In August 2011, CUbiC began hosting a new Integrative Graduate Education and Research Traineeship (IGERT) funded by the National Science Foundation (NSF). This five-year, interdisciplinary initiative, called the Alliance for Person-Centered Accessible Technologies (APAcT), is a partnership between Arizona State University (ASU) and California State University, Long Beach.

It is my pleasure to present the CUbiC Spring 2012 newsletter, which highlights the recent developments and achievements of CUbiC, and to thank all those who make our goal of the betterment of society through multimedia research possible.

Over the last few months, CUbiC has made great strides in expanding the impact of our research through successes on several fronts. We have been awarded the prestigious NSF IGERT grant to develop a new interdisciplinary PhD program on “Person-centered Technologies and Practices for Individuals with Disabilities” over the next 5 years. This program - a partnership with California State University, Long Beach - will train doctoral graduates to become future leaders in the field of disabilities through an integrated education-research-practice model involving faculty from various departments. We have also been awarded the NSF IIS grant to design and develop assistive social situational awareness aids for individuals with visual impairments. In addition, we co-organized the ACM Multimedia conference in Scottsdale in November 2011, and our research work has continued to be accepted for presentation at premier venues including NIPS, ACM Multimedia, and ACM ASSETS for 2011.

We have recently had outstanding students join our research family. I am delighted to welcome Eric Luster and Arash Tadayon to CUbiC as part of our first cohort of IGERT Fellows. Eric is a US army veteran with an interdisciplinary background in technology, business and law; and Arash is a former ASU undergraduate student with several academic honors and a founder of two companies. Shantanu Bala, who had worked with us as a high-school student, won the prestigious Flinn scholarship and joined us as a freshman.

I would like to thank all our students, faculty, collaborators, alumni and staff for their hard work and support to CUbiC. I welcome this opportunity to connect with you through this newsletter. I invite you to visit us at CUbiC, and follow us at http://cubic.asu.edu.

Dr. Sethuraman Panchanathan
Center Director

Alliance for Person-Centered Accessible Technologies—a new IGERT Program by Jay Klein—Project Director, and Vineeth Balasubramanian—Research Director

In August 2011, CUbiC began hosting a new Integrative Graduate Education and Research Traineeship (IGERT) funded by the National Science Foundation (NSF). This five-year, interdisciplinary initiative, called the Alliance for Person-Centered Accessible Technologies (APAcT), is a partnership between Arizona State University (ASU) and California State University, Long Beach.
State University, Long Beach (CSULB), and is jointly led by PI and CUbiC Director, Dr Panchanathan at ASU, and Co-PI Dr Golshani at CSULB. The program will provide more than 25 fellowships to train a new generation of doctoral students, with and without disabilities, to become future leaders in the field of disabilities through an integrated interdisciplinary focus on technology (computing, processing, communication, analysis, engineering), adaptation (design, usability, efficacy, effectiveness) and policy (governance, commercialization, law, ethics) for person-centered assistive, rehabilitative, interventional and preventive solutions. These students will work on cutting-edge research projects spanning departmental and institutional boundaries, will be engaged in immersive internships in disability research, and will be exposed to novel threads of learning, such as entrepreneurship and leadership.

APAcT is founded on concepts of person-centeredness, universal access, and inclusion, which form the fundamental cornerstones of its design and implementation. While the impacting factors causing disabilities may be common across groups of people, the experience of disability and its debilitating effects on daily living are unique to each individual. Until now, person-centeredness in the field of disabilities has been primarily focused on delivering services, whereas technologies and technology-related policies have largely been designed in a “one-size fits-all” approach. The enhanced abilities of advanced computing and communication technologies allow technologies and practices to be increasingly individualized. APAcT’s transformative program will lead to novel person-centered approaches and practices that will focus on the competency of individuals with disabilities, while maintaining a broader relevance to all individuals and universal results. For example, great inventions, such as the typewriter and antibiotics, have resulted from efforts to find solutions for some aspect of disabilities. This IGERT will have a significant impact on the lives of individuals with disabilities, including injured veterans, the elderly, children with developmental/learning disabilities, individuals with autism, neglected groups among persons with disabilities such as persons with low vision who are not blind, and - in the most general sense - a very large portion of society.

