

HOT RESEARCH

Assisting the Comprehension of Intention versus Reality

Software does exactly what the developer told it to do — including when it fails. The reason that it sometimes fails is that it was told to do the wrong thing — in other words, it contained bugs created by the

developers. Professor **Jim Jones** and his students conduct research to help address such bugs and thus ultimately improve the quality of software. As Jones puts

it, “One way to define a bug is as a gap between human intention and implementation reality, neither of which are easy to identify or define. Understanding what the program is doing during execution and deployment can involve extensive research. Similarly, defining exactly what should be happening — what you want to happen — is often a process of discovery and iterative modification.” Making both intention and reality more visible and discoverable is a common theme of Jones’s and his students’ research.

To this end, Jones is conducting a multi-faceted research agenda. One area that Jones is investigating is field testing of mobile applications. Along with his Ph.D. student **Yang Feng**, they conducted studies of the testing practices of crowdsourced field testers for mobile phone applications. They found that such beta-software testers often submitted bug reports that were less descriptive, in terms of textual descriptions, and more richly descriptive, in terms

RESEARCH BRIEFS

NEW! The Donald Bren School of Information and Computer Sciences has launched a professional Master of Software Engineering (MSE) program. Prof. **Cristina Videira Lopes** is serving as Faculty Director. Read all about it in the story on page 5 and in the Message from the Director on page 3.

Prof. **Gloria Mark** is co-PI on an \$8M IARPA grant, “A Comprehensive Approach to Modeling Job Performance via Unobtrusive, Continuous, Multimodal Sensing,” with six collaborating universities.

Prof. **André van der Hoek** will be hosting visiting professor **Eduardo Almeida**, from the Federal University of Bahia - Ondina Campus, Brazil, for a year starting in September. Together, they plan to study the work of software architects, how they view and use existing design tools and notations, and what may be done to assist them in their work.

Prof. **Alfred Kobsa** received the ICS Dean’s Award for Research. Kobsa was recognized as a pioneer in the area of user modeling in human-computer interaction. Kobsa’s research addresses issues in security and privacy for end users, specifically helping users make choices about their privacy settings.

Prof. **Cristina Videira Lopes** was recognized as a Dean’s Honoree for Excellence in Undergraduate Teaching at UCI’s 25th Annual Celebration of Teaching.

Dr. **Joshua Garcia**, now an Assistant Professor in the ICS Department of Informatics, presented his paper titled “Lightweight, Obfuscation-Resilient Detection and Family Identification of Android Malware” at the 40th International Conference on Software Engineering (ICS 2018), held May 27 – June 3 in Gothenburg, Sweden. The paper is co-authored by Ph.D. student **Mahmoud Hammad** and Prof. **Sam Malek**. This paper was accepted as an ICSE journal first paper, and was published in *ACM Transactions on Software Engineering and Methodology (TOSEM)*, 26 (3), January 2018.

More Research Briefs on page 5.

of screenshots, than was found for more traditional desktop software. Such a finding may not be surprising, given the relative ease of taking screenshots on a mobile

device and the relative difficulty of typing long-form, descriptive text. However, this characteristic creates difficulties for several automated testing and triaging software-engineering tools. For example, automatic bug-report duplicate detection tools traditionally rely on similarity of the words that are used to describe a failure. These tools can suggest to developers that a cluster of bug reports may be describing a similar bug, and the developer can use this information to identify especially problematic field failures, attribute a severity level to the class of bug reports, and assign developers to investigate and fix the bugs.

However, for mobile applications where the text descriptions are often too sparse, Jones and his team found that they can leverage the relatively rich set of screen-

IN THIS ISSUE

- 2-Message from the Director
- 5-New Master of SE Program, Research Briefs
- 5-7, 10-11-Student News
- 6-NTT SIC Visitor Collaborates with ISR Researchers
- 7-ISR Research Forum
- 8-ISR Sponsorship
- 9-Alum Hitomi Receives Ingenuity Award, Alumni News
- 10-Congrats to Graduates, Tech Reports
- 11-LIMITS Workshop
- 12-ISR Events

MESSAGE FROM THE DIRECTOR

It my pleasure to welcome two new faculty members to the Institute for Software Research: Dr. **Joshua Garcia** and Dr. **Iftekhhar Ahmed**. They both join the School of ICS as Assistant Professors in the general area of Software Engineering. Dr. Joshua Garcia has been a post-doctoral researcher working with Prof. **Sam Malek**. His research is in security and quality of software, especially in the mobile domain. Dr. Iftekhhar Ahmed comes to us from Oregon State University, where he received his Ph.D. His research interests combine software testing, analysis, and machine learning. We are very excited to have them both join ISR, and wish them great success here at UCI!



On June 8, we hosted the 14th Annual ISR Research Forum. It is always a pleasure to organize this event, as it attracts many of our alumni. We had 135 participants, with a mix of past and current students, local industry professionals, and academics. This year, I had the pleasure hosting my former student Dr. **Sara Javanmardi** as one of the keynote speakers. Dr. Javanmardi is a Staff Software Engineer at Google, where she works on, among other projects, Google's Autocomplete – all those suggestions when you type a query?, that's partly her work. The other keynote speaker was Dr. Satish Chandra, from Facebook. He talked about the use of Machine Learning for optimizing certain processing-intensive software development activities, a fascinating topic.

One year ago, I took over as Interim Director of ISR. A lot has happened since then, including the approval of a new Professional Master degree in Software Engineering, MSE, within the School of ICS (see article on page 5). I have shepherded the MSE effort through its development and approval process, and now have agreed to serve as the Director of this new MSE program. So I am stepping down as Director of ISR and am pleased to announce that, as of July 1st, ISR has a new permanent Director: Prof. Sam Malek. I am honored to have served as Interim Director of ISR, and I'm happy to transition the leadership to such capable hands. Fun fact: Sam is an academic grandchild of Prof. **Richard Taylor**, ISR's Founding Director. It comes full circle!

