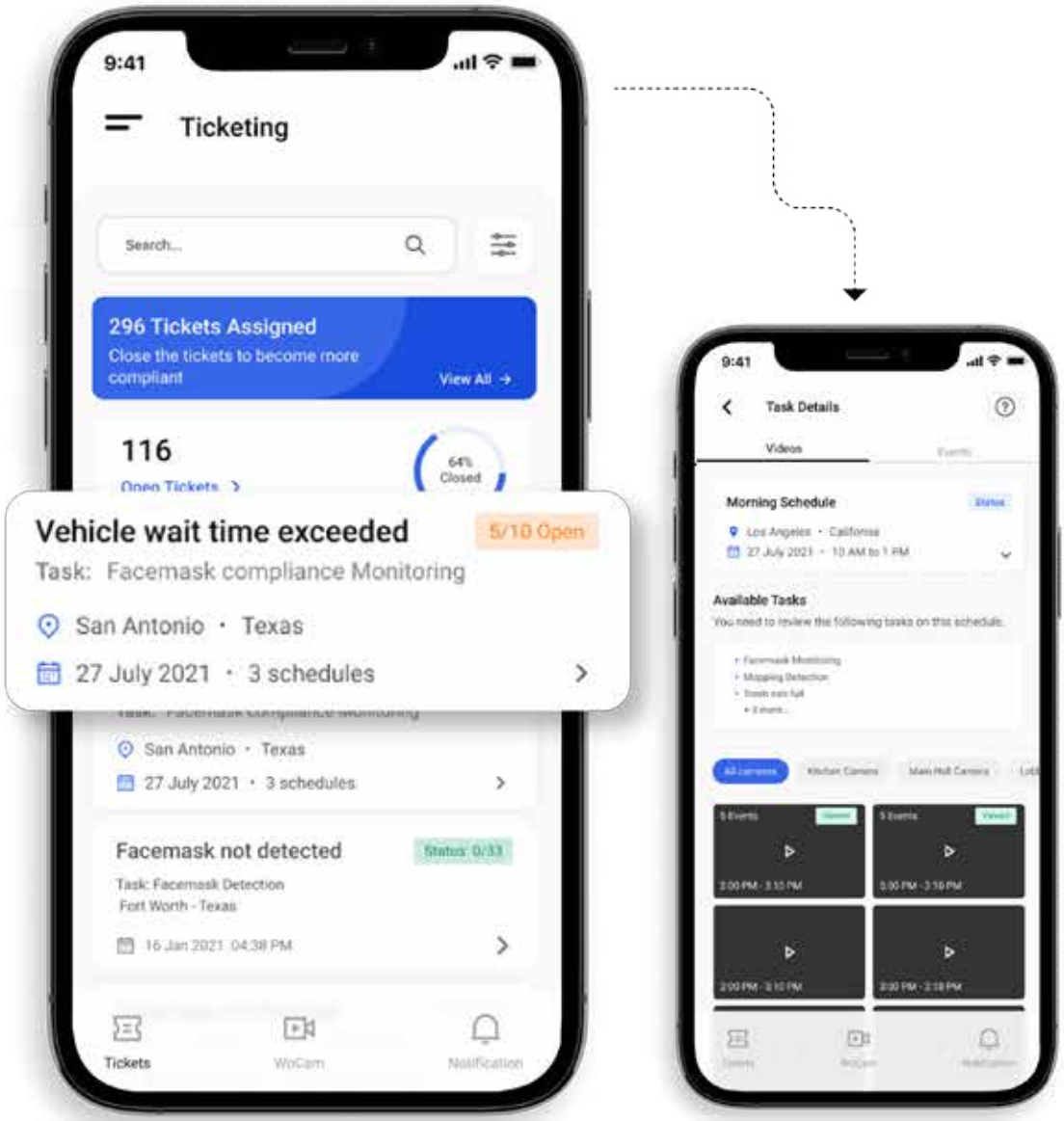
Instant Onboarding of Existing CCTV Cameras

- Add any IP camera in minutes vs. hours
- Support for all popular NVRs and OEMs
- Access live or recorded video feeds, anytime, anywhere
- Add multiple locations



