

The logo for the 2024 Embedded VISION Summit is centered within a white octagonal shape. The octagon is surrounded by a colorful, multi-layered border of overlapping triangles in shades of purple, blue, green, yellow, and orange. The text inside the octagon reads "2024 embedded VISION SUMMIT" in a clean, sans-serif font. "2024" is at the top, "embedded" is below it, "VISION" is in a large, bold font with a blue-to-orange gradient, and "SUMMIT" is at the bottom.

2024
embedded
VISION
SUMMIT®

Omnilert Gun Detect: Harnessing Computer Vision to Tackle Gun Violence

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Director of Artificial Intelligence

Omnilert



Gun Violence in 2023



658

MASS SHOOTINGS

For each of the last three years there have been more than 600 mass shootings - almost two a day on average. More than 1 million lives have been lost to gun violence since 1990

42,996

Deaths

38,368

Injuries

Due to gun violence

2023 broke the record for the most school shootings in

OVER 4 DECADES

4



Sources: <https://omnilert.com/gun-violence-statistics>

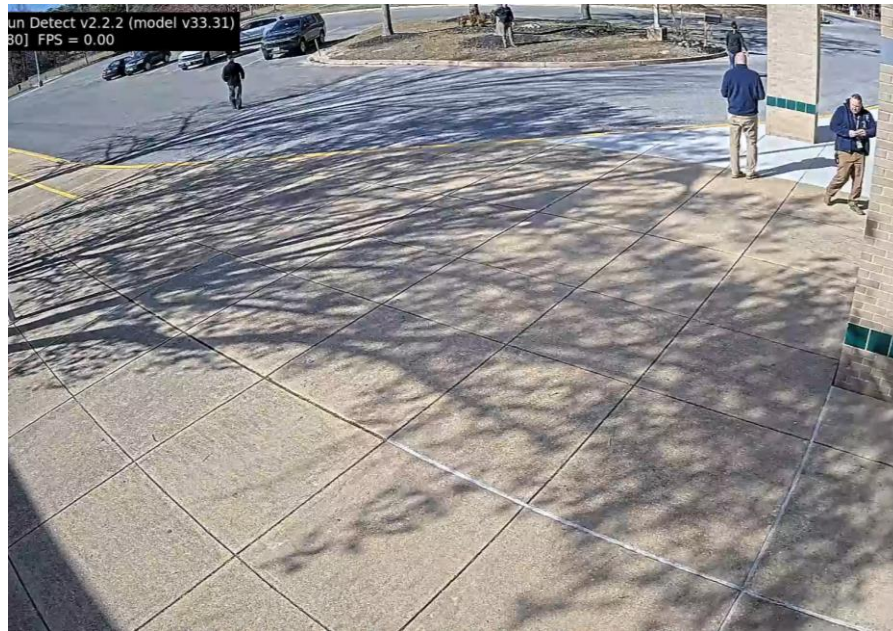
My Personal Connection to Gun Violence



- **Dec. 2012, Sandy Hook Elementary shooting in Newtown, Connecticut**
- **Emilie Parker, daughter of my cousin Robbie Parker, was a victim**
- **20 students and 6 adults lost their lives**

Omnilert Gun Detect – AI-Powered Visual Gun Detection

- Early warning system – before shots are fired
- Fast, reliable, and continuous camera monitoring through artificial intelligence
- Detects and classifies both handguns and rifles
- Improves response through accurate reporting of type of gun, location, and number of shooters
- On premise integration with existing IP camera installations with standard computer hardware



Four Critical Actions of the System

Detection

Detect guns before shots are fired, inside and outside

Verification

Verify detections and escalate as appropriate

Activation

Automatically activate response plans and systems as designed

Notification

Broadly warn your people of the threat and how to seek safety

Market Traction and Impact

- Solution announced end of 2020
- Market took off in 2022
- Deployed at hundreds of K-12 schools, universities, hospitals, state and local gov't, retail, banking, and hospitality
- Baltimore County Schools is largest deployment of its kind in the country
- Expanding into stadiums, casinos and more



BALTIMORE COUNTY PUBLIC SCHOOLS

Engage. Empower. Excel.

7,000
cameras



METRO
NASHVILLE
PUBLIC
SCHOOLS

1,300
cameras

Why Computer Vision?

