Researchers advance biometric security

Neural network mimics the brain for improved decision-making in biometric security systems

Researchers in the Biometric Technologies Laboratory at the University of Calgary have developed a way for security systems to combine different biometric measurements—such as eye colour, face shape or fingerprints—and create a learning system that simulates the brain in making decisions about information from different sources.

Marina Gavrilova, the founding head of the lab—among the first in the research community to introduce and study neural network based models for information fusion—says they have developed a biometric security system that simulates learning patterns and cognitive processes of the brain.

Biometric information is becoming more common in our daily lives, being incorporated in drivers' licenses, passports and other forms of identification. Gavrilova says the work in her lab is not only pioneering the intelligent decision-making methodology for human recognition but is also important for maintaining security in virtual worlds and avatar recognition.

"Our goal is to improve accuracy and as a result improve the recognition process," says Gavrilova, a professor in the Faculty of Science. "We looked at it not just as a mathematical algorithm, but as an intelligent decision making process and the way a person will make a decision."

The algorithm can learn new biometric patterns and associate data from different data sets, allowing system to combine information, such as fingerprint, voice, gait or facial features, instead of relying on a single set of measurements.

The key is in the ability to combine features from multiple sources of information, prioritise them by identifying more important/prevalent features to learn and adapt the decision-making to changing conditions such as bad quality data samples, sensor errors or an absence of one of the biometrics.

"It's a kind of artificial intelligence application that can learn new things, patterns and features," Gavrilova says. With this new multi-dimensional approach, a security system can train itself to learn the most important features of any new data and incorporate it the decision making process.

"The neural network allows a system to combine features from different biometrics in one, learn them to make the optimal decision about the most important features, and adapt to a different environment where the set of features changes. This is a different, more flexible approach."

The research has been published in several journals, including *Visual Computer* and *International Journal of Information Technology and Management*. The work was also presented at the CyberWorlds and International Conference on Cognitive Informatics & Cognitive Computing in Banff in 2011.

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