The Villanova Center for Analytics of Dynamic Systems

In spring 2015, Dr. C. Nataraj launched the Villanova Center for Analytics of Dynamic Systems (VCADS), which will focus on the development of new tools and techniques for the analysis of dynamic systems with applications in engineering, medicine and finance.

“Our increasingly interconnected and sensor-filled world generates a profusion of big data,” explains Dr. Nataraj. “VCADS was formed to determine how best to make use of this data to divine the underlying dynamics for analysis, diagnostics, prognostics and health management.”

VCADS possesses a unique set of tools that seek to forge an optimal synthesis of nonlinear science and machine learning. “Its diverse areas of application offer an exciting vista of opportunities,” notes Dr. Nataraj, who expects the center to make many fundamental advances in this field.

In addition to a natural synergy with the College of Engineering’s existing research centers, VCADS expects to work closely with the Center for Business Analytics in the Villanova School of Business, and for Statistics Education in the College of Liberal Arts and Sciences. The center will be headed by Dr. C. Nataraj with collaborating faculty from departments of engineering, math and business.

Putting the Brakes on Greenhouse Gases

A t Villanova University Associate Vice President for Research Alok Gopinath, PhD, “Laudato Si®: On Care for Our Common Home” — the encyclical on global warming—an amazing document that reads like it could be our mission statement! It startles us with an unexpected answer.

“The best way to understand what we’re doing at the ES2 Center is to read the Pope’s encyclical on global warming—an amazing document that reads like it could be our mission statement!”

According to Dr. Ortega, the 194-page papal encyclical (published June 18 under the title “Laudato Si’: On Care for Our Common Home”) contains a passionately intense and beautifully written argument in favor of taking immediate steps to begin reducing needless energy consumption in order to help stem the threat from global warming.

That is precisely the goal of ES2—a National Science Foundation Industry University Cooperative Research Center that commonly includes dozens of engineering researchers at four American universities (Villanova, SUNY-Binghamton, Georgia Tech and the University of Texas, Arlington). A widely published expert on the management of thermal data inside U.S. data centers and the director of the Villanova ES2 program, Dr. Ortega says he’s feeling “very hopeful about the way that more and more university engineering researchers are combining their expertise to reduce energy demands and cooling inefficiencies at our massive data centers, which contribute heavily to the greenhouse gases that trigger global warming.”

In order to begin reducing consumption of electrical energy and waste heat at data centers—often the most complex, the Villanova ES2 lab program is hard at work “researching and devising ‘smart systems’ that can use electricity more efficiently and prevent the waste through loss of heat that often occurs with computer usage.”

The Villanova ES2 team—which now includes more than a dozen researchers, from undergraduates to faculty members—has been a highly visible leader in the consortium in recent years. Among the most promising of the Villanova center’s projects is a bread-based effort to develop computational and experimental models to improve cooling methods at big-data centers, and a complex thermodynamic study aimed at “Waste Heat Recovery and Reuse.”

ES2 Villanova Highlights

• ES2 has four active member projects worth $200,000.
• Villanova partners include: Comcast, Emerson Network Power, Verizon, Steel ORCA, QuantaCool Corporation and DVL Group.
• One post-doctorate, seven PhD candidates, three master’s degree students and four undergraduates are involved in ES2 research.