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**Association for
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Advancing Computing as a Science & Profession



SIGCSE'17

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**Association for
Computing Machinery**

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Welcome from the SIGCSE Chair

Welcome to the *48th SIGCSE Technical Symposium on Computer Science Education (SIGCSE 2017)*, the premiere technical conference for computer science educators. *SIGCSE 2017* is sponsored by the ACM Special Interest Group on Computer Science Education (SIGCSE).

SIGCSE is an organization of about 2700 members interested and engaged in computer science education. One of the strengths of SIGCSE is the dedication of members who volunteer to ensure that the activities and events held throughout the year are successful. There are two volunteers without whom *SIGCSE 2017* would not be possible, and we owe them a great debt. Conference co-chairs Stephen Edwards and Michael Caspersen have spent countless hours over the past several years ensuring that the approximately 1300 attendees at *SIGCSE 2017* will have a rewarding and inspiring experience. They have led a committee of nearly 100 people in the process of creating an engaging and informative program, creating opportunities for networking, and handling all the issues big and small that come with a conference of this size. On behalf of the SIGCSE organization and Board, I thank Stephen and Michael for the leadership in that made this conference possible.

This conference also provides us with a chance to honor two people each year for their contributions to computer science education and the SIGCSE community. The annual SIGCSE award for Outstanding Contribution to Computer Science Education will be awarded to Gail Chapman. Among her many accomplishments, her leadership in the Exploring Computer Science program has set a strong foundation for efforts toward expanding computer science into the K-12 curriculum in the United States. The annual SIGCSE award for Lifetime Service will be awarded to Mats Daniels. Mats has extensive service in the global computing education community, including serving (twice!) as the co-chair for the Annual Conference on Innovation and Technology in Computer Science Education (ITiCSE). Please join me and the rest of the SIGCSE Board in congratulating both of them on their well-deserved awards.

The *SIGCSE 2017* conference will offer you many opportunities to network, whether at sessions, during breaks, at the social events associated with the conference, or simply as you meet new people in the halls. I hope that some of the people you will get a chance to meet will be the members of the newly elected SIGCSE Board. One opportunity to see the Board members will be at the SIGCSE Business meeting on Friday, March 10th from 5:10 pm to 6 pm. Please come to hear from and talk to Vice Chair Judy Sheard, Secretary Sue Fitzgerald, Treasurer Adrienne Decker, At-Large Board Members Michelle Craig, Briana Morrison, and Mark Weiss, and Past Chair Susan Rodger. At this annual meeting we will discuss the overall structure of the SIGCSE organization and share the results of the many SIGCSE projects and events that have been carried out during the past year.

As you attend sessions, meet people, and learn about all the things that SIGCSE members have done, I hope that you will think about what you can bring to the organization. We are always interested in involving new volunteers in SIGCSE, and you can sign up to indicate your interest in volunteering using the online form on the sigcse.org site.

Enjoy the conference!

Amber Settle

SIGCSE Chair, 2016-2019

Welcome from the SIGCSE 2017 Symposium and Program Chairs

Welcome to Seattle and SIGCSE 2017! Seattle is a vibrant, forward-thinking city that offers the perfect backdrop for SIGCSE. We are sure that together, the Symposium and Seattle’s many attractions, such as the Space Needle and Pike Place Market, will engage your mind and your sense of adventure.

The SIGCSE 2017 conference theme—**Inspire, Innovate, Improve!**—highlights our aim to inspire computing educators to innovate new teaching strategies, and to improve those strategies by engaging in the self-reflection and evaluation necessary to deliver the best possible learning outcomes for all. Our program showcases computer science education efforts in K-12, lower- and upper-level undergraduate courses, open-source software, outreach, and education research. A variety of sessions are sure to help you find what you are looking for, from Papers on experience reports, new curricula, and research studies, to Panels, Special Sessions, Workshops, Posters, Demonstrations, Birds of a Feather and the ACM SIGCSE Student Research Competition. We encourage you to visit our exciting Exhibits showcasing the latest in hardware, software tools, textbooks, educational programs, and educational research.

On Thursday, Jeannette Wing, Corporate Vice President for Microsoft Research, will deliver our opening plenary address. Jeannette will challenge us to embrace uncertainty in computing, which abounds in the real world where data drives discovery, as she helps us understand what implications this has for undergraduate computer science curricula. During our Saturday lunch, Mitchel Resnick, Professor of Learning Research at the MIT Media Lab, will discuss strategies for fulfilling Seymour Papert’s dream of using programming as a new way for all children to explore, experiment, and express themselves. This year’s recipient of the SIGCSE Award for Lifetime Service to the Computer Science Education Community, Mats Daniels (Associate Professor and director of undergraduate studies at the Department of Information Technology, Uppsala University, Sweden), will speak at the First Timers’ Lunch on Friday and Gail Chapman (Director of Outreach for Exploring Computer Science), recipient of the SIGCSE Award for Outstanding Contributions to Computer Science Education, will give the Friday morning plenary address. We look forward to hearing the keynotes by these valued members of the SIGCSE community.

The SIGCSE Symposium strives to promote high-quality scholarship and community engagement around computer science education. 916 volunteers provided each Paper, Panel, Special Session, and Workshop with at least 5 reviews, and each Poster, Birds of a Feather, Demonstration, Lightning Talk, and ACM Student Research Competition submission with at least 3 reviews. These reviewers, along with 50 Associate Program Chairs (APC) and 8 Track Chairs, discussed the papers to come to consensus and resolve misunderstandings. The Program Chairs made final selections based on Track Chair and APC recommendations as well as importance to the SIGCSE community, novelty, and timeliness. The table below shows the number of submissions received and accepted in each submission category.

