

Project Goal: Video Anomaly Detection System

Goal 23: GSO Camera Machine Vision Detection and Alerting System (Video Detection for Safety/Security Events) - version 1

Description: For the Loss Prevention, Safety, and Environmental Assurance teams, who require site situational awareness and a proactive approach to security and safety events, the Video Anomaly Detection System is a web based interface designed to assist the teams to detect and receive alerts of abnormal safety and security events in near real-time, review events for an immediate investigation using a video clip, and extract statistical data to drive operational intelligence. Version 1 of the system will deliver a solution to pull video/images from all cameras at a site to run the ML model and will detect anomalies. Once an anomaly is detected, the system will raise an alert on the system and notify the adequate team.

Benefits:

A feasibility analysis and a successful proof of concept is required to define system will provide expected benefits. Once developed, The Video Anomaly Detection System is expected to provide the following:

- Alerts of abnormal events in near real time to shorten response time, ensure an appropriate response is taken, and to review events over time for LP, Safety and Environment teams. This system will also ensure to meet use cases that can benefit global teams.
- GSO SDDV recognizes that there is a need to leverage the camera infrastructure to build analytics models using visual anomaly detection approaches build on images/video streams recorded.
- Having a single platform for video analytics will reduce the risk of affecting bandwidth and camera systems to pull images as well as limit the access to video to specific groups/cameras only.
- By developing an amazon build platform we do not need to engage third party vendors that offer additional servers and licenses to provide a video analytics service.

Why is it important:

- The lack of situational awareness of security/safety incidents can cause delayed responses that can put in danger Amazon Associates and Amazon Product on site.

- False alarms of current systems cause production losses as events cannot be located/reviewed in real time. Having an immediate alert and video attached to it can quickly identify if it is a real threat or a false alarm.
- When performing investigations for events such as fire false alarms, water/HazMat spillages, security breaches, policy breaches, and contamination events, safety and security teams take a considerable amount of time to find root cause of the event.
- Sometimes events are detected at a later time, therefore root cause investigations take place after the event was detected. This means that there is risk that video evidence that can support the investigations is not available anymore due to the different retention times based on the camera locations.

How it is measured:

- Video/Image inference engineering architecture design complete and developed
- ML models for anomaly detection use cases with 95% accuracy- pilot will be done with at least two different models.
- Anomaly alert is received in interface after XX seconds of the event.
- Proposed solution to run analytics (GPU vs CPU)
- Proof of concept with all cameras on one site at each region (1 site AMER, 1 site APAC)
- UI developed

Achievable: This goal is not achievable without support from OTIT, PARS Tech and software development resources.

Owner: Paola Basulto

Dependencies:

- Ability to get images/video with the right frequency/velocity to detect events in real time.
- Camera on-boarding methodology to be developed to capture images/stream of all cameras on site.
- Ability to transmit video event on the web interface.
- Define Machine Learning system to filter images - can all use cases be used at once?
- ML analytics models to integrate with system will work with the interface for further review of the image/video.
- Hiring of SDEs and Product Manager
- PARS tech team availability of resources

Risks:

- Availability of Software development resources

- Video events are not able to be pulled on real time on analytics platform.
- Analytics models are not accurate, providing high number of false events.

PRFAQ

GSO Tech launches AVISA

Computer vision powered web interface that will provide a real time notification of theft and safety related incidents

Seattle - INSIDE AMAZON - Jan 202X - Today, GSO Tech launched the Advanced Video Intelligent System Alert (AVISA), a new web interface that will provide real time alerts of theft and safety incidents to Loss Prevention (LP) and Safety teams. Powered by computer vision, AVISA can automatically detect events such as people fall, blocked exit doors, flooding, tailgating etc. using the existing camera infrastructure. Response teams can now act faster to on-site incidents and ensure an appropriate response is taken. Leaning into one of Amazon's latest leadership principles 'Strive to be Earth's Best Employer' AVISA has set a higher standard for the safety of the Amazon Operation Spaces.

