Meet Rutgers' RADICAL supercomputing guru

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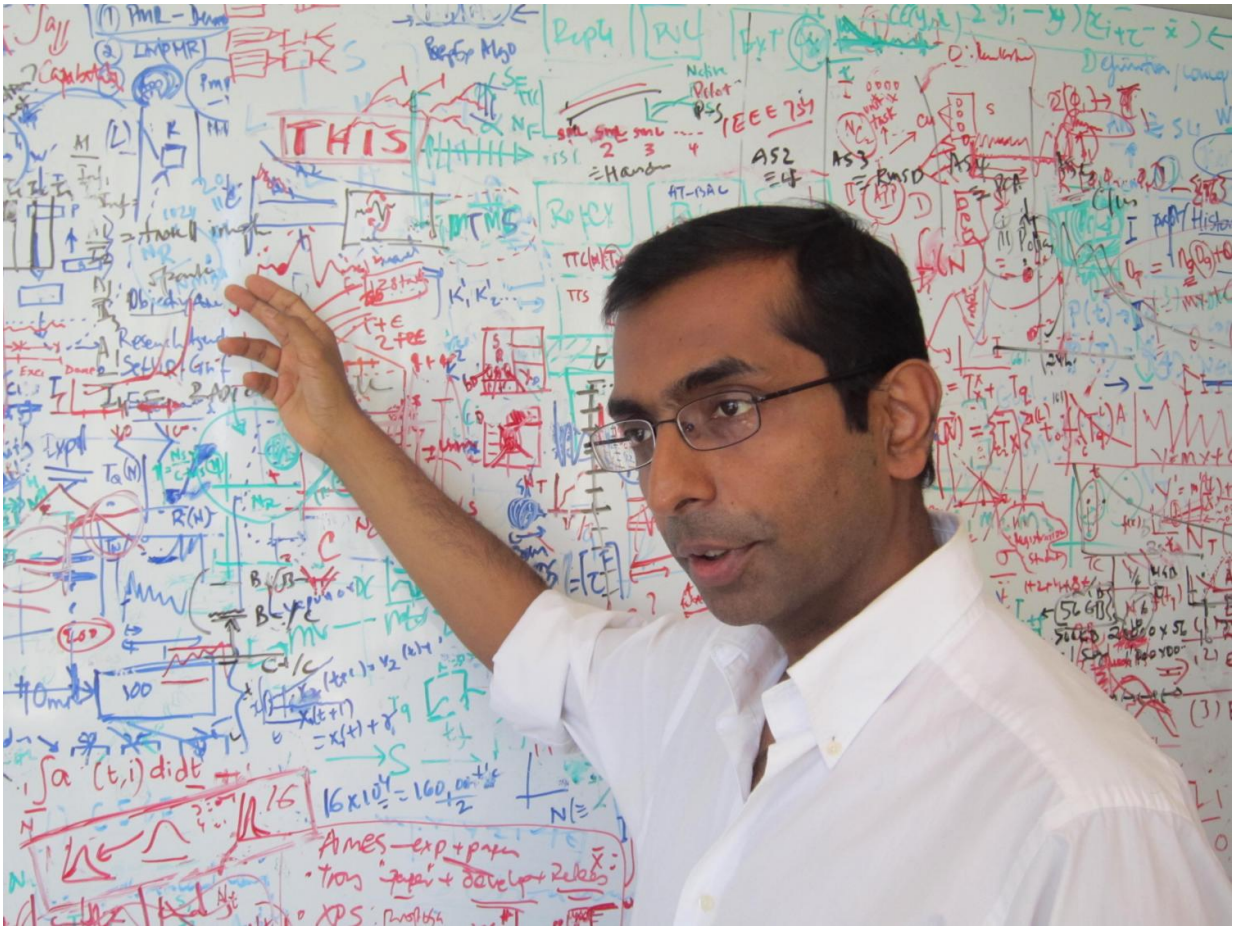

Rutgers Professor Shantenu Jha wants to enhance personalized medicine. Credit: John Scafidi

Shantenu Jha is a RADICAL man.