Prof. **Cristina Videira Lopes** can be reached at lopes@uci.edu.



ICS alumni turned out for the ISR Research Forum held on June 8, 2018.

shot images to benefit developer understanding and automated triaging. Using techniques borrowed from the computer-vision domain, screenshots from mobile applications can be analyzed and utilized to benefit testing efforts. Screenshots for mobile applications are often more well-defined (e.g., more consistent aspect ratios,

consistent theming, no overlapping windows) than traditional desktop software, and as such analysis of these screenshots becomes more tractable.

So Jones and team developed a number of tools that target the mobile application testing domain, specifically crowdsourced

or field testing, to make the reality of software behavior in the field more easily understandable and manageable for developers and testers back at their development organization. One such effort is a tool called CTRAS (Crowdsourced Test Reports Aggregation and Summarization), which is a novel approach to identify and



CTRAS

Administrator

Online

Search...

Dashboard

Reports

All Reports

Assigned Reports

Unassigned Reports

The Master Report contains the basic information and main points of the bug.

The supplementary points show the key sentences and screenshots of duplicate reports.

Summaried Report

ML-AG-1709

Create Time: 2016-11-01 ~ 2016-11-23 Bug Severity: Trivial ~ Blocker

Bug Category: Security User Experience Other Performance Incomplete Function

Creators: 8-Abdurt 8-Barnes 8-Rodrík 8W Choi 8A Banker 8V Gellada 8B Kim 8Y Ruh 8T Rightout 8D Summers 8W Tibbitt 8C Hubner 8R Krugman 8T Johansson 8S Peters 8A Prochiro 8WM Cowan

Assignee: Xiaohai Dai

Main Point: Step: open "Mylistening". Login with QQ. Login with Weibo. Expected results: Login successfully. Actual results: the system prompts login failure, even the network condition is normal.

Supplementary Topic Points: Supplementary 1: Please download the legal app. ... Supplementary 2: Third party login: WeChat login page can not be displayed. ... Supplementary 3: Click on the WeChat icon once unresponsive, and then click on the page repeatedly, then, enter the page loading state. ... Supplementary 4: The error code is 100044. ... Supplementary 5: Login by a new micro-blog account, and then jump to the test information after authorization. ...

CTRAS

Administrator

Online

Search...

Dashboard

Reports

All Reports

Assigned Reports

Unassigned Reports

ALL REPORTS: 35

ASSIGNED: 28 (80%)

UNASSIGNED: 7 (20%)

Aggregation result

Recommended assignee

Assign status

ID	Creator	Category	Severity	Content	Aggregated Report	Assignee
ML-0001	S.Angemont	User Experience	Major	Click on the following list, no response.	ML-AG-0001	Li Hong
ML-0155	D.Cowellson	Incomplete Function	Critical	The filter function is not working.	ML-AG-0001	Xiaohai Dai
ML-0009	M.Pattar	User Experience	Blocker	Click on the B2TS test line, but it shows the fifth.	ML-AG-0001	Xiaohai Dai
ML-0006	GE Seib	User Experience	Critical	Enter the complete and correct phone number at...	ML-AG-0001	Xiaohai Dai
ML-0044	G.Sato	Incomplete Function	Critical	Sometimes, even if the phone number is entered...	ML-AG-0001	Xiaohai Dai
ML-0002	KS Ananth	Incomplete Function	Critical	After entering the correct phone number, we can...	ML-AG-0001	Xiaohai Dai
ML-0001	L.J.Davies	Other	Minor	When I input too long phone number, the system...	ML-AG-0001	Xiaohai Dai
ML-0001	John Wiley	Page Layout	Major	The layout of picture doesn't, which is under the...	ML-AG-0001	Xiaohai Dai
ML-0001	JY Ruh	Other	Major	Step: open "Mylistening". Login with QQ. Login wi...	ML-AG-0001	Xiaohai Dai
ML-0001	A.Aldort	Incomplete Function	Major	Click on WeChat, then, click on login, no response...	ML-AG-0001	Xiaohai Dai
ML-0001	D.Barnes	Security	Trivial	Can not login. It suggested downloading in the s...	ML-AG-0001	Xiaohai Dai
ML-0001	NC Hubner	Other	Major	Third party login: WeChat login page can not be d...	ML-AG-0001	Xiaohai Dai
ML-0001	JB Kim	User Experience	Blocker	Login with third party is exception.	ML-AG-0001	Xiaohai Dai
ML-0001	WM Cowan	Incomplete Function	Critical	Login by WeChat can't start.	ML-AG-0001	Xiaohai Dai
ML-0001	GA Banker	Performance	Critical	Using WeChat to achieve the third party login is...	ML-AG-0001	Xiaohai Dai
ML-0001	D.Rodrík	Incomplete Function	Critical	Unable to login with QQ. The system prompts on...	ML-AG-0001	Xiaohai Dai
ML-0001	MW Tibbitt	Incomplete Function	Major	Click on "login with WeChat" without response...	ML-AG-0001	Xiaohai Dai