Earlier, LP Specialists had to rely on nearby witnesses to get informed when a theft or safety related incident occurs. If there were no nearby witness, the event would go unnoticed until a visible impact or damage would occur. Additionally, even if the LP specialist were informed about the incident, they would still spend one to two hours to find and review the video footage. They need a way to eliminate this dependency and have a robust and automated mechanism to get notified about such incidents.

With GSOTech's AVISA, users can now get automated real time alerts of theft and safety related incidents along with a 20 second video clip on the web-based user interface. This product leverages the existing camera infrastructure and advanced machine learning models to identify such incidents and provide proactive alerts in the real time basis. The web interface will also have a reporting dashboard that will provide insights on what kind of incidents are occurring at each site.

These alerts come with a 20 second video clip that the user can download and attach it to the case management system, thus saving 1-2 hours spent on finding the video footage to substantiate the case. AVISA has now reduced the notification time of such incidents.

The LP specialists would log into the AVISA portal using the single sign on feature. The landing page would provide thumbnails of newly detected events at the top of the page along with event name site id and time stamp. When the users click on the thumbnail, they will be navigated to new page where they can see the 20 second video clip of the event. The users can also enter the comments and acknowledge if it was a true event or a false alarm.

“AVISA completely changes how I get notified about the severe incidents. Earlier, I had to rely on associates working on the sites, but now I get these notifications on my laptop.” XYZ the Loss Prevention Manager explains. “The Insight dashboard is a useful tool for me. It provides a quick glance view of the type of severe incidents that occur at my site. This has helped me to partner with the Workplace Health and Safety team and take precautionary actions”. PQR, the regional head of Workplace Health and Safety quoted- “AVISA has provided more visibility to safety related incidents. In the past, some of the events would go unnoticed if there was no one to report it. Now with the help of technology, we have more coverage of such incidents.”

AVISA is available today at <https://avisa.gso.amazon.dev/events> for every LP manager.

Customer FAQ

- **Question: What exactly is AVISA?**

Answer: AVISA is a Machine Learning powered software solution that uses existing CCTV camera network in the FCs to detect severe safety incidents in near real time basis. The web interface will allow LP Specialists to review the incidents, mark them as seen or false positive and add comments to those incidents.

- **Question: What problems [MOU1] does it help me solve?**

Answer: With help of AVISA, you will be able to detect the severe incidents at much faster rate. You no longer have to depend on nearby witnesses to identify and report on those incidents. Additionally, you do not need to manually research the video footage [MOU2] in the Video Management System. The AVISA web interface

- **Question: Who can access this web interface?**

Answer: Any Amazon employee who is a part of the [GSO- approved VMS Users Groups](#) can access the interface

- **Question: How do I access the web interface?**

Answer: If you are connected to Amazon network and has access to view the video footage in Milestone or Bosch Video Management Service (VMS), you can launch the

AVISA portal at dummywebsitename.com. You do not need to set up any username or password.

- **Question: I do not have access to Milestone or Bosch VMS. Is there a way to access the AVISA portal?**

Answer: In accordance with the [GSO Video Management System \(VMS\) Permissions Standard](#), usage of the GSO-approved VMS system is limited to members of GSO and approved VMS users. Non-GSO users may only have permissions to the VMS if they align with the [GSO-approved VMS Groups](#). Additionally, usage of the VMS system for purposes other than those listed within the GSO-approved VMS Groups is not permitted. To request a GSO-approved VMS group, please follow the directions located in the [Permissions standard, Section 11](#), and utilize [River](#) for submission.

- **Question: Will I get alerts for all sites or just my local site?**

Answer: This will depend upon your access permission based on [GSO- approved VMS Users Groups](#).