APAcT accepted its first four IGERT fellows in January, including 2 outstanding doctoral students at CUbiC, Eric Luster and Arash Tadayon (who have been profiled in this newsletter). These students will be trained in an interdisciplinary education-research-practice model including faculty from computer science, bioengineering, education, public policy, law and ethics, health science, design and architecture, and psychology. Novel threads of learning, including service learning, entrepreneurship, leadership and commercialization, will be value-added dimensions of a new integrated training model for disabilities, the sum of which will be infused with the tremendous potential to generate social and economic impact. The involvement of two institutions with contrasting styles of academic delivery, yet sharing the same objectives, makes this IGERT program unique in its function as well as structure. Trainees will also actively participate in formal interactions with collaborators in various institutions across the country and the world to obtain broader national and global perspectives.

In summary, the balance of research, instruction and practicum experience will produce graduates who will be strong advocates for persons with disabilities in all areas of life, and who will have a life-long commitment to improving the lives of individuals with disabilities. The transformational power of the proposed program cannot be understated. The trainees will witness first-hand the personal, environmental, and social barriers people with disabilities face as they attempt to achieve a high quality of life in home, school, and community, and as they pursue academic excellence in their respective disciplines. Most significantly, IGERT trainees will have the opportunity to follow their research through to its logical conclusion - that of making a difference in the lives of people they have chosen to serve and impact, those with disabilities. For more information, we invite you to visit the program’s website at apact-igert.org.
**Transfer Learning for Wearable Activity Recognition** by Ashok Venkatesan

Activity recognition is a prominent challenge that is being researched upon in the fields of human computer interaction and pervasive computing. At CUbiC, we have been progressively solving various aspects of developing activity recognition systems in the context of building a cognitive orthotic (a reminder system for people with cognitive impairments) to assist people through the process of food preparation, counted as one of the instrumental activities of daily living. A key challenge in building such a system is to make the core classifier robust against non-stationary and continuously evolving data. In machine learning, one of the classic assumptions made when designing a classifier is the similarity in the distributions for the training and testing datasets. However, this assumption fails to hold ground in real-world conditions where the decision boundaries continuously shift depending on factors such as the operating environments or individual user traits. Learning a classification model on such data (dataset shift) requires a framework that can adapt itself to the dataset shifts.

Under such circumstances, transfer learning has come to be seen as a good methodology for improving classification performance with reduced training costs and without the need for explicit re-learning from scratch. The concept of transfer here refers to that of knowledge transfer, a phenomenon that occurs instinctively in human learning. As part of this project, we have devised a "cost-sensitive" variation of AdaBoost which capitalizes on the theoretical and functional properties of AdaBoost to selectively reuse outdated training instances obtained from a training domain to effectively classify unseen instances occurring in a different, but related "target" domain.
**Meet Our IGERT Fellows**

**Eric L. Luster** is a second year Ph.D. student in Computer Science working at CUbiC lab under the supervision of Dr. Panch. Eric is a veteran of the U.S. Army where he has earned various awards and accolades while serving. He has over eleven years of proven experience in the IT/Telecommunications industry including management, feasibility analysis, systems integration, and hardware/software testing & evaluation. He is the founder of an Arizona based technology firm, where he has established successful collaborations to bridge the gap between research and industry. He has the desire to understand the needs of people with disabilities and ultimately create innovative assistive technologies. In this effort, he is working on methods that will be used to accurately identify and archive data from Traumatic Brain Injuries (TBI). His preliminary work was presented at the IEEE Healthcom 2011 conference and was a finalist for the Arizona State University Innovation Challenge 2011. His current research interests are in human-computer interaction and policy/governance issues. He plans to graduate in Spring of 2015.