This year we recognize a new category of the top 25% of accepted papers as “Exemplary papers”, highlighted by the Program Chairs for their accomplishment of high quality, novelty and broad appeal to reviewers. The Program Chairs also selected three best papers, that each received at least 2 of the highest rankings from reviewers. The **Best CS Education Research Paper** is “Computing with CORGIS: Diverse, Real-world Datasets for Introductory Computing” by Austin Bart, Ryan Whitcomb, Dennis Kafura, Cliff Shaffer and Eli Tilevich. The **Best New Program Paper** is “Infrastructure for Continuous Assessment of Retained Relevant Knowledge” by Kathleen Timmerman and Travis Doom. The **Best Experience Report Paper** is “Making Noise: Using Sound-Art to Explore Technological Fluency” by Erik Brunvand and Nina McCurdy.

<i>Proposal Type</i>	<i>Accepted</i>	<i>Received</i>	<i>Acceptance Rate</i>
Exemplary Paper	26	348	24.8% of Accepted; 7.5% of Papers
Paper	105	348	30.2%
Panel	16	29	55.2%
Special Session	12	22	54.5%
Workshop	30	45	66.7%
Poster	48	140	34.3%
Birds of a Feather	36	74	48.6%
Demonstration	10	34	29.4%
Lightning Talk	12	18	66.7%
Student Research Competition	33	25	75.7%

The 2017 Pre-symposium Events include: POGIL in CS: Small Steps & Giant Leaps (Clif Kussmaul, et al); Managing the Early Academic Career for Women Faculty in Undergraduate Computing Programs (CRA-W); Managing the Mid Academic Career for Women Faculty in Undergraduate Computing Programs (CRA-W); Strategies for Integrating Driverless Cars into the Computing Curricula (SIGCAS); Aligning to the ACM Cybersecurity-infused CS Transfer Curriculum (CCECC); Making K-12 CS Accessible (Access10K); POSSE Roundup—Student Participation in Humanitarian Open Source Software (Gregory Hislop, et al); NSF UP CS Ed Research Event for Emerging CS Education Researchers at SIGCSE (Eileen Kraemer, et al); Seeking Global, Industry and Training Provider Perspectives to Inform the ACM Joint Task Force for Cybersecurity Education (ACM JTF for Cybersecurity Education); and the Department Chairs Roundtable (SIGCSE).

A symposium as large as SIGCSE 2017 involves the efforts of many people and we wish to thank all of them for their help in making the event a success. Our program committee members (Ruth Anderson, Bo Brinkman, Alison Clear, Tom Cortina, Michelle Craig, Lynn Degler, Paul Denny, Brian Dorn, Phil East, Charles Hardnett, Rachelle Kristof Hippler, Sarah Heckman, Matt Jadud, Cary Laxer, Sara Melnick, Brad Miller, Larry Merkle, Christine Moore, David Musicant, Jill Pieritz, S. Monisha Pulimood, Ann Sobel, Leenkiat Soh, Leigh Ann Sudol-DeLyser, Valerie Henderson Summet, Paul Tymann, Steven Wolfman, and Jian Zhang) have worked tirelessly on many details.

This year the Associate Program Chairs and Track Chairs served as discussion leaders to help reviewers resolve differences in individual perspectives to create a more comprehensive review process (Eric Aaron, Liz Adams, Joel Adams, Rajeev Agrawal, Carl Alphonse, Christine Alvarado, Ruth Anderson, Marie Bienkowski, Don Blaheta, Kristy Elizabeth Boyer, Bo Brinkman, Alistair Campbell, Lilian Cassel, Michael Clancy, Steve Cooper, Adrienne Decker, Leigh Ann Sudol-DeLyser, John Dougherty, Kathi Fisler, Judith Gal-Ezer, Don Goelman, Elizabeth Hawthorne, Sarah Heckman, Cecily Heiner, Sharon Hsiao, Daniel Joyce, Amy Ko, Michael Kölling, David Levine, Colleen Lewis, Lester McCann, Robert McCartney, Kris Nagel, Jody Paul, Manuel Pérez-Quñones, S. Monisha Pulimood, Samuel Rebelsky, Brad Richards, Judy Sheard, Mark Sherriff, Beth Simon, Jaime Spacco, Luther Tyhonievich, Paul Tymann, Jan Vahrenhold, Tammy Vandegrift, Henry Walker, Ellen Walker, Steven Wolfman, Ursula Wolz, and Jian Zhang).

The International Liaison Committee (Craig Anslow, Karen Bradshaw, Paul Denny, Daniel Fokum, Mehdi Jazayeri, Carsten Kleiner, Tsunenori Mine, Kazushi Ohya, Marco Silva, Ben Stephenson, Claudia Szabo, Gary Wong, and Ming Zhang) ensures that attendees from all over the world find SIGCSE 2017 a welcoming and rewarding experience.

The many student volunteers, led this year by Sarah Heckman, are the engine that makes the Symposium go, by preparing conference bags, checking registration badges, distributing t-shirts, and counting attendance at sessions,

Our supporters, vendors, exhibitors and in-kind donors make the Symposium possible. We especially wish to thank our platinum supporters: Google, IBM, Intel, Microsoft, and Vocareum; our gold supporters: Oracle Academy and zyBooks; and our silver supporters: ABET, Codio, GitHub, Gradescope, LEGO Education, and Teradata University Network; and our bronze supporter: NVIDIA.

