Pragmatics Fellows
2012-13

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Anindya Das chose Iowa State University for his graduate study because of the faculty he would have the opportunity to work with. “I had a good offer from another university, but I was really interested in working with some of the faculty at Iowa State,” Das says. His application to the department was ranked at the top by the CS faculty admissions committee, and his interest in bioinformatics was noted by Professor Xiaoqiu Huang. “He was interested in my research area and his application materials, in particular his recommendation letters, indicated that he would be a highly productive researcher and problem solver,” says Huang, who offered Das a research assistantship with his research laboratory if he accepted admission. Das has jumped into his new role as a PhD student quickly, taking classes and handling a 20 hour per week research load. “Dr. Huang has me working on sequence algorithm problems and phylogenetic trees to start building my knowledge in this research area.” Das intends to build his skills into a lifelong career in research, either in academia or industry.

Das became interested in computing during his first year of undergraduate study. “I took a programming class and I liked it a lot! I also like computational problems. They have well defined solutions, and can be proofed for correctness. I also like to find ways that solutions can be not only correct, but also efficient, especially in consideration of resource constraints.” His appreciation for programming, algorithms design, and creative solutions inspired his undergraduate level participation in the ACM ICPC, an international programming contest well known to students at Iowa State University. Das intends to offer his help in training undergraduate students for competition, and is also considering competition at the graduate level. “Working on problems that have specific constraints and time requirements is a critical skill for computer scientists. This competition is a valuable experience at many levels,” says Das.

Research:
Algorithms
Computational Complexity
Bioinformatics

B.Sc.: Electrical & Electronic Engineering, Bangladesh University of Engineering & Technology
Research Assistantship:
Dr. Xiaoqiu Huang

“Sometimes in research you find you need or would really like to have additional tools, either software or hardware. Funding for those things can be hard to come by, especially when starting out. The Pragmatics Fellowship will help me have access to those tools if I find that I need or want them.”


Ju Cheol MOON

Iowa State University, where the computer age began, continues its leadership by adapting technology to improve peoples’ lives. An innovative leader in computer science, Iowa State’s ability to further enhance computing by persistently pursuing the ingenious concepts of John V. Atanasoff and Clifford E. Berry is demonstrated by the following examples:

- In 1971 Iowa State took part in the Link network — one of the first five major computer networks in higher education. The Link still plays a leadership role in the educational community.

- In 1982 Iowa State was among 15 universities that created Mailnet, an inter-campus electronic mail system. This system was a precursor to today’s widely used e-mail system.

- In 1987 Iowa State was among the first universities to connect to MIDnet and NFSnet — precursors to today’s Internet, the global information network.

- In both 1997 and 1998 Iowa State was ranked among the 100 “most-wired” campuses in the nation by Yahoo! Internet Life magazine.

Today Iowa State is helping to shape the future of the Internet with its involvement in the very high performance backbone network service (vBNS) and Internet2 projects. The vBNS allows faculty and students at leading research and educational institutions like Iowa State to use high-speed communications to collaborate with their peers across the country.

One of the world’s most advanced virtual reality rooms – the C3 – allows researchers to introduce physical objects into virtual environments. It combines high-resolution projection technology, high-performance 3-D graphics, an advanced localized sound system and a variety of interaction devices. It’s a powerful tool for solving 3-D problems in architecture, biomedicine, data visualization, manufacturing, physics and space.
Ju Cheol Moon used to work in the manufacturing industry in South Korea as a quality control engineer. “We had hundreds of different manufacturing processes to build a single chip, but we did not, or maybe could not know the relationship between all of those processes and how they affected the final product. In 2007, I attended the SEMICON conference in Korea, where there was a presentation about detecting fault causes in products. Software was the key to linking the relationships among manufacturing processes and the quality of the final product. That research presentation convinced me that we had to pay more attention to these relationships.” Moon particularly liked the fact that computers lack the bias inherent in humans, increasing the likelihood that quality problems in manufacturing were quantifiable and identifiable through the use of software systems. “I took these ideas back to my own company, and convinced them to adopt software to efficiently identify the causes of product failure. My work in implementing the software systems where I worked in industry is what led me to pursue advanced study in computing,” Moon says.

