

# Beyond the tip of the Iceberg

**'Using AI Video Surveillance to  
Manage Operational Risk'**

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# 01. BACKGROUND

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History has shown, many times, the risk of operating on limited or hidden visual data. A perfect example is the Titanic which sunk after hitting the tip of a huge iceberg that wasn't detected by those on watch.

Hindsight demonstrates the need for more detection capability for the great ship which in 1912 would primarily have been more crew on deck. What a difference today's technologies would have made.

Today, there are many technologies available to assist those responsible for the security and safety of their facilities and the people who use them.

This white paper discusses a very important advancement in the use of Artificial Intelligence (AI) applied to video surveillance infrastructures to manage operational risk.

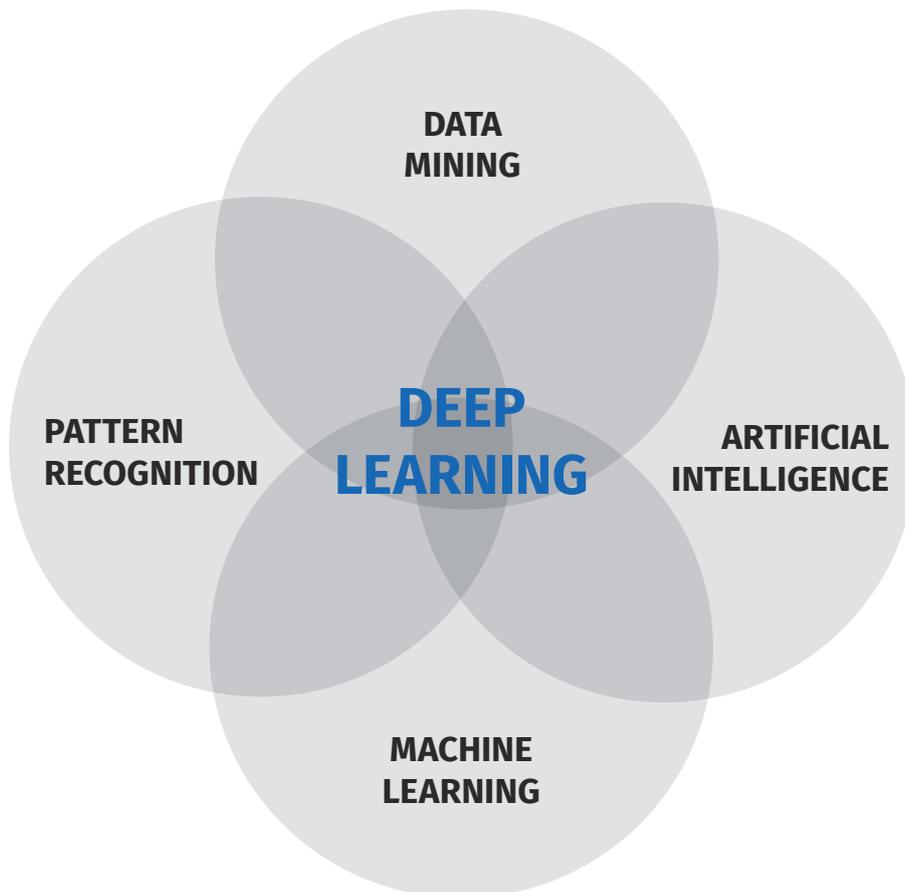
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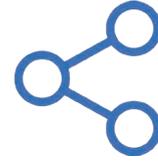


## 02. ARTIFICIAL INTELLIGENCE

Machine learning, a subset of artificial intelligence, is enabling the creation of systems that are cognitive in nature and learn from their environments.

AI encompasses overlapping approaches to data analysis including the oft used term neural networks, all of which are iterative technologies applied to different levels of understanding vast amounts of data and inferring or predicting outcomes.





# FOUR BASIC IMPLEMENTATIONS OF ARTIFICIAL INTELLIGENCE:

1

**AUTOMATED INTELLIGENCE - AUTOMATION OF MANUAL/COGNITIVE AND ROUTINE/NON-ROUTINE TASKS.**

2

**ASSISTED INTELLIGENCE- HELPING PEOPLE PERFORM TASKS FASTER AND BETTER**

3

**AUGMENTED INTELLIGENCE - HELPING PEOPLE MAKE BETTER DECISIONS**

4

**AUTONOMOUS INTELLIGENCE - AUTOMATING DECISION MAKING PROCESSES WITHOUT HUMAN INTERVENTION.**

## 03. APPLYING AI TO VIDEO SURVEILLANCE

Detecting events/incidents from video feeds requires the use of Spatial-temporal reasoning applied to each video feed to analyze abnormal behavior. This alerts operations personnel to a situation that requires further human analysis for intervention and/or mitigation.

A combination of computer vision and machine learning technologies are used as the building blocks of a cognitive approach to analyzing video streams. No rules or human intervention is needed during the learning and automatic algorithm generation period. The system analyzes patterns to detect anomalous events and/ or behavior.

An AI based system learns what is normal behavior for people, vehicles, machines and the environment based on its own observation of patterns of various characteristics such as size, speed, reflectivity, grouping, vertical or horizontal orientation.

