# Asking a Machine to Spot Threats Human Eyes Miss

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Cambridge, Mass. (AP) -- The surveillance cameras at Big Y, a Massachusetts grocery chain, are not just passively recording customers and staff. They're studying checkout lines for signs of "sweethearting."

That's when cashiers use subtle tricks to pass free goods to friends: obscuring the bar code, slipping an item behind the scanner, passing two items at a time but charging for one.

There simply aren't enough watchful human eyes to keep it from happening. So Big Y is using technology to block it — with implications far beyond dishonest cashiers.

Mathematical algorithms embedded in the stores' new security system pick out sweethearting on their own. There's no need for a security guard watching banks of video monitors or reviewing hours of grainy footage. When the system thinks it has spotted evidence, it alerts management on a computer screen and offers up the footage.

The possibilities that researchers envision for this kind of technology have the ring of science fiction. Think of systems that spot abandoned packages on a train platform or alert an airline crew to a potential terrorist on board. Already, cities like Chicago have invested in "anomaly detection" cameras around town, linked to emergency headquarters. The city plans to announce this week that it is using the technology at Navy Pier, one of Chicago's best-known attractions.

But just how smart have these cameras really become? "Some of the claims that are made are just ridiculous," says Oliver Vellacott, the chief executive of IndigoVision, a British company that makes video-analysis technology. "That you're going to spot suspicious behavior in people about to stab someone on the street."

Big Y's security system comes from a Cambridge, Mass.-based company called StopLift Inc. The technology works by scouring video pixels for various gestures and deciding whether they add up to a normal transaction at the register or not.

In the middle of a six-month trial, Mark Gaudette, Big Y's head of loss prevention, decided he'd seen enough and began rolling out the system in all of the chain's 58 locations.

"We realized that we had a problem with training," Gaudette said, explaining that in many cases cashiers didn't realize they were missing the scanner. "Most folks are

just distracted."

He would not say how much the company is spending on the technology, but said he expects to save up to $3 million a year by using it.

As a test case, Big Y's success may be misleading. Cameras in grocery stores have a limited area to keep an eye on. They look for only a few sets of defined behaviors that may signal a cashier is not charging the customer. And they don't have to catch every thief to save a store money.

The task grows much more complicated if you're trying to, say, spot the one hijacker among a plane full of innocent passengers.

Yet that is entirely possible, according to some researchers. Dr. James Ferryman leads a team at Britain's University of Reading that joined a European consortium last year with just that goal in mind. The European Union put up part of the funding.

Using a mock-up of an Airbus, the researchers tested camera systems that would identify threats inside passenger planes. Some of the cameras on board, Ferryman said, focused on a passenger's face and upper torso, looking for telltale signs that someone may be up to no good — heavy sweating, for instance.

A central computer would take on the job of compiling data from the cameras — and from audio sensors and the plane itself, among other sources — and deciding whether a credible threat existed before alerting the crew.

But giving a camera the ability to sniff out unruly behavior or what Ferryman called "the potential beginnings of a terrorist action" requires accounting for a huge number of variables that could affect passengers' behavior. Is the plane on a short domestic flight or a 12-hour trans-Atlantic haul? Are there mostly business customers on board or families headed for a vacation? Is the plane landing or taking off?

"A threat in one particular situation may not be in another," Ferryman said. "You don't want a system where the cabin crew is constantly being given false alerts."

For all of the complexity, Ferryman said the testing done so far leaves him confident that automated threat detectors will emerge — assuming regulations would prod airlines into paying extra for planes outfitted with the systems.

Officials in Chicago are already sold on the idea that cameras can detect a variety of threats. The city announced plans in 2004 to build a more intelligent surveillance system, using cameras to tip off police about possible terrorist threats such as an abandoned package or a truck circling a skyscraper.

IBM Corp. installed the technology last year. It's now out of the pilot stage and connected to hundreds of cameras around the city. The system can make sense of data captured by separate cameras. For instance, one camera sees a car coming to a stop and another reads its license plate, and the system tells city officials a BMW

belonging to John Doe just illegally parked on Michigan Avenue.

Privacy watchdogs have raised concerns. Is surveillance less invasive when a computer rather than a human is doing the watching? The Illinois chapter of the American Civil Liberties Union says the answer is unclear, because the public has little evidence the system really works or that checks are in place to prevent abuse.

"What we'd really like to see is more public input into the whole process — that before there are new systems or cameras put online, there is a way for the public to have real, meaningful input into whether this system is desirable, or effective or nonintrusive," said Ed Yohnka, a spokesman for the Illinois ACLU.

Ray Orozco, Chicago's head of emergency management, is cagey about offering details. He said he can't reveal specific threats the system may have detected, for fear of compromising security. He emphasized that no camera in the city offers any view that couldn't be seen from a park bench.

"The individuals out there that pay taxes, they want the cameras," Orozco said. "We haven't had anyone come and say, 'Take the camera out of my neighborhood.”

As for its effectiveness, Orozco has few doubts. In fact, Chicago is expanding the technology's reach. At Navy Pier, the city is training the same capability on the surrounding waterway, with alerts for unauthorized boats in restricted areas.

"My expectation is it's going to keep Chicago as safe as any big city can be in the U.S.," Orozco said.

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