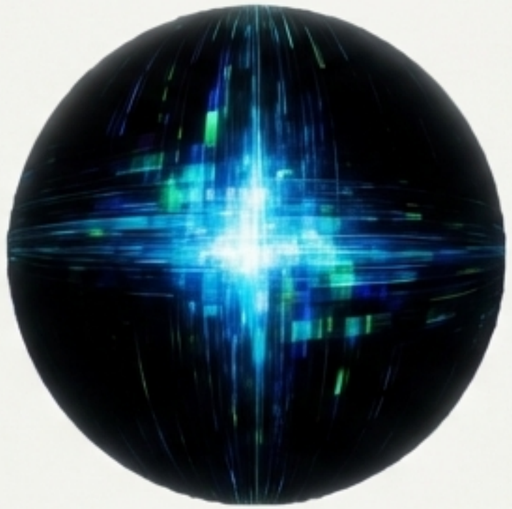
SARAHAI-INFERENCE

The AI Force-Multiplier for the Warfighter Advantage



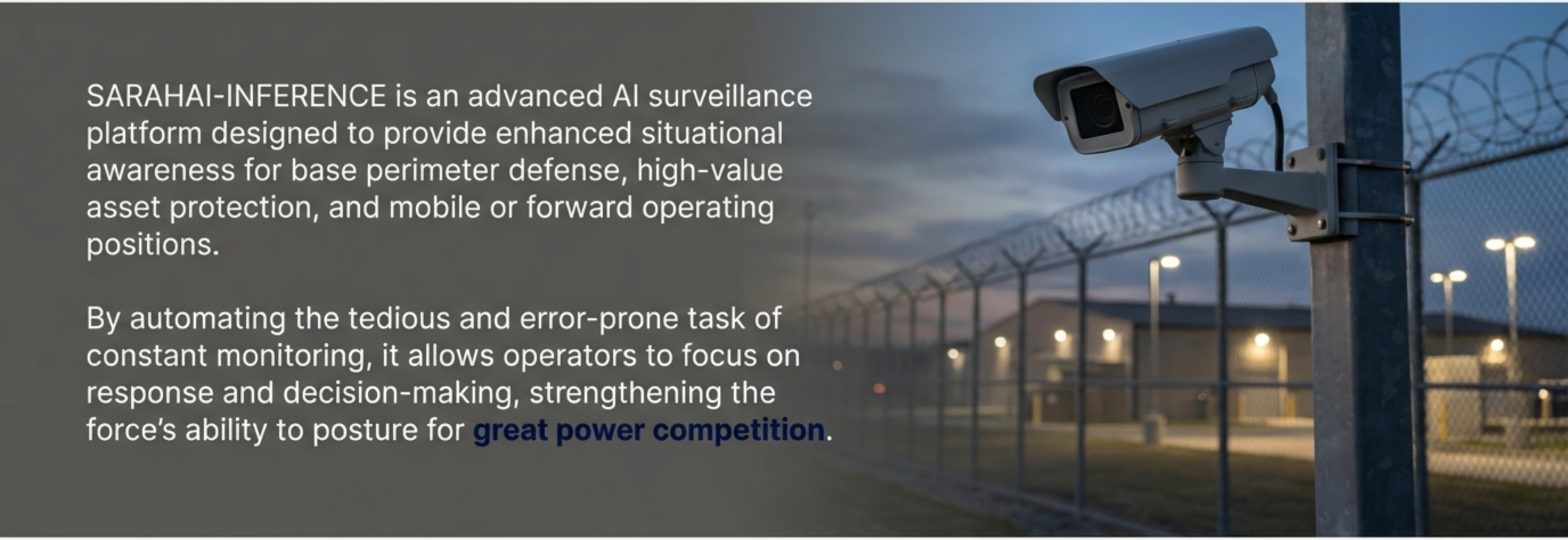
(S)ituational **(A)**wareness **(R)**esponse **(A)**nd **(H)**elp **(AI)**

TENSOR™ NETWORKS

Enhancing Lethality, Readiness, and Resilience in Complex Environments

SARAHAI-INFERENCE is an advanced AI surveillance platform designed to provide enhanced situational awareness for base perimeter defense, high-value asset protection, and mobile or forward operating positions.

