A software application created by two University of Central Arkansas students to track the speed of a skin lesion’s progression to better diagnose and treat skin cancer is among the software designs selected to compete in the U.S. national finals of the Imagine Cup.

The Imagine Cup is the world’s premier student technology competition sponsored and hosted by Microsoft. More than 200,000 teams from over 100 countries participate in the annual international competition.

UCA Ursus Team is among the top five teams competing in the first round of the U.S. finals scheduled in April at the Microsoft campus in Redmond, Wash. Team members include sophomore Brendan Lee of Alma and Muhyeddin Ercan, an international graduate student from Turkey. Sinan Kockara, assistant professor in the Computer Science Department, serves as team mentor.

The UCA team will compete in the Software Design category. Other teams in this category include Brigham Young University, Arizona State University and the University of California - Los Angeles. The teams created real-world software applications using Microsoft technologies. The software applications addressed the Imagine Cup 2011 theme: Imagine a world where technology helps solve the toughest problems.

This is the first time UCA Ursus Team has competed in Imagine Cup. The team’s success was not a surprise, said Kockara.

“Our students learn to find creative solutions to real-world problems. Thus, they become one of the technology leaders of tomorrow,” he explained. “Students in our computer science program have access to a variety of hands-on research projects with outstanding faculty, such as biomedical informatics, multimedia, interval computing, networking, data mining and software engineering. Achievements, such as the Imagine Cup, prove that UCA has a nationally competitive undergraduate program as well as a graduate program in Applied Computing.”

The Imagine Cup 2011 Worldwide Finals will be held in July in New York City. The grand prize is $8,000.
Although the department has many outstanding students this semester a couple were acknowledged for outstanding work and service to the department. Wayne Werner and Jason Barnes.

**Christopher Kline** is a senior computer science major working with Dr. Yu Sun in the Department of Computer Science. Christopher described his work to develop an improved rate control algorithm for video compression. He explained the importance and the challenge of developing effective rate control algorithms for the newest video compression standard - H.264/SVC. His work with Dr. Sun involved the proposed use of an adaptive initial encoding parameter selection for H.264/SVC rate control. He described their research progress that has produced considerable performance improvements in bit-rate regulation and video coding quality when compared with the rate control algorithm adopted by H.264/SVC compression standard.

**Priyatham Anisetty** presented a paper he co-authored with Dr. Paul Young titled “Collaboration Problems in Group Projects” at The Ninth Annual Consortium for Computing Sciences in Colleges Mid-South Conference, held in Conway April 1-2, 2011. The paper stems from experience gained while directing the members of Dr. Young’s Software Engineering Class in a classwide, semester-long software development project.

**Luke Irvin** is a senior computer science major. He has worked as a software developer at Clarovista, LLC, a new media agency in Conway, Arkansas. Luke described how he applied his knowledge learned in Computer Science at UCA on developing Apps for the iPhone and iPad. He demonstrated some of the basic routines common to traditional Apps. He also outlined the logic necessary to assemble these routines into a simple App, providing a simple but effective example of the organization involved in these tools so common to modern handheld electronics.
Dr. Chen Bernard will lead several students to join the conference on July 18~21 at Las Vegas, NV

ALL three research papers involve both undergraduate and graduate students are accepted as Regular Research Paper (RRP) - ie, accepted for both, publication in the proceedings and oral formal presentation. The acceptance rate for this highest level is around 21% as of April 3. The three papers are (underlined names are UCA students):

Title: Clustering on Protein Sequence Motifs Using SCAN and Positional Association Rule Algorithms
Authors: Bernard Chen, Ben Nordin, Sriram Bobba, Devendar Singireddy, Brad Taylor, Sinan Kockara, Mutlu Mete

Title: Constructing Super Rule Tree (SRT) for Protein Motif Clusters Using DBSCA
Authors: Bernard Chen, Sait Suer, Muhyeddin Ercan, Rahul Tada, Recep Avci, Sinan Kockara

Title: Protein Sequence Motif Extraction Using Decision Forest
Authors: Bernard Chen, C. Hudson, M. Kim, A. Crawford, C. Wright, D. Chen

In December 2010, Dr. Yu Sun and her student published a peer-reviewed paper at the IEEE Global Communications Conference (Globecom 2010), a premier conference in Telecommunications in the world.