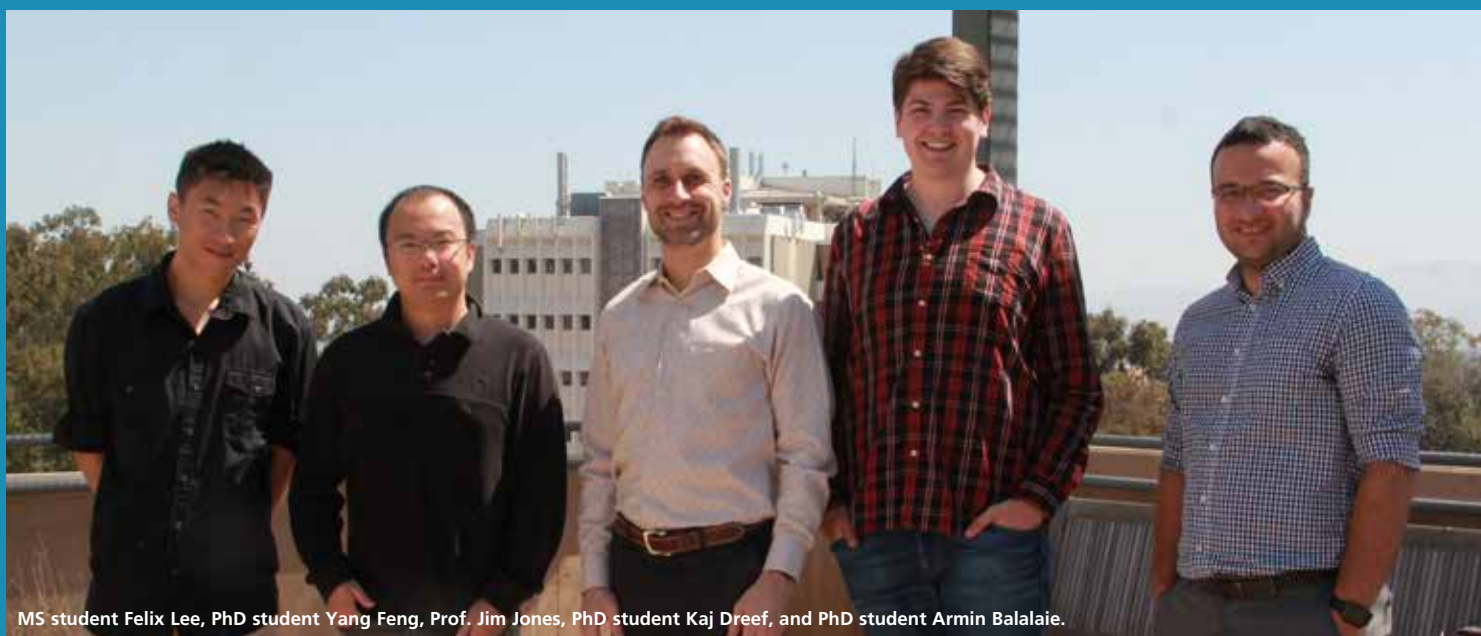
CTRAS tool automatically aggregates and summarizes crowdsourced bug reports to assist developer understanding and support triaging.

leverage duplicate bug reports to enrich the content of bug descriptions and improve the efficiency of inspecting these reports. CTRAS is capable of automatically aggregating duplicates based on both textual information and screenshots, and further summarizes the duplicate test reports into a comprehensive and comprehensible report. It can automatically generate high-level summaries to highlight the most prevalent aspects of the group of similar bug reports. With these groupings of bug reports, the developer is then able to take action on the group of bug reports as a whole — e.g., attributing severity levels and assigning developers to investigate and fix the bugs. Jones's team hopes that the use of such tools may encourage different behavior from crowdsourced field testers — instead of discouraging the submission of duplicate bug reports (which is common in practice for traditional desktop software), testers will be encouraged to submit their failures in the hopes that such redundancies can help provide a more holistic and descriptive view of the bugs.

Another thrust of work to help bridge the gap between developer intention and software reality is a research project that aims to provide high-level abstractions and visualizations of software execution. Understanding what happens during execution can be a daunting process — millions of instructions can be executed in the blink of an eye, and logging all instruction executions can produce trace files in the gigabytes. To help developers understand what is happening during execution, Jones and his Ph.D. students **Kaj Dreef** and **Yang Feng** are working on providing interactive and understand-

SPRING/SUMMER 2018

3



MS student Felix Lee, PhD student Yang Feng, Prof. Jim Jones, PhD student Kaj Dreef, and PhD student Armin Balalaie.

able representations of software execution. These research efforts utilize a number of technologies (including machine-learning clustering, data-mining, frequent pattern mining, information-retrieval labeling, and information visualization) to take extremely large execution trace files and produce an explorable interface that allows developers to see multiple levels of abstraction of software behavior. Their tool called Sage provides a visualization that reveals a timeline of execution, in terms of behavioral phases — each phase can be “unfolded” to reveal sub-phases. Jones and team hope that such tools can help developers understand the dynamic behavior of their software, and thus be able to diagnose problems, fix bugs, and identify performance bottlenecks.

Another area of interest is the popular and challenging area of testing for distributed systems. Jones and his Ph.D. student

Armin Balalaie are creating a system called SpiderSilk that provides a testing framework for distributed systems. After years of development, distributed systems can still malfunction, lose data, and be inconsistent in certain scenarios and during environmental failures. These failures are often caused by race conditions and environmental uncertainties, e.g., partial network failures and improper time synchronization. Due to the lack of testing frameworks, current distributed systems cannot be tested against these failures in an automated way. To address this problem, SpiderSilk is a novel testing framework specifically tailored for distributed systems which can inject environmental failures, impose order between different nodes’ operations for testing concurrency and race conditions, and do assertions that are based on internal states of different processes.

Jones believes that there is a never-ending need for greater comprehension of software — both the developers’ intention of what it should do and the reality of what the software is actually doing. As software becomes more prevalent in our everyday lives and is responsible for more of our functioning as a civilization, and as it grows larger and more complex, such comprehension becomes ever more important.

