



**INNOVATION:**



**PRIMING THE GLOBAL TALENT PIPELINE**



Microsoft  
**Research**



External Research Division

“We want to do everything we can to equip a new generation of technology leaders with the knowledge and tools they need to harness the magic of software to improve lives, solve problems and catalyze economic growth.”

—**Bill Gates**  
*Chairman, Microsoft Corporation*

**INNOVATION: PRIMING THE GLOBAL TALENT PIPELINE**

“Our goal at Microsoft Research is to advance the state of the art in technology and through that advancement contribute to the future for society and for our planet. One important way we’re doing that is identifying talented students and early-career university faculty and providing them with tools and opportunities to pursue important discoveries across a range of research and scientific fields.”

—**Rick Rashid**  
*Senior Vice President, Microsoft Research*



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# BY THE NUMBERS Microsoft Research Builds Community

Each year, thousands of university students and early-career faculty worldwide participate in Microsoft Research programs. A spectrum of internships, fellowships, scholarships and other programs are helping to develop the next generation of computer scientists and are providing young researchers in other fields with vital software tools and skills.

80

students from around the world selected in 2008 for Ph.D. fellowships and scholarships

MORE THAN

100 top Ph.D. research students

from leading European academic institutions currently supported by Microsoft Research fellowships

10

computer science students selected each year under the

GRADUATE WOMEN'S SCHOLARSHIP PROGRAM

ABOUT

400

TOP STUDENTS

from dozens of universities participate each year in Microsoft Research Asia's Stars of Tomorrow internship program

25

Microsoft Research Faculty Fellowships awarded since 2005 in the U.S. and Canada

MORE THAN

25,000

scientists, academic researchers, faculty and students have attended Microsoft Research-sponsored summits, conferences and workshops since 2005

Microsoft Research collaborates with more than

100

top universities in North America

NEARLY

1,000

students selected annually for internships at Microsoft Research labs in the U.S., China, India and the UK

ABOUT **100**

students and young faculty attend the annual  
**MICROSOFT RESEARCH INDIA  
SUMMER SCHOOL PROGRAM**

**1,500**

attendees at Microsoft Research India's TechVista  
2008 research symposium in Chennai

**465**

students  
from more than

**35** countries

have interned at the Microsoft  
Research Cambridge (UK) lab  
during the past seven years

**3,000**

students, faculty and research scientists  
attended Microsoft Research Asia's

**Computing in the 21st Century**  
conferences in Beijing and Singapore

MORE THAN **30**

collaborative institutes and technology learning labs supported  
worldwide in research areas such as parallel computing, games for  
learning, artificial intelligence, computational and systems biology,  
and computational thinking

**250**

**Ph.D. fellowships** granted to students from  
50 universities in the Asia-Pacific region since 1998

**250**

RESEARCHERS FROM

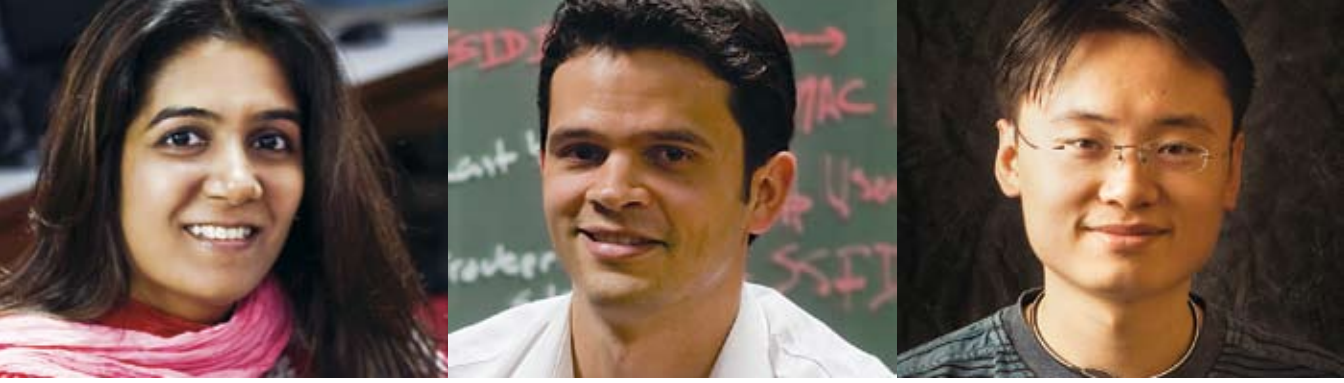
**50**

UNIVERSITIES IN

**16**

COUNTRIES

have joined with Microsoft Research  
in the Latin American and Caribbean  
Collaborative ICT Research Federation  
(LACCIR)



## MICROSOFT RESEARCH PROGRAMS

# Empowering Young Innovators

Computer science innovations are enabling scientists to better understand our fast-changing climate, unlock the genetic mysteries behind many deadly or debilitating diseases, and share data that will help lead to breakthroughs in healthcare, the environment, energy and education.

In addition to supporting today's leading innovators with software, services, and technical and financial support, Microsoft Research is nurturing the innovators of tomorrow through a broad range of regional and global programs.

Given the pace of technological change, it's vital that undergraduates, graduate students and early-career researchers have ample opportunity to explore what technology has to offer—to them in their careers and to society as a whole.

Over the past decade, our External Research Division has helped advance the careers of thousands of talented young scientists and researchers—in computer science and in fields that rely on the power of advanced computing. In the pages that follow, we share a few of their stories. But first, a sampling of Microsoft Research programs:

### Internships

Microsoft operates the largest Ph.D. internship program in the technology industry. Each year, nearly 1,000 top computer science students are given the opportunity to work at one of six Microsoft Research labs around the world. During the internships, which typically last three to six months, students work alongside leading researchers on complex, real-world projects. The skills they develop and the relationships they build help provide a solid foundation for careers in industry or academia.

In 2008, more than 400 students from 13 countries participated in the Microsoft Research Asia Stars of Tomorrow internship program at our lab in Beijing, China. In the United States, roughly 20 percent of all Ph.D. candidates in computer science participate in Microsoft Research internships, primarily at our lab in Redmond, Washington. The internship program at our lab in Bangalore, India, which is open to college seniors, draws more than 100 students annually.

### Ph.D. Fellowships and Scholarships

Microsoft Research works extensively to identify and support computer science students who have demonstrated outstanding potential as research leaders. We sponsor a variety of Ph.D. fellowship and scholarship programs that over the past decade have benefited hundreds of students worldwide. The awards typically cover a student's tuition and expenses, provide stipends to travel to academic conferences and offer opportunities to collaborate with Microsoft researchers.