Your experience at SIGCSE 2017 is influenced in countless ways by the planners at Executivevents: Cara Candler, Elizabeth Taggart, Brooke Daley, Roxane Rose, and Shannon Cunningham. Your experience has been further enhanced by the SIGCSE 2017 Puzzle Challenge by Zach Butler (Rochester Institute of Technology) and the CONNECT networking app by Tracy Camp and her CONNECT Team (Colorado School of Mines).

A debt of gratitude is owed to Amber Settle (President) and the entire SIGCSE Board. Additional thanks go to Bob Beck and Scott Grissom (SIGCSE Symposium Site Coordinators), April Mosqu and Donna Cappo (ACM staff), Lisa Tolles (Sheridan Publishing), Bill Guckert (WRG Design), Sun Kim (Washington State Convention Center), Emily Elkind and Meaghan Fox (Sheraton Seattle), and Kelly Amig (Grand Hyatt). We'd also like to extend a special thank you to Aaron Davis of Visit Seattle, who went above and beyond to help support the conference committee and representatives of all the organizations involved. These outstanding individuals have contributed a myriad of details that go into the planning of a successful conference and we are grateful to each and every one of them.

Our home institutions (Aarhus University, NC State University, UC Berkeley, and Virginia Tech) have generously supported our service to the SIGCSE community as Symposium organizers.

We are inspired and humbled by the engagement and support of the SIGCSE community and volunteers. We thank you for your contributions, and we are excited to welcome you to SIGCSE 2017, where we hope you will connect with friends and colleagues old and new, and Inspire, Innovate, and Improve computer science education.

Stephen Edwards
Symposium Co-Chair
Virginia Tech

Michael Caspersen
Symposium Co-Chair
Aarhus University

Tiffany Barnes
Program Co-Chair
NC State University

Daniel Garcia
Program Co-Chair
UC Berkeley

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David Kosbie, *Carnegie Mellon University*
Anna Koufakou, *Florida Gulf Coast University*
William Krehling, *Western Carolina University*
Joan Krone, *Denison University*
Jan Kruger, *Unisa School for Business Leadership*
Andrew Kuemmel, *Madison West High School*
Amruth Kumar, *Ramapo College of New Jersey*
Deepak Kumar, *Bryn Mawr College*
Benjamin Kuperman, *Oberlin College*
Zachary Kurmas, *Grand Valley State University*
Clifton Kussmaul, *Muhlenberg College*
Richard Ladner, *University of Washington*
Jenny Lam, *San José State University*
Yedidyah Langsam, *CUNY Brooklyn College*
David Largent, *Ball State University*
Brian Larkins, *Rhodes College*
Dave Larson, *Metropolitan State University*
Eric Larson, *Seattle University*
Mary Last, *self-employed*
Kung-Kiu Lau, *The University of Manchester*
Bobby Law, *Glasgow Caledonian University*
Deirdre Lawless, *Dublin Institute of Technology*
Alina Lazar, *Youngstown State University*
Christopher League, *Long Island University*
Arthur Lee, *Claremont McKenna College*
Byong Lee, *Bennett College*
Cynthia Lee, *Stanford University*
En-Shiun Annie Lee, *University of Waterloo*
Gilliean Lee, *Lander University*
Irene Lee, *Massachusetts Institute of Technology*
Chi-Un Lei, *University of Hong Kong*
Ben Leong, *National University of Singapore*
Terry Letsche, *Wartburg College*

Anany Levitin, *Villanova University*
Dalit Levy, *Zefat Academic College*
Gary Lewandowski, *Xavier University*
Mark Lewis, *Trinity University*
Dan Leyzberg, *Princeton University*
Justin Li, *Occidental College*
Taihua Li, *DePaul University*
Huang Libo, *National University of Defense Technology*
Panos Linos, *Butler University*
Alex Lishinski, *Michigan State University*
Jiangjiang (Jane) Liu, *Lamar University*
Yue Liu, *National University of Defense Technology*
Doug Lloyd, *Harvard University*
Josje Lodder, *Open University Netherlands*
Stephanie Ludi, *University of North Texas*
Andrew Luxton-Reilly, *University of Auckland*
Roman Lysecky, *University of Arizona*
John Maccormick, *Dickinson College*
Bonnie Mackellar, *St. John's University*
Joaquim Madeira, *Universidade de Aveiro*
Mary Lou Maher, *University of North Carolina, Charlotte*
Jonathan Maletic, *Kent State University*
Bill Manaris, *College of Charleston*
Daniela Marghitu, *Auburn University*
Maira Marques Samary, *Universidad de Chile*
Fred Martin, *University of Massachusetts Lowell*
Pablo E. Martínez López, *UNQ*
Manuel Martins Barata, *Instituto Superior de Engenharia de Lisboa*
Julian Mason, *Toyota Research Institute*
Suzanne Matthews, *United States Military Academy*
Bruce Maxim, *University of Michigan—Dearborn*
Bruce Maxwell, *Colby College*
Keith Maycock, *National College of Ireland*
Chris Mayfield, *James Madison University*
Renee Mccauley, *College of Charleston*
Robert McCloskey, *University of Scranton*

