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Student-Organized CodeRED Liftoff Hackathon Largest in Greater Houston Area

In November, more than 600 students came to the University of Houston to attend the “CodeRED Liftoff” Hackathon, the largest hackathon event hosted in Greater Houston to date. CodeRED Liftoff was an event where students at various levels – high school, college and university, and graduate school – from all over the world gathered to solve problems, build ideas and push the limits of mind and body to create something amazing in 24 hours.

Innovation is the singular idea governing CodeRED’s existence. It brings the new generation of up-and-coming-minds in computer science,



computer engineering and information technology together in the hope of making a positive change in the community.

During a hackathon, attendees spend 24 hours collaborating intensively on a software and/or hardware project. These projects can be their own brainchild or challenges brought to the playing field by leading national companies, like PROS and Microsoft. For 24 hours, participants brainstorm ideas for a project and complete it. At the end, the contestants present their projects to a panel of judges.

During CodeRED Liftoff, attendees networked with sponsoring company employees from various industries in an open environment where they could showcase their ingenuity and intellectual prowess. Experienced software developers, consultants and computer science enthusiasts from companies, such as PROS, Microsoft, Pariveda Solutions and others, offered a helping hand so the students could advance their own projects as well as the company-sponsored challenges.

Attendees and sponsors were not the only ones enjoying CodeRED Liftoff. Dozens of UH computer science alumni working in various industries showed up to support and motivate the young coders as they endeavored to impact the technological community. Ahren Esquenazi, a first-time CodeRED attendee, said, “It’s really nice, because you learn so much. The amount I learned from actually making something with my own abilities is unbelievable. I learned more in the past day than I would have in a month in school.”

CodeRED Liftoff was organized and run by UH’s computer science student organization, CougarCS. Fourteen CougarCS officers spent over six months planning the administrative details and logistical issues: fundraising from potential sponsors; contacting and accommodating more than 600 student attendees and 100 sponsors, CS alumni, mentors and judges for a 24-hour period; ordering, delivering and serving four meals, and hiring bus services to pick up students in Dallas, College Station and Austin.

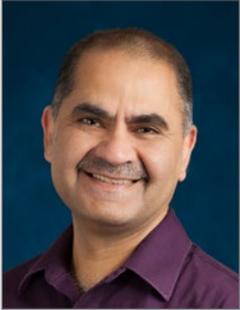
CougarCS Director of Hackathons Aaron Dancer explained his dedication to running the massive event, “We want to promote student innovation and involvement in the programming culture. There are so many wonderful ideas that could be made reality if only given the chance.”



The dedicated CougarCS team, with the support of UH Department of Computer Science and the CodeRED sponsors, made the event one of the most popular hackathons in the nation.

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Message from the Chair



The University of Houston is the largest university in the fastest growing big city in the United States. And, Computer Science is the fastest growing and the most dynamic field of study today. It is important to enhance and grow computer science at UH for the benefit of current and future students as well as the local economy.

UH computer science graduates are playing an important role in virtually every major industry in Houston – from energy and medicine to banking and software. However, the UH faculty and administration alone cannot build academic programs in computing for the future. An important role must be played by others, particularly industry, alumni and funding agencies. I am glad to report that we have made great strides in these directions in the past year.

UH was recently selected to receive two, major new research awards from the U.S. Department of Homeland Security. The Center for Borders, Trade and Immigration Research, led by Dr. Ioannis Kakadiaris, a Hugh Roy and Lillie Cranz Cullen University Professor of Computer Science, was established with a \$3.4 million grant from the DHS Science and Technology Directorate, Office of University Programs, and includes researchers from 10 universities.

And, a group at UH led by Dr. Weidong “Larry” Shi, assistant professor of computer science, was awarded \$2.6 million by the DHS to develop technology to help protect emergency response systems, such as current and next-generation 911 systems, against Distributed Denial of Service attacks. This project is highlighted in this issue of CS Now!