In 2008, Microsoft awarded fellowships or scholarships to nearly 80 Ph.D. students. In Europe, we awarded scholarships to 25 graduate students from leading academic institutions. We made a similar number of awards in North America, including 10 through our Graduate Women's Scholarship program. Two Ph.D. students from Latin America were selected for two-year fellowships.



### Early-Career Faculty Fellowships

The Microsoft Research Faculty Fellowship Program is designed to identify and support exceptional young professors who are doing innovative research in computer science. In addition to receiving an unrestricted grant for their research, fellows have access to Microsoft resources such as software and technical support and receive invitations to conferences. By giving fellows the freedom to pursue important yet unexplored or unproven avenues of research, we are encouraging their potential to make groundbreaking discoveries.

We select five new fellows each year—from a pool of nominees representing more than 100 leading universities—who show great promise as research leaders. We sponsor similar programs around the world, such as our Young Faculty Award in India, which helps universities in that country attract and retain top talent. In China, the Young Professorship Award Program administered by Microsoft and China's Ministry of Education is helping to strengthen information technology education.

### Conferences, Workshops and Symposiums

Microsoft Research hosts numerous academic conferences and workshops worldwide where students and university faculty can interact and exchange ideas with top computer science researchers in academia, government and industry.

The first Microsoft Research Faculty Summit in 2000 drew 150 participants. Since then, we've held faculty summits in Asia, India, the UK and Latin America—drawing some of the world's most influential academic, scientific and government leaders. About 3,000 students, faculty and research scientists attended Microsoft Research Asia's 2008 Computing in the 21st Century conferences in Beijing and Singapore. Attendance at our annual TechVista conference in India topped 1,500 in 2008.

We host many other events that bring together academic and scientific leaders from a wide range of disciplines to examine the latest advances in computer science research. For example, in the United States and Europe, we host numerous workshops and symposiums throughout the year. Microsoft Research India's annual Theory Day gives students and faculty an in-depth look at a particular area of computer science.

### Summer Schools, Student Clubs, Visiting Professorships and Awards

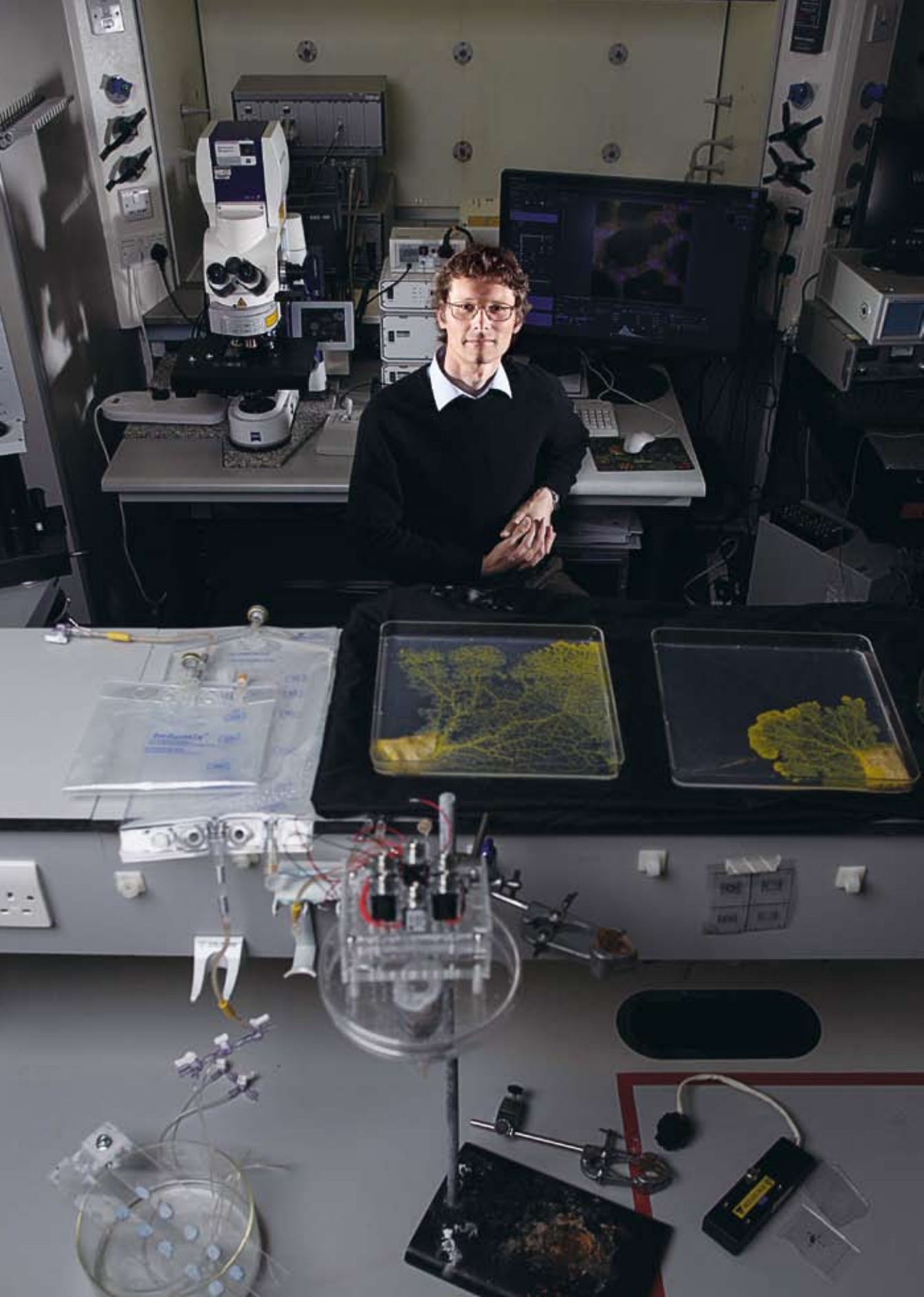
Microsoft Research sponsors an assortment of programs that help give young computer scientists the tools they need to become leading researchers. In India, for example, our annual summer school program gives about 100 college seniors and graduate students, research scholars and university faculty an up-close look at the latest advances in a specific area of computer science research.

The Visiting Researchers Program supports research exchanges at Microsoft Research labs around the globe. Through the Microsoft Research Inspire Programme, we recognize and support talented students and faculty in Africa and the Middle East by promoting increased interaction among researchers, faculty and students from developed and developing countries. The two-year assistant researcher position at the Microsoft Research India lab offers recent college graduates the chance to conduct full-time research, publish papers and attend conferences.