By automating the tedious and error-prone task of constant monitoring, it allows operators to focus on response and decision-making, strengthening the force's ability to posture for **great power competition**.



The Core AI Engine: See, Understand, and Learn

SEE - Real-Time Object Detection

Utilizes the YOLOv8n model to identify and classify critical objects in up to 24 simultaneous streams.

- person
- car
- gun
- knife
- drone
- fire

UNDERSTAND - High-Fidelity Tracking

Advanced Color Recognition: Employs the CIEDE2000 formula for precise color identification (e.g., "person in a red shirt").

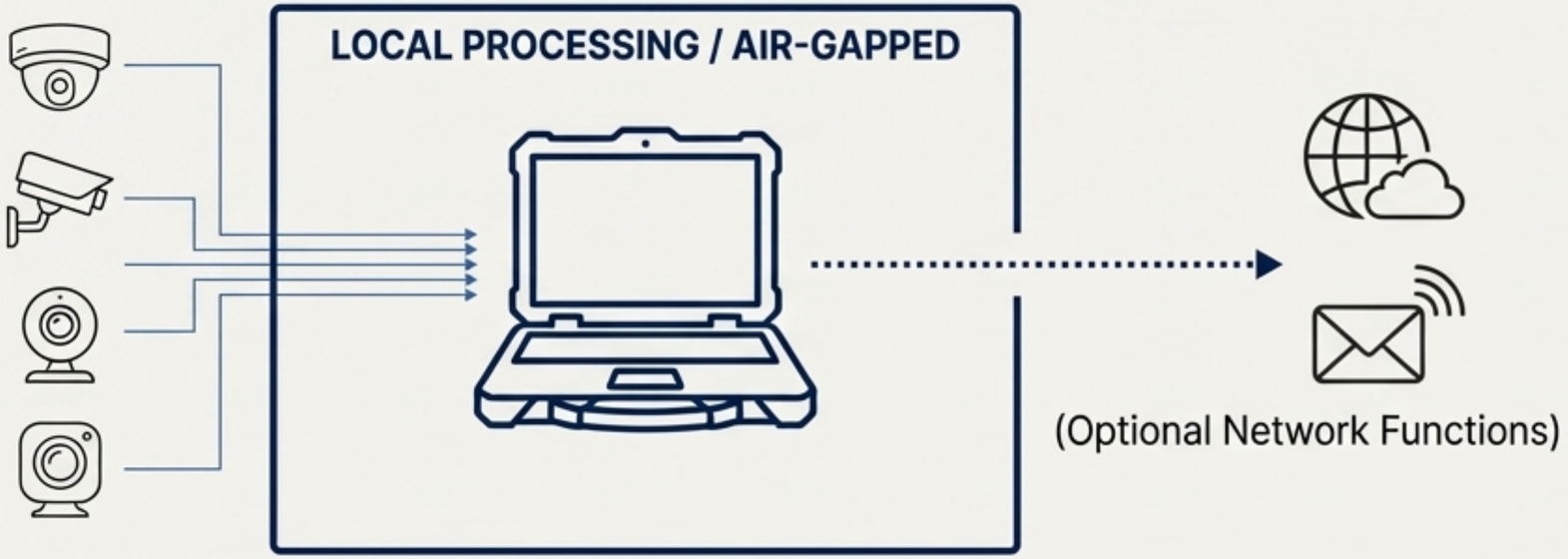
Persistent Object Tracking: Assigns unique IDs to moving objects, tracking their position and speed across the field of view.

LEARN - Proactive Anomaly Detection

Pattern of Life Anomaly (PoLA): Establishes a baseline of normal activity and automatically flags abnormal events, providing proactive threat indicators.

Engineered for Field Operations and Maximum OPSEC

Air-Gapped Operations



- Core AI processing and surveillance functions operate entirely on the local machine.
- No internet connection required to detect, track, and record events.
- Ideal for secure networks and forward positions with limited or denied connectivity.

(Note: Network connection is only required for optional functions like email/SMS alerts or cloud backups.)

