AI HACKATHON: COMPUTER VISION BASED SMART SURVEILLANCE FOR WAREHOUSES

ANDHRA PRADESH STATE CIVIL SUPPLIES CORPORATION

1 BACKGROUND

Andhra Pradesh State Civil Supplies Corporation Limited (APSCSCL) operates a vast network of warehouses and transportation infrastructure for the procurement, storage, and distribution of essential commodities under the Public Distribution System (PDS). With the increasing scale and complexity of operations, there is a growing need to adopt advanced technologies to improve efficiency, accuracy, and transparency across supply chain processes.

One of the key opportunities identified lies in leveraging Artificial Intelligence (AI) and video analytics to harness the potential of existing CCTV infrastructure deployed across warehouses. AI-driven solutions can help automate critical operational tasks such as inventory verification, vehicle tracking, access control, and real-time monitoring, significantly reducing manual errors and enhancing security.

To explore innovative, scalable, and cost-effective solutions, APSCSCL is organizing a Hackathon aimed at engaging startups, incubators, research institutions, and technology experts. The objective is to identify and pilot AI-based video (CCTV feed) analytics solutions for real-world use cases observed in APSCSCL warehouses and other godowns. Successful prototypes from this Hackathon will be considered for further development and deployment through formal engagements with APSCSCL.

2 USE CASES AND PROBLEM STATEMENTS

AIM: DEVELOP REAL-TIME COMPUTER VISION BASED VIDEO ANALYTICS USING CCTV CAMERAS FOR PUBLIC WAREHOUSE MONITORING, IMPROVING SECURITY, AND OPTIMIZING INVENTORY HANDLING OPERATIONS

Participants are expected to develop solutions for the problem statements as mentioned below. The proposed solutions should demonstrate scalability, cost-effectiveness, and integration capabilities with existing infrastructure.

SN	Use Cases	Problem Statement	Description
1	**Real-time gunny bags**	Develop an AI-powered	The solution should use AI-driven video analytics to track and count gunny bags in real time from CCTV

	counting and volumetric analysis	system to dynamically track, count, and perform volumetric analysis of gunny bags, automatically measuring and verifying their numbers while being loaded, unloaded, and stacked in warehouses.	footage. It must have adaptive contrast enhancement for poor lighting and employ techniques like: • Computer vision models like Yolo, SAM, Detr, etc. for object detection and motion tracking for accuracy • Real-time streaming inference using HTTP REST or gRPC for real-time object tracking
2	**AI-Powered Vehicle Recognition**	Build an AI-based vehicle recognition system that reads and logs vehicle license plates for authentication and tracking at warehouse premises.	The solution should use optical character recognition (OCR) and AI-powered image processing to detect & read vehicle number plates from CCTV footage and alert to unauthorized entries. It must support timestamp logging, movement tracking, vehicle categorization, multiple languages/fonts, and function in variable lighting conditions.
3	**AI-Driven Facial Recognition**	Develop a facial recognition system to authenticate warehouse managers, hamalis (labour), and detect unauthorized intrusions in real time.	The solution should use AI-based facial recognition to identify and verify individuals in CCTV footage, distinguishing authorized personnel from unknown individuals and triggering near real-time alerts for unauthorized access. It must function efficiently in different lighting conditions and maintain a history log for better monitoring.
4	**Contextual Intelligence for near Real-time analysis and Query**	Develop an AI-powered system capable of analyzing videos in near real-time, grounded in context to capture anomalies and events. Enabling users to search, retrieve and query activities in video scenes	The solution will utilize AI-driven video analysis to process CCTV or video feeds in near real-time, identifying contextual anomalies (e.g., unusual movements or behaviors) and significant events (e.g., specific activities or incidents) within warehouse environments. It will enable users to search and retrieve video segments based on specific activities or events and query the system for detailed insights (e.g., timestamps, locations, or individuals involved). The system must operate reliably under varying conditions, such as different lighting or camera angles, and maintain a searchable log of analyzed events for efficient monitoring and review.