The acceptance rate of this conference is 35.6%. The student author, Jin Yang, co-advised by Dr. Sun, is a Ph.D. student at the University of Electronic Science and Engineering Technology of China. In this research, the team developed a new rate control algorithm for the emerging H.264 Scalable Video Coding standard. The proposed algorithm can accurately regulate the compression bit rates for miscellaneous networked video applications with diverse needs in resolution, video quality and frame rate.

Invited Talk:

Yu Sun, “Rate Control for Video Compression and Communication”, Invited Talk, Sichuan Normal University, Chengdu, Sichuan, P. R. China, May 24, 2011.
The staff of the UCA Institute for STEM Professional Development and Education Research (UCA STEM Institute), formerly known as Arkansas Center for Mathematics and Science Education (ACMSE) held an open house on February 18, 2011.

The faculty and staff of the College of Natural Sciences and Mathematics (CNSM) and the College of Education (COE) were invited to tour the facilities and learn about the programs and resources offered by the UCA STEM Institute. About 30 people attended the open house.

Computer-related technology is increasingly driving the U.S. economy and according to The National Association of Colleges and Employers, computer science ranks as one of the top five highest-paying career paths and is projected to further expand within the next decade. However, the number of computer science (CS) majors in the United States is declining. One of the primary reasons is absence of exposure to computer science and computational thinking in the high school experience. The vast majority of high school students has no concept of what a Computer Science major entails and lack awareness of multiple career opportunities for CS majors.

The Computer Science Department at the University of Central Arkansas is organizing road trips aimed at piquing students’ interests in CS. The presentation started with an overview on Computer Science and career options for CS majors by Dr. Vamsi Paruchuri. Later, Rema Taneja, a sophomore student in CS major and alumni of Benton High School, gave an introduction to game programming and animations. Luke Irvin, a graduating senior in CS Major and alumni of Hope High School, presented multiple career options in Mobile programming. Jason Barnes, also a graduating senior in CS, gave an overview on Computer Security and Hacking. The undergraduate students also shared their perspectives of Computer Science and UCA. Rema Taneja is CS Club secretary, Luke Irvin has co-founded Conway Co-Work and Jason Barnes will be pursuing Ph.D. degree in Washington University in St. Louis.
CS4HS (Computer Science for High School) is an initiative sponsored by Google to promote Computer Science and Computational Thinking in high school and middle school curriculum.

This summer the department hosted this workshop on campus July 11 – 14, 2011. Sponsored by Google and Co-Sponsored by Acxiom. Faculty who helped with workshop’s success: Chenyi Hu - PI, Bernard Chen, Michael Nooner, Vamsi Paruchuri and Karen Thessing. We had 15 teachers complete the workshop.
The Research Experience for Undergraduates (REU) project "HIT@UCA: Applied Research in Health Information Technology" is a National Science Foundation (NSF) funded research program hosted by the Computer Science Department at UCA. This is the first ever Computer Science REU in Arkansas selected by the Computer & Information Science & Engineering (CISE) Directory of NSF. It is one of the seven newly selected NSF-CISE RUE sites across the Nation this year together with other seven renewed sites. The primary objective of the UCA REU site is to encourage motivated undergraduate students to pursue graduate study and research careers in computer science by providing them a competitive research experience. This project integrates fundamental research of computer science with applications in health information technology (HIT), aimed at improving the overall quality, safety and efficiency of the health delivery system. The interdisciplinary nature of this REU program offers opportunities to the participants to perceive the importance and applications of computer science and continue their education in this field. A series of training seminars and field trips equip students with knowledge specific to the various research projects as well as general skills required in graduate school. The students participate in a full range of research activities including designing and conducting experiments, analyzing data, documenting research results and writing papers for publication, and presenting at a symposium. Ten undergraduates from across the country were selected from a strong pool of forty applicants to conduct research on four HIT projects, along with four CS graduate students. The REU mentor team for 2011 includes Drs. Vamsi Paruchuri (PI), Yu Sun (Co-PI), Sinan Kockara, Micheal Nooner, Paul Young, Umit Topaloglu (UAMS) and Shengli Sheng. Further details about the award and the program can be found at: www.nsf.gov/awardsearch/showAward.do?AwardNumber=1062838 and http://sun0.cs.uca.edu/reu/program.html
REU Students: Back Row, L to R: Brent, Keenan, Ryan, Travis, Sait
Front, L to R: Chase, Aaron, Ashley, Karen, Melissa, Danielle, Tejaswi