Deployment Flexibility

Portable: Can be run directly from a USB Thumb Drive or installed on a local HDD.

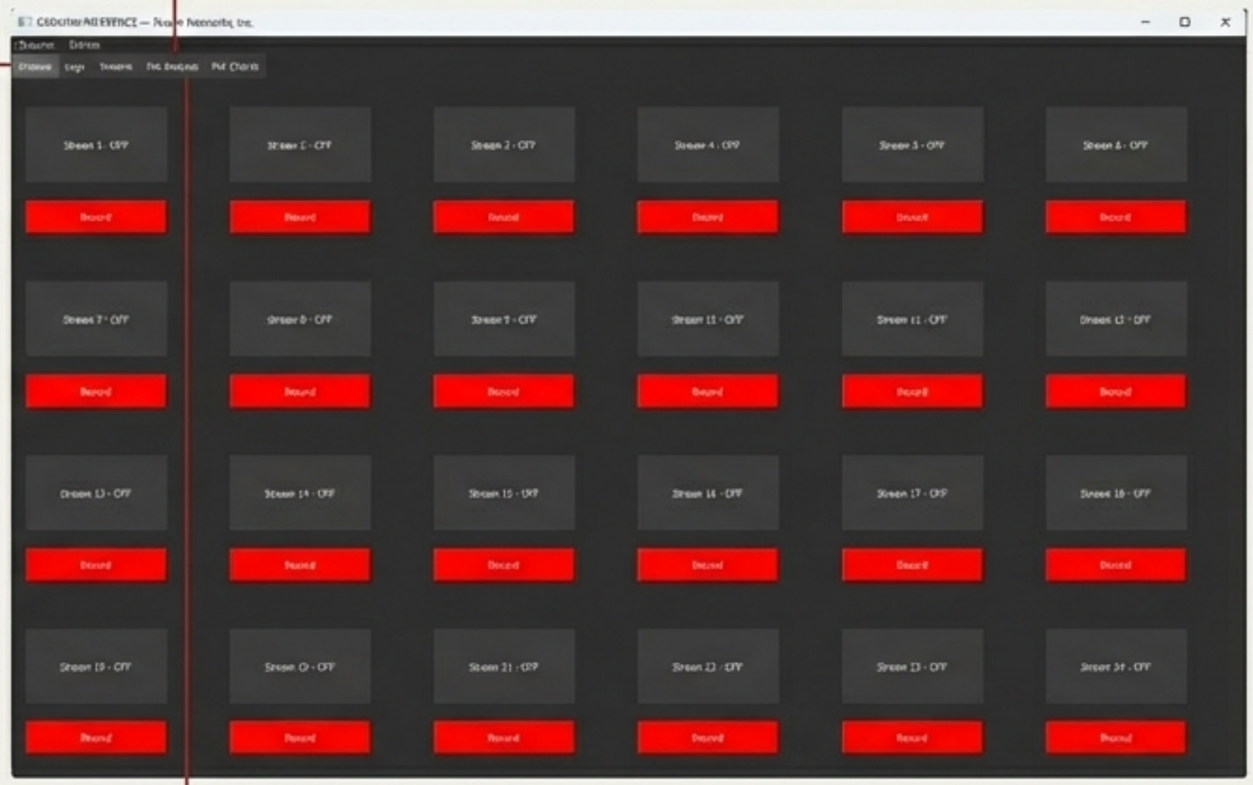
Versatile Camera Support: Connects to cameras via USB, RTSP, or ONVIF.

Hardware: Optimized for Windows 11 with a dedicated NVIDIA or AMD GPU for real-time performance.

Your Mission Dashboard for Live Command & Control

Streams Tab

Your primary dashboard for live monitoring of up to 24 feeds.