Our summer schools enable students and faculty to interact with leading computer science experts. In China, we sponsor Microsoft Technology Club chapters at about 30 universities. The clubs organize events and competitions, offer training and select members to attend Microsoft Research summer camps.

Microsoft Research also sponsors programs aimed at recognizing top students and established researchers for their work. We work closely with organizations such as the National Center for Women & Information Technology to encourage young women to pursue careers in IT and increase diversity in the sciences. Together with organizations such as the Association for Computing Machinery, we sponsor dozens of student research competitions at key conferences that offer students valuable experience in research collaboration and presentation.

We sponsor the Royal Society and Académie des sciences Microsoft Award, which recognizes European scientists who have made major contributions to the advancement of science through computational methods and is one of the most significant international science awards.



**Klaus-Peter Zauner, Microsoft Research European Fellow**

*Senior lecturer, School of Electronics and Computer Science, University of Southampton, UK*

**Research Focus:** Molecular computing

**Education:** M.S. and Ph.D. in computer science, Wayne State University

# Klaus-Peter Zauner

## Fascination with Science Launches a Career in Molecular Computing

For Klaus-Peter Zauner, it all started with rockets. Like many kids growing up in the 1970s, Zauner was enthralled with the idea of space travel. By the second grade, he was building his own model rockets—a hobby that over time required him to learn the basics of chemistry and physics. During his many trips to the library in search of ideas on how to make his rockets fly faster and higher, Zauner came across books that expanded his scientific interests to electronics and eventually computers.

By age 10, Zauner was soldering circuits together based on diagrams he found in books. A few years later, he started attending evening adult-education classes, mainly because it gave him a chance to get his hands on computers. At 15, Zauner had saved enough money to buy his first computer—a Sinclair ZX81 that he soldered together from a kit.

While still attending high school in southwest Germany, Zauner won national student science competitions in physics and computer science and even landed his first computer programming jobs. But instead of studying computer science when he went on to the University of Tübingen, Zauner took up biochemistry, a subject he knew little about. It was there that he began to ponder the possibility of using biomolecules to build computers—a subject that has become the focus of his career.

In the late 1980s, while he was studying at the University of Tübingen, Zauner heard about Michael Conrad, a researcher at Wayne State University in Michigan who for some two decades had been exploring molecular computing. “It was clear that this was the field I wanted to work in,” Zauner says. “It brought all of my interests together—and very few people seemed to recognize its possibilities.” Zauner moved to Michigan in 1992 to do research under Conrad and pursue his Ph.D.

Zauner’s work in molecular computing has drawn international attention and acclaim. In 2005, Zauner was awarded the prestigious Microsoft Research European Fellowship, which is intended to encourage and support a few promising early-career scientists who are making unique and important contributions to computer science. That award is still funding a significant portion of Zauner’s research at the University of Southampton

in the UK, where he is a senior lecturer in the School of Electronics and Computer Science.

As when he was growing up, Zauner remains driven by diverse scientific interests and an insatiable curiosity. Today, he is recognized as one of the world’s leading researchers in the revolutionary field of molecular computing—which, in essence, looks for ways to replicate the biochemical processes in living cells in order to make computers smaller, more powerful and more efficient. The financial award associated with the Microsoft fellowship is helping Zauner in his efforts to engineer information-processing architectures from protein molecules.

**“Biology shows what is possible in our physical world—now we need to figure out how it works and how we can add these tricks to our engineering toolkit.”**

“There is much that computer scientists and electrical engineers can learn from the molecular computers present in every living cell,” Zauner says. “Biology shows what is possible in our physical world—now we need to figure out how it works and how we can add these tricks to our engineering toolkit.”

Zauner says the Microsoft Research fellowship has helped his work in many ways beyond the financial support that is often so difficult for younger academic researchers to secure. He says the recognition that came with the fellowship lent credibility to his research, helped him secure additional funding and was instrumental in his promotion to senior lecturer at Southampton. In 2007, he received a Leverhulme Trust Research Leadership Award.

What has impressed Zauner most about the Microsoft fellowship is the unrestricted nature of the support. “My work is, of course, not mainstream computer science, so there is always the question of whether and when it may become useful in practical applications,” he says. “The very fact that I receive support from industry has enhanced the perception of the potential impact of my research.”



**Parul Shah, Microsoft Research Ph.D. Fellow**

*Ph.D. candidate, electrical engineering, Indian Institute of Technology, Bombay*

**Research Focus:** Image processing, multimodal image fusion

**Education:** B.S. and M.S. in engineering and electronics, Thadomal Shahani Engineering College

# { Parul Shah

Passion for Engineering, Teaching Helps Researcher Push Past Barriers

**P**arul Shah has been bucking traditions and trends her whole life. Growing up in the 1970s and '80s in Bombay (now Mumbai), India, she was one of five children in an upper middle-class family. In keeping with the conservative traditions of the Gujarati community, Shah's father did not think it was appropriate for his daughter to pursue a college education in a technical field—and certainly not a career.

But Shah was determined to study engineering and become financially independent. With quiet encouragement from her mother—who had not been allowed to study beyond the 11th grade—Shah gained admission to the Thadomal Shahani Engineering College (TSEC), one of the best colleges in the city.

After graduating near the top of her class in 1991, Shah was hired as a lecturer at TSEC. With encouragement from her husband, who, like her mother, supported her efforts to keep reaching higher, Shah earned her master's degree in 2002 and was promoted to assistant professor.

Today, after 15 years as a teacher, Shah is once again pushing through barriers by pursuing a Ph.D. in electrical engineering at the Indian Institute of Technology, Bombay, one of the premier universities in India.

While India is well known for producing undergraduates in computer science and information technology, the country's research capacity in these fields is still in a nascent stage—with only about 100 Ph.D.s awarded each year. Shah says the fact that engineering jobs pay so much better than research positions in India prevents most students from continuing on to Ph.D. studies.

But for Shah, all of those concerns melted away in 2008 when she was selected to receive a Microsoft Research India Ph.D. fellowship—an award given to just five recipients in India each year. The fellowship covers all of her school costs and provides a stipend for attending academic conferences. “It is difficult to express in words how much it meant to me,” she says. “I got the financial independence I needed so badly and could now concentrate on my research.”

Shah's fellowship was announced at TechVista, Microsoft Research India's annual research symposium, which draws more than 1,500 people and features numerous world-renowned scientists. “It

was indeed a big day for me to receive the Microsoft Research India award in the presence of some of the best-recognized scientists from across the world as well as my teachers and friends at IITB,” Shah says.

Working in the SPANN (Signal Processing and Artificial Neural Networks) Lab at IIT Bombay, Shah's primary Ph.D. research focus is in computer image processing. She is helping to develop techniques for “multimodal image fusion,” combining image data from multiple types of sensors into a smaller set of images or a single image. She says image fusion, which offers a more effective method for interpreting and comparing image data, has many possible uses.

