Development of an intelligent camera for first responders

EXECUTIVE SUMMARY

This project centers on the development of an intelligent camera proof of concept to assist law enforcement in the field when searching for objects or people. This is a collaboration between Motorola Solutions, the leading provider of mission-critical communication solutions and services for public safety and commercial customers, and Neurala, which creates deep learning artificial intelligence solutions. The goal of the intelligent camera is to help law enforcement be more effective by adding "more eyes" to searches as well as reducing effort and distraction for the officers, who can then concentrate on other tasks.

THE CHALLENGE

Public safety requires quick-responding capabilities and a "situational intelligence" partner

Seconds count. When first responders are in the field looking for a lost child during an Amber Alert, a suspect or a suspicious object, they cannot afford to waste time. They need fast-responding technology that seamlessly detects, identifies and delivers actionable information in real time.

KEY ISSUES

Quickly learning new objects

Each time an officer needs to search for new information, such as the description of a person or object, there is often insufficient time to retrain an entire AI system. New information must be learned quickly by the AI software at the edge and without direct intervention or action by the first responder.

Latency

Even the few seconds it takes to send and receive information over the wireless network can be too long during a search. First responders operate in real time and capture large amounts of video, or data, on their body-worn cameras. Information must be analyzed quickly, without using large amounts of network bandwidth. Running the first round of analysis at the edge could free up bandwidth and improve performance.

Catastrophic forgetting

One problem limiting the growth of deep learning neural networks for real-time use is catastrophic forgetting. In order to perform in a real-time environment helping first responders, learning must occur at the edge, on the intelligent camera, without the system forgetting previous training.

SOLUTION

Neurala's patent-pending Lifelong Deep Neural Network (Lifelong-DNN)™ mimics in software the process of learning a new object commonly used by humans in their everyday activities. Unlike other deep neural network technologies, Lifelong-DNN can be pre-trained to recognize objects of interest, without expensive and time-consuming server training. This cutting-edge capability can run directly on a smartphone, tablet or purpose-built public safety device, such as the Motorola Solutions Si500 body-worn camera, to create a flexible solution for mission-critical environments where at-the-edge learning is crucial.

Quickly learning new objects

Neurala's AI brain allows new items to be identified in the field, in real time, and then relayed back to the server. Learning "on the fly" allows new classifiers to be built quickly, and the learned information can also be deployed to other officers' cameras, multiplying the number of "eyes and ears" in the field.

Improving latency

The intelligent camera performs the first round of analysis at the edge to ensure only potential matches are sent on to the cloud or server for further analysis. This means video is analyzed in real time, and results can be found more quickly. Officers can continue to perform mission-critical tasks and make decisions, all while searching for the person or object of interest.

Catastrophic forgetting

Neurala's cutting-edge AI technology not only allows new items to be learned quickly but also will not forget previously trained items. Officers can train as many objects of interest "on the fly" as needed, providing reliable detection and monitoring across a wider area.

> **"We looked at many companies to help us explore different applications of artificial intelligence for public safety, and Neurala had the neural network technology we were looking for. Neurala's at-the-edge learning is critical to a variety of applications, such as finding a lost child in a crowd."**
>
> – Paul Steinberg, Motorola Solutions chief technology officer

KEY BENEFITS

Intelligent, Predictive Training and Brain Building - effortlessly train, create and deploy enterprise-specific solutions on any device

LIGHT ON THE EDGE

Hardware agnostic, metrics below running on following GPUs

Hardware: Adreno 540 and Snapdragon 835 chipset

Memory: 60 MB, with 5 pre-trained objects

Frames per Second: 6

INCREMENTAL "ON-THE-FLY" LEARNING

Objects of interest, defined by officer, can be trained in real-time