William McClung, *Nebraska Wesleyan University*
Jeffrey McConnell, *Canisius College*
Frank McCown, *Harding University*
Sean McCulloch, *Ohio Wesleyan University*
Nina Mccurdy, *University of Utah*
Chris McDonald, *University of Western Australia*
Scott McElfresh, *Longwood University*
Monica McGill, *Bradley University*
Aidan Mcgowan, *Queen's University Belfast*
James McGuffee, *Christian Brothers University*
John Mcmanus, *Randolph-Macon College*
Bonita McVey, *St. Norbert College*
Lisa Meeden, *Swarthmore College*
Christoph Meinel, *Hasso Plattner Institute*
António Mendes, *University of Coimbra*
Susan Mengel, *Texas Tech University*
Suzanne Menzel, *Indiana University*
Rachel Menzies, *University of Dundee*
Timothy Meyer, *Edinboro University*
Susan Miller, *University of Colorado*
Alexandra Milliken, *North Carolina State University*
Afsaneh Minaie, *Utah Valley University*
Amitabh Mishra, *University of West Florida*
Sandeep Mitra, *The College at Brockport, SUNY*
Saad Mneimneh, *Hunter College CUNY*
Selvarajah Mohanarajah, *University of North Carolina—Pembroke*
Dagmar Monett, *Berlin School of Economics and Law*
William Mongan
Michael Moorman, *Saint Leo University*
Nelma Moreira, *Faculdade de Ciências da Universidade do Porto*
Patricia Morreale, *Kean University*
Briana Morrison, *University of Nebraska at Omaha*
Srikanth Mudigonda, *Saint Louis University*
Joshua Munsell
Christian Murphy, *University of Pennsylvania*

Michael Murphy, *retired*
Tom Naps, *University of Wisconsin—Oshkosh*
Krish Narayanan, *Eastern Michigan University*
Thu Nguyen, *Rutgers University*
Lijun Ni, *SUNY, Albany*
Victor Norman, *Calvin College*
Cindy Norris, *Appalachian State University*
Theodore S. Norvell, *Memorial University of Newfoundland*
Linda Null, *Penn State*
Keith O'Hara, *Bard College*
Brian O'Neill, *Western New England University*
Eleanor O'Rourke, *University of Washington*
William Oblitey, *Indiana University of Pennsylvania*
Rainer Oechsle, *Trier University of Applied Science*
Chris Okasaki, *USMA*
Amos Olagunju, *St. Cloud State University*
Nina Soo Onesti, *Indiana University*
Lawrence Osborne, *Lamar University*
Peter-Michael Osera, *Grinnell College*
Greta Pangborn, *St. Michael's College*
Joonsuk Park, *Williams College*
Young Park, *Bradley University*
David Parker, *Salisbury University*
Jeff Parker, *Harvard Extension*
Miranda Parker, *Georgia Institute of Technology*
James Paterson, *Glasgow Caledonian University*
Laurie Patterson, *University of North Carolina Wilmington*
Richard Pattis, *University of California, Irvine*
Navrat Pavol, *Slovak University of Technology*
Jamie Payton, *Temple University*
Jamie Payton, *University of North Carolina at Charlotte*
Arnold Pears, *Uppsala University*
Joslenne Pena, *Penn State University*
Lillian Pentecost, *Colgate University*
Andrew Petersen, *University of Toronto Mississauga*
John Peterson, *Western State College*
Zachary Peterson, *Cal Poly, San Luis Obispo*