**“It is difficult to express in words how much [the Microsoft fellowship] meant to me. I got the financial independence I needed so badly and could now concentrate on my research.”**

For example, Shah says, it could be used in public surveillance systems—such as at airports or train stations—to combine images from regular video cameras with images from infrared cameras. Or it could be used by physicians to fuse different types of medical images, such as CT scans and MRIs.

After completing her Ph.D., Shah would like to work as a researcher in the high-tech industry. But she says her main reason for pursuing the degree is so she can continue moving ahead as a teacher. “Teaching is my passion,” she says. “Eventually, I want to go back to teaching and help students in building research skills.”

Shah says things have changed dramatically in India since she was starting out in college. There are fewer societal pressures holding women back from pursuing an education and a career. But the hurdles that Shah had to overcome two decades ago only reinforced her passion and her commitment. “It helped me. It made me stronger,” she says.



**Xiao Zhang, Microsoft Research Ph.D. Fellow**

*Ph.D. candidate, Advanced Center for Study, Tsinghua University, Beijing*

**Research Focus:** Computer vision, image retrieval

**Education:** B.S. in electronic engineering, Tsinghua University

# Xiao Zhang

## Young Researcher Focuses on Image Search and Retrieval Technology

A few years ago, while visiting the Louvre in Paris, Xiao Zhang found himself wanting to know more about certain paintings and sculptures. “Most of them had very few descriptions,” Zhang says, “and most of the descriptions were in French, which I couldn’t understand.”

Wouldn’t it be great, Zhang thought, if a person could use a camera phone to take a picture of an object, enter the image into an online search engine and quickly retrieve information revealing the history and stories behind the object?

Soon after returning home to Beijing, China, Zhang went to work developing his own prototype version of an image search engine. In a country known for turning out talented young engineers and computer scientists, Zhang stands out.

Zhang grew up in Tianjin, the sixth-largest city in China. When he was 18, he moved to Beijing to study electronic engineering at Tsinghua University. During his undergraduate studies, Zhang realized that while he did not excel in electronics and circuit design, he had a natural gift for computer programming.

Zhang stayed at Tsinghua University for his graduate studies and in 2007 was awarded a Ph.D. fellowship through the Advanced Center for Study, a joint Ph.D. program funded by the university and Microsoft Research Asia. Zhang’s Ph.D. advisor is Harry Shum, a former managing director of Microsoft Research Asia who now works in Redmond, Washington, as Microsoft’s corporate vice president for Core Search Development.

Besides covering all of Zhang’s Ph.D. costs, the fellowship gave him the opportunity to participate in Microsoft Research Asia’s Stars of Tomorrow paid internship program. For nearly two years, Zhang worked alongside researchers at Microsoft’s world-class lab in Beijing, where he focused primarily on projects in computer vision, machine learning and information retrieval.

“Microsoft provided me with access to a lot of very powerful computers and powerful tools,” Zhang says. “And they gave me access to expert researchers from different groups and from different disciplines within computer science.”

Zhang worked with veteran Microsoft software developer Xin Zou on a project called Cartoon.SDK. Using advanced computer vision

and machine learning techniques, they developed tools that enable users to create cartoon images from actual photos. Zhang’s work on the project led to a paper that was published at the 2008 IEEE Conference on Computer Vision and Pattern Recognition.

“Xiao was passionate about his work and was always willing to accept more challenges,” recalls Xin Zou, now a development manager at Microsoft Research Asia.

Zhang says his mentors at Microsoft Research taught him the importance of taking abstract theoretical ideas and turning them into “real products that change people’s lives.” Under their guidance, he developed a content-based image search engine that was able to index 2 million images on a single workstation and return search results within a few milliseconds.

**“Microsoft provided me with access to a lot of very powerful computers and powerful tools. And they gave me access to expert researchers from different groups and from different disciplines within computer science.”**

In the spring of 2009, Zhang traveled to the United States for a three-month internship with Microsoft Live Labs’ computer vision group in Redmond, focusing on state-of-the-art multimedia retrieval systems, including image and video search engines.

Zhang envisions many possible uses for image search technology. For instance, he says, someone who is traveling could take a picture of a prominent building or feature, enter that image into a search engine and get back information about the area or get suggestions of local landmarks to visit. Similarly, someone who is out shopping could use an image search engine to retrieve information about a particular product, such as reviews and prices.

“Currently, people are only able to use text to search information,” Zhang says. “The fundamental impact of this technology is that it could enable people to use images to interact with computers and search information.”



**Radhika Nagpal, Microsoft Research New Faculty Fellow**

*Assistant professor of computer science, School of Engineering and Applied Sciences, Harvard University*

**Research Focus:** Bio-inspired computing, robotics

**Education:** B.S., M.S. and Ph.D. in computer science, Massachusetts Institute of Technology

# Radhika Nagpal

## Fellowship Enables Early-Career Professor to Pursue Research Passions

One of the greatest challenges for early-career university faculty is attracting the recognition and financial support needed to pursue their research interests. But all of that fell into place early on for Radhika Nagpal, an assistant professor of computer science at Harvard University.

In 2005, just a year after joining the faculty at Harvard's School of Engineering and Applied Sciences, Nagpal was selected to receive a Microsoft Research New Faculty Fellowship.

It was the first year of the fellowship program, which selects five recipients annually from a pool of nominees representing more than 100 leading research universities throughout the United States and Canada. The program recognizes uniquely talented individuals who are advancing computing research in novel directions and who demonstrate great potential for becoming thought leaders in their field.

Nagpal says the award gave her instant recognition among her peers. "All of a sudden, people know who you are and what you do," she says. "When you walk into a room and you want to discuss science and research, a little bit of the groundwork has already been laid."

More importantly, the fellowship enabled Nagpal to pursue research in an area outside the mainstream of computer science—looking to biology for ideas about how to make computing systems more robust and developing "bio-inspired" self-adapting robots.

"The Microsoft Research fellowship gave me the time and courage to take a risk and try new things, like working with biologists to model their systems," Nagpal says. "Now this is an important part of my research and has led to some novel and exciting science."

In 2007, Nagpal's research ambitions received another huge boost when she was awarded a prestigious Faculty Early Career Development (CAREER) award from the National Science Foundation.

Nagpal, who grew up in the United States and India, earned her undergraduate, master's and Ph.D. degrees in computer science at the Massachusetts Institute of Technology (MIT). It was during her Ph.D. studies that Nagpal first became interested in the intersection between computer science and biology.