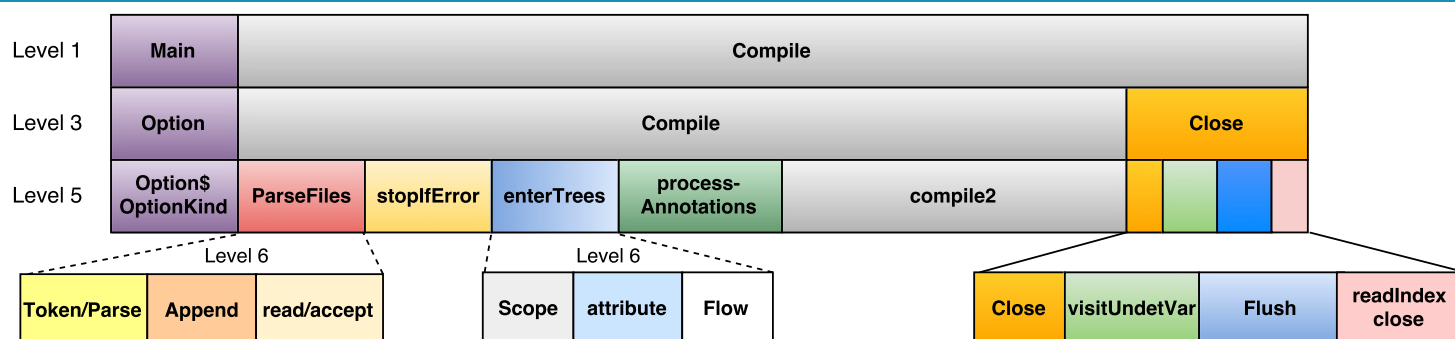
For more information on Jones’s research, see his homepage:

<http://www.ics.uci.edu/~jajones>

and his research group’s website:

<http://spideruci.org>

Contact Prof. Jones at: jajones@uci.edu



Sage tool provides an interactive multi-level abstraction of internal software behavior.



UCI Master of Software Engineering

NEW! ICS Launches Professional Master of Software Engineering Program

UC Irvine's Donald Bren School of Information and Computer Sciences (ICS) is pleased to announce the launch of its new and innovative Master in Software Engineering (MSE) program. Housed in the Department of Informatics, and staffed by ISR faculty, the program prepares students to work in the booming software industry in California and beyond. The 5-quarter program starts by exposing students to broad topics in computing through hands-on programming, and then offers specialized software engineering courses covering how existing software is engineered and the foundational principles of the field, an internship, and a capstone project. Also embedded in the program is a pair of professional development courses that prepare students for interviews and career skills to land a job after graduation. All throughout, the program guides students through extensive practice in the design, implementation, and maintenance of software. It also prepares them for the non-technical aspects of professional careers.

The program is designed for a diverse set of students. While the program expects to admit many students with a background in Computer Science, students from majors other than Computer Science are also targeted, as well as local IT professionals whose careers would benefit from formal training in Software Engineering. Besides requiring a BS or equivalent, the second main requirement for admission is knowledge of programming in one or two programming languages, which may be acquired in a variety of ways.

The new professional MSE program will begin accepting applications in Fall 2018. The first cohort of students will start one year later, in September of 2019. Please help spread the word by encouraging suitable candidates to apply. You can also help by partnering with the MSE program for internship opportunities in your company.

To learn more, visit:
<http://mse.ics.uci.edu>

For more information and partnerships, please contact Prof. **Cristina Lopes**, Faculty Director of the MSE Program, at lopes@uci.edu.

RESEARCH BRIEFS

Assistant Project Scientist **Pedro Martins'** paper titled "50K-C: A dataset of compilable, and compiled, Java projects" was presented at Mining Software Repositories (MSR 2018), co-located with ICSE 2018, in May in Gothenburg, Sweden. The paper is co-authored by Prof. **Cristina Lopes** and Ph.D. student **Rohan Achar** (C. Lopes, advisor).

The paper titled "Complex Mediation in Formation of Political Opinions," authored by alumnus Dr. **Yubo Kou**, a Postdoctoral Research Associate at Purdue University, and Prof. **Bonnie Nardi**, received an Honorable Mention Award at the SIGCHI Conference on Human Factors in Computing Systems (CHI), held in April in Montreal, Canada.

Prof. **Nenad Medvidović** received the Distinguished Engineering Merit Award from the Orange County Engineering Council, for his contributions to computer science including his highly impactful research in software architecture.

ISR STUDENT NEWS

Adriana Meza Soria (A. van der Hoek, advisor) presented her poster "Toward Collecting and Delivering Knowledge for Software Design at the Whiteboard" at the CHASE workshop at ICSE 2018, held in Gothenburg, Sweden in May.



The poster was co-authored by her advisor Prof. **André van der Hoek**.

Zhendong Wang (D. Redmiles, advisor) presented his paper titled "Competence-Confidence Gap: A Threat to Female Developers' Contribution on GitHub" in the Software Engineering in Society (SEIS) track at ICSE 2018 in Gothenburg, Sweden in May. The paper is co-authored by alum Prof. **Yi**



(**Oliver**) Wang, Rochester Institute of Technology, and Prof. **David Redmiles**. Wang also served as a student volunteer at ICSE.

Samantha McDonald (B. Nardi, advisor) has been awarded a National Science Foundation (NSF) Graduate Research Fellowship.



McDonald is researching how the presence and use of information and communications technology affect how staffers in Congress man-

age contact from constituents and how those systems reflect deeper ideas of citizen engagement within a digitally mediated democracy.