Besides providing much needed financial support for cutting-edge research, these major DHS awards are a vote of confidence to the quality and practical value of our research program. UH Computer Science has grown in stature to the point where the federal government trusts our faculty to deliver solutions to some of the most pressing national needs.

The relationship between the department, our alumni and local industry is a virtuous circle; our alumni benefit from the enhanced prestige and standing of the department, while industry is able to recruit world-class computer scientists in their neighborhood.

I am glad to report that our alumni and industry friends have stepped up admirably to partner with the department. The UH Computer Science job fair has attracted a larger number of companies every year for the past 3 years. Also, 2 years ago, we started a mixer that brings together the UH Computer Science community – alumni, faculty, staff, students and friends. The attendance at this event has doubled every year, well exceeding 100 this time. More importantly, the alumni are in the process of formalizing a relationship with the department and taking leadership in a multitude of efforts to support the department. We are very excited about an enhanced alumni presence in department affairs.

I end this note with a big thank you to all our friends and supporters. Please do not hesitate to contact me if you have ideas and suggestions for us, or would like to participate in any departmental activities, or even to complain!

- Jaspal Subhlok

Department Hosts Research Open House

Thanks to all the presenters, research mentors, moderators, volunteers and attendees, the 2015 Computer Science Research Open House, hosted on November 13, was a huge success!



The Computer Science Research Open House was a chance for faculty to share their research experiences with the large UH computing community and industry partners. The Open House also provided a forum for students, faculty and the community to discuss cutting-edge research topics and to examine the connection between research and application.

The Open House featured three formal talks: *State of the Department* by Dr. Jaspal Subhlok, department chair, *Living in a World Without Passwords* by Dr. Ioannis Kakadiaris, Hugh Roy and Lillie

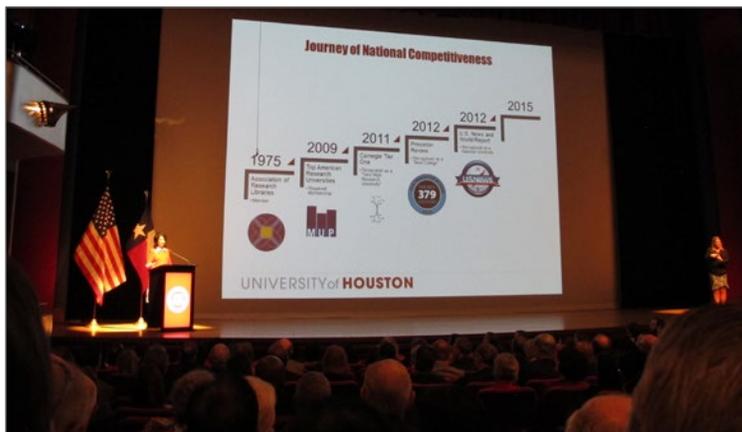
Cranz Cullen University Professor of Computer Science, and *Engine of the Power House* by Dr. Larry Shi, assistant professor of computer science. These talks were followed by poster and demonstration sessions highlighting research within the department.

Featured Research Exhibits

CS Research Exhibits, UH Computer Graphics and Interactive Media Lab, Parallel Software Technologies Laboratory, Visualization and Modeling for Science and Engineering, UH Data Mining and Machine Learning Group, Surgical Robots Guided with Real-Time Imaging, Research in Text Understanding and Analysis of Language (RITUAL) Group, UH Software-Defined Networking Lab, Pattern Analysis Laboratory, New Technologies to Connect People and Devices in the Air, Land, and Sea, UML Modeling – Prelude to Programming, Automatic B Cell Lymphoma Detection Using Flow Cytometry Data, Real-Time Systems Laboratory, Security Solutions for Web and Cloud, Computational Biomedicine Lab, State of the Department, ReDAS – Reasoning and Data Analytics for Security, Quantitative Imaging Laboratory, Computational Physiology Lab, and UH Gaming Program: Success Stories and Future Prospects

Phi Beta Kappa Chapter Established at UH

After becoming a Carnegie Tier One university in 2011, the University of Houston has reached another milestone in 2015: bringing a chapter of the Phi Beta Kappa Honor Society to the campus, thus joining the ranks of the nation's best in undergraduate education.