- **Question: I am a part of Global VMS User Group but I don't want to be bothered by the alerts of all sites. Is there a mechanism through which I can select sites for which I want to be alerted?**

Answer: Yes. The AVISA web interface has a Setting option (Appendix A1.4) where users can filter the sites based upon their preference.

- **Question: Can AVISA be used to identify the training gaps for the employees?**

Answer: No. Any use of video to monitor associate performance (individual or group), such as workflow compliance, productivity, quality assurance, etc. is prohibited.

- **Question: What to do if I find an alert to be false positive?**

Answer: AVISA uses Machine Learning models to detect severe incidents. These Machine Learning models are never 100% correct. Therefore, the interface has an option where you can click the button to mark the incident as False Alarm. The backend mechanism will capture this feedback and send it to Machine Learning model. This will help in increasing the accuracy of the model overtime.

Internal FAQ

- **Question: Does this product meets the privacy requirements?**

Answer: Yes. The SDDV team has obtained necessary approvals from the Privacy team.

- **Question: What is the data retention policy?**

Answer: For the situations where AVISA detects a severe incident, the images and corresponding 20 seconds video is retained as per [GSO – Security Systems Standard Global](#) policy. For improving the accuracy of the ML model, the system retains 5 % of the images and videos of the situation where no severity is detected. These are stored for not more than X days.

- **Question: What is the accuracy of AVISA?**

Answer: AVISA uses continuously improving machine learning models to detect these severe incidents. The performance metrics are captured in the 'Insights' Tab of the interface. These metrics vary across different use cases.

- **Question: How can we ensure that users will not use these videos for training purposes or any other secondary usage?**

Answer: The access to the AVISA is limited to members of GSO and approved VMS users. This will restrict the access to any unauthorized user. Secondly the system provides only 20 seconds video on the interface which restricts user to use for secondary purpose.

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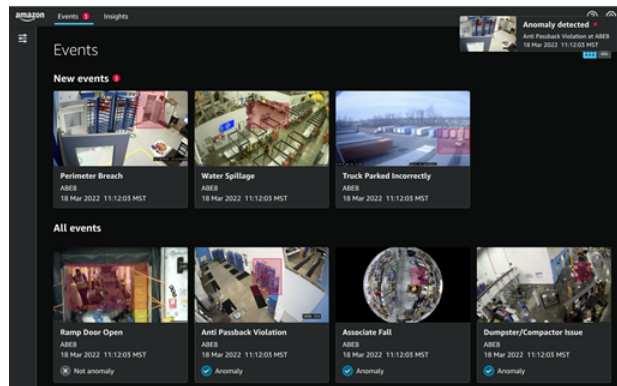
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[MOU1]To answer this question, in the answer we should probably lead with how today we do not have any consistent way to identify leads/tips for issues/incidents that occur, we rely on witnesses to alert/notify of issue. Add how this might have safety risk, security risk, etc. that could result in...

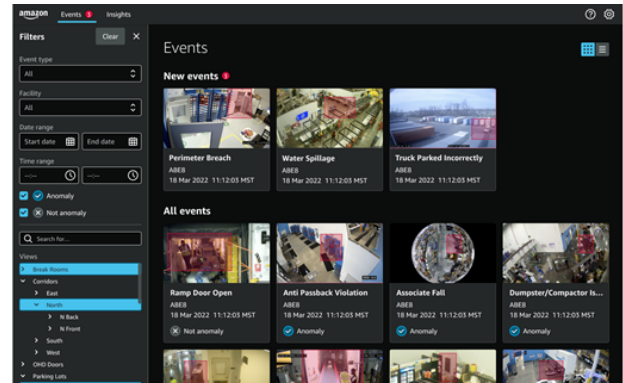
[MOU2]I am not sure what the benefit of looking at video in the current state would do other than to investigate and determine the root cause. Video footage in these scenarios would help users validate the incident soon after it happen to react to the incident and take appropriate action to minimize the severity of the incident.