Chrisila Pettey, *Middle Tennessee State University*

Vinhthuy Phan, *The University of Memphis*

David Phelps, *University of Washington*

Vreda Pieterse, *University of Pretoria*

Johanna Pirker, *Graz University of Technology*

Irene Polycarpou, *UCLan Cyprus*

Jari Porras, *LUT*

Leo Porter, *UC San Diego*

Jon Preston, *KSU*

Thomas Price, *North Carolina State University*

Roger Priebe, *Texas State University*

Binsen Qian, *UC Davis*

Noa Ragonis, *Israel Institute of Technology*

Farzana Rahman, *James Madison University*

Brian Railing, *Carnegie Mellon University*

Rajendra Raj, *Rochester Institute of Technology*

Bina Ramamurthy, *University at Buffalo*

Yolanda Rankin, *Spelman College*

Saqib Razak, *Carnegie Mellon University*

Michael Redmond, *La Salle University*

Dale Reed, *University of Illinois Chicago*

Donna Reese, *Mississippi State University*

Loren Rhodes, *Juniata College*

Detlef Rick, *University of Hamburg*

Charles Riedesel, *University of Nebraska—Lincoln*

Kelly Rivers, *Carnegie Mellon University*

Suzanne Rivoire, *Sonoma State University*

Steven Robbins, *University of Texas at San Antonio*

Christian Roberson, *Florida Southern College*

Michael Robinson, *Florida International University*

Brandon Rodriguez, *Colorado School of Mines*

Michael Rogers, *Northwest Missouri State University*

Nicholas Rosasco, *Valparaiso University*

Joel Ross, *University of Washington Information School*

Guido Röbling, *TU Darmstadt*

Mary Beth Rosson, *Pennsylvania State University*

Jerry Roth, *Vanderbilt University*

Krishnendu Roy, *Valdosta State University*

Martin Ruckert, *Hochschule München*

Anthony Ruocco, *Roger Williams University*

Ingrid Russell, *University of Hartford*

John Russo, *Landmark College*

Becky Rutherford, *Kennesaw State University*

Rebecca Rutherford, *Kennesaw State University*

Ian Sanders, *University of South Africa*

William Sanders, *University of Hartford*

Rafi Santo, *Indiana University*

Tanmoy Sarkar, *Microsoft Corporation*

Allison Sauppé, *University of Wisconsin-La Crosse*

Christopher Scaffidi, *Oregon State University*

Pasqueline Scaico, *Universidade Federal da Paraíba*

Walter Schilling, *Milwaukee School of Engineering*

Suzanna Schmeelk, *Columbia University*

Karl Schmitt, *Valparaiso University*

Diane Schwartz, *California State University Northridge*

Stephanie Schwartz, *Millersville University*

Michael Scott, *Falmouth University*

Otto Seppälä, *Aalto University*

Christian Servin, *El Paso Community College*

Cliff Shaffer, *Virginia Tech*

Philipp Shah, *Technische Universität München*

Bonita Sharif, *Youngstown State University*

Mohamed Shehab, *University of North Carolina at Charlotte*

Anil Shende, *Roanoke College*

C-K Shene, *Michigan Technological University*

Ching-Kuang Shene, *Michigan Technological University*

Amit Shesh, *Northeastern University*

Swapneel Sheth, *University of Pennsylvania*

Yasuo Shirai, *Shizuoka University*

William Siever, *Washington University*

Maria Simi, *Università di Pisa*

Murali Sitaraman, *Clemson University*

Hugh Smith, *Cal Poly*

Jacqueline Smith, *University of Toronto*

Peter Smith, *California State University - Channel Islands*

Bir Sodhi, *California State University San Bernardino*

Sohum Sohoni, *Arizona State University*

Ellis Solaiman, *Newcastle University*

Takako Soma, *Illinois College*

Joel Sommers, *Colgate University*

Raja Sooriamurthi, *Carnegie Mellon University*

Greg Speegle, *Baylor University*

Nathan Sprague, *James Madison University*

Nigamanth Sridhar, *Cleveland State University*

Sumukh Sridhara, *UC Berkeley*

Terry Steinbach, *DePaul University*

Ben Stephenson, *University of Calgary*

Jeffrey Stone, *Pennsylvania State University*

Forrest Stonedahl, *Augustana College - Rock Island*

Jane Stout, *Computing Research Association*

Fred Strickland, *South University*

Kristina Striegnitz, *Union College*

Deborah Sturm, *College of Staten Island (CUNY)*

Kalpathi Subramanian, *University of North Carolina at Charlotte*

Rajendran Swamidurai, *Alabama State University*

Rajendran Swamidurai, *Alabama State University*

Claudia Szabo, *The University of Adelaide*

Robert Tairas, *Vanderbilt University*

Burcin Tamer, *Computing Research Association*

Adelina Tang, *Sunway University*

Cara Tang, *Portland Community College*

Andrea Tartaro, *Furman University*

Rahman Tashakkori, *Appalachian State University*

Michael Tashbook, *Stony Brook University*
Cynthia Taylor, *University of Illinois at Chicago*
William Thacker, *Winthrop University*
Jakita Thomas, *Auburn University*
Megan Thomas, *California State University, Stanislaus*
S. Rebecca Thomas, *Bard College*
Kathleen Timmerman, *Wright State University*
Andrew Tjang, *Rutgers University*
David Touretzky, *Carnegie Mellon University*
Gloria Townsend, *DePauw University*
Christian Trefftz, *Grand Valley State University*
Deborah Trytten, *University of Oklahoma*
William Turkett, *Wake Forest University*
William Turner, *Wabash College*
Hakan Tuzun, *Hacettepe University*
Jozef Tvarozek, *Slovak University of Technology in Bratislava*
Jeramey Tyler, *Rensselaer Polytechnic Institute*
Prem Uppuluri, *Radford University*
Timothy Urness, *Drake University*
Ian Utting, *University of Kent*
Frank Vahid, *UC Riverside*
David Valentine, *Slippery Rock University*
Robert Van Camp, *Marietta College*
Marko Van Eekelen, *Radboud University Nijmegen*
James Vanderhyde, *St. Xavier University*
Jorge Vasconcelos, *National Autonomous University of Mexico*
Steve Vegdahl, *University of Portland*
Nanette Veilleux, *Simmons College*

Christie Veitch, *Workbench Platform*
J. Ángel Velázquez-Iturbide, *Universidad Rey Juan Carlos*
Gabriela Vilanova, *National Patagonia Austral University*
Giovanni Vincenti, *University of Baltimore*
Rebecca Vivian, *The University of Adelaide*
Kenneth Vollmar, *Missouri State University*
Nadine von Frankenberg Und Ludwigsdorff, *Technische Universität München*
David Voorhees, *Le Moyne College*
Rosita Wachenchauer, *Universidad Nacional de Tres de Febrero*
Amber Wagner, *Kennesaw State University*
Paul Wagner, *University of Wisconsin—Eau Claire*
Sally Wahba, *NetApp*
Gursimran Walia, *North Dakota State University*
Xinli Wang, *Michigan Technological University*
Stan Warford, *Pepperdine University*
Andrew Watkins, *Baldwin Wallace University*
Thomas Way, *Villanova University*
David Webb, *University of Colorado Boulder*
Nick Webb, *Union College*
Josh Weese, *KSU*
Duo Wei, *Stockton University*
David Weintrop, *University of Chicago*
Scott Weiss, *Mt. St. Mary's University*
Stephen Weiss, *University of North Carolina at Chapel Hill*
Kevin Wendt, *University of Minnesota*
Emily Wenk, *Penn State University*