Her passion for research really took root when, as a student, she worked alongside prominent computer scientists at AT&T (now Alcatel-Lucent) Bell Labs in New Jersey. "It was incredibly innovative," she says. "They were constantly pursuing ideas that seemed crazy at the time but today would be considered mainstream."

Before joining the computer science faculty at Harvard, Nagpal spent a year as a research fellow in Harvard Medical School's newly created Department of Systems Biology. That work helped lay the foundation for Nagpal's research into bio-inspired computing.

**"The Microsoft Research Fellowship gave me the time and courage to take a risk and try new things..."**

Nagpal used the Microsoft fellowship to fund a Ph.D. student who helped in her study of how biological systems—such as cells in an organism or ants in a colony—work collaboratively to perform complex functions, make repairs and adapt to environmental conditions.

Based on that research, Nagpal is developing algorithms that enable her to replicate these biological processes to create self-organizing, self-adapting distributed computing systems. As a demonstration, a student in her lab developed a self-adapting table. Four multi-jointed robotic legs work in unison to keep the tabletop level when the table is placed on varying surfaces.

Nagpal sees many potential uses for self-adapting artificial systems, such as helping to stabilize building structures and bridges. She also envisions possible uses in medicine, such as a programmable stent that can intelligently adjust its pressure against an artery wall.

"One of the things that has always excited me about computer science is the creativity—it's all about thinking and inventing, and once you do that, the ideas can almost instantly come to life and be used by others," Nagpal says. "I also love the mix of science and engineering—it's both about what we can learn about the world and how we can change it."



**Alban Rrustemi, Microsoft Research Ph.D. Scholar**

*Software engineer; former Ph.D. intern, Microsoft Research Cambridge Laboratory, UK*

**Research Focus:** Display and sensor network technologies

**Education:** Diploma in applied mathematics, University of Prishtina; Ph.D. in computer science, University of Cambridge

# Alban Rrustemi

## Movies Inspire Researcher's Work on Futuristic Computer Displays

**A**s a teenager in war-torn Kosovo during the 1990s, Alban Rrustemi loved watching a good crime movie—especially if it involved computing gadgets.

Growing up in a community with limited access to computers, Rrustemi says he was “intrigued by films where the police could look up anybody in a database to find out who they are and what they do. I kept thinking, ‘Somebody would have to feed all of that information into the computer somehow—and that’s not really feasible.’”

But as the Internet revolution began sweeping across Eastern Europe a few years later, Rrustemi’s skepticism turned to elation. “I realized that ‘somebody’ doesn’t have to be just one person,” he says. “A whole community of Internet users could contribute to this ever-growing pool of knowledge for everyone’s use.”

Rrustemi’s fascination with the power of technology to promote and facilitate the flow of information eventually landed him at the University of Cambridge in the UK, one of the world’s leading research universities. A Microsoft Research Ph.D. Scholarship not only provided financial support for his doctoral studies, but it also allowed him to work with leading researchers in the area of display and sensor network technologies.

While earning his doctorate, Rrustemi also was selected for an internship at the Microsoft Research laboratory in Cambridge. “It was obvious from the outset that Alban had a true aptitude and passion for technology that should be nurtured,” says Steve Hodges, manager of the Sensors and Devices Group at Microsoft Research Cambridge.

As an intern, Rrustemi worked closely with Microsoft researchers on several projects involving technologies that influence how people interact with computing devices. One of his most memorable experiences was contributing to a research paper on the development of ThinSight, an optical sensing system that enables computer users to interact directly with on-screen objects using their fingertips.

“Without the Microsoft scholarship, it would have been extremely difficult for me to do this exciting work,” he says. “But beyond that, having access to some of the best minds in the world at Microsoft Research gave me tremendous experience and laid the foundation for my whole Ph.D. dissertation.”

Rrustemi’s doctoral thesis presents a novel approach to designing interactive displays with scalable resolution, called computing surfaces, which are assembled using small adjoining display units that respond to touch-based input. Such displays can extend the power and capabilities of technology beyond the confines of a traditional computer monitor and mouse.

“With computing surfaces that are flexible like wallpaper and that respond to touch, there’s no reason why your computer screen can’t be part of your wall or your desk or any other piece of furniture,” says Rrustemi. “Advertising posters or any other static visual information that you see while walking down the street could be more dynamic and provide richer information.”

**“Having access to some of the best minds in the world at Microsoft Research gave me tremendous experience and laid the foundation for my whole Ph.D. dissertation.”**

After receiving his doctorate in November 2008, Rrustemi was hired as a senior software engineer at a company that develops complex event processing systems—essentially, tools for managing and analyzing patterns of intricate streams of information in real time. He is pleased to be contributing to the development of new technologies that once existed only in movies.

“Access to information is quickly becoming the most powerful means for people to accomplish anything,” says Rrustemi, whose future plans include returning to Kosovo to help improve its educational programs. “The support I’ve received from Microsoft Research has given me amazing opportunities and freedom to pursue my research goals of bringing information to more people, in more useful ways.”



**Ece Kamar, Microsoft Research Ph.D. Fellow**

*Ph.D. candidate in computer science, School of Engineering and Applied Sciences, Harvard University*

**Research Focus:** Artificial intelligence

**Education:** B.S. in computer science and engineering, Sabanci University; M.S. in computer science, Harvard University

# Ece Kamar

## Ph.D. Researcher Aims to Push the Limits of Artificial Intelligence

Most of us take the spell-check feature in our software programs for granted and don't spend much time pondering how it works. That's not the case for Ece Kamar. During her second year at Sabancı University in Istanbul, Turkey, Kamar's passion for computer science blossomed when she began helping on a research project that used artificial intelligence techniques to develop better spell-check applications for the Turkish language.

"After doing research on this, you see that it's not a miracle," Kamar says. "There are algorithms, logical reasoning underlying these processes that explain how a computer can understand a language and work with people to correct mistakes."

Kamar says this realization opened her eyes to the vast potential of artificial intelligence and the promise it holds for making computers more useful in our everyday lives. "What amazes me about computing technologies is how—with a little creativity and understanding of computation—you can create software that affects people's lives," she says.

Kamar has stood out academically her entire life. The science high school she attended in Turkey admitted only 100 students from across the nation. She received a fellowship from Sabancı University after ranking 21st among more than a million students in Turkey's national university entrance exam.

As a Ph.D. student at Harvard University—advised by Professor Barbara J. Grosz of the Artificial Intelligence Research Group in the School of Engineering and Applied Sciences—Kamar says her goal is to "pursue research that pushes the limits of artificial intelligence."