Appendix: 1

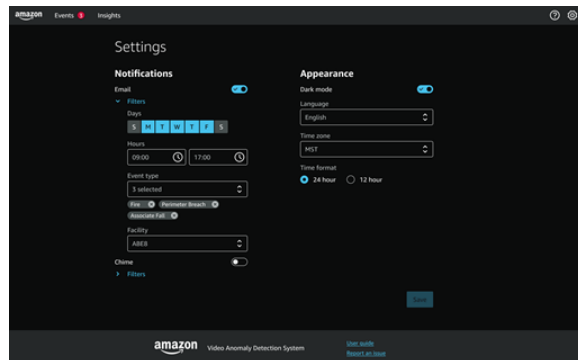
A1.1: Landing Page



A1.2: Landing Page with filter configuration



A1.4: Settings Page



5 Customer Questions

Q1 Who is the customer and what insights do we have about them?

Our customers are LP Managers and Specialists sitting across the globe who are responsible for maintaining the security of Amazon Operation centers. Majority of them are based out of AMER region. They spent 20 minutes of their time on average in reviewing and retrieving the video footage of the theft or safety related incidents.

2. (Define) What is the prevailing customer problem/opportunity? What data informed this?

Today, the LP specialists need to rely on nearby witnesses to get informed when a theft or safety related incident occurs. Customers need to eliminate this dependency and have a robust and automated mechanism to get alerted about such incidents.

3. (Invent) What is the solution? Why is it the right solution to address the customer need versus other alternatives?

Advanced Video Intelligent System Alert (AVISA) is a computer vision based solution that provides real time alerts of theft and safety related incidents along with a video clip on the web-based user interface. This product leverages the existing camera infrastructure to capture these incidents and provide proactive alerts in the real time basis. The video clip provides opportunity for immediate investigation, which otherwise would have taken 1-2 hours.

Alternate Approach considered and rejected: The team rejected the use of third-party software that uses the computer vision technology because of privacy risk and creating further dependencies on third party tool. The team also tested the video analytics capabilities of the existing camera with object detection. However, all the three tests failed as they generated 700 false alarms in one week.

4. (Refine) How would we describe the end-to-end customer experience? What is the most important customer benefit?

The LP specialists would log into the AVISA portal using the single sign on feature. The landing page would provide thumbnails of newly detected events at top of the

page along with event name site id and time stamp. When the users when click on the thumbnail, they will be navigated to new page where they can see the 20 second video clip of the event. Users can also enter the comments and acknowledge if it was a true event or a false alarm. Ability to get alerts in near real time along with the 20 seconds video is the most important benefit. This would ensure a timely response is taken by the LP specialist and reduce their time spent in retrieving the video footage

5. (Test & Iterate) How will we define and measure success?

AVISA will provide alerts to the customers within two minutes of the occurrence of the incident where right now it takes about 20 minutes to do the same. It will also help customers to reduce the amount spent to complete the case report by at least 50%

Elevator Pitch

Introducing AVISA, a computer vision powered web interface that will provide a real time notification of theft and safety related incidents in Amazon Operation centers. The alerts will consist of incident name, warehouse ID, timestamp, and a 20 second video clip for immediate investigations.

Customer Vignette

If you are a LP specialist at Amazon Fulfilment center, you know how tedious it is to investigate a theft or safety related incident. Not only you are dependent on the nearby witness to get notified but also need to log into video management system and spend an hour or two to get the video of the incident. Have you ever wondered if there was an automated solution that would detect these events and provide a video clip?

AVISA is there to fulfill your wish. AVISA a computer vision powered web interface that will provide a real time notification of theft and safety related incidents. When you login to the page you will see the thumbnails of the incidents detected along with incident name, warehouse ID, timestamp and a 20 second video clip. You can view this video as many times as you want and also download it to your system and attach it to your case management report. Gone are the days when you would have to spend hours and hours for finding the video footage of the incident.