Linda Werner, *University of California, Santa Cruz*
Roger West, *University of Illinois at Springfield*
Elizabeth White, *George Mason University*
James Williams, *University of Wisconsin*
Judith Williams, *William Penn University*
Craig Wills, *Worcester Polytechnic Institute*
Victor Winter, *University of Nebraska at Omaha*
Marty Wolf, *Bemidji State University*
Greg Wolffe, *Grand Valley State University*
Zoe Wood, *Cal Poly*
Aman Yadav, *Michigan State University*
Nikhil Yadav, *St. John's University*
Arthur Yanushka, *Christian Brothers University*
Duane Yoder, *University of West Georgia*
Xiaohong Yuan, *North Carolina A & T State University*
Kwok-Bun Yue, *University of Houston—Clear Lake*
Timothy Yuen, *University of Texas at San Antonio*
Mark Zarb, *Robert Gordon University*
Evelyn Zayas, *One Schoolhouse*
Xin Zhang, *National University of Defense Technology*
Yuanlin Zhang, *Texas Tech University*
Weiyang Zhu, *Metropolitan State University of Denver*
Craig Zilles, *University of Illinois at Urbana-Champaign*
Rina Zviel-Girshin, *Rupp Academic Center*

Recipients of the SIGCSE Award for Outstanding Contributions to Computer Science Education

- 1981 **William F. Atchison**, *University of Maryland*
- 1982 **Alan Perlis**, *Yale University*
- 1983 **Karl V. Karlstrom**, *Prentice-Hall*
- 1985 **Elliot I. Organick**, *University of Utah*
- 1986 **Donald Knuth**, *Stanford University*
- 1987 **Niklaus Wirth**, *ETH, Zurich*
- 1988 **Grace Murray Hopper**, *Rear Admiral, USN, Digital Equipment Corp.*
- 1989 **Edsger W. Dijkstra**, *The University of Texas at Austin*
- 1990 **Curriculum '68 Committee:**
William F. Atchison, Samuel D. Conte, John Hamblen, Thomas E. Hull, Thomas A. Keenan,
William B. Kehl, Edward J. McClusey, Silvio O. Navarro, Werner Rheinboldt, Earl J. Schweppe,
William Viavant, David M. Young, Jr.
- 1991 **David Gries**, *Cornell University*
- 1992 **Daniel D. McCracken**, *City College, City University of New York*
- 1993 **Alan C. Kay**, *Apple Computer*
- 1994 **Norman E. Gibbs**, *Software Engineering Institute*
- 1995 **Robert M. Aiken**, *Temple University*
- 1996 **Nell B. Dale**, *The University of Texas at Austin*
- 1997 **Andrew Tannenbaum**, *Vrije University*
- 1998 **William A. Wulf**, *University of Virginia and National Academy of Engineering*
- 1999 **Peter J. Denning**, *George Mason University*
- 2000 **Andries Van Dam**, *Brown University*
- 2001 **Allen B. Tucker**, *Bowdoin College*
- 2002 **Elliot Soloway**, *University of Michigan*
- 2003 **Eric Roberts**, *Stanford University*
- 2004 **Mordechai Ben-Ari**, *Weizmann Institute of Science*
- 2005 **Kim Bruce**, *Williams College*
- 2006 **Richard Pattis**, *Carnegie Mellon University*
- 2007 **Judith Gal-Ezer**, *Open University of Israel* and **John Hughes**, *University of Technology, Sydney*
- 2008 **Randy Pausch**, *Carnegie Mellon University*
- 2009 **Elliot B. Koffman**, *Temple University*
- 2010 **Sally Fincher**, *University of Kent, Canterbury*
- 2011 **Matthias Felleisen**, *Northeastern University*
- 2012 **Harold (Hal) Abelson**, *Massachusetts Institute of Technology*
- 2013 **Michael Kölling**, *University of Kent, Canterbury*
- 2014 **Robert M. Panoff**, *The Shodor Education Foundation, Inc.*
- 2015 **Mark Allen Weiss**, *Florida International University*
- 2016 **Jan Cuny**, *National Science Foundation*
- 2017 **Gail Chapman**, *Exploring Computer Science*

Recipients of the SIGCSE Lifetime Service Award

- 1997 **Richard Austing**, *University of Maryland*
- 1998 **Della Bonnette**, *University of Southwestern Louisiana*
- 1999 **Robert Aiken**, *Temple University*
- 2000 **James E. Miller**, *University of Southern Mississippi*
- 2001 **Lillian N. (Boots) Cassel**, *Villanova University*
- 2002 **Joe Turner**, *Clemson University and Zayed University*
- 2003 **Harriet Taylor**, *National Science Foundation and Louisiana State University*
- 2004 **Bruce Klein**, *Grand Valley State University*
- 2005 **Andrew McGettrick**, *University of Strathclyde*
- 2006 **Joyce Currie Little**, *Towson State University*
- 2007 **John Impagliazzo**, *Hofstra University*
- 2008 **Dennis Frailey**, *Raytheon Corporation*
- 2009 **Michael J. Clancy**, *University of California, Berkeley*
- 2010 **Peter Denning**, *Naval Postgraduate School*
- 2011 **Gordon Davies**, *Open University*
- 2012 **Jane Prey**, *Microsoft Research*
- 2013 **Henry Walker**, *Grinnell College*
- 2014 **Andrea Lawrence**, *Spelman College*
- 2015 **Frank H. Young**, *Rose-Hulman Institute of Technology*
- 2016 **Barbara Boucher Owens**, *Southwestern University*
- 2017 **Mats Daniels**, *Uppsala University*

SIGCSE 2017 Best Paper and Exemplary Paper Awards

This year the program chairs recognize a new category of the top 25% of accepted papers as “Exemplary papers”, highlighted for their accomplishment of high quality, novelty and broad appeal to reviewers. There were a total of 348 full papers submitted to SIGCSE 2017. Of these, 105 were accepted. Of these 105, 26 were selected as exemplary papers. All exemplary papers had an average reviewer score of 4.8 or above (on a 6-point scale), with no scores below 3. One best paper was selected in each category of New Program (i.e., Curriculum / Program / Degree Initiative), Experience Report, and CS Education Research, based on receiving 2 of the highest reviewer ratings.