Timeline Tab

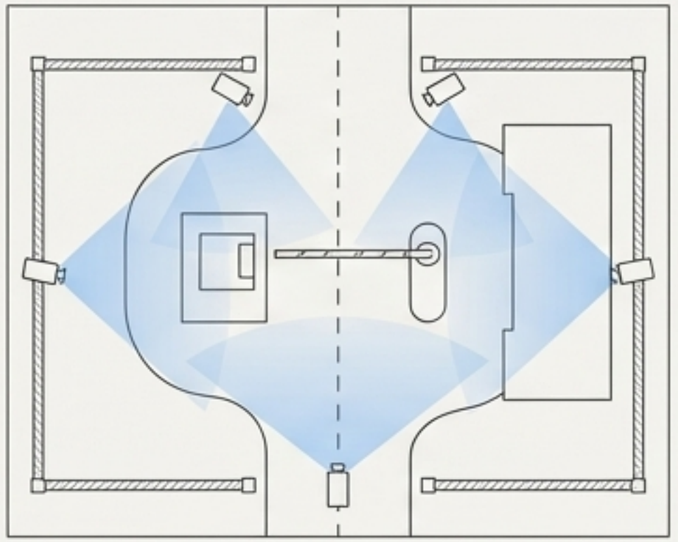
A structured, real-time table of every detection event, timestamp, and detection event, including timestamp, object type, confidence score, and PoL Anomaly flags.

Logs Tab: A detailed text log of all system events, detections, and errors for forensic review.

TTP 1: Overt Surveillance for Deterrence & Active Monitoring

Scenario: Ideal for Entry Control Points (ECP), perimeter defense, and high-traffic areas.

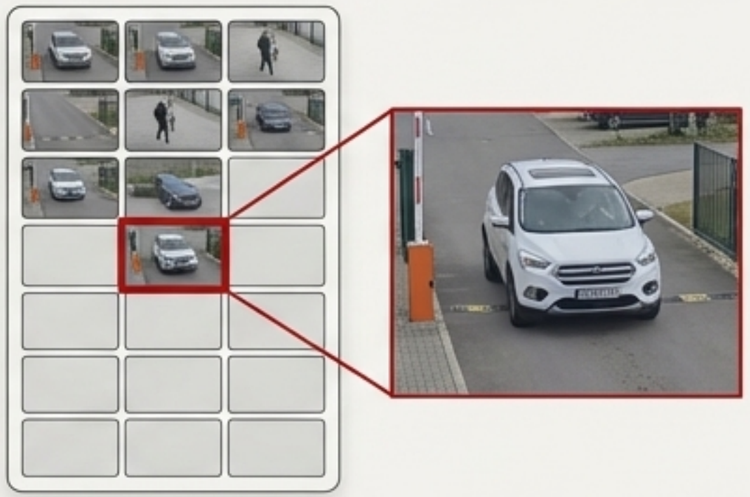
1 Deploy → 2 Monitor → 3 Investigate



Position cameras to cover key areas and add all streams to the `Streams` Tab.

Timestamp	Object	Confidence
10:45:32	Vehicle	92%
10:45:35	Person	89%
10:45:38	Vehicle	95%
10:45:32	Vehicle	92%
10:45:35	Person	89%
10:45:35	Person	89%
10:45:38	Vehicle	95%
10:45:38	Vehicle	95%
10:45:38	Vehicle	95%

Actively watch the `Timeline` Tab as detections are logged in real-time, providing a structured view of all activity.



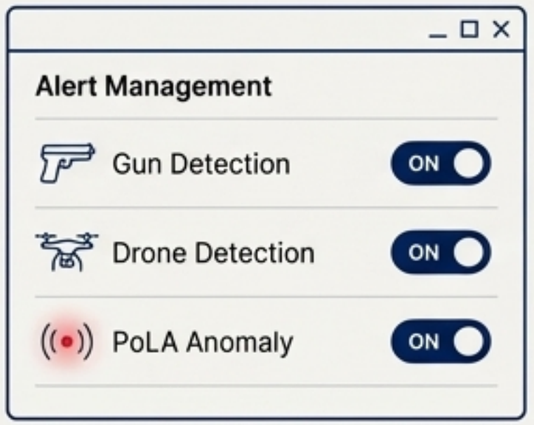
Click any stream cell to open an `Enlarged View` for detailed, high-resolution monitoring of a specific feed.

Outcome: Maximizes operator situational awareness and provides a persistent, searchable record of all activity.

