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The cyber sleuth

DePaul computer scientist develops system to help Chicago Police Department solve serial crimes

By Patrice M. Jones
Tribune staff reporter

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Tom Muscarello has the gravely voice and dry wit that conjures up an image of a hardened police detective.

And he certainly seems to spend a great deal of his time contemplating the morbid intricacies of the criminal mind. "Most criminals are creatures of habit," Muscarello said recently, shuffling through data by light of his computer screen. "Typically, a thief does not just rob once. He will rob a different person every week of the year without fail. He will hit old ladies every Social Security day. It is his job; his occupation."

Muscarello, the man who can reel off a criminal profile like a pro, himself has an unusual occupation: He is, in fact, a cyber sleuth.

A veteran DePaul University computer scientist, Muscarello has been working since the mid-1990s on perfecting an artificial intelligence system that is aimed at helping the Chicago Police Department blaze a bold new trail in the way it solves serial robberies, rapes and other violent crimes.

And he just might have hit pay dirt.

The computer system, called the Classification System for Serial Criminal Patterns (CSSCP), is expected to begin live trials at the Chicago Police Department as soon as early next year.

Developed by Muscarello with DePaul researcher Kamal Dahbur, CSSCP uses pattern-recognition software that acts like a superhuman brain.

The computer system will be able to cull massive amounts of data, pulling out details of individual crimes, such as the assailant's age, sex, height, location of the crime, weapons and vehicle used, to create a criminal profile that can be compared with others.

The goal is to help overcome a thorny problem in police work -- the fact that detectives can have difficulty linking serial cases.

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The system also will have the potential to search through words or phrases in police reports, such as a criminal who wears "green military fatigues" or one who says "give it up" every time he robs a bank.

It can work 24 hours a day without human intervention, sorting through thousands of criminal records per second, revealing patterns in seemingly unrelated crimes that a mere mortal could miss.

"It could revolutionize the way [the Chicago Police Department] does police work," said Charles Padgurskis, former director of information systems for the Chicago police, who has worked with Muscarello since the research project was launched a decade ago. Padgurskis retired from the CPD last May.

"[The system can tell us], for example, these six cases have the same characteristics so that we can attribute them to one offender," added Steve Maris, the Chicago police's current representative for the project and the acting assistant director for information services.

Cracking serial crimes has long been especially tough for law enforcement since the crimes can occur over a long stretch of time, a widely dispersed area (involving different police districts within a city or separate police departments) and may even have differing criminal patterns in each incident.

"We decided to try to build a system that is intelligent enough to do what the best detectives are already doing," said Muscarello, who explored the techniques of six top Chicago detectives during the initial stages of the study. The cyber sleuth DePaul computer scientist develops system to help Chicago Police Department solve serial crimes A veteran DePaul University computer scientist, Muscarello has been working since the mid-1990s on perfecting an artificial intelligence system that is aimed at helping the Chicago Police Department blaze a bold new trail in the way it solves serial robberies, rapes and other violent crimes. Computer system may help police solve serial crimes or DePaul computer scientist joins forces with Chicago police or DePaul researcher may help Chicago police crack serial crimes

In a recent study using three years of Chicago police robbery data (not active cases), the CSSCP system -- which uses a computer network particularly suited for this type of inquiry called a Kohonen neural network -- detected at least 10 times as many related crimes as a team of detectives with access to the same data.

Muscarello, who started his career as a federal investigator of Medicare fraud, has garnered national attention since the research project was published last year. He said he has gotten calls from law-enforcement representatives across the globe, even from as far away as Australia.

Still Muscarello cautions that the new system could enhance, not replace, solid criminal investigations.

Discovering a criminal's internal script -- whether it is a rapist who usually strikes young women at night on the Near West Side or a bank robber who uses a trademark phrase -- is the genius of the best detective work, Muscarello said.

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Other computerized crime-analysis systems exist, but the CSSCP system is unique because it can search for patterns without the help of a computer operator or programmer.

The system can give alerts when patterns of criminal activity emerge and can potentially alert law

enforcement to begin an investigation of serial crimes long before they are detected in the normal course of an investigation.

"Nobody today in 2005 has come up with a program that has done what this network can accomplish," Padgurskis said.

Muscarello, 55, who grew up in a working-class family in Rogers Park, says using technology to solve problems has long been a major focus in his career.

He graduated from the University of Illinois at Chicago in 1971 with a degree in biology. And after wading his way through various jobs -- including a stint as a federal investigator -- he got a master's degree in computer science at DePaul.

Later, Muscarello earned a doctorate in computer science and electrical engineering at UIC.

David Miller, acting director of DePaul's school of computer science, telecommunications and information systems, said: "This is all interesting since I would not say that [Tom] is a well-known researcher. But what Tom is really good at is making connections with people in industry and solving problems for them."

"I don't do books," Muscarello said, somewhat proudly. "I have done chapters in books. But the people I know who have done books, they take years doing it and then the book comes out and already in the computer science world, the research is old. My focus has always been looking at ways to use technology to solve problems."

With his time split between research, teaching and various administrative roles, Muscarello says he has little time for hobbies. But in a strange twist of fate, the man who now focuses on finding better investigative tools for law enforcement once worked for a short time as a mechanic in the Chicago Police Department garage. It was a time when Muscarello was finding himself, he said.

"Isn't that strange?" Muscarello said. "From fixing cars to this."

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Tom Muscarello

Age: 55

Raised: West Rogers Park

Education: bachelor's degree, biology, University of Illinois at Chicago, 1971; master's, computer science, DePaul University, 1985; doctorate, computer science, UIC, 1993

Career highlights: federal investigator, specialty, Medicare fraud, 1977-83; consultant, information systems, 1983-1992; currently associate professor, along with various administrative roles, DePaul University.

Family: Wife, Bernadette.

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