ISR STUDENT NEWS

Mahmoud Hammad's (S. Malek, advisor) paper "A Large-Scale Empirical Study on the Effects of Code Obfuscations on Android Apps and Anti-Malware Products" was presented at ICSE in May in Gothenburg, Sweden. The paper is co-authored by



Hammad

Prof. **Joshua Garcia** and Hammad's advisor Prof. **Sam Malek**. Hammad also served as a member of the Artifact Evaluation Committee for the 13th Int'l Symp. on Software Engineering for Adaptive and Self-Managing Systems (SEAMS 2018).

Jun-Wei Lin (S. Malek, advisor) presented his paper "Nemo: Multi-Criteria Test-Suite Minimization with Integer Nonlinear Programming" at ICSE in Gothenburg, Sweden on June 1. The paper is co-authored by Ph.D. student **Reyhaneh Jabbarvand**, Prof. **Joshua**



Lin

Garcia, and Lin's advisor Prof. **Sam Malek**. Lin received a SIGSOFT CAPS travel grant to attend.

Elahe Paikari's (A. van der Hoek, advisor) paper "A Framework for Understanding Chatbots and their Future" was presented at the 11th Int'l Workshop on Cooperative and Human Aspects of Software Engineering (CHASE



Paikari

2018), which was held in May at Gothenburg, Sweden at ICSE.



Dr. Shinobu Saito, Prof. André van der Hoek, and graduate student Adriana Meza Soria.

NTT Software Innovation Center Visitor Collaborates with ISR Researchers

From July 1, 2016 through June 30, 2018, ISR was pleased to host visiting researcher Dr. **Shinobu Saito**, Senior Research Engineer at the NTT Software Innovation Center (NTT SIC), Software Engineering Project, in Tokyo, Japan. Dr. Saito's research interests are in software requirements engineering, design recovery, business modeling, and business process management. During his stay at ISR, Dr. Saito has formed productive relationships with multiple ISR faculty members. Dr. Saito's managers and colleagues from NTT SIC, Software Engineering Project have also made shorter visits to ISR, adding to the warm relationship that has been established between ISR and NTT SIC.

Most recently, Saito is collaborating with Prof. **André van der Hoek**; the collaboration will continue after Saito returns to Japan this summer. Together, Dr. Saito, Prof. van der Hoek, and van der Hoek's graduate student **Adriana Meza Soria** have been studying issue tracking inside NTT. As a large corporation, NTT processes tens of thousands of both usage-oriented issues and code-oriented issues. Making sure that these are handled effectively and efficiently represents a serious challenge. The team is addressing this challenge by studying the kinds of issues being processed, how they are being processed, and how smart tools may be able to provide assistance.

"Working with Shinobu, and NTT more broadly, has been an absolute delight," says van der Hoek. "Working at a distance with the home NTT team to precisely identify the problem took of course some time, but we are now in full swing in investigating how we can design solutions that would not only benefit NTT, but other organizations in the same boat."

Dr. Saito reflected on his time at UCI. "I've had the most fulfilling and productive days at UCI's Institute for Software Research, thanks to fantastic researchers and students who work in state-of-art software engineering domains. I am moved by the way they are always searching for the fundamental essence of their research issues and problems.

"Of course, theory and practice do not always correlate. From the perspective of an industrial researcher, I reaffirm the importance of collaborations between industry and academia to constantly tackle issues in innovative business from long term view points."

We are delighted to have built a such a rewarding relationship with Dr. Saito and NTT Software Innovation Center, and have thoroughly enjoyed having Dr. Saito here at ISR!



Keynote Speaker Dr. Satish Chandra, Facebook.



Keynote Speaker Dr. Sara Javanmardi, Google.

2018 ISR Research Forum: *Where Research meets the Real World*

ISR held its flagship event, the ISR Research Forum, on Friday, June 8. The goal of this day-long event is to foster interaction between industry and ISR researchers, and encourage research collaborations among all. The 2018 Forum – the fourteenth since inception – attracted 135 attendees from thirty-two companies and organizations, and nine regional and national universities.

This year's Forum featured two engaging keynote speakers. The Forum opened with Dr. Satish Chandra, Software Engineer at Facebook, who spoke on "Bringing ML to the Developer." In the afternoon, alumnus Dr. **Sara Javanmardi**,

Staff Software Engineer at Google, spoke on the topic of "Google Autocomplete."

The program also included six faculty talks on current research topics, including: what makes expert software designers successful; expertise location; cybersecurity, android apps, and anti-malware; privacy and security; checking concurrent data structures written with C/C++ atomics; and missteps in software framework design.

Always a highlight, the poster and demo session held over lunch featured over 25 projects by students and faculty from UCI, USC, Indiana University Bloomington, and a joint project between UCI, Northern Arizona University, and the University of São Paulo, Brazil. The poster/demo session provides an ideal opportunity for attendees to interact with researchers one-



Visiting PhD student Yorah Bosse, center, presents her research poster to industry attendees.

ISR STUDENT NEWS

Di Yang (C. Lopes, advisor) is interning this summer at Facebook in Menlo Park, CA. She is working on code mining and program automation, which is applicable to her research on adapting and integrating online open-source programs. Her manager is Dr. Satish Chandra.



Yang

Wen Shen's (C. Lopes, advisor) paper "Information Design in Crowdfunding under Thresholding Policies" was accepted to the 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2018), held in Stockholm,



Shen

Sweden in July. The paper was co-authored by Jacob W. Crandall (Brigham Young Univ.), Ke Yan (China Jiliang Univ.), and his advisor Prof. **Cristina V. Lopes**.

Reyhaneh Jabbarvand (S. Malek, advisor) has been awarded a



Jabbarvand

Google Ph.D. Fellowship in programming technology and software engineering. Jabbarvand is one of just 39 new Google Fellows from North America, Europe and the

Middle East. Fellows both receive financial support and are matched with a Google Research Mentor.

on-one and learn about projects firsthand.