TTP 2: Covert Surveillance for Automated Monitoring & Alerts

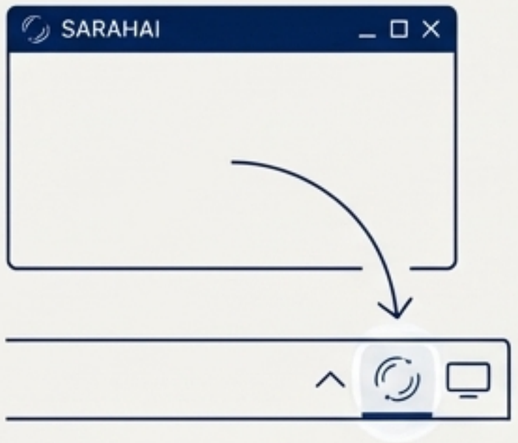
Scenario: Suited for clandestine operations, remote monitoring, and protecting low-traffic but high-value areas.

1 Configure



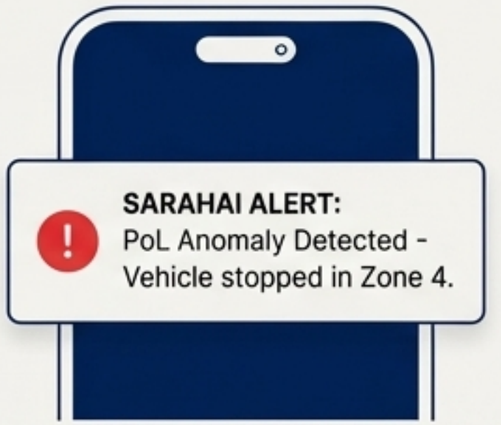
Set up discreet camera sources and configure `Alerts` for high-threat objects (gun, knife, drone) and PoL anomalies.

2 Activate



Start the streams. The application can be minimized and will continue processing autonomously in the background.

3 React

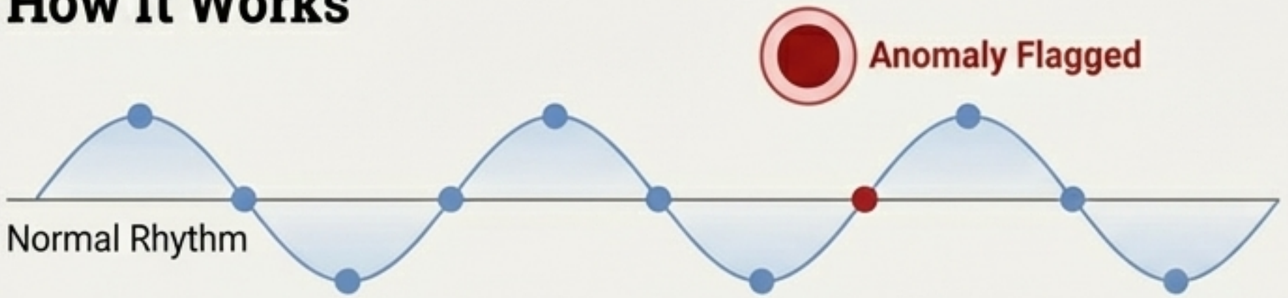


Operators are notified via email or SMS when an alert condition is met, allowing them to react immediately without constant screen time.

Outcome: Reduces manpower requirements, eliminates monitoring fatigue, and ensures critical events are never missed.

The Decisive Edge: Proactive Threat Detection with Pattern of Life Anomaly (PoLA)

How It Works

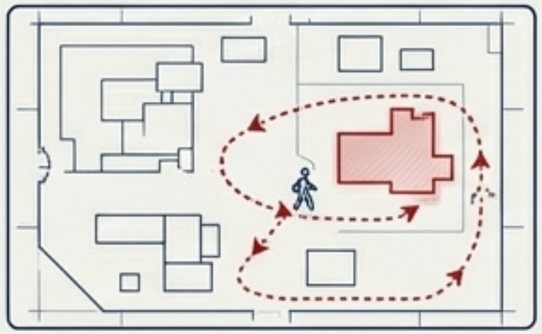


The PoLA engine learns the normal 'rhythm' of a location (objects, locations, speeds, times) and automatically flags events that deviate from the established baseline.