REU Research Posters
Dr. Chenyi Hu, Chair of the Computer Science Department participated in and presented his research work at two recent conferences. The first was the World Conference on Soft Computing (WConSC’11) in San Francisco, May 23-26, 2011. His paper titled "Decision Making in Dynamic Environment with an Interval Rule Matrix Model" is published in the conference proceedings with index 113-483 (8 pages).

The second presentation was at the 2011 ACM Federated Computing Research Conference on June 7–11, 2011 in San Jose, California. He presented his research work on Symbolic Numeric Computation (SNC). His paper titled "Interval Function and Its Linear Least-Squares Approximation" is published in the SNC proceedings pages 16-23.
Dr. Victor Sheng, assistant professor of computer science, has received official notice from the National Science Foundation that his proposal, entitled “RUI: Improving Data Quality and Data Mining Using Noisy Micro-Outsourcing”, has been funded. The award is for $260,628 with the duration of 36 months. It can support one master and two undergraduates each year for three years. In this project supported by the Information Integration and Informatics (III) program of the NSF division of information and intelligent systems, Dr. Sheng and his research team (graduates and undergraduates) will develop a framework on obtaining and utilizing noisy information from online micro-outsourcing systems. The online micro-outsourcing systems provide a new alternative for the large-scale acquisition of data from non-experts at very low cost. A non-expert can provide very useful information. However, the information provided contains errors, and the error rates may still be significant, due to lack of expertise, dedication, attention, interest, or other factors. Thus, when using these systems to obtain the labels of some or all data points, it is natural to consider obtaining multiple labels. There is currently no clear understanding how to utilize the multiple noisy labels, and smarter repeated-labeling methods are also needed, in order to improve data quality and the quality of models built from the data.

To be specific, Dr. Sheng and his research team will design intelligent repeated-labeling strategies, which will take advantage of the low cost of micro-outsourcing to acquire multiple labels for data points, in order to improve data quality and the quality of models built from the data. To make smart decisions on which examples need more labels, the proposed repeated-labeling strategies need to make use of the obtained multiple labels. In order to utilize the multiple labels obtained, Dr. Sheng and his team will design proper utilization strategies for learning models. These utilization strategies would also improve the repeated-labeling strategies, and affect the example-labeler allocation.

The project will advance the state of the art of micro-outsourcing, and enhance the techniques of utilizing multiple noisy labels in data processing and information fusion. Generally useful active micro-outsourcing of case labeling will have impact across a broad variety of scientific, government, and business tasks. In addition, this project will provide research opportunities to undergraduates and enhance the quality of education.

Jason Barnes, Derius Campbell, Alex Chalupka, Luke Irvin, Chase Mitchell, Kyle Richards, Phillip Smith, Wayne Werner, and John Write

Pavan Roy Marupally – Thesis Title – “Forecasting Network Bandwidth using Interval Computing & Privacy Preserving Portable Health Records based on Smart Cards”.
Dr. Sinan Kockara from the Department of Computer Science received ASTA and NSF funding with the amounts of $15,000 and $18,000 respectively for investigating prognostic factors of Standard Uptake Value (SUV) distributions in head and neck cancer patients. Dr. Kockara’s collaborators on this project are Mauricio Moreno, M.D. and Gal Shafirstein D.Sc. from UAMS.

After the introduction of quantitative analysis of Positron Emission Tomography (PET) scan for monitoring the early response of tumors in breast cancers in 1993, (SUV) has been used as a prognostic factor in cancer cases in addition to anatomical metrics of the tumor such as the volume or the growth rate. However, current studies have focused on using a single value like maximum SUV or mean SUV rather than a whole distribution. Moreover, two important prognostic factors, volume and SUV distribution have not been studied together. In this on-going study, SUV distribution and the tumor volume will be used to develop a prognostic model for head and neck cancers. The images to the right show a sample segment and the three-dimensional image built by putting segments together. The pink object in the images is the tumor.