In the summer of 2007, Kamar was offered an internship at the Microsoft Research lab in Redmond, Washington, where she had the opportunity to work alongside leading experts in artificial intelligence. Later that year, she was nominated by her mentors at Harvard for a Microsoft Research Fellowship, an award given to just a dozen Ph.D. students each year in North America.

After a rigorous selection process, Kamar got word that she would receive the fellowship. That meant the final two years of her Ph.D. costs at Harvard would be covered fully by Microsoft. The fellowship also came with a new laptop, an annual stipend for attending academic conferences and

another paid internship at Microsoft Research in Redmond.

She says the fellowship has enabled her to interact frequently with researchers from different computing fields, learn about challenges in applying theoretical ideas to real-life applications and work with the latest cutting-edge technologies.

"The financial aspect of the fellowship is very nice," Kamar says. "But the most important thing for me is the collaboration I get to do with researchers at Microsoft. The time I spent at Microsoft has allowed me to work on problems that I had not even thought of before."

Kamar has worked under veteran Microsoft researcher Eric Horvitz on a variety of artificial intelligence projects that could eventually lead to new software features or products. For instance, by observing people's daily activities, she helped design a program that learns which meeting notices people are most likely to forget—information that could eventually be used to improve reminder systems in personal calendar programs.

**"The time I spent at Microsoft has allowed me to work on problems that I had not even thought of before."**

Kamar has also been working with Horvitz on a project to design an intelligent application for setting up carpools. Using GPS devices, they tracked the daily commutes of 215 Microsoft employees in Redmond. They are using that information to run simulations that will show which employees should ride together and what routes they should take in order to achieve the greatest reductions in fuel consumption and carbon emissions.

Kamar is convinced that such artificial intelligence approaches will become increasingly important as researchers continue to expand and enhance the way humans interact with computers.

"In many settings right now, computers are more like servants—you give a command, it responds back," Kamar says. "But in artificial intelligence, we want computers to be our partners. We want them to understand us, correct us and work with us."



**Rodrigo de Oliveira, Microsoft Research Ph.D. Fellow**

*Researcher, Multimedia Scientific Research group, Telefónica I+D, Barcelona, Spain*

**Research Focus:** Human-computer interaction, mobile computing, artificial intelligence

**Education:** B.S. in computer science, University of Lavras; M.S. and Ph.D. in computer science, State University of Campinas (UNICAMP)

# Rodrigo de Oliveira

## Early Calling to Computer Science Takes Young Researcher Far

In the late 1980s, when Rodrigo de Oliveira was about 7 years old, he went to visit his father's new office at the University of Lavras in Brazil. His father thought he would be impressed with the spacious office and fancy furniture. But the boy was fixated on one thing—the computer.

Though reluctant at first to let his son try out the computer, Oliveira's father agreed to show him a few basic commands and eventually put him to work reformatting two boxes of old floppy disks. "It was amazing to me—I was giving orders to an electronic machine and it was doing exactly what I told it to do," Oliveira says. "From that moment on, I no longer had the chance to choose my path. It chose me."

That path has already taken Oliveira a long way. He now lives in Barcelona, Spain, where he works as a researcher for Telefónica I+D, Spain's largest private research and development center. As a member of Telefónica's Multimedia Scientific Research group, Oliveira is working on cutting-edge research projects in areas such as human-computer interaction and mobile computing.

Oliveira credits a variety of influences for shaping his budding career as a computer scientist. For instance, he talks excitedly about a paper he read in college by computer science pioneer Alan Turing, pondering the concept of artificial intelligence. "I knew it was something I had to understand, I had to study," Oliveira says.

But perhaps nothing was more influential than the support he received—and the relationships he established—during his Ph.D. fellowship sponsored by Microsoft Research.

While studying for his master's degree in computer science at the State University of Campinas (UNICAMP) in Brazil, Oliveira developed an intelligent tutoring system for the Web that captures a student's psychological profile and uses the information to optimize the person's learning experience. After completing his degree program with perfect grades in 2004, Oliveira stayed at UNICAMP to pursue his Ph.D. and delve deeper into human-computer interaction and mobile computing.

Two years into his Ph.D. studies, Oliveira got word that he had been selected for the Microsoft Research fellowship—an award granted to just two students each year from the Latin American and

Caribbean region. The fellowship covered all of Oliveira's Ph.D. costs for two years and gave him the opportunity to work as an intern at the Microsoft Research lab in Redmond, Washington.

While in Redmond, Oliveira worked alongside veteran researcher Nuria Oliver on a project called MPTrain, a cell phone-based personal training device. MPTrain—now called TripleBeat—tracks the user's running or walking pace and heart rate and then selects music to encourage the person to speed up or slow down in order to stay within the target workout zone. Oliveira developed a new graphical interface for the device and a feature that enables users to compete with one another by seeing who is able to best meet their training targets.

**"The moment you get a Microsoft Research fellowship, the doors start opening for you."**

That three-month Microsoft Research internship jump-started Oliveira's career as a computer scientist. His work on TripleBeat—which was featured on a popular American television show—yielded his first software patent. A paper he wrote on the project was presented at a major international conference. And he co-authored a chapter for a book titled *Mobile Health Solutions for Biomedical Applications*.

In 2007, Nuria Oliver was hired as scientific director of multimedia at Telefónica I+D. About a year later, after Oliveira had completed his Ph.D., Oliver hired him for his first full-time job in computer science. Oliver says she could see early on during Oliveira's internship at Microsoft Research that he has the intelligence, passion and creativity to become a leading researcher in areas such as human-computer interaction and mobile computing.

Says Oliveira, "The moment you get a Microsoft Research fellowship, the doors start opening for you."



**Bijendra Jain, Microsoft Research Community Partner**

*Professor, Department of Computer Science and Engineering, Indian Institute of Technology (IIT) Delhi*

**Research Focus:** Network security and ad hoc, sensor and high-speed networks

**Education:** B. Tech. in electrical engineering, IIT Kanpur; M.S. and Ph.D. in electrical engineering, State University of New York at Stony Brook

# Bijendra Jain

## Striving to Make India an IT Research Powerhouse

Early in his career as a computer science researcher, Bijendra Jain's vision of expanding access to technology in his native India helped spawn ERNET, the nation's first data network. Launched in 1989, ERNET now connects millions of students and professors at several hundred higher-learning institutions in India. Currently, Jain is helping to create a high-speed data network that will enable people to offer a range of services supported by integrated voice, video and data communication between even the most remote locations in India.

He also has another ambitious goal: to recruit more computer science students into Ph.D. programs at India's universities and strengthen the country's information technology research community. While India produces more than 150,000 graduates a year in computer science, information technology and related fields, fewer than 100 students a year earn a doctoral degree in computer science from Indian Institutes of Technology (IITs) and other higher-education schools in India, says Jain.