A reception closed the day, and provided a second opportunity for attendees to see select posters.

Each year the Forum attracts a significant number of alumni, who are keen to stay informed on current ISR projects. Alums frequently say they enjoy getting to know the current crop of student researchers, and networking with other alums and industry colleagues. This year over 20 alumni joined us – some who graduated from as far back as the 1980s, to some who graduated as recently as the past year.

“This year’s ISR Forum was a great opportunity for industry folks like me to connect and re-connect with colleagues working on issues across the entire spectrum of software engineering – and beyond,” said alumnus Dr. **Eric Dashofy**, Principal Director of Development, Enterprise Information Services, The Aerospace Corporation. “Particularly memorable

WANT TO GET INVOLVED?

Sponsoring ISR has many benefits. It enables your company to form closer ties with our faculty and students, puts you on the fast track to our leading edge research, and gives you first crack at our experimental software tools. Choose from multiple levels of sponsorship:

Support Level	Annual Contribution	Contribution goes to:
Friend	\$10,000	ISR’s general research fund.
Affiliate—Collaborative	\$20,000	Collaborative efforts.
Affiliate—Research	\$30,000	Designated ISR research area.
Affiliate—Visiting	\$40,000	Visitor at UCI.
Affiliate—Grad Student	\$60,000	Graduate student research.
Partner	\$100,000 or more	Large-scale research project.

For more information about ISR Sponsorship, please contact:

Debra A. Brodbeck
brodbeck@uci.edu
(949) 824-2260

were talks about how expert designers work, cybersecurity in the mobile environment, and a first ‘behind-the-scenes’ look at Google’s Autocomplete feature.

Discussions at the poster sessions about training early-career computer scientists and understanding what makes phishing attacks effective were informative and relevant to real-world issues we’re facing right now.”

For more info, visit the 2018 Forum website:

<http://isr.uci.edu/isr-events/forum/2018>

Videos of talks by professors **Brian Demsky**, **Joshua Garcia**, **Sam Malek**, and **David Redmiles** are available on the Forum website and the ISRUCI YouTube channel.

Become Part of the ISR Family

Rubbing elbows with ISR faculty, staff and students gives you a valuable window into the technology landscape of the future. But a relationship with ISR can be much more: Think of us as an extension of your



company—a think tank, an R&D department, a research library, a consulting firm, a training department, and an employment agency, all rolled into one. More importantly, when you sponsor ISR you become part of a friendly group of folks who speak the same language and are eager to work with you to solve your current technical problems in the most cost-effective way possible.

Be part of the ISR Family—a Friend, Affiliate, or Partner.

For more information, visit:

<http://isr.uci.edu/partnerships/sponsorship/> or contact:

Debra A. Brodbeck
Assistant Director
brodbeck@uci.edu, (949) 824-2260



Prof. Alfred Kobsa, center, with his alums Yang Wang (Syracuse Univ), Sameer Patil (Indiana Univ Bloomington), Bart Knijnenburg (Clemson Univ), and Xinru Page (Bentley College).



Prof. Redmiles, center, with his alum Hiroko Wilensky (Boeing), PhD student Zhendong Wang, and industry collaborators Stewart Sutton (The Aerospace Corp.) and Ban Al-Ani (ADP).

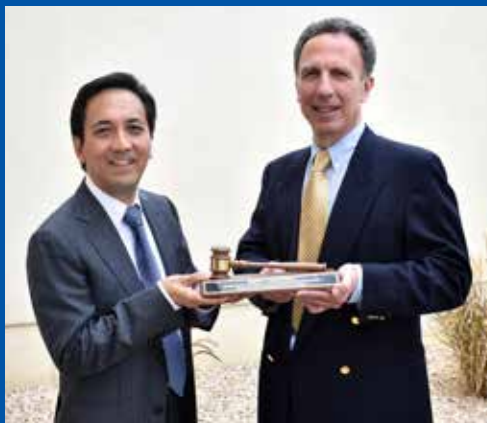


Dean Papaefthymiou and alum Dr. Arthur Hitomi, Ingenuity Award.

Alumnus Dr. Art Hitomi Receives ICS Ingenuity Award

On May 29, alumnus Dr. **Arthur Hitomi** received the ICS Ingenuity Award at the joint ICS and Engineering Ingenuity 2018 event held at UCI's Arnold and Mabel Beckman Center. The Ingenuity Award is bestowed upon individuals who have had a tremendous impact on the schools of engineering and ICS by devoting not only material resources but also significant amounts of time to help advance the academic programs. ICS Dean **Marios Papaefthymiou** presented the ICS award to Hitomi.

Dr. Hitomi earned his Ph.D. from ICS in 2010. His advisor was Prof. **Richard N. Taylor**, founding Director of ISR. Hitomi



With Appreciation for Service as Chair of the ICS Dean's Leadership Council.

also earned his B.S. ('96) and M.S. ('04) from ICS. He is president, CEO and co-founder of Numecent, and is a recognized figure in the areas of application virtualization and streaming. Hitomi is a former chair of the ICS Dean's Leadership Council, a role he held for three years. He was inducted into the ICS Hall of Fame in 2017.

"On behalf of the ICS community, I wish to express my deep appreciation for Art's dedicated and impactful service as Chair of the ICS Leadership Council," said Dean Papaefthymiou. "Through his tireless efforts, Art was instrumental in the rapid and deliberate expansion of this vital ICS committee, engaging the School's influential alums, key corporate partners, and friends in the community. A passionate supporter of ICS, Art is a leader in technology and entrepreneurship who brings distinction to our School and recognizes the importance of supportive alumni in elevating its prominence. It has been a privilege working with Art, and I look forward to his continued engagement with our School."