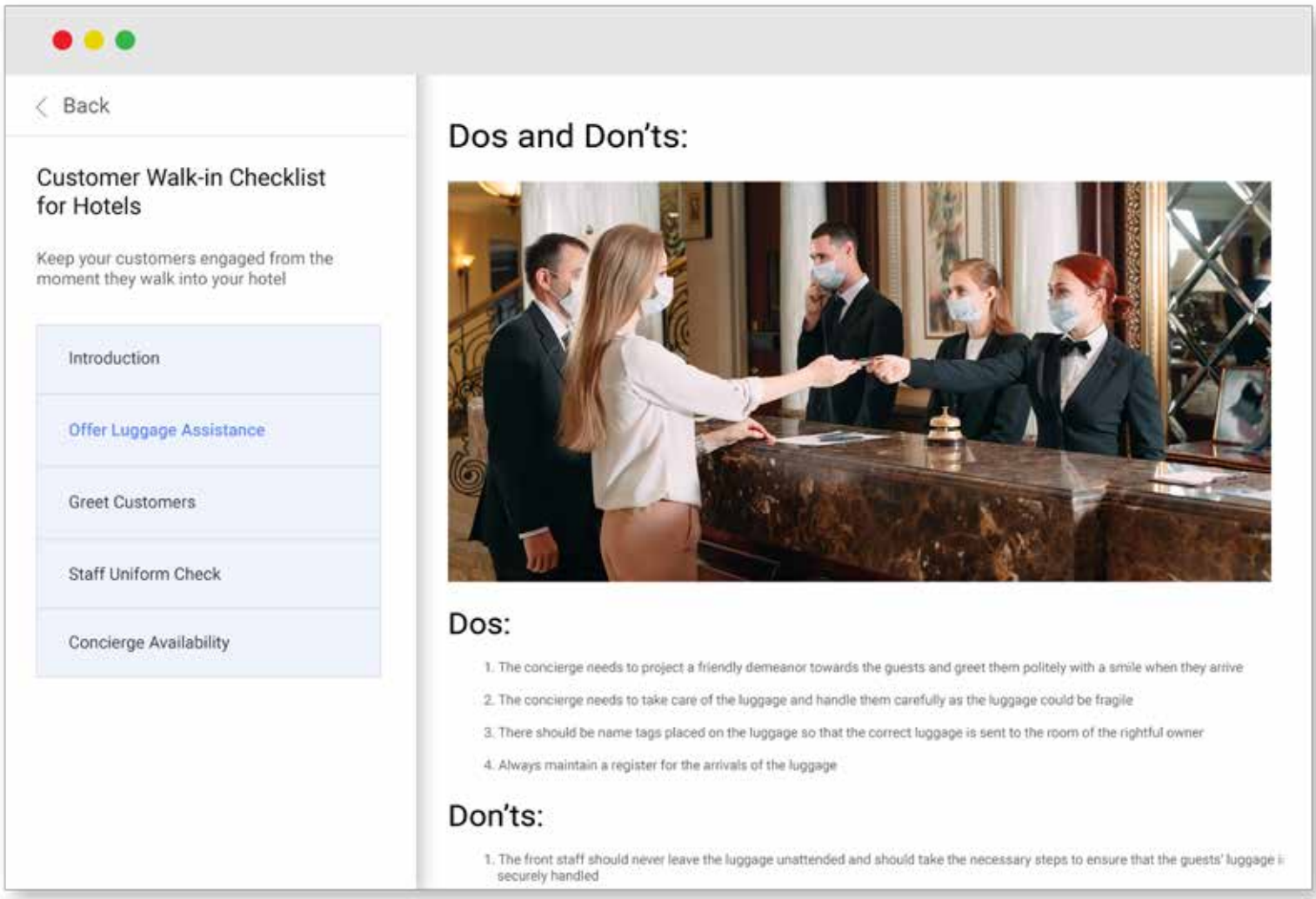
AI-powered Checklists

- Pre-defined checklists and use cases to choose from
- AI-powered tracking and event detection
- Quick viewing and tagging of events on the recorded video clips