"India has developed an exceptional software services industry over the past two decades. Now we would like to see the country become an IT research powerhouse," says Jain, who is a computer science professor and deputy director in charge of faculty affairs at IIT Delhi. "To achieve this, we must continue to improve our graduate degree programs and convince students that there are rich career opportunities for researchers in the industry as well as in the teaching profession. Our institutions also need to attract the best available talent, for it is they who will help students decide whether to pursue a Ph.D. in India or elsewhere."

Microsoft Research is supporting Jain and other academic leaders in this effort through several programs designed to expand India's computer science research capacity and bring greater worldwide visibility to the innovative work of the country's talented researchers.

At the Microsoft Research India lab in Bangalore, more than 60 full-time researchers work closely with dozens of Ph.D. students and visiting professors on a range of research ideas. Since 2005, Microsoft Research has awarded Ph.D. fellowships to 20 of the top young scholars at India's leading technology institutes. The fellowship covers a stu-

dent's tuition, books and other expenses for up to four years of doctoral studies in an IT-related field, and recipients are invited to collaborate extensively with teams at Microsoft Research in India and elsewhere.

"This support is vital to making our Ph.D. programs more attractive and attainable to our brightest students," says Jain. "The collaborative research opportunities offered by Microsoft Research are also helping IIT Delhi and other institutions attract some of the finest faculty from within India as well as abroad."

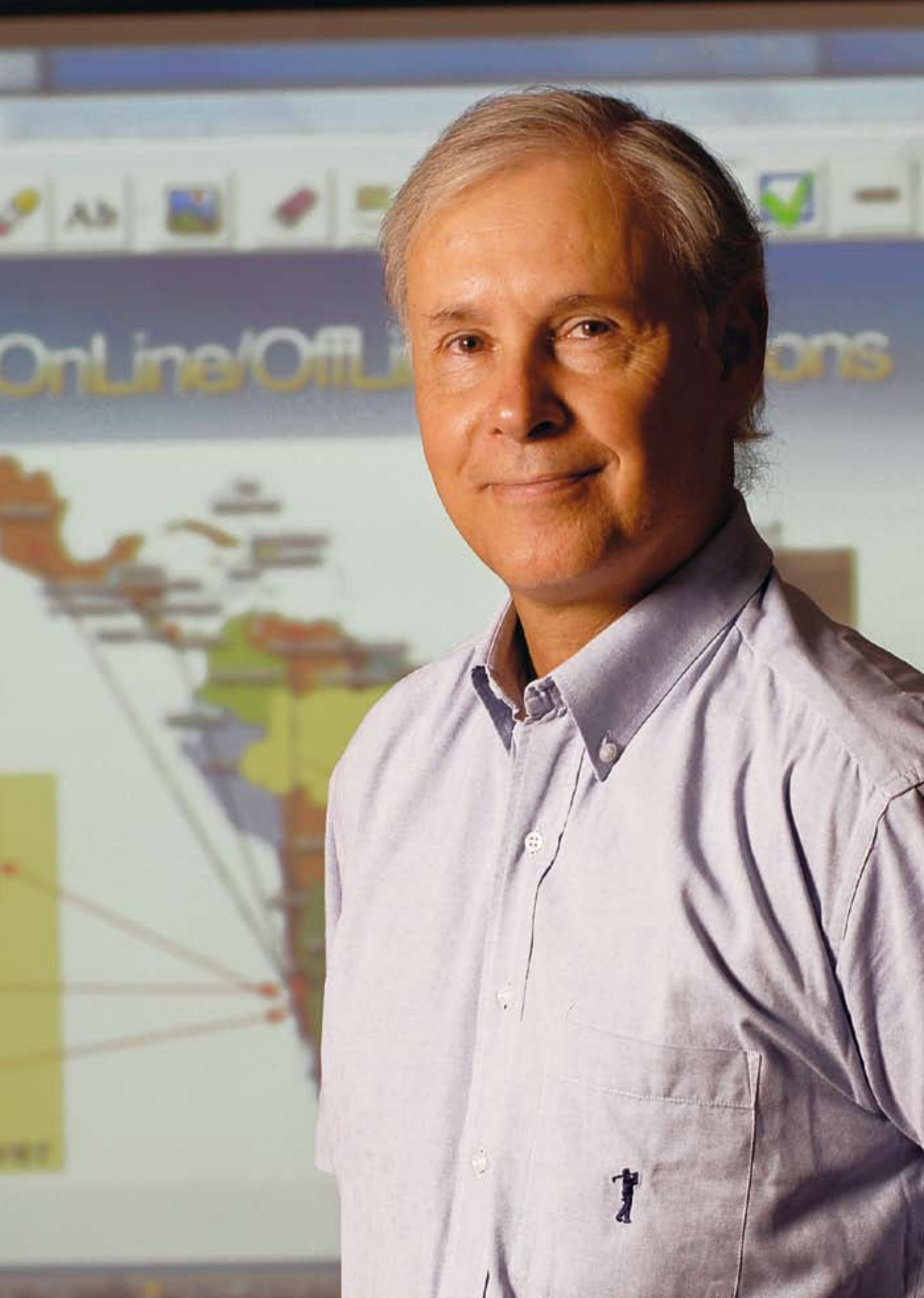
Another important way that Microsoft Research helps build students' interest in advanced IT studies is by hosting events such as TechVista, an annual symposium that features world-class computer scientists presenting the results of their applied research in interactive sessions. "When these giants in the computer science field share their excitement about doing great research and demonstrate the rewards of pursuing this type of career, you can feel young people in the audience getting energized," says Jain.

**"This is an exciting time to be part of the cycle of innovation that will sustain and expand India's computing talent pipeline."**

Similarly, Microsoft Research facilitates valuable discussions among academic, government and IT industry leaders about their priorities for the future of computing, he says. "We need all stakeholders working together to improve India's computer science education programs, and Microsoft Research has helped lead the way."

Having global corporations such as Microsoft invest significantly in research programs in India also encourages more local companies to launch their own labs, says Jain.

"Over time, I think we will see steady growth in the opportunities that are available to talented researchers in this country," he says. "This is an exciting time to be part of the cycle of innovation that will sustain and expand India's computing talent pipeline."



**Ignacio Casas, Microsoft Research Community Partner**

*LACCIR executive director; associate professor of computer science, Pontificia Universidad Católica de Chile (PUC-Chile)*

**Research Focus:** Advancing computer science research and academic collaboration in Latin America

**Education:** Diploma in electrical engineering, PUC-Chile; M.S. and Ph.D. in computer science, University of Toronto

# Ignacio Casas

## Latin American Professor Helps Nurture Tomorrow's Computing Leaders

A professor's keen eye for aptitude in computer science nearly 40 years ago set Ignacio Casas on a career path that has ultimately led full circle.