Working towards his M.S. at South Dakota State University, Moon conducted research with a team that also analyzed the relationship between process and product, although on a slightly different level. “We worked on breast cancer Microwave iTomography Imaging (MTI) diagnosing. Microwave imaging technique is an emerging medical imaging method with a much lower cost compared to the more common Magnetic Resonance Imaging (MRI). The reliability of MTI as a diagnostic tool, however, has not been sufficiently studied. The overall goal of my M.S. work was to contribute data mining and computing methods to develop a systematic linkage between MTI and MRI and show MTI to be an effective first step in making a diagnosis.” Moon published 3 research papers during his work on this project, two in conferences and one in an international, interdisciplinary journal. He looks forward to continuing computing research in medical sciences, such as bioinformatics, here at ISU.

“The Pragmatics Fellowship definitely influenced my decision to come to Iowa State. It was a big help for getting settled in a new town, purchasing books and supplies. I didn’t feel the need to worry about finding resources in a new place! I look forward to all of the opportunities here to build a research-based career.”


Taylor Bergquist is looking to make broad impacts with his research contributions and is talented enough to achieve his goals. “I want to be a part of the discovery process...to invent something brand new that is both practical and theoretical at the same time.”

Bergquist is finding that mix with Laboratory for Nanoscale Self-Assembly (LANSA) at ISU. Faculty at LANSA are starting a new research initiative to bring software engineering concepts and practices to nanoscale self-assembly. Taylor looks forward to being part of that new initiative. “We have a lot of techniques in SE to ensure safety and correctness in software. DNA nanoscale technology is very complex, and not always safe because we don’t necessarily know what these structures will do once they are formed. If we combine techniques learned in software engineering that promote safety and reliability to DNA nanoscale self-assembly, then we might be able to make some real discoveries about what nanostructures can do and how we can use them.”

Faculty in LANSA recruited Bergquist, a graduate of our own B.S. program. “He is simply a brilliant student, with a rare ability to look at ideas and concepts in unique ways,” says Jim Lathrop, co-Director of the LANSA Laboratory. “He thinks outside of the box, and his dream is to make a large contribution to society with broad impacts on how we live.” Bergquist thinks that he can achieve this dream to convince students to choose ISU, or in this case, to stay at ISU. “We invest a lot of time and energy teaching in this country...MIT, Stanford, anywhere. We are happy he chose ISU.”

The Pragmatics Fellowship was an immediate help to Bergquist when his computer failed just one week into the fall 2012 semester. “The Pragmatics Fellowship was certainly an incentive to accept admission into this program, this laboratory” says Bergquist. “It allows me to focus on research and not have to worry about details.” Bergquist will be able to participate in the Requirements Engineering conference in September 2012, where he and his coauthors are presenting the paper, *Requirements Analysis for a Product Family of DNA Nanodevices*.

**B.S. Computer Science, Iowa State University**
- **Teaching Assistant:** Com Sci 311, Design & Analysis of Algorithms
- **Research Assistant:** Laboratory for Nanoscale Self-Assembly
- **Advisors:** Jack Lutz, Jim Lathrop
- **Research:** Software Engineering, DNA Nanoscale Self-Assembly
Taylor Bergquist is looking to make broad impacts with his research contributions and is talented enough to achieve his goals. “I want to be a part of the discovery process...to invent something brand new that is both practical and theoretical at the same time.” Bergquist is finding that mix with Laboratory for Nanoscale Self-Assembly (LANSA) at ISU. Faculty at LANSA are starting a new research initiative to bring software engineering concepts and practices to nanoscale self-assembly. Taylor looks forward to being part of that new initiative. “We have a lot of techniques in SE to ensure safety and correctness in software. DNA nanoscale technology is very complex, and not always safe because we don’t necessarily know what these structures will do once they are formed. If we combine techniques learned in software engineering that promote safety and reliability to DNA nanoscale self-assembly, then we might be able to make some real discoveries about what nanostructures can do and how we can use them.”

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