Hitomi reflected on the award: "I am honored that the school of ICS recognized me with the Ingenuity Award. I am especially grateful as it was my ICS experience that gave me the foundation for providing innovations to industry over the years. Chairing the ICS Leadership Council was an opportunity that allowed me to connect both local and Bay Area talents to UCI. I am happy I was able to make a substantial impact in bridging academia and industry for the school."

Congratulations to Dr. Art Hitomi!



Prof. Emeritus Richard Taylor with Dr. Art Hitomi.

Alumni News



Danyel Fisher (Ph.D. 2004, advisor P. Dourish), is now Principal Design Researcher at Honeycomb.io, a startup in San Francisco, CA.



David Levine (Ph.D. 1993, advisor R. Taylor) is now Lead Technologist at Booz Allen Hamilton in Boston, MA.

Ankita Raturi (Ph.D. 2017, advisors D. Richardson and B. Tomlinson)



is now a Postdoctoral Research Scholar at USDA Agricultural Research Service & North Carolina State University. Raturi co-

organized the inaugural Gathering for Open Agricultural Technology (GOAT 2018) held in May.

Erik Trainer (Ph.D. 2012, advisor D. Redmiles), is now a User Researcher at Fidelity Investments in New Jersey and a User Experience Specialist at The Graduate Center, City University of



New York (CUNY).

ISR STUDENT NEWS

Fatema Akbar (G. Mark, advisor) attended the Grad Cohort for



Akbar

Women 2018, hosted by the Computing Research Association's Committee on the Status of Women in Computing Research (CRA-W). Akbar was

one of six graduate students who received support from the ICS Dept. of Informatics to attend the event held in April in San Francisco, CA.

Robert Maldonado (C. Lopes, advisor), an undergraduate student in



Maldonado

Prof. **Cristina Lope's** Mondego research group, is interning this summer at Google working on the Node Storage Team, the backend of Google Cloud, to implement

features in the Linux operating system kernel.

Negar Ghorbani (S. Malek, advisor) presented the paper "A Temporal Permission



Ghorbani

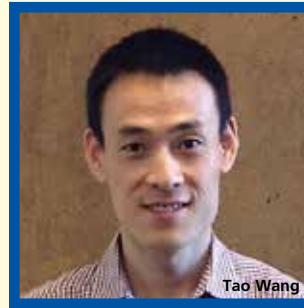
Analysis and Enforcement Framework for Android" at the International Conference of Software Engineering (ICSE), held in Gothenburg, Sweden in May.

The paper is authored by alum Dr. **Alireza Sadeghi** (Google), Ph.D. student **Reyhaneh Jabbarvand**, Ghorbani, Prof. **Hamid Bagheri** (Univ. Nebraska-Lincoln), and Prof. **Sam Malek**.

Congratulations Graduates!



Lee Martie



Tao Wang



Mengyao Zhao

Lee Martie (Ph.D., advisor A. van der Hoek) is joining IBM Research in Cambridge, MA as a Research Staff Member in August.

Tao Wang (Ph.D., advisor D. Redmiles) is on the job market.

Mengyao Zhao (Ph.D., advisor D. Redmiles) is now a UX Researcher at Uber in San Francisco, CA.



ISR Technical Reports Available Online

ISR technical reports present information resulting from student and faculty research carried out under the auspices of the Institute. They showcase early results not available in print elsewhere. ISR technical reports are available in PDF on the ISR website. Recent reports include:

"The Java Build Framework: Large Scale Compilation"

Pedro Martins, Rohan Achar, Cristina V. Lopes
UCI-ISR-18-3, April 2018

"DELDROID: An Automated Approach for Determination and Enforcement of Least-Privilege Architecture in Android"

Mahmoud Hammad, Hamid Bagheri, Sam Malek
UCI-ISR-18-2, April 2018

"Discovering Business Processes from User Operation History"

Shinobu Saito
UCI-ISR-18-1, March 2018

All ISR technical reports are available at: isr.uci.edu/publications/



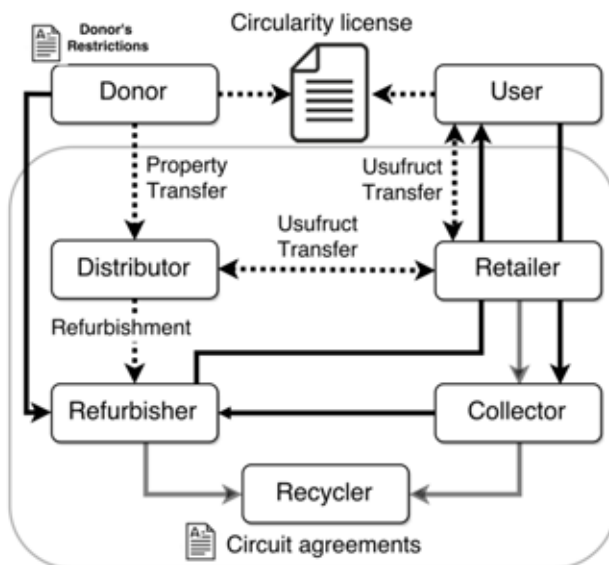
Prof. Bonnie Nardi making introductions at LIMITS 2018.