Paper Category	Submitted	Accepted	Exemplary
Experience Report	99	21 (21.2%)	4 (4.0%)
New Program	20	7 (35.0%)	2 (10.0%)
CS Education Research	229	77 (33.6%)	20 (8.7%)
TOTAL	348	105 (30.2%)	26 (7.5%)

We present the SIGCSE 2017 Best Papers, then the SIGCSE 2017 Exemplary Papers, ordered by category, with the best paper first, and then ordered by the last name of the first author.

Best Experience Report Paper

[Making Noise: Using Sound-Art to Explore Technological Fluency](#)

Erik Brunvand, Nina McCurdy (*University of Utah*)

Best New Program Paper

[Infrastructure for Continuous Assessment of Retained Relevant Knowledge](#)

Kathleen Timmerman, Travis Doom (*Wright State University*)

Best CS Education Research Paper

[Computing with CORGIS: Diverse, Real-world Datasets for Introductory Computing](#)

Austin Cory Bart, Ryan Whitcomb, Dennis Kafura, Clifford A. Shaffer, Eli Tilevich (*Virginia Tech*)

Exemplary Experience Report Papers

[Making Noise: Using Sound-Art to Explore Technological Fluency](#)

Erik Brunvand, Nina McCurdy (*University of Utah*)

[A Two-Course Sequence of Real Projects for Real Customers](#)

Christian Murphy, Swapneel Sheth, Sydney Morton (*University of Pennsylvania*)

[Preparing and Supporting Industry Professionals as Volunteer High School Computer Science Co-Instructors](#)

Anthony Papini (*TEALS*); Leigh Ann DeLyser (*CSNYC*); Nathaniel Granor, Kevin Wang (*TEALS*)

[Integrating Computer Science into Music Education](#)

John Peterson, Greg Haynes (*Western State Colorado University*)

Exemplary New Program Papers

Infrastructure for Continuous Assessment of Retained Relevant Knowledge

Kathleen Timmerman, Travis Doom (*Wright State University*)

Preparing STEM Teachers to offer New Mexico Computer Science for All

Irene A. Lee (*Massachusetts Institute of Technology*); Maureen Psaila Dombrowski (*Los Alamos National Laboratory*); Ed Angel (*University of New Mexico*)

Exemplary CS Education Research Papers

Computing with CORGIS: Diverse, Real-world Datasets for Introductory Computing

Austin Cory Bart, Ryan Whitcomb, Dennis Kafura, Clifford A. Shaffer, Eli Tilevich (*Virginia Tech*)

Incorporating Human Error Education into Software Engineering Courses via Error-based Inspections

Vaibhav Anu, Gursimran Walia (*North Dakota State University*); Gary Bradshaw (*Mississippi State University*)

Employing Retention of Flow to Improve Online Tutorials

Ashok Basawapatna (*SUNY Old Westbury*); Alexander Repenning (*University of Applied Sciences and Arts Northwestern Switzerland*)

Examining the Relationship Between Introductory Computing Course Experiences, Self-Efficacy, and Belonging Among First-Generation College Women

Jennifer M. Blaney (*University of California, Los Angeles*); Jane G. Stout (*Computing Research Association*)

Pencil Puzzles for Introductory Computer Science: An Experience- and Gender-Neutral Context

Zack Butler, Ivona Bezáková (*Rochester Institute of Technology*); Kimberly Fluet (*St. John Fisher College*)

Evaluating Student Learning from Collaborative Group Tests in Introductory Computing

Yingjun Cao, Leo Porter (*University of California, San Diego*)

Evaluating Neural Networks as a Method for Identifying Students in Need of Assistance

Karo Castro-Wunsch (*University of Toronto Mississauga*); Alireza Ahadi (*University of Technology, Sydney*); Andrew Petersen (*University of Toronto Mississauga*)

Evaluating the Effectiveness of Algorithm Analysis Visualizations

Mohammed F. Farghally (*Virginia Tech*); Kyu Han Koh (*California State University Stanislaus*); Hossameldin Shahin, Clifford A. Shaffer (*Virginia Tech*)

The Code Mangler: Evaluating Coding Ability Without Writing any Code

Nick Cheng, Brian Harrington (*University of Toronto Scarborough*)

Interactions of Individual and Pair Programmers with an Intelligent Tutoring System for Computer Science

Rachel Harsley (*University of Illinois at Chicago*); Davide Fossati (*Emory University*); Barbara Di Eugenio (*University of Illinois at Chicago*); Nick Green (*University of Illinois at Chicago*)

Building a Statewide Computer Science Teacher Pipeline

Helen H. Hu (*Westminster College*); Cecily Heiner (*Southern Utah University*); Thomas Gagne (*University of Puget Sound*); Carl Lyman (*Utah State Office of Education*)

Student Perspectives of Team-Based Learning in a CS Course: Summary of Qualitative Findings

Michael S. Kirkpatrick (*James Madison University*)

Generating Hints and Feedback for Hilbert-style Axiomatic Proofs

Josje Lodder, Bastiaan Heeren (*Open University of the Netherlands*); Johan Jeuring (*Open University of the Netherlands & Utrecht University*)

Understanding Student Interactions in Capstone Courses to Improve Learning Experiences