2.1 AI TOOLS RECOMMENDATIONS

1. All participants must ensure ethical AI practices, including fairness, accountability, and compliance with the Digital Personal Data Protection (DPDP) Act, 2023.
2. Participants are encouraged to use state-of-the-art, open-source models and lightweight architectures* such as:
   - YOLOv8, Detectron2, DINOv2 for object detection.

- PaddleOCR, Donut, EasyOCR for license plate recognition.
- ArcFace, DeepSort for face recognition and tracking.
- MiDaS, SAM (Segment Anything), NeRF for 3D scene understanding
- LLMs can be used to generate contextual intelligence

*The list mentioned above is indicative. The participants are free to use their own tools.

3 SHORT, MID, AND LONG-TERM EXPECTATIONS

SN	Use Cases	Short term	Mid term	Long term
1	**Real-time gunny bags counting and volumetric analysis**	Develop a PoC to be deployed in AP Civil Supplies warehouses for counting and volumetric analysis of gunny bags in motion from CCTV footage. Ensure moderate accuracy and real-time display of count data	Enhance accuracy, optimize AI models for different lighting conditions, and integrate real-time error correction. Deploy at multiple warehouse sites.	Implement a fully automated system integrated with the AP Civil Supplies portal for real-time stock monitoring and predictive analytics.
2	**AI-Powered Vehicle Recognition**	Develop a PoC deployed in AP Civil Supplies warehouses to read vehicle license plates from CCTV footage and validate recognition accuracy.	Enhance robustness for varying plate designs and lighting conditions, integrate with the VAHAN portal (of NIC) for vehicle authentication, and deploy at key locations.	Implement a fully automated system across all warehouses with centralized vehicle tracking, real-time alerts for unauthorized vehicles, and AP Civil Supplies portal integration.
3	**AI-Driven Facial Recognition**	Deploy a PoC in AP Civil Supplies warehouses for facial recognition of managers and workers using CCTV footage, with basic authentication accuracy.	Improve accuracy for partial obstructions (e.g., masks, caps), implement real-time alerts for unauthorized access, and integrate with attendance records.	Scale across all warehouses with an AI-driven security system, real-time monitoring, and predictive threat detection for enhanced security.
4	**Contextual Intelligence for Real-time analysis and Query**	Deploy a PoC using AP Civil CCTV footage to analyze videos for contextual insights and provide verbose description of events.	Incorporate event detection for a broad range of events and incidents based on real-time CCTV footage stream. Allow end users to reconfigure an “event” or “incident”. Notify at the time of event in near real-time.	Allow user configurable events. Provide users the ability to query events from a corpus of videos in “YouTube” style format based on free-style search and chat freely based on Natural language in English (and Telugu).

4 IMPLEMENTATION MECHANISM

4.1 **PHASE 1:** APPLICATION, INITIAL SCREENING, AND INITIAL SHORTLISTING

A. **Application Submission** (**Deadline- 10th May 2025**): Participants will submit their application form along with the following:

- Brief proposal on which use case(s) they are applying for.
- Team credentials (organization/start-up details, if applicable).
- Technical approach and proposed solution methodology.

Note: Participants can apply for one or multiple use cases, but preference will be given to those with capability across more use cases (refer to point 4 under the Eligibility Criteria table).

B. **Screening and shortlisting** (**Deadline: 15th May 2025**): A panel of evaluators will screen the applications based on the **generic eligibility criteria** listed below.

SN	Eligibility criteria	Description	Marks
1	Relevance of Proposed Solution	Solution's relevance to the selected use case(s)	20
2	Technical Feasibility	Is the solution practically implementable and scalable?	40
3	Multi-Use-Case Capability	Number of use cases they are addressing (Addressing 4 – 40, 3 – 30, 2 – 20, 1 – 10)	40

The **top 6 participants** will be shortlisted for the next stage. The shortlisted participants will be sent email confirmation regarding their selection for the next round. These participants will then proceed to **Phase 2**.

4.2 PHASE 2: ON-GROUND TESTING & SHOWCASE

A. On-ground testing at selected warehouses (**Deadline: 31st May**): Shortlisted participants will be provided-

- Remote access to real-time warehouse camera feeds
- Necessary guidelines on data handling and privacy compliance

They will be required to:

- Conduct their solution testing in real-world conditions.
- Fine-tune their models/approaches based on live camera data.