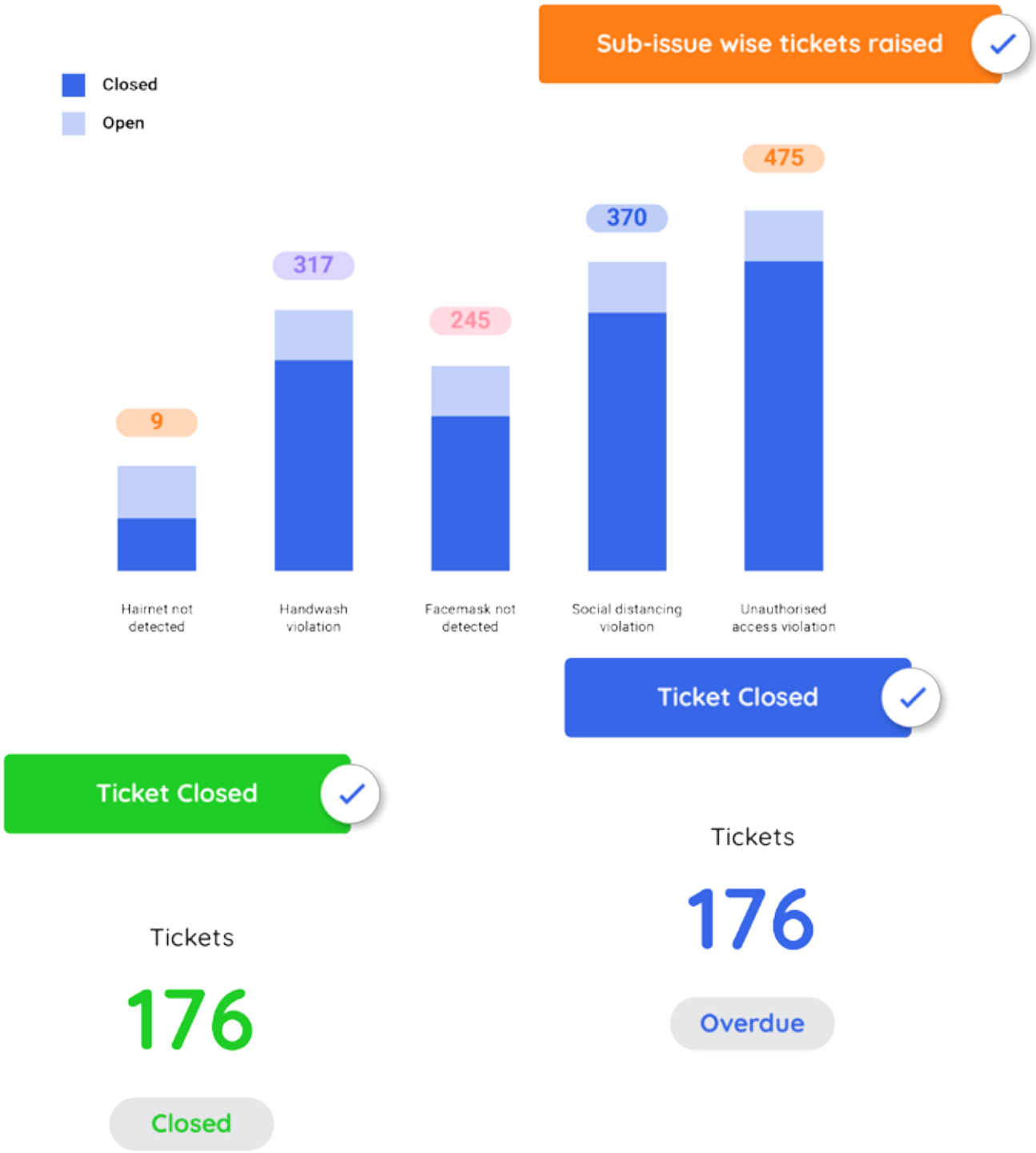
One Platform for Event and Incident Tracking

- Use your smartphone to view live video feeds and check AI-detected events
- View and share footage/images from anywhere, without visiting the location
- Work together on one platform and accelerate coordinated responses to events



Learn From our Powerful LMS

- Train your employees on industry best practices
- Learn how a task works and find out best practices for a productive, safe, and secure workplace



Mission-Critical Analytics

- Informative dashboards for a company-wide-overview
- Insightful reports sent straight to your inbox help you make critical business decisions

About Wobot.ai

Wobot Intelligence Inc. was established in 2017 to harness real-time insights from cameras and unleash their full potential. We are on a mission to help businesses make better decisions by powering their existing CCTV cameras with Video Intelligence.

Our goal is to enable organizations to autonomously look at processes through various checklists across safety, security, hygiene, and customer experience scenarios and gain invaluable insights from cameras.

Here's why everyone loves Wobot.ai:

- Industry-specific checklists and tasks
- Makes your cameras intelligent
- Event-driven search
- Live views
- Make use of your own use-cases
- Holistic ticketing system

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