Studying to become an electrical engineer at Pontificia Universidad Católica de Chile (PUC-Chile) in his hometown of Santiago, Casas had his initial encounter with a computer in a software programming course. "After my professor reviewed the first assignment that I turned in, he came over and offered me a position helping other students at the computer center," says Casas.

"Computing was completely new for me, yet I had somebody telling me, 'You have a real talent for this,'" he adds. "His encouragement opened up an opportunity that I might never have considered otherwise."

After earning his Ph.D. in computer science in 1986 from the University of Toronto in Canada, Casas returned to PUC-Chile as a professor. Along with serving as the university's chief technology officer from 1995 to 2005, he has devoted much of the past two decades to fostering opportunities for new generations of young information and communications technology (ICT) students and researchers throughout Latin America. Together with Microsoft External Research, Casas and other academic leaders established the Latin American and Caribbean Collaborative ICT Research Federation (LACCIR) in 2007 as a framework for advancing the region's economic and social objectives through innovations in technology. LACCIR now encompasses more than 250 researchers from 50 universities in 16 countries.

"We are seeking to build a collaboration environment that enables Latin American and Caribbean researchers to work together more easily and build a critical mass of regional ICT expertise," says Casas, who serves as executive director of LACCIR. "We believe that greater regional collaboration will lead to more technology breakthroughs that have the potential to improve healthcare, education, small-business development and other priorities in this region."

The federation's efforts include linking more than 20 university campuses in about a dozen countries through ConferenceXP, an Internet-based video conferencing system developed by Microsoft Research. The technology enables

researchers, teachers and students who might be hundreds or thousands of miles apart to participate in real-time research collaboration, wireless-enabled classrooms and highly interactive distance-learning experiences. For example, ConferenceXP participants can share documents, slide presentations and other electronic files within a session as well as view live presentations by prominent technology researchers.

"As more people discover how easily they can use ConferenceXP to connect with other academics who are investigating similar challenges, it will help draw even greater attention and financial support to the strong computer science research that's taking place in Latin America," says Casas.

**"Microsoft Research has been a tremendous ally for LACCIR in supporting the research leaders of the future to make an even greater impact in our region and on people's well-being."**

To further promote collaboration on locally relevant research, LACCIR awards five research grants per year averaging US\$50,000 each for computer science projects based in Latin America and the Caribbean. LACCIR also draws on support from Microsoft External Research to sponsor the Short Stays Program, an opportunity for post-graduate students to spend up to four months at a university research center in another Latin American or Caribbean country. Created to help expand the regional pipeline of talented researchers, Short Stays covers students' travel and living expenses. "It is a great motivator for students to access broader expertise and resources beyond what their home institutions may provide," says Casas.

The ICT field has evolved dramatically since Casas wrote his first software program in the early 1970s, feeding punch cards into a mainframe computer. But today's bright young computing students need encouragement and opportunities just as much, he says.

"Microsoft Research has been a tremendous ally for LACCIR in supporting the research leaders of the future to make an even greater impact in our region and on people's well-being," says Casas.



**Lucy Sanders, Microsoft Research Community Partner**

*CEO and co-founder, National Center for Women & Information Technology*

**Focus:** Encouraging young women to pursue degrees and careers in computer science

**Education:** B.S. in computer science, Louisiana State University; M.S. in computer science, University of Colorado

# Lucy Sanders

## illuminating the Power of Technology Careers for Young Women

People often compare a sudden revelation in their lives to a light bulb turning on. But for Lucy Sanders, it was actually an LED.

In 1978, fresh out of the University of Colorado with a master's degree in computer science, Sanders was working at the prestigious AT&T (now Alcatel-Lucent) Bell Labs in Denver. Although she had received top grades and several awards throughout college, "I wasn't really in love with computing yet," she says.

"Then I got to write some software that, when you picked up the handset of a phone, made this little light go from red to green," Sanders recalls. "I was like, 'Oh, my gosh—look at that!' The power of computing finally hit me. I wasn't writing a program for class to get a good grade. I was doing something real in the world."

Sanders went on to earn the Bell Labs Fellows Award in 1996 for her work on leading-edge software architectures for telecommunications, including an operating system called Oryx/Pecos that helped pave the way for the use of Voice over Internet Protocol (VoIP) in enterprise telephony systems. A named inventor on six technology patents, Sanders was inducted into the Women in Technology International organization's Hall of Fame in 2007.

As co-founder and CEO of the nonprofit National Center for Women & Information Technology (NCWIT), Sanders' passion these days is encouraging girls and women to study computer science and pursue careers in information technology. "Women make up half the world's population, they use technology as much as men and they are innovative technical thinkers," says Sanders. "So if we want the best technology that we can get, we need diversity at the design table."

The challenge is that few women choose to pursue college degrees in computer science or professional careers in information technology. In much the same way that she became fervent about technology only after college, Sanders believes that many students—women and men—struggle to see the real-world value of pursuing a computer science degree. To address this challenge, NCWIT is partnering with more than 170 universities, corporations and nonprofit organizations on a range of programs that Sanders says can "show how computing can unlock people's passion and

enable them to solve society's most complex problems."

Microsoft provided startup funding for NCWIT when it was launched in 2004 and has been a strong supporter ever since, contributing US\$1 million in 2006 to help NCWIT raise awareness of women's positive impact on the IT industry and improve the image of computer science. Through the organization's Academic Alliance Seed Fund, sponsored by Microsoft Research, NCWIT provides up to US\$15,000 for educational projects aimed at recruiting and retaining women in technology fields. Microsoft External Research also helps fund NCWIT's Aspirations in Computing Award program for high school girls and supports NCWIT's yearly national conference involving more than 100 organizations.

**"Women make up half the world's population, they use technology as much as men and they are innovative technical thinkers. So if we want the best technology that we can get, we need diversity at the design table."**

"Having the support of Microsoft, a worldwide leader in research, sends a strong message that diversity of thought is essential to innovation," says Sanders. "And technology research is one of the areas where we most want to attract more women."

Likewise, she says NCWIT's success flows from its diverse academic, industry, government and nonprofit partners.

"We are at a tipping point in our mission to promote greater opportunities and advancement for women in computing," says Sanders. "So many good-spirited people and organizations are working to make progress on this issue. I just have the honor of helping to orchestrate it all."

*[research.microsoft.com/careers](http://research.microsoft.com/careers)*

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