- **Numeric Anomalies**
  Unusual location or speed.
- **Categorical Anomalies**
  Rare or never-before-seen object types.

Tactical Usefulness - Early Warning Indicators a Human Might Miss

Hostile Reconnaissance

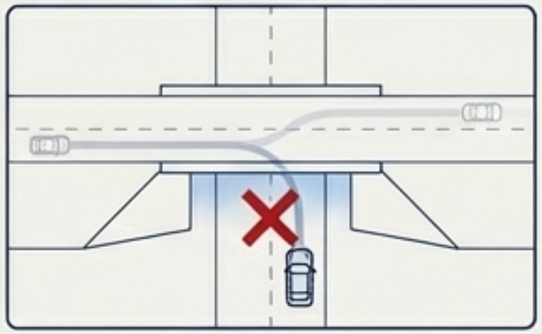


Hostile Reconnaissance
An individual repeatedly appearing in sensitive, low-traffic areas.

Insider Threat

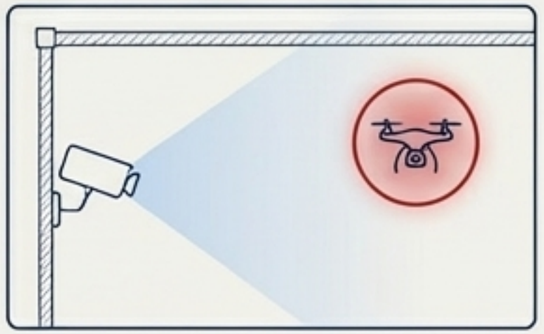
Insider Threat
An authorized vehicle appearing in a restricted zone at an unauthorized time.

IED Emplacement



IED Emplacement
A vehicle stopping in a location where vehicles normally don't stop.

Pre-Attack Indicators

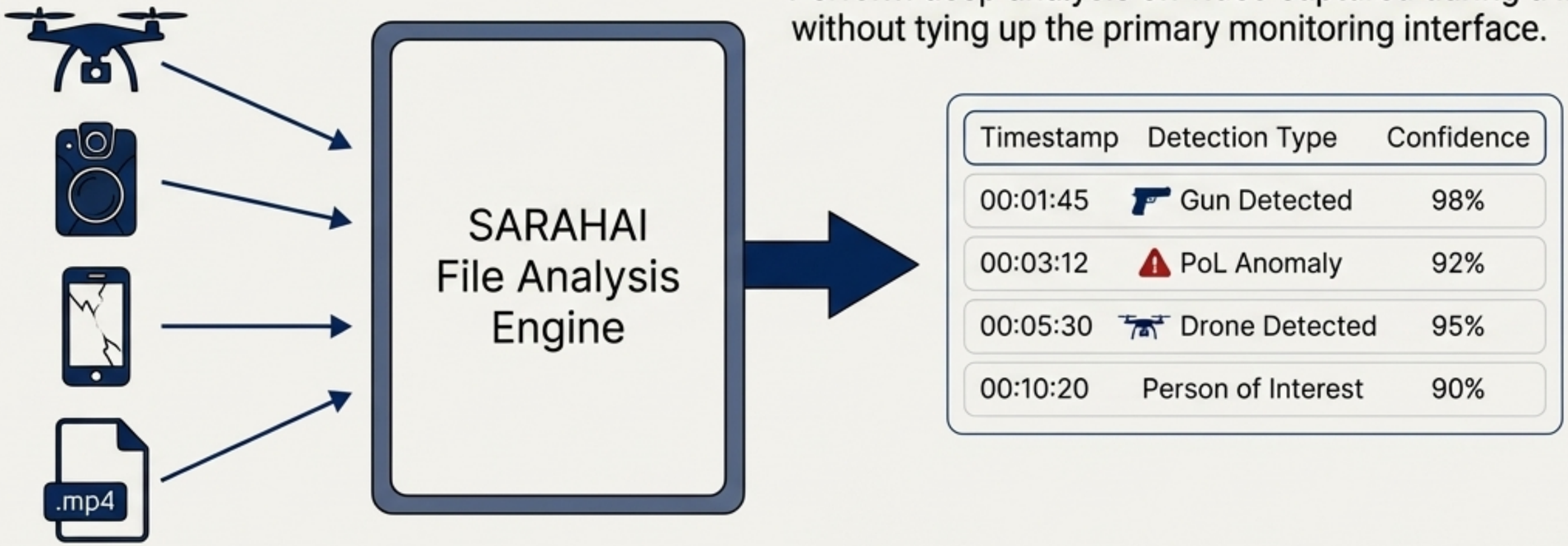


Pre-Attack Indicators
The sudden appearance of a drone or weapon in a monitored area.