- It's what we're good at: DARPA experience with optical targeting and threat recognition
- 70M+ security cameras in the U.S. – huge opportunity to transform a forensic system
- Real-time, 24x7, proactive surveillance, without fatigue or distraction



Why Computer Vision?

- Provides threat location and shooter description
- Works indoor and outdoors
- Ideal technology for early detection
 - Audible/shot detection is late
 - Concealed detection works only at entryways



100% Organic Training Data



Hybrid Training Data



Fully Synthetic Training Data



Why 100% organic training data?

- Most flexible
 - Succinct, relevant, low-volume data allows for crafting tailored performance
- Equal attention to “training-out” objects as “training-in”
- More explainable

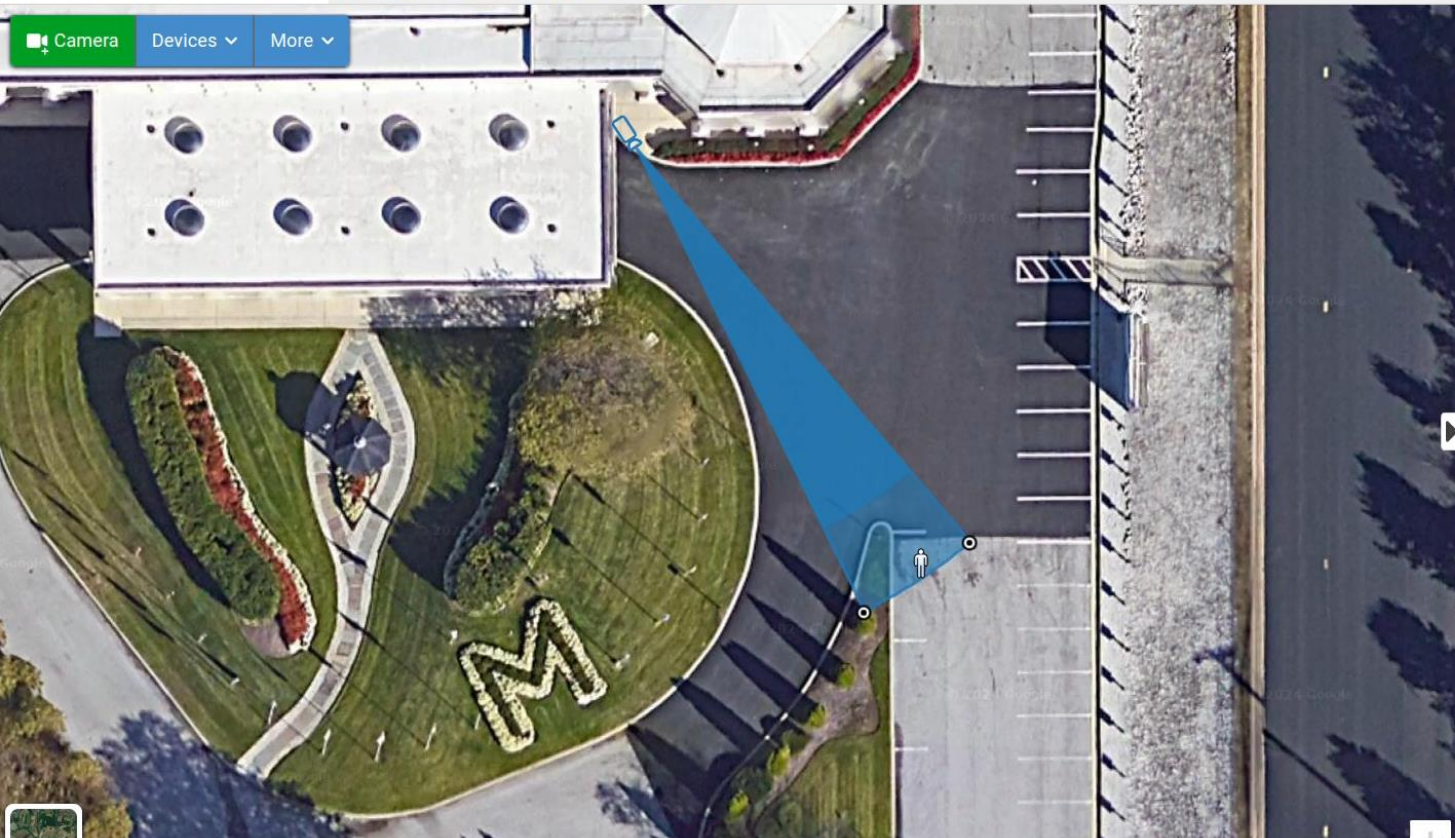


Creating Your Own Object Detector?