**Arash Tadayon** is a first year Ph.D. student studying Computer Science and is working in the CUbiC lab under the supervision of Dr. Panch. Arash completed his undergraduate study at ASU and immediately enrolled in the graduate program the following semester under the IGERT program at CUbiC. His areas of interest include mobile computing, distributed computing and human-computer interaction. Through these interests, he has co-founded two different companies. One of his companies does mobile application development and the other is focused on developing a novel gesture-based interaction system for use in the hospital environment. In his junior year as an undergraduate, Arash was part of a team that developed an assistive technology to help the visually impaired population better access the local bus system. This project was a national finalist in the Microsoft Imagine Cup competition. During his undergraduate career, Arash also published a peer-reviewed paper in FECS '09 titled “Interactive Visual Programming.” He plans to graduate in Spring of 2016.

**Featured CUbiC Alumnus**

**Dr. Narayanan C Krishnan (CK)** completed his PhD in Computer Science in December 2010 under the guidance of Dr. Panch. His dissertation work on “A computational framework for wearable accelerometer based activity and gesture recognition” was nominated for the Outstanding Thesis Award. He is currently working along with Prof. Diane Cook as an Assistant Research Professor in the Center for Advanced Studies in Adaptive Systems at Washington State University developing algorithms for activity recognition from smart home sensor data. CK received his Bachelors and Masters in Science majoring in Mathematics and Masters in Technology (Computer Science) from the Sri Sathya Sai Institute of Higher Learning in 2000, 2002 and 2004 respectively. His research interests are: activity recognition, pervasive computing, pattern recognition and applied machine learning. He has published 4 book chapters and journal articles, and over 20 conference and workshop papers and offered a tutorial on sensor based activity recognition at the International Conference on Multimedia and Expo - 2010. He was the publicity chair for the IEEE HAVE symposium in 2010 and serves as program committee member for activity recognition related workshops. He is the recipient of The President of India Dr. A. P. J. Abdul Kalam gold medal for academic excellence in Masters of Technology in Computer Science in 2004. At CUbiC, CK has mentored senior design capstone projects and won research grants. CK hopes to pursue an academic career conducting research that makes a positive impact on the society.
**Highlights**

**Recent Publications**
7. M. J. Astrauskas, D. Hayden, Q. Yan, J. Black, "Student project aimed at helping the visually impaired take notes in class wins prize at Microsoft Imagine Cup", SIGACCESS Access. Compute., USA, 2011.

**News**

**New Students at CUbiC**
CUbiC welcomes IGERT research scholars, Arash Tadayon and Eric Luster, and undergraduate student researchers, Kian Fakhri, Bijan Fakhri, Derrick Kiarash Rahbar and James Fiacco.

**CUbiC Students win FURI Grant**
Two CUbiC undergraduate students, James Fiacco and Bijan Fakhri, were awarded Fulton Undergraduate Research Initiative grants to pursue their research interests.

**CUbiC Hosts Open House @ ASU**
From August 24-26th 2011, CUbiC hosted an open house for an hour each day. Dozens of students and researchers received a tour of the lab and demonstrations of projects.

**CUbiC Co-Organized ACM MM 2011**
ACM Multimedia Conference, 2011 was successfully hosted by ASU in Scottsdale. CUbiC students volunteered throughout the organization of the conference.

**CUbiC Student Wins ASU Innovation Challenge 2011**
CUbiC student Arash Tadayon has won the ASU Innovation Challenge for the year 2011 for the company Augmented Innovations. The company creates a novel computer interface for doctors to be able to access and interact with patient data technologies in sterile environments.

**Prominent Visitors at CUbiC in Fall 2011**
- Dr. Carole Stoel, NSF IGERT Program Officer
- Dr. Melur Ramasubramanian, NSF IGERT Program Officer
- Tom Forese, Arizona Representative
- Neal Stephenson, Science Fiction Writer

Read more at cubic.asu.edu/news

**Upcoming Events**

**Engineering Open House**
The Ira A. Fulton Schools of Engineering hosts FIRST EVER Engineering Open House (EOH) - a FREE event open to the public. Come see CUbiC exhibits on Friday, March 30, 2012 9:00 am - March 31, 2012 3:00 pm at Tyler Mall on the Tempe.