As the only Phi Beta Kappa faculty member in UH's Department of Computer Science, Prof. Albert Cheng worked with more than 100 UH faculty and staff members to bring a PBK chapter to UH. After a rigorous six-year evaluation process, the collective effort came to fruition on October 9 with the announcement that UH had been granted a PBK chapter.

To qualify for a chapter, UH faculty and programs had to demonstrate excellence at the highest level in undergraduate arts and sciences education. The selection process also required votes of approval from multiple bodies of the national PBK organization, including the PBK Senate, which voted unanimously in favor of granting the UH faculty permission to shelter a chapter.

The organization extended its evaluation into every corner of the University, from the Honors College to athletics. Thousands of pages of documentation were compiled and submitted by the UH organizing committee, made up of faculty who earned Phi Beta Kappa membership through their undergraduate education. Prof. Albert Cheng was invited to join PBK during his senior year as the top student in his class at The University of Texas at Austin majoring in Computer Science. The committee also hosted a site visit by the national organization in 2014, which involved the participation of

more than 100 UH faculty and staff members.

Founded in 1776 at the College of William and Mary, just five months after the signing of the Declaration of Independence, Phi Beta Kappa is the nation's oldest and most prestigious honor society recognizing outstanding academic achievements of individuals and institutions. The mission of the organization "is to champion education in the liberal arts and sciences, to recognize academic excellence, and to foster freedom of thought and expression." Phi Beta Kappa members have included 17 U.S. Presidents, 37 U.S. Supreme Court Justices, and 131 Nobel Laureates.

There are only 286 colleges and universities in the nation (around 10 percent) with PBK chapters, including UH as one of the three newly approved esteemed institutions. In these PBK institutions, fewer than 10 percent of their arts and sciences graduates are invited to join. As a result, each year only one college senior in a hundred, nationwide, is invited to join Phi Beta Kappa.



Following her Fall 2015 Address, UH President Renu Khator congratulates Prof. Albert Cheng for his effort in helping bring to UH a chapter of Phi Beta Kappa, the oldest and most prestigious honor society.

Twenty-six colleges and universities applied during this triennial cycle, with just three winning approval. Previously, UH faculty had made formal applications as early as the 1980s.

- Albert M. K. Cheng

Cheng Delivers Keynote at STEM Conference at Lamar University

On October 3, Lamar University hosted the 3rd Annual Texas STEM Conference, Transforming Undergraduate Education in STEM. Dr. Albert Cheng, professor of computer science, provided the keynote address titled "How to do Research? & Functional Reactive Real-Time Systems."

Cheng, an advocate for STEM programing, stated "STEM education of K-12 and college students is critical to our nation and vital to the well-being of society and its people. STEM teachers and programs

need to inspire students to do more research so that they can innovate when they join the workforce."

ExxonMobil sponsored the STEM conference which was designed for undergraduate STEM majors. Over 120 students from Texas and Louisiana attended. The STEM conference seeks an interdisciplinary collaboration between science, technology, engineering and mathematics (STEM) across undergraduate and graduate education.

Data Mining and Machine Learning Group



The UH Data Mining and Machine Learning Group led by Dr. Christoph Eick targets the development of data analysis, data mining and machine-learning techniques and the application of those techniques to challenging problems in geology, astronomy, urban computing, ecology, environmental sciences, web advertising, and medicine. Educational Data Mining (EDM) led by Dr. Nouhad Rizk at UH is an emerging field that deals with the

development of methods to explore data in an educational context.

Since EDM is concerned with the application of data mining and machine learning to data from educational datasets, different methods, such as classification, clustering, regression, factor analysis, association rule mining, and sequential pattern mining, can be applied on educational data. The increase in instrumented educational software, as well as databases of student test scores, has created large repositories of data reflecting how students learn. EDM focuses on the collection, archiving and analysis of data related to student learning and assessment.

