Smart camera tech that could automate cars, home, security settings

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A startup that licenses Purdue University technology has created a deep-learning camera and hardware package that can be taught to recognize objects or perform tasks that could be used in security, automotive, industrial and defense applications.

Eugenio Culurciello, associate professor in the Weldon School of Biomedical Engineering and co-founder of TeraDeep, said deep-learning technology is inspired by the human brain.

"TeraDeep is commercializing a very popular scientific tool that is based on large neural networks to learn and understand data, like the content of images and videos, the same way humans do," he said. "The technology can be trained to perform a certain way by watching similar videos or being shown examples. Users can apply rules to enable it to detect a certain action or object and even recognize individual faces."

TeraDeep licensed the technology through the Purdue Research Foundation Office of Technology Commercialization. The company also is a client of Purdue Foundry, an entrepreneurship and commercialization hub located in the Burton D. Morgan Center for Entrepreneurship at Purdue. More than 20 startups based on Purdue intellectual property were launched in the 2015 fiscal year.

Culurciello said TeraDeep's technology gives machines the ability to see the environment around them. He said it could be applied to any industry that needs to process large numbers of images or videos.

"One of the biggest applications for our technology could be in the automotive industry. Automotive manufacturers are trying to make car segments semi-autonomous, which could lower the risk of accidents due to human error. Our technology is able to bring a processing capability to a vehicle, perceiving the outside environment and taking action based on certain elements, such as identifying pedestrians, navigating and ensuring security," he said. "Another application could be changing how a device performs depending on who is operating it. This could mean changing television settings based on whether a child or adult is watching, or automatically adjusting the temperature based on occupancy in a room."

Culurciello said traditional camera systems aren't as sophisticated as the TeraDeep technology.

"Current systems have problems distinguishing between things such as humans and pets because they detect only movement instead of a particular object or person. These systems have a large number of false alarms and have to record huge amounts of video to determine if there is a threat, which wastes time and resources," he said. "Our system records the segments only where a person or object that the client wants to identify is present. It can also allow for smart locks, giving people access to different locations based on facial recognition."

TeraDeep uses its own hardware system so footage can be processed faster with more privacy than conventional methods.

"Video that is captured on current camera systems usually is streamed in the cloud, and people hosting the server look at the video and process the parts that are interesting so users don't have to look at hours of footage. This method has no means to protect privacy and can take hours," Culurciello said. "TeraDeep utilizes an accelerator-embedded hardware system rather than software and the cloud. This means footage can be processed locally, privately and more timely, so that it can raise an alarm

almost immediately without relying on the cloud or cell phones."

TeraDeep has received interest from the automotive industry and various defense industries.

Culurciello said TeraDeep, which has offices in Santa Clara, California, and West Lafayette, Indiana, is looking to develop its technology further and establish relationships in industrial sectors.

"We would like to make our own microchip or license our own microchip so everything would run faster and better. Partnerships with both server and hardware entities would allow us to do that," he said. "We are also open to securing partners in the security and or automotive industries while growing our offices."

Provided by Purdue University