Beyond Live Ops: Turning Any Video File into Intelligence

****Introducing the File Analysis Tab**:**
Apply SARAHAI's powerful AI detection and tracking capabilities to pre-recorded video files (`.mp4`, `.mkv`, etc.).

****Expanded Use Cases**:**
- Analyze footage from drones, body cameras, or seized devices.
- Re-analyze historical footage with new intelligence requirements.
- Perform deep analysis on video captured during a live mission without tying up the primary monitoring interface.

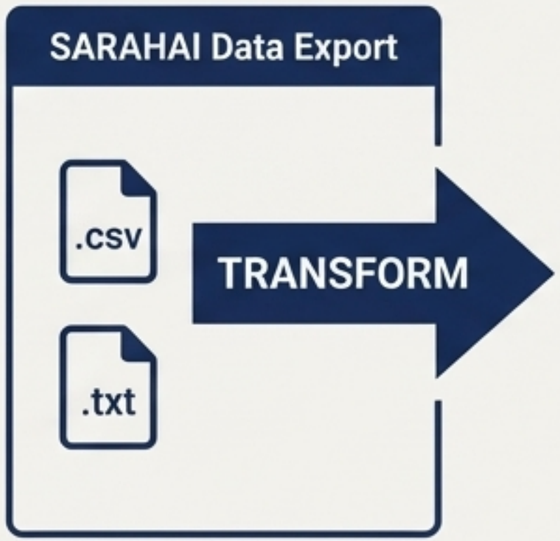


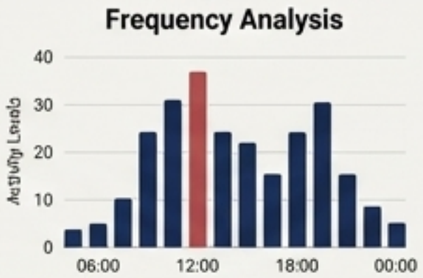
****Process**:**
Simply open a video file, and the analysis begins automatically, populating a table with timestamped detections.

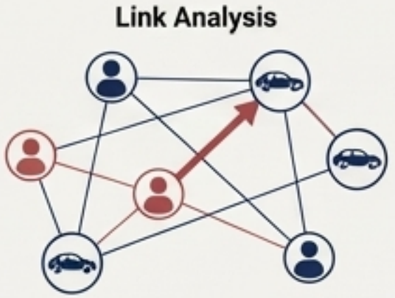
From Data to Dominance: Integrating with the Intelligence Cycle

Seamless Data Export

- Export the `Timeline` of all detection events as a structured `.csv` file.
- Export the complete system `Logs` as a `.txt` file for forensic review.
- Export `File Analysis` results as a dedicated `csv` file.