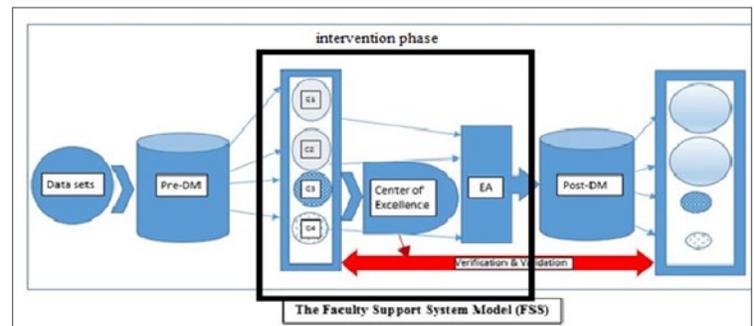


EDM is concerned with developing frameworks for exploring the unique types of data that come from educational settings, and using those methods to better understand students and the setting in which they learn. For example, our group at UH implemented a new framework called Faculty Support System (FSS) using different classification techniques to predict student outcomes, implement an assistance system, and classify students based on their academic performance.

The application of the FSS conceptual framework uses early detection techniques to identify struggling students and to implement evidence-based strategies to promote their performance achievement. The FSS model addresses a two-fold problem: first, to evaluate the efficiency of using Naïve Bayes classifier in identifying students at risk, and secondly, to assess the efficiency of the action, implemented by the center of excellence, in reducing the dropout rate and in enhancing performance. The model is promising for

reducing drop rate and ensuring success for low-performing students.

Moreover, identifying the most performing predictive data mining algorithms applied in an educational data environment deals with extracting information from data and using it to predict trends and behavior patterns. The core of predictive analysis relies on capturing relationships between explanatory variables and the predicted variables from past occurrences, and exploiting them to predict the unknown outcome. It is important to note, however, that the accuracy and usability of results will depend greatly on the level of data analysis and the quality of assumptions.



Evaluation of predictive data mining algorithms provides the best prediction and classification algorithms using different performance metrics relevant for evaluation of a specific model. Metrics summarize performance of a model and give a simplified view of model behavior.

Thus, another part of our research is using several performance metrics and checking whether they agree in order to better understand the model behavior and to quantify its performance. We distinguish practical application of performance metrics: probabilistic understanding of errors is based on sum of error contributions for individual prediction, and qualitative understanding of errors is based on classifying predictions by choosing a threshold and doing the classification by comparison to this threshold. Once predictions are binarized, they can be classified as true/false positives/negatives by a confusion matrix.

The long-term goals of EDM are to get all levels of data into the hands of faculties and administrators so that corrections and student outcomes can be enhanced, and to explore the benefitting factors of using supportive educational models to enhance the academic environment.

Dr. Rizk is the founder and counselor of IEEE-NSM branch at University of Houston. She has a very strong academic background in computer science combined with over twenty eight years work experience in industries as a chief information officer. Her position at University of Houston allowed her to further develop and strengthen her teaching development skills as well as her research. As a researcher, she had the opportunity to be a member of Edinburgh parallel computing center EPCC Scotland where she did many researches in parallel programming; she implemented these skills in a book chapter of parallel programming as well as publishing in the "concurrency Journal". After completing her PhD in E-learning at Leicester University, her research focused on information retrieval and educational data mining.

Dr. Rizk was appointed as Director of Undergraduate studies in January 2016.

ExxonMobil IT: Delighting Users by Design

ExxonMobil

Technology professionals face a daily challenge: solving problems at

the intersection of technology and business. ExxonMobil's IT professionals now have another perspective – the needs of the user. ExxonMobil IT solves problems by incorporating leading-edge technology to improve a business process, while meeting the user's needs. But how can the needs and behaviors of the user be woven into a technical solution, while still solving the business problem? Why does this perspective matter more today than ever before? What is the business advantage of delighting the end user?