In March 2011, Dr. Yu Sun from Computer Science Department published a journal paper in IEEE Transactions on Circuits and System II, a leading journal in the field of Hardware and Architecture. Fully sponsored by Chinese Scholarship Council (CSC), the co-author Dr. Yimin Zhou, had been a visiting scholar in CS department at UCA from Dec. 2007 to May, 2009. He conducted advanced research in the area of multimedia computing with Dr. Sun. In this study, based on the PID control theory, they proposed a novel and robust bit allocation scheme for H.264/Advanced Video Compression (H.264/AVC). Experimental results demonstrate that the proposed scheme outperforms the approach adopted in H.264/AVC standard by providing accurate rate regulation, precise buffer control and coding quality improvement up to 1.17 dB.

Improving Data Quality and Data Mining Using Noisy Micro-Outsourcing

Dr. Victor Sheng, assistant professor of computer science, has received official notice from the National Science Foundation (Information Integration and Informatics (III) program of the NSF division of information and intelligent systems) that his project, entitled “RUI: Improving Data Quality and Data Mining Using Noisy Micro-Outsourcing”, has been funded. The award is for $260,628 with a duration of 36 months and will support at least one master and two undergraduates each year for the duration of the grant. Dr. Sheng and his undergraduate and graduate student research team will develop a framework for obtaining and utilizing noisy information from online micro outsourcing systems. The online micro-outsourcing systems provide a new alternative for the large-scale acquisition of data from non-experts at very low cost. A non-expert can provide very useful information. However, the information provided often contains errors, and the error rates may be significant due to lack of expertise, dedication, attention, interest, or other factors. Thus, when using these systems to obtain the labels of some or all data points, it is natural to consider obtaining multiple labels. There is currently no clear understanding of how to utilize the multiple noisy labels, and smarter repeated-labeling methods are also needed in order to improve data quality and the quality of models built from the data.

More specifically, Dr. Sheng and his research team will design intelligent repeated-labeling strategies which will take advantage of the low cost of micro outsourcing to acquire multiple labels for data points, in order to improve data quality and the quality of models built from the data. To make smart decisions on which examples need more labels, the proposed repeated-labeling strategies need to make use of the obtained multiple labels. In order to utilize the multiple labels obtained, Dr. Sheng and his team will design proper utilization strategies for learning models. These utilization strategies would also improve the repeated-labeling strategies, and affect the example-labeler allocation. The project will advance the state of the art of micro-outsourcing, and enhance the techniques of utilizing multiple noisy labels in data processing and information fusion. Generally useful active micro outsourcing of case labeling will have an impact across a broad variety of scientific, government, and business tasks. In addition, this project will provide research opportunities for undergraduates and graduate students, enhancing the quality of their educational experience.

Faculty in Computer Science and Mathematics Receive University Research Grants

Dr. Mark Smith worked jointly with Dr. Long Le, assistant professor of Mathematics, to receive a URC grant for $2,287. They will work to create an educational tool on the iPad for mathematics classrooms in high schools.
Summer Research Experience for Undergraduates in Applied Research in Health Information Technology

REU: HIT @ UCA
May 23 – July 29

Ten selected applicants will receive a grant through summer weeks to participate in Applied Research in HIT in the Computer Science Department at the University of Central Arkansas. The program will provide undergraduate students with competitive research experience to tackle a variety of significant HIT problems.

IT ACADEMY
June 22 – 24th

IT Academy is a one week summer camp offered by jointly by the Computer Science and Management Information Systems departments. The academy will host 50 high-school students who will learn about exciting potential IT careers. During the camp students will stay at a dorm and experience life on campus. During the day they will gain valuable technical skills and even take a tour of Acxiom, a top employer of IT professionals in the area.

TEACHER WORKSHOP
July 11 – 14th

CS4HS is a primarily sponsored summer workshop that will prepare teachers for bringing computer science to Arkansas high schools. The theme of this year’s workshop will be Computing is Cool and Fun! We will emphasize the core aspects of computer science using a entertaining and dynamic set of hands on exercises. These exercises will be packaged in such a way that you can then take them back to your classroom for your students to enjoy.