Andres Neyem, Juan Diaz-Mosquera, Jorge Munoz-Gama, Jaime Navon (*Pontificia Universidad Catolica de Chile*)

Exploring the Pair Programming Process: Characteristics of Effective Collaboration

Fernando J. Rodríguez, Kimberly Michelle Price, Kristy Elizabeth Boyer (*University of Florida*)

Improving Students' Learning and Achievement in CS Classrooms through Computational Creativity Exercises that Integrate Computational and Creative Thinking

Duane F. Shell, Leen-Kiat Soh, Abraham E. Flanigan, Markeya S. Peteranetz, Elizabeth Ingraham (*University of Nebraska-Lincoln*)

Deconstructing the Discussion Forum: Student Questions and Computer Science Learning

Mickey Vellukunnel (*University of Florida*); Philip Buffum (*North Carolina State University*); Kristy Elizabeth Boyer (*University of Florida*); Jeffrey Forbes (*Duke University*); Sarah Heckman (*North Carolina State University*); Ketan Mayer-Patel (*University of North Carolina*)

iSnap: Towards Intelligent Tutoring in Novice Programming Environments

Thomas W. Price, Yihuan Dong, Dragan Lipovac (*North Carolina State University*)

Evaluation and Impact of a Required Computational Thinking Course for Architecture Students

Nick Senske (*Iowa State University*)

Exam Wrappers: Not a Silver Bullet

Ben Stephenson (*University of Calgary*); Michelle Craig (*University of Toronto*); Daniel Zingaro (*University of Toronto Mississauga*); Diane Horton, Danny Heap, Elaine Huynh (*University of Toronto*)

SIGCSE 2018 -- CALL FOR PARTICIPATION

“CS for All”

The 49th ACM Technical Symposium on Computer Science Education

February 21 – 24, 2018, Baltimore, Maryland, USA, <http://sigcse2018.sigcse.org>

The SIGCSE Technical Symposium is a forum for educators and researchers to share new results and insights around developing, implementing, or evaluating computing programs, curricula, and courses. We invite colleagues from around the world to contribute to, review for, and attend SIGCSE 2018. We encourage you to share your new ideas for computing syllabi, laboratories, teaching, pedagogy, and education research at all levels of instruction.

Our 2018 theme *“CS for All”* highlights our common goal to equitably engage all people to learn computer science, since computing and computational thinking are increasingly important literacies for living in the 21st century. We are particularly interested in broadening participation and diversity, K-12 and novice learners, improved and scalable pedagogies, leveraging data and analytics to improve learning, peer learning and instruction, novel outreach, events and engagement strategies, involving students in solving social and global challenges, advanced CS topics, and education research. SIGCSE encourages multiple ways of sharing ideas, including papers, panels, special sessions, workshops, BoFs, posters, demos, lightning talks, and the ACM Student Research Competition.

PAPERS (6 pp. max; 25 min.) Papers describe an educational research project, classroom experience, teaching technique, curricular initiative, or pedagogical tool. All papers should explicitly state their motivating questions, relate to relevant literature, and contain an analysis of the effectiveness of the interventions. CS education research papers and research studies should adhere to rigorous standards, describing hypotheses, methods, and results. Experience reports should carefully describe the context and provide a rich reflection on what worked, what didn't, and why. Papers on new curricula, programs, teaching techniques, or pedagogical tools should provide enough detail so that others could adopt the new innovation and understand its possible impacts. Initial submissions must be anonymous.

PANELS (2 pp. max; 75 min.) Panels present multiple perspectives on a specific topic. Panel proposals include a topic description, panelists, affiliations, panelist position statements, and a plan for audience participation.

SPECIAL SESSIONS (2 pp. max; 75 min.) Special sessions are your opportunity to design a unique 75-minute session in a standard conference space, but distinct from papers, panels, posters, or BoFs.

WORKSHOPS (2 pp. max; 3 hours) Workshops engage participants in learning new techniques and technologies designed to foster education, scholarship, and collaboration. Proposals must include an abstract, intended audience and size, and specify power/A/V/equipment/space needs. Workshops do not conflict with the technical sessions.

BIRDS OF A FEATHER (BoF) (1 p. max; 50 min., no A/V) BoFs provide an environment for colleagues with similar interests to meet for informal discussions. A/V equipment will not be provided for BoFs.

POSTERS (2 pp. max; 2 hours) Posters describe CS education materials or research, particularly works in progress. Posters enable one-on-one discussion with conference attendees. Prepared handouts are encouraged.

DEMOS (2 pp. max; 90 min.) Demos showcase the relevance, potential, and innovation of a tool and allow time for discussion with its creator in the exhibition hall. Proposals include an abstract and specify power/A/V/space needs.

LIGHTNING TALKS (500 words max; 5 min.) Lightning talks describe works in progress, new and untested ideas, or opportunities for collaborative work. Talks are an excellent way to spark discussions and get feedback on an idea.

ACM STUDENT RESEARCH COMPETITION (SRC) (2 pp. max; 3-hour poster) Undergraduate and graduate student ACM members are invited to submit individual research contributions from all areas of computer science.

PRE-SYMPOSIUM EVENTS (2 pp. max; 4 or 8 hours) Affiliated organizations are invited to submit proposals for events, including: target audience, # participants, duration, topic, schedule, power/A/V/space needs, and organizers.

IMPORTANT DUE DATES

Friday, August 25, 2017: Papers, Panels, Special Sessions & Workshops

Friday, October 20, 2017: BoF, Posters, Demos, Lightning Talks, SRC, Pre-symposium Events

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