More than ever, users want more from their workplace technology experience. Consumer-focused companies like Apple have raised the expectation that the technology should not only be easy to use, but also delightful. Consumer apps, for example, are easy to install and use. A teenager's new smart phone is typically set up with no help from a parent. Workers in corporations around the world now expect the same ease of use when they go to the office. No training is needed for tools in daily life – why should technology within a corporation be any different? Most enterprise systems are far from delightful, but why?

ExxonMobil IT seeks to transform the user experience through a research-based understanding of the user's behaviors, needs and motivations. This process, known as User-Centered Design, encourages engaging the user from the start and including user input at each stage of design and development. User researchers observe and interview users while they work, and gather information about how the average user engages with the current technology. The researchers take the findings and analysis back to designers, who then rely on this information to describe and design a user experience. Armed with a greater empathy and understanding

of what the user wants, developers then build the tool, iterating frequently. Throughout the build process, they confirm with users that the tool is meeting their needs.

The result of these early steps is an intuitive technology solution that users are happy to adopt. Ideally, little or no user training is required, as the technology is easy to understand and complements how the work is done. Because the tool addresses a need, users need not be convinced to use the new system or application. Change management becomes less time consuming or even non-existent. Reduced training and easier change management result in faster and less expensive projects. The system is used as intended, resulting in more accurate data; a higher return on investment; and happier, more productive users. ExxonMobil is taking this user-centered approach for all IT projects, large and small.

Gone are the days when a system is designed by a few experts sitting in a conference room for days and days. Observing and interviewing users is the most important first step in understanding how a technology solution should be designed or improved. Through user-centered design, the user's needs must be incorporated into how a system or application is designed, right from the beginning. ExxonMobil IT has built a team of experts who provide advice and training about user-centered design. These user-research, design and development professionals consult throughout ExxonMobil about how best to delight our enterprise users while building technology solutions designed to meet our biggest energy challenges.

- Margaret V. Whittaker, Manager of Mobility & Design, IT, ExxonMobil Global Services Company

Student-Organized CodeRED Liftoff Hackathon Largest in Greater Houston Area

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Dr. Chang Yun, CougarCS faculty advisor and CodeRED co-organizer said, "We had more than a dozen meetings to ensure CodeRED hackathon was a success. We achieved our goal, receiving positive comments and praise from attendees, sponsors and alumni. My thanks to the many CS students who volunteered more than 24 hours to run this event."

CougarCS has held successful hackathons in two consecutive terms, hosting the inaugural CodeRED hackathon at UH in April 2015 with 300 students from all over the world attending. The group is preparing for its next CodeRED Hackathon, "CodeRED Curiosity," scheduled for fall 2016. Plans are for CodeRED Curiosity to host more than 1,000 attendees and more than a dozen sponsors. "This time, it'll be bigger, better and 10 times more awesome!" said Cesar Salazar, CougarCS Secretary.

CodeRED Liftoff ran successfully thanks to its industry sponsors

including PROS (CodeRED joint sponsor), BlueChasm, Microsoft and Pariveda Solutions. The partners included UH Department of Computer Science, RED Labs, CS Girls and Major League of Hack.



Hackers Gonna Hack: UH Gets \$2.6M to Protect Next-Gen 911 Centers

With \$2.6 million in funding from the Department of Homeland Security, University of Houston computer science professors Stephen Huang, Omprakash Gnawali and Larry Shi are working to develop low-cost mitigation strategies to strengthen the resilience of emergency response systems against Distributed Denial of Service, or DDoS, attacks.

Cyberattacks are no longer a question of if, but when. It's become a regular occurrence to hear of breaches hitting private companies, the government, retailers, airlines, banks, law firms and, now, even 911 dispatch centers.

UH Computer scientists are joining forces with the Department of Homeland Security (DHS) Science and Technology Directorate to confront these threats. UH has been awarded \$2.6 million to develop technology to help protect emergency response systems, such as current and next-generation 911 systems, against DDoS attacks. UH's award is part of a larger Distributed Denial of Service Defenses (DDoSD) program announced by DHS recently.