- Try traditional computer vision first!
 - Learn what optical features are important
 - Will help when deciding what to annotate
- Know your dataset!
- Include adversarial data
 - Focus on specificity (true negative rate) as well as sensitivity (true positive rate)

Technical Challenges: Pixel Density and Quality

Camera Devices More



Name Camera 1

Model Generic Camera Select Model

Color

Resolution 1080p Distance 95 ft

PPF 82.1 Width 23.4 ft

Unit Imperial HAoV 14

▶ Simulated View

▼ Simulated Person

Day - Ideal Dark With IR

82.1 ppf
↑ ↓
95 ft
Away

Warning: results may vary depending on light and camera

Two simulated person images. The left image shows a person in daylight with a license plate 'JFM-8620'. The right image shows the same person in dark with IR, also with a license plate 'JFM-8620'.

▶ Cabling to Network Closet

▶ Blind Spot

▶ Advanced: Lens, IR

▶ Location, Description, Notes



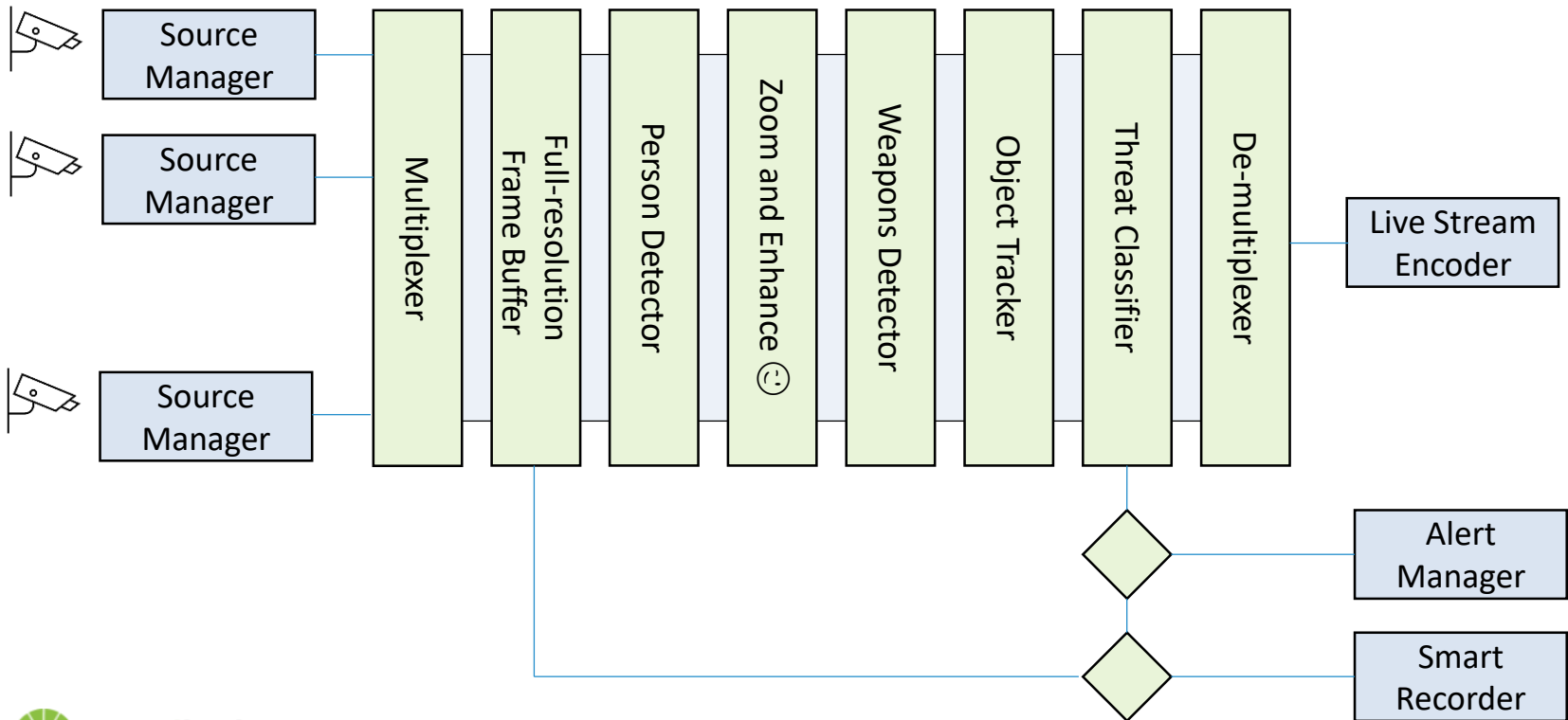
Customer needs:

- Needs to be simple, low IT impact
- Process 55 cameras at 1080p
- Plug and play, set it and forget it

Design challenges:

- Small and quiet (no server rack)
- Low-cost (\$1,500 retail)
- Commodity CPU/GPU

Technical Challenges: GPU Pipeline



- **Sources of interference:**
 - **Packet loss:** bad switch, network congestion, MTU packet size (VPN or VLAN), etc.
 - **Camera settings:** low bitrate, outdated firmware, unhelpful “smart encoders”, missing timestamp information
 - **Decoding:** missing packets, high jitter, mislabeled packets, bad frames
- **Customer may not want to increase framerate or resolution due to cost of storage**

Technical Challenges: False Alarms

Improving false alarm rate without losing accuracy

- Use a tracker: helps to ensure you're evaluating the same object frame to frame
- Heuristics: don't rely on the raw confidence levels from the neural network



- Early market challenges – lots of end user education and technology demonstrations
- Proof of concepts required in early days
- Long procurement cycles, not a budgeted technology
- Overcoming stigma of AI – AI for Good

Real-World Impact / Routinely Detecting Guns

Subject Arrives

5:05pm

5:09pm

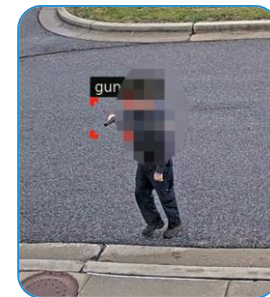
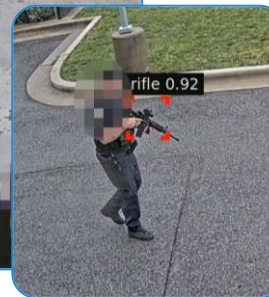
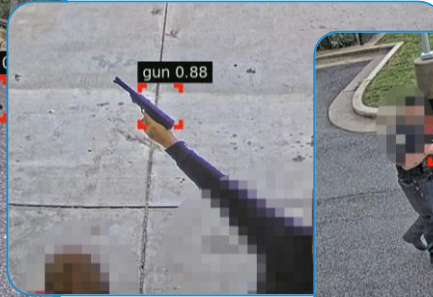
5:13pm

Situation Deescalated

1st Weapon Detections
11s – Omnilert Verification

2nd Weapon Detections
9s – Omnilert Verification
Alert to Point of Contact
First Responder Dispatch

Police on Scene
Omnilert Monitor with
Dispatch
Officers made aware it is
likely a BB gun



Conclusion

- **Visual gun detection is protecting people today**
- **Countless numbers of guns are routinely detected**
- **High accuracy with managed monitoring makes this a widely deployable solution**

Ecosystem Needs

- More decoding capacity within GPUs to alleviate bottlenecks
- More edge processing power for complex on-camera analytics to simplify deployment

Technology questions?

- Email: cgreen@omnilert.com
- LinkedIn: @chadtgreen

Product interest?

- <https://omnilert.com>
- Email: info@omnilert.com



Download Our Overview

omnilert.

ACTIVE SHOOTER PROTECTION

The Only AI Visual Gun Detection Solution with Automated Response and Emergency Notification

A hand holding a handgun, with a grey AI detection overlay showing a bounding box around the gun and a red crosshair. A QR code with the Omnilert logo is overlaid at the bottom.

Read Our Blog

evolv.

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A monitor displaying the Evolv software interface, showing a person in a uniform walking in a hallway. A QR code with the Omnilert logo is overlaid at the bottom.

Evolv Integrates Omnilert's AI Gun Detection Technology into Evolv Extend to Help Keep Customers Safe from Active Shooters

New product offering combines leading AI technologies for concealed weapon and brandisf

Start Re