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Computer science professor wins Microsoft award

Radhika Nagpal's research focuses on creating self-repairing systems
Meera Rajagopalan

CAMBRIDGE, Mass. - Radhika Nagpal, an assistant professor of computer science at Harvard University, is trying to make machines more like humans. Nagpal's research-engineering self-organizing, self-repairing systems using inspiration from how our body repairs itself- has made her one of the first five recipients of the \$200,000 Microsoft New Faculty Fellowship award. A pool of Microsoft researchers whittled down the 110 nominations to 20, who were further subject to a review after which 11 made the cut. The finalists were then invited for an interview and presentation session, after which the winners were decided. "It's very very exciting to get some support from Microsoft," says Nagpal. "This is huge for new faculty. Grants like this are key to being able to pursue new research." Nagpal, who is interested in distributed systems with a large number of parts, is trying to figure out how to program the system so that they can organize and reorganize themselves. Her research is inspired by the way cells behave. For example, with several short-range wireless networks, how can you program something so that once a specific part fails, the system can repair itself? "Applications would be in sensor networks and robotics and distributed networks," Nagpal says. The other part of her research deals with understanding the way cells organize themselves to form complex structures - for example, how small genetic changes can effect large changes in organisms. Nagpal's overall goal is to provide a framework for self-organizing systems by combining traditional computer science techniques (for managing complexity) with biological models (for robustness at the local level). Associate dean for the department of computer science and engineering at Harvard University, Margo Seltzer, says that Nagpal's research comes at an appropriate time. "We are quickly building systems that are so complex that no one understands them," Seltzer, who nominated Nagpal for the award, says. "Radhika's research goes in the other direction: she takes simple things and creates complex behavior from them. This could be one of the more important breakthroughs in this field." With almost no formal training in biology, Nagpal spent a year at Harvard Medical School's systems biology department, before she joined Harvard's computer science department. At HMS, she learnt more about experimental techniques and cell genetics, specifically how decisions at the cell level contribute to system-level properties. "It [Nagpal's research] is somewhat high risk, but offers the possibility of high payoff. It's some of the most exciting work I've seen in some time," Seltzer says. Nagpal enjoys teaching, and thinks it is the perfect counter balance to research. "It [teaching] is immediately gratifying. I see students grasp my lectures, and understand. I see their faces light up when I explain something, and I think, "Wow! I just taught them something." They are the generators of future ideas," she says. Nagpal says she learns from the students as much as they do from her. Her research group consists of two graduate students now, and is starting to grow. Nagpal received her bachelor's and master's degrees and doctorate, all in computer science, from the Massachusetts Institute of Technology. Nagpal, who lived in the United States till she was 8, before her family moved to Amritsar, India, returned to the United States when she was 18. She worked with Bell Labs for a year, before returning to Cambridge to work on her doctoral degree. "It's hard to leave Cambridge," she says. "There is a tight-knit intellectual community out here." Nagpal was an active member of the online community, Chowk, for which she did the artwork. The founder of the Website was her friend, Umair Khan, who was Pakistani, and Nagpal was struck by their cultural similarities. "I realized that lines are just lines, and people on both the sides of the border would have the same misconceptions. In fact," she says, "Our grandparents' stories would also sometimes turn out to be the same." The Web site has grown by leaps and bounds since then, and Nagpal is aware of how international it is when someone tells her while talking about her research, "By the way, I read Chowk." Married to Quinton Zondervan, a scientist with IBM, Nagpal has two children, a girl, 5 and a boy, 2. With all that's going on in her life, Nagpal tries to design activities so that the whole family can participate. She is painting a collage with her daughter right now. "If you can do something that you love, and also involve her in it, that's perfect," Nagpal says. She was earlier involved in the MIT Bhangra Club as well. Where does she find the time for all her activities? "The challenge for me is to fit all the things I want to do into the time available. If only there were a couple of extra hours in a day," Nagpal says.



Nagpal

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