DDoS attacks are an attempt to make an online service unavailable by overwhelming it with traffic from multiple sources. Additionally, the attacks addressed by the UH computer scientists not only threaten to disrupt emergency services, but also hold them hostage by demanding a ransom.

"These hackers engage in blackmail, trying to extort payment in return for not launching an attack that would make access to 911 services unavailable," said Larry Shi, the principal investigator (PI) on the grant and UH assistant professor of computer science. "Banks have been a big target, and emergency services have also been compromised. The FBI and DHS issued security alert warnings to call centers of the possibility of such attacks. While this has not yet taken place in Houston, it has happened in New York."

Used to render key resources unavailable, a classic DDoS attack usually seeks to disrupt an organization's website and temporarily block a consumer's ability to access it. A more strategic attack makes a key resource inaccessible during a critical period, which is what Shi and his colleagues are working proactively to prevent.

In Houston, for example, the largest one is the Houston Emergency Center which gets more than three million emergency calls annually. During inclement weather or large-scale, citywide special events, the average 9,000 daily calls the center receives can easily double. Citing examples of actual cyberattacks that have transpired in other cities, Shi noted a case in New York where service

was lost from several hours to a day.

"This could become a life or death matter for callers in medical distress or reporting a fire," he said. "Whether it's a person experiencing a heart attack or an explosion at one of Houston's many chemical plants, every minute is critical in mitigating damage and reducing issues. We aim to address this now before it becomes a problem, as well as develop solutions to be better prepared in case a cyberattack does come to pass."

Any organization that relies on network resources, even an emergency management system, is considered a potential target, and the current environment offers many advantages to the attacker. As 911 emergency services consolidate to share infrastructure and resources and as more systems become connected to and reliant upon the Internet, these systems become vulnerable to DDoS attacks. The next-generation 911 system, NG9-1-1, will enable emergency calls from any wired, wireless or IP-based device, as well as allow multimedia sharing. This evolution may make NG9-1-1 more vulnerable to different types of existing or new cyberattacks.

Shi and his co-PIs professor Stephen Huang and assistant professor Omprakash Gnawali, also in the UH Department of Computer Science, will be working to develop low-cost mitigation strategies to significantly strengthen the resilience of emergency response systems against DDoS attacks.

With the goal to develop technology that improves security, defense and resilience, Shi explained his group's three-tiered approach. They will first do a vulnerability analysis to proactively identify potential weaknesses that need to be fortified before those targets and holes are attacked. Secondly, they will develop mitigation strategies, solutions and best practices for how to respond if a security breach does occur. The third task is to make the results readily accessible and adaptable by emergency service providers, providing a layman-friendly plan with liaisons to help emergency call centers adopt and implement the recommendations developed by the researchers.

Yang Lu, another UH computer science researcher on the team and the program manager of the effort, said they will work with a variety of consultants and subcontractors, including SecureLogix, a firm specializing in solutions to address real-world problems in the enterprise voice security market; First Watch, a leader in real-time public safety data analysis used by police, fire, emergency medical services and public health organizations; and the Industry Council for Emergency Response Technology, or iCERT, a trade association focused on the commercial sector in the emergency response technologies field. Lu said they also will be working with reformed hackers, who now perform security consulting services for both private industry and the government, to sniff out vulnerabilities.

"With Wi-Fi in everything and the prevalence of smart devices nowadays, we must think out of the box," Shi said. "Even refrigerators can be hacked, and there was, in fact, a case where a refrigerator was taken over by a hacker and used as a tool in a denial of service attack to extort money from a bank. Learning of cases such as this, it's not surprising, then, to hear 911 also is vulnerable."

- Lisa Merkl

Staff Spotlight – No Matter What, We are Here for You

Underlying the day to day actions in the Department of Computer Science is a passion to serve. “I love people,” explained Desi Miller, Department Business Administrator. “It is a joy coming to work every day. I love helping people and being a part of something great!” said Geralyn Urquhart, student worker.