The Rutgers professor wants to enhance personalized medicine, global health, science and engineering through high-performance computing.

Jha and his RADICAL (Rutgers Advanced Distributed Cyberinfrastructure and Applications Laboratory) team operate at the crossroads of computing and science, and their work has benefited research in the molecular sciences, polar sciences and high-energy physics.

Jha's expertise earned him a summer invitation to The White House, where he attended a workshop organized by its Office of Science and Technology Policy.

"I think there was agreement that the role of high-performance computing is paramount in solving societal problems and enhancing the competitiveness of the nation in the rest of the 21st century," said Jha, an associate professor in the Department of Electrical and Computer Engineering in the School of Engineering. "High-performance computing is making the impossible problems possible and making the barely possible routine."

In the five years since Jha arrived at Rutgers and formed the RADICAL team, it has made major advances in the design and implementation of distributed computing. That means harnessing more than one supercomputer or many smaller computers to solve problems. The team also conducts research on cyberinfrastructure (the computing infrastructure to support science and engineering); middleware (the software that supports calculations and smooths the transfer of data between computers); and software for science and engineering.

This summer, the National Science Foundation (NSF) announced a

$19.4 million grant to create the Molecular Sciences Software Institute, with Jha as a co-principal investigator and scientists at seven other universities led by Virginia Tech.

Software developed by the institute will boost understanding of molecules and chemical processes, improving the health of citizens and security and growing the national economy, the NSF says.

"What we hope to do is to try to solve problems that the research community just cannot solve on their own," Jha said. "We don't solve the drug design problem, for example, but we provide the tools and understand the computing requirements to help solve them."

Two years ago, using the National Science Foundation-supported Kraken and Ranger supercomputers, Jha and scientists at University College London pinpointed the shape of a key protein involved in a patient's HIV infection. They later ranked the drug molecules most likely to block the infection, according to the NSF.

The project showed how researchers might use supercomputers and genetic sequencing techniques to tailor drug treatments for patients in close to real-time. Experts expect this to become routine in the future.

Jha, a visiting scientist at University College London, is part of a European Union CompBioMed project that's using high-performance computing for personalized medicine.

Jha's research has been funded by multiple National Science Foundation awards as well as grants from the National Institutes of Health, U.S. Department of Energy, and Engineering and Physical Sciences Research Council in the United Kingdom. He is the principal investigator or co-principal investigator for more than 10 federally funded projects in supercomputing and high-performance computing. He's leading a new

$1.25 million National Science Foundation-funded project with Penn State and Princeton researchers to advance high-performance computing analysis of climate data and modeling of seismic hazards.

"It keeps me out of trouble, as I jokingly say," said Jha, a native of northern India who grew up mostly in Great Britain and lives in Highland Park, New Jersey. He earned a Master of Science degree from the Indian Institute of Technology Delhi in 1995 and a doctorate from Syracuse University in 2004.

Jha has received numerous honors, including a National Science Foundation CAREER award, several supercomputing awards, a 2014 Rutgers Board of Trustees Research Fellowship for Scholarly Excellence and a 2016 Rutgers Chancellor's Award for Excellence in Research.

"What I'm most interested in, where I see the next 10 years of my life, is taking high-performance computing into the domain of medicine," Jha said. "All the work I'm doing in molecular science is a stepping stone toward that work. I think that's where we see computing really make a societal impact at a level unseen before."

Narayan Mandayam, a distinguished professor who chairs the Department of Electrical and Computer Engineering, said he is extremely pleased with all the great things that Jha is doing. "Shantenu's participation in the Molecular Sciences Software Institute is fabulous for Rutgers," Mandayam said. "I think it's putting us very prominently on the map."

Provided by Rutgers University