# 0.4 MANAGING OPERATIONAL RISK USING AI-ASSISTED VIDEO SURVEILLANCE

Organizations face many types of operational risk that video surveillance can assist in detecting and mitigating. Most of these activities go unnoticed, unreported, or under reported, and can cause both short and long-term damage to personnel, the environment, critical assets, finances, and reputation.

- **Unsafe behavior by employees and near misses not reported**
  - Fork lift operator driving too fast.
  - Warehouse worker climbing on shelves.
  - Not using appropriate safety procedures and equipment.
  - Workplace violence and/ or intimidation.
  - **Unsafe conditions / horseplay and other at risk Behaviors**
- **Asset damage or miss use, pre-cursor events to insider threats / sabotage**
- **Environmental incidents and permit violations**
  - Inappropriate/illegal waste dumping
  - Spills and contamination incidents
- **Off-shift production issues**
  - Why is off shift production/quality subpar to primary shift?
- **Failing or malfunctioning machinery**
- **Real-time condition monitoring of critical assets**
- **Procedural violations**
  - Only one person in dangerous area that requires two at all times.
  - Production workers not following quality procedures.
  - Mistreatment of animals during pre-processing.
- **Are crowds gathering / dispersing for pre-task safety meetings and after action reviews, per company procedure?**
  - Unauthorized access to secure or off-limits areas.

# 05. THE 'ICEBERG' PROBLEM

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As the list and graph illustrates, there are many operational risks that organizations face each day. Whether industrial, retail, office, schools, government or public domain, these issues not only have a negative impact on an organization but can pose health and safety concerns.

The "Tip of the Iceberg" analogy shows how hidden problems, near misses, undetected or ignored or unreported at risk Behaviors, can quickly escalate to become major problems that have very serious consequences to personnel, the environment, assets, financials, and reputation. As with the Titanic example at the beginning of this document, there is a need for more "hands on deck".

Since it is every organization's goal to run as efficiently as possible while utilizing personnel and assets in the best manner possible, the problem is perfect for the application of AI assisted video technology.

Utilizing AI assisted video surveillance technology, organizations can effectively increase the "hands on deck", or more appropriately "eyes on deck", while maintaining the most efficient use of personnel and assets. Video images from different areas can be streamed, analyzed for abnormal or suspicious behavior and highlighted for personnel to review and take action if necessary.

## Example Use Cases

A global food company uses AI assisted video surveillance technology to monitor production line employees to detect activity that could result in injury. The company has been able to reduce worker injuries, worker compensation claims and production lost time while promoting and teaching safe practices.

Campuses, both corporate and educational, use AI assisted video technology to monitor facility use, people /vehicle traffic and behavior patterns to detect activity that could result in breaches of security and safety, e.g. asset theft, facility break-ins, attacks on personnel, suspicious activity, and graffiti.

A shopping mall monitors customer behavior to detect suspicious behavior like theft, lost children, suspicious gathering of crowds within the facility as well as parking lots for traffic patterns and after-hours activity.

FATALITIES / LOST TIME INJURIES

ENVIRONMENTAL ACCIDENTS

LOST PRODUCTION

CUSTOMER COMPLAINTS

EQUIPMENT DAMAGE

## INCIDENTS

with potential to cause major accidents, production outages, or environmental damage

## NEAR MISSES

or close calls with minor consequences

## PROBLEMS

such as at-risk behaviors, unreliable equipment, unsafe conditions, quality issues, excessive human errors, environmental permit violations, bad designs...



# 06. WHERE TO FROM HERE

## - MAN & MACHINE

While computers are very good at processing, analysing and characterising large quantities of data, they are still unable to provide the context that a human operator brings. Humans are still the “essential ingredient” in any implementation of AI assisted video surveillance solution. While machines/software are a powerful asset, the absolute best use of AI technology is in combination with a human. There are many examples of the wisdom of this approach, the airplane fly-by-wire inflight controls is but one. People are still the most important component and will be for the foreseeable future.

AI assisted video surveillance is a sophisticated tool for organizations that rely on the training and judgement of operators to determine appropriate actions in real-time, as “at risk-behaviors” and unsafe practices are observed, near misses are captured on video, or as incidents / accidents occur. No technology can yet replace the intuitive intellect of humans, but using technology as a super human enabler improves the effectiveness of both.

A blended work force, AI technologies and humans, is recognized as the future. No longer will there be humans versus machines but humans with machines, seeing through the chaos and identifying undesirable events first, working together to manage / reduce operational and safety risks, and produce better outcomes that neither could produce alone.

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## REFERENCES

1. Chris Curran; Anand Rao- Price Waterhouse Coopers. "Briefing: Artificial Intelligence".
2. Piotr Dollar, Vincent Rabaud; Garrison Cottrell; Serge Belongie- University of California at San Diego: "Behavior Recognition via Sparse Spatio-Temporal Features".
3. E.R Davis (2012). " Computer and Machine Vision".
4. N.Sulman, T. Shanoki; D Goldgof: " How effective is human video surveillance performance".
5. Vasanth Ganesan- McKinley Consulting: "Video Meets the Internet of Things".
6. Alan Morrison; Anand Rao – Price Waterhouse Coopers.: Machine learning infographic".



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