This attitude is shared throughout the department. “I love working with different people and personalities,” said Brenda Stevens, Financial Coordinator for travel. “The staff and I work to create an environment of good relationships,” said Babu Sundaram, Systems Administrator. “When students look back at their time at UH, I want them to feel they were treated right,” said Chris Pedraza, Financial Assistant. Hanh Nguyen, Financial Coordinator and alumna added, “My goal is to share what UH can offer to its students, faculty and staff.”

“I figure out what people really need. I want students to have a good experience, find out what will work for them and help them discover they have opportunities,” said Liz Faig, Graduate Advisor for over 12 years and UH alumna. Laura Miller, MicroSystem Analyst added, “I am here to help people accomplish their goals.” Debbi Davis, Assistant Department Business Administrator who has worked at UH for 18 years, added, “I consider each faculty member, each staff, and all the students to be my customer and I aim to please.” For Melissa Nieto, Program Coordinator and UH alumna, “It is all about student success. It is exciting to see the students I serve graduate. This is my favorite part of working here.”

The Computer Science department has doubled in the last 10 years from 328 undergraduate and graduate students in fall 2006 to over 870 in fall 2015. Behind the scenes of departmental growth are the staff who seek to make your experiences positive and helpful. “The service we provide is a fundamental cornerstone to teaching and research. Service includes travel arrangements, rooms scheduling, infrastructure, and all these behind-the-scene pieces. Service is indispensable of all that to enable day-to-day functions,” said Babu Sundaram. “We are all committed to your success,” added Tiffany Roosa, Program Director.



The department’s commitment to success reaches far and wide. “I work here to give back to our students, staff and faculty in order to further UH’s presence nationally and globally,” said Gillian Bautista, Executive Secretary, and alumna. “My students succeeding is a top priority. I enjoy seeing my students that have graduated come back and visit or call to let me know what’s going on in their lives,” said Yvette Elder, Graduate Advisor.

We welcome you to stop by, call, or send us an email. “We want everyone to know we are here to provide good service, no matter what you need assistance with,” said Desi Miller. If you are a current student or a member of our alumni we welcome you to contact us.

- CS Staff

Fall 2015 Graduates

B.S.

Michelle George
Sherie Ruter
Allen Van
Asim Aleem
Jay Brandin
Maria Briceno Rojas
Daniel Burns
Juan Castillo
Alba Chacon
Steven Cupit
Ryan Dickey
Maeghan Dickson
Adam Dyer
Joseph Eldridge
Michael Graham

Pramudita Halim
Yassir Jamal
Jacob Kapusta
Zaid Khayat
Ryan Khondker
Allen Lin
Christopher Lopez
Jainesh Mehta
Stephen Meriwether
Paul Miller
Stuart Millner
John Montgomery
Roger Moore
Sarah Moore
Austin Nash
Andrew Nguyen
Duc Nguyen

Khanh Nguyen
Daniel Huan Nguyen
Brayan Paris
Viral Patel
Parita Patel
Christian Andres Pesantes Torres
Jeff Phan
Javier Rivera
Robert Rouse
Aidaly Santamaria-Martinez
Maria Sarabia
Parvez Sayani
Faysal Sharif
William Souraphath
Nicolae Taylor
Stefan Theard

M.S.

Puja Anchlia (w/ thesis)
Yamuna Ghimire Khatiwada
Hadi Montakhabi (w/ thesis)
Nirmala Rai (w/ thesis)
Akshay Anil Soni (w/ thesis)
Stanislav Vladimirov Yotov (w/ thesis)

Ph.D.

Malcolm Trevor Dcosta
Pranav Mantini
Panagiotis Moutafis
Ahmad Rafi Mohammad Qawasmeh
Avinash Wesley

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Sponsors



Submit News

Please submit Alumni News to csnow@cs.uh.edu.

For information on upcoming alumni events, join the **Computer Science at University of Houston** group on LinkedIn.

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