Computing Within Limits Workshop 2018

This year marks the 4th Computing within LIMITS Workshop, which was held in Toronto, Canada, and co-chaired by ISR Professor **Bonnie Nardi** together with Professor Jay Chen from NYU-Abu Dhabi. The Computing within LIMITS community asks: How would we conduct computing differently if we considered planet-scale limits in resource use and waste capacity in our designs and programs? Scientists in many fields are increasingly concerned about these limits and their effects on human and non-human life. Most computing work is predicated on the assumption of continued economic growth, although this is not possible—Earth is a bounded system, so the economy, as a subset of that system, must, therefore, also be bounded. Computing within LIMITS seeks to design according to those limits. There may be no limits to our creativity but there are material limits to our economic activity. As a global society, we have not been paying enough attention to them and we now find ourselves battling increasing pollution, loss of biodiversity, soil erosion, water shortages, and of course climate change. Now is a good time to use computing to address

these realities. Computing within LIMITS is not just about making computing more efficient but about using the powerful tools of computing to refigure manufacturing, agriculture, transportation, and commerce—the big ticket items from a resource/waste point of view.

For example, at this year's LIMITS Workshop, David Franquesa and Leandro Navarro of the Polytechnic University of Barcelona reported on an implementation of a “Commons” based approach to recycling in their paper “Devices as a Commons: Limits to premature recycling.” Instead of individual owners deciding when to recycle, collective ownership and management of devices reside in the



Franquesa and Navarro: Agreements and flows during a device lifecycle.

ISR STUDENT NEWS

Eugenia Ha Rim Rho (A. Kobsa, advisor) presented her paper “Differences in Online Privacy & Security Attitudes Based on



Rho

Economic Living Standards: A Global Study of 24 Countries” at the European Conference on Information Systems (ECIS) held in Portsmouth, UK in June.

The paper is co-authored by her advisor Prof. **Alfred Kobsa** and Carolyn Nguyen (Microsoft).

Hosub Lee (A. Kobsa, advisor) is interning this summer at Samsung Research America Digital Media Solutions Lab in Irvine, CA. He is



Lee

working on a next-generation recommender system that predicts the “rating” or “preference” a user would give to an item (e.g., movies, products, research articles, privacy

settings). His team is analyzing large-scale log data collected from millions of Samsung products (e.g. Smart TV) and building deep learning-based predictive models that give users recommendations.

Leah Horgan’s (P. Dourish, advisor) paper “Ambiguity, Ambivalence, and Activism: Data Organizing



Horgan

Inside the Institution” was published in *Krisis*, the journal for contemporary philosophy. The paper is co-authored by her advisor Prof. **Paul Dourish**.

community or organization. The authors described “an algorithm to estimate the use value of the devices, such as laptops and desktops. When this value is too low



Prof. Bonnie Nardi

or has no demand, the community obtains recycling permission; otherwise, a cycle of reuse begins.” This approach is important because it could scale to practically all com-

modities of any value. This system is in use, and has helped to reuse/recycle over 700 computers. The system also serves the purpose of building community, bringing people into contact with one another to achieve shared goals.

Another paper, by UCI graduate student **Meena Muralikumar**, who is advised by Nardi, looked at food tracking, a technology that could allow consumers to decide



Meena Muralikumar

on which food they buy based on factors such as sustainable production, distance traveled, and fair labor practices. She presented a technical framework that generalizes from

current implementations. Muralikumar examined potential problems and possibilities for widespread food tracking.

This year’s LIMITS featured two excellent keynote speakers. The first was ecological economist Peter Victor (emeritus, University of Toronto), author of *Managing without Growth: Slower by Design not Disaster* (2008). Victor discussed plausible economic models that are not dependent on economic growth and that foreground well-being rather than

ISR EVENT SCHEDULE

Mark your calendars!



February 25-28, 2019

Ground System Architectures Workshop (GSaw 2018)

Held in cooperation with ISR.

gsaw.org

Friday, June 7, 2019

ISR Research Forum: Where Research Meets the Real World

The 2018-2019 ISR Distinguished Speaker Series will be announced in Fall.

We look forward to seeing you!

For more information, visit: isr.uci.edu/isr-events

gross domestic product (GDP). GDP is increasingly critiqued as failing to measure quantities such as environmental externalities and social inequality. The second keynote speaker was computer scientist Alan Borning (emeritus, University of Washington) who spoke about his work on the “SEED” platform. SEED stands for Solutions for Economy, Environment, and Democracy. The platform is attempting to connect various social movements that tend to be scattered but that are all aiming for broad societal well-being.

This was the largest LIMITS Workshop in the series, with 45 participants. Participants came from Canada, the USA, Sweden, Switzerland, the UK, Denmark, Norway, Spain, Germany, Abu Dhabi, and New Zealand. The Workshop was co-located with the international conference ICT4S (ICT for Sustainability) enabling more people to attend.

Several LIMITS researchers (Bonnie Nardi, Bill Tomlinson, Don Patterson, Jay Chen, Birgit Penzenstadler and Barath Raghavan) wrote a paper “Computing within LIMITS” that will appear in the October issue of *Communications of the ACM*. This paper lays out the main limits ideas for a broad audience.

All LIMITS papers (peer-reviewed and in collaboration with ACM) are avail-

able at computingwithinlimits.org. The Workshop programs are also available there. LIMITS papers from 2016 onward are also available in the ACM digital library, dl.acm.org.

In addition to Nardi and Muralikumar, others from ISR who participated in LIMITS 2018 include Prof. Emeritus **Debra Richardson** and alumnae Dr. **Nithya Sambasivan** (Ph.D. 2012, advisor Bonnie Nardi, now a Sr. User Experience Researcher at Google), both of whom served on the program committee.

The location for LIMITS 2019 has not yet been determined but will probably be co-located with a conference again to provide greater access. Check the LIMITS website for the latest LIMITS news.

ISR

Follow **ISRUCI** on:



For more information:

isr@uci.edu

(949) 824-2260

isr.uci.edu

SPECIAL THANKS

The UCI Institute for Software Research is generously supported by:

NTT Software Innovation Center

UCI University of California, Irvine