- Record and document outputs and insights in the use cases they are participating in.

Note: APSCSCL will facilitate controlled access to cameras.

B. Showcase of solutions (**Deadline: 2nd & 3rd June**): Participants must

- Present their analysis/findings, including:
  - Technical outcomes.
  - Accuracy rates, edge case handling, etc.
  - Video footage demonstrating the solution in action (screen-recorded or feed-extracted).
  - Limitations and learnings.
- Submit a detailed demo report with visual evidence.
- **The evaluation committee will consist of**:
  - Commissioner, AP Civil Supplies Department.
  - Vice Chairman & Managing Director, AP State Civil Supplies Corporation Limited (APSCSCL)
  - Independent Technical Experts

Note: ***Each team will be given 30 minutes to present the above-mentioned details.***

C. Evaluation and Scoring (**Deadline: 4th June**): The presentations of the participants will be evaluated based on the following criteria. The scoring for each criterion has been mentioned below:

Technical feasibility	Scalability	Cost-effectiveness	Impact	Integration
20	20	20	20	20

SN	Use Cases	Technical feasibility	Scalability	Cost-effectiveness	Impact	Integration
1	**Real-time gunny bags counting and volumetric analysis**	Accuracy of real-time bag detection in motion using CCTV; minimal latency	Can be scaled across multiple warehouses	Requires only a software layer over existing infrastructure	Automates a manual task; improves transparency and reduces pilferage	Sync with APSCSCL's portal
2	**AI-Powered Vehicle Recognition**	OCR accuracy in various lighting, angles, and plate formats	Scalable to all entry/exit points with fixed cameras	Software-only solution using existing cameras; low hardware cost	Secures inbound/outbound logistics and prevents unauthorized access	Integration with the VAHAN portal and APSCSCL's portal
3	**AI-Driven Facial Recognition**	Face detection accuracy under	Can be deployed across all warehouses	Reuses existing CCTV; low per-site cost after base model is	Increases warehouse security and supports attendance validation	Seamless integration with APSCSCL's

		obstructions (masks, low light, angles)	for staff and intruder verification	ready		portal
4	**Contextual Intelligence for Real-time analysis and Query**	Ability to analyze videos and capture significant events under different conditions	Applicable across all warehouses with a variety of events and incidents in near real-time	Reduce cost of inference using existing CCTV video stream	Enables high recall of event detection across a range of target events	Seamless integration with APSCSCL's portal

The **Top 3 participants** will be selected as winners of the Hackathon challenge.

Phase 3: Award (**Deadline: 5th June**): The Top 3 winners will receive cash prizes, as detailed below.

Sl. No.	Rank	Prize Amount
1.	1st	₹ 10 lakhs
2.	2nd	₹ 5 lakhs
3.	3rd	₹ 3 lakhs

Phase 4: Procurement (**15th June onwards**): The Top 3 winners will be presented opportunity for deployment as a part of APSCSCL Portal (Digital Stack) as per the MSME / Startup Policy of Andhra Pradesh that provides purchase preference and market access to the winners of such hackathons / grand challenges.

5 TIMELINES AND DURATION

S. No.	Milestone	Date
1	Launch of Hackathon	21/04/2025
2	Application submission deadline	10/05/2025
3	Shortlisting announcement	15/05/2025
4	On-ground testing	16/05/2025 to 31/05/2025
5	Presentation round	02/06/2025 to 03/06/2025
6	Evaluation and scoring	04/06/2025
7	Award	05/06/2025
8	Procurement	15/06/2025 onwards

6 SUPPORT AND QUERIES

The participants are encouraged to reach out to the designated SPOCs for any queries related to:

- Application process and eligibility
- Clarifications on use cases and problem statements
- Submission requirements and timelines.

Please reach out to the following SPOCs:

Sl. No.	Milestone	Designation	Email ID	Contact number
1	Sri Lakshmi	Manager Storage	pdsho.apscsc@ap.gov.in	7093501314
2	Goutham	Consultant	ksgoutham94@gmail.com	9486875272

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