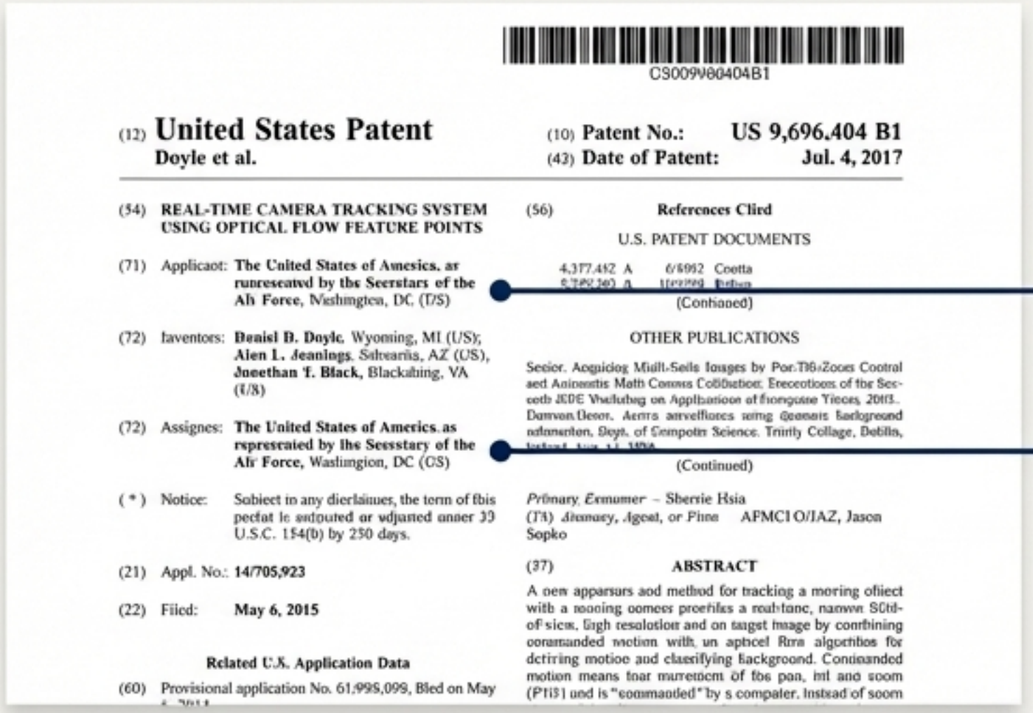




Immediate Application in Data Science & Intelligence Platforms

- **Frequency Analysis:** Determine peak times for vehicle or personnel movement.
- **Trend Identification:** Analyze object data over days or weeks to identify emerging patterns.
- **Link Analysis:** Correlate detections across multiple cameras to track subjects across a facility.

Built on a Foundation of Proven, Government-Owned Innovation



US009696404B1

(12) **United States Patent**
Doyle et al.

(10) **Patent No.: US 9,696,404 B1**
(43) **Date of Patent: Jul. 4, 2017**

(54) **REAL-TIME CAMERA TRACKING SYSTEM USING OPTICAL FLOW FEATURE POINTS**

(71) Applicant: **The United States of America, as represented by the Secretary of the Air Force**, Washington, DC (US)

(72) Inventors: **Daniel B. Doyle**, Wyoming, MI (US); **Alan L. Jennings**, Sahuarita, AZ (US); **Jonathan T. Black**, Blacksburg, VA (US)

(72) Assignee: **The United States of America, as represented by the Secretary of the Air Force**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 250 days.

(21) Appl. No.: **14/705,923**

(22) Filed: **May 6, 2015**

Related U.S. Application Data

(60) Provisional application No. 61/998,099, filed on May

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,377,432 A 6/1992 Costa

(Continued)

OTHER PUBLICATIONS

Senior, Acquiring Multi-Scale Images by Pan-Tilt-Zoom Control and Automatic Multi-Camera Calibration, Proceedings of the Seventh IEEE Workshop on Applications of Computer Vision, 2005.

Damen, Dima, Automatic surveillance using dynamic background subtraction, Dept. of Computer Science, Trinity College, Dublin,

(Continued)

Primary Examiner – Sherrie Hsia
(74) *Attorney, Agent, or Firm* – AFMCLO/JAZ, Jason Sopko

(57) **ABSTRACT**

A new apparatus and method for tracking a moving object with a moving camera provides a real-time, robust, high resolution and on target image by combining commanded motion with an optical flow algorithm for defining motion and classifying background. Commanded motion means that movement of the pan, tilt and zoom (PTZ) unit is "commanded" by a computer. Instead of zoom

Assignee: The United States of America as represented by the Secretary of the Air Force, Washington, DC (US)

Applicant: The United States of America, as represented by the Secretary of the Air Force, Washington, DC (US)

The core technology within SARAHAI-INFERENCE is licensed from the United States of America.

This is not just another commercial tool; it is a capability built upon a bedrock of patented research and development from within the U.S. Department of Defense ecosystem.