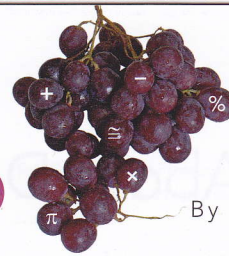# The mathematical VINEYARD

By Susan Hickman

John Oommen enjoys a glass of wine with his dinner as much as the next person. But now that he has met with representatives of the Chilean Wine Industry (CWI), what swirls in his glass has taken on new meaning.

Mathematically minded for as long as he can remember, and the first person ever to attain the rank of Fellow of the International Association of Pattern Recognition (IAPR) in Ontario, Oommen is confident that he and his Chilean graduate student César Astudillo can automate some wine production processes, and assist in many wine- and grape-related decision processes for the wine industry in Chile. His toolkit includes techniques he has learned and developed for other applications.

"Pattern recognition principles," explains Oommen of Carleton University's School of Computer Science, "have been applied to such issues as breast cancer tumours, the classification of species, speech recognition and spam determination, but have rarely been used for wine-related problems."
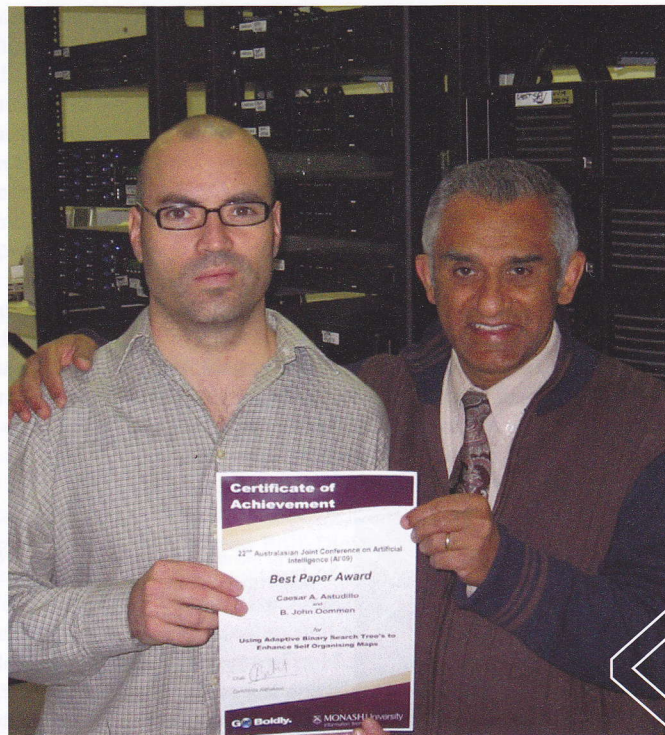
Thus, when the CWI delegation came to Canada last November to look for solutions to having to move their grape plantations further south due to global warming, Oommen, with seed money from Interim Dean of Science John Armitage, stepped in to help.

Along with his student, Astudillo, originally from the University of Talca in Chile, he presented to the Chilean team, which included the ambassador of Chile, the Chilean scientific attaché and a chief scientist from Agriculture Canada, some potential solutions and ideas for future collaborative efforts to improve wine production in the South American country.

Oommen's research has been extremely productive in academia and in industry collaborations for more than 30 years. He has reaped some of the highest awards in his field of

artificial intelligence and pattern recognition since he joined Carleton University's School of Computer Science in 1981. He is also one of only a handful of scholars to attain the rank of Fellow of the Institute of Electrical and Electronic Engineers (IEEE)—for his work in artificial intelligence and pattern recognition—and, since 2006, he has been one of Carleton's select Chancellor's professors.

The foundations of a paper he co-authored with Astudillo, which won

Oommen (right) and his graduate student, César Astudillo (left), with their Best Paper Award won at last year's annual conference on Artificial Intelligence in Melbourne, Australia.

the Best Paper Award at last year's annual conference on Artificial Intelligence in Melbourne, Australia, will enable future work with the CWI.

"The idea is very simple," he explains. "Pattern recognition can be used for numerous problems. It essentially involves making well-founded inferences based on measurements called *features*. The inferences are based on formal mathematical principles, which involve numbers, symbols or the structure of the patterns being recognized."

Oommen became fascinated by the field of pattern recognition while studying electrical engineering in India in the 1970s. After obtaining his

master's of engineering in India, he pursued a master's in science and a doctorate in electrical engineering at Purdue University in Indiana.

Initially, Oommen and Astudillo intend to apply pattern recognition strategies to determine the type of grape best suited for a specific location, based on characteristics of the soil and the types of grapes grown in neighbouring vineyards. Their project will also help the wine producer decide whether a wooden barrel or a stainless steel container, for example, is optimal for a specific grape and wine.

Oommen and Astudillo's project will also provide the CWI with a system that can *simulate* the art of wine tasting.

"The system will make decisions about the quality of the wine, just as an experienced winemaker would," Oommen explains, "thus augmenting the decision of the wine taster, helping streamline and automate the wine tasting process, and hopefully assisting in training the next generation of wine tasters."

As Astudillo completes his doctoral studies this year and returns to Chile as a professor instructor in Talca's computer science department, Oommen foresees an ongoing collaboration.

"We can go on to look at market-related problems," suggests Oommen, "and develop a system that can advise how best to combine grapes and wines into a blend that satisfies customers from specific locations. There is a huge market for wine in China and India and I am quite confident that in the future, we can develop a system for the CWI that can advise on the optimal combination of grapes and wines to best satisfy the good taste of customers."