

Access Computing

NEWS

from the Alliance for Access to Computing Careers

Increasing opportunities in computing for people with disabilities

September 2018

AccessComputing at the Tapia Celebration

By Brianna Blaser, *AccessComputing* Staff

AccessComputing is a Bronze Sponsor of the 2018 Tapia Celebration of Diversity in Computing, being held September 19–22 in Orlando, FL. *AccessComputing* partner Shiri Azenkot from Cornell Tech will give a keynote titled "Changing the Way We See Things: Designing Technology for People with Low Vision" (Thursday 9:30–11:00 am, Regency O-R).

Come visit with *AccessComputing* staff and team members in the Exhibit Hall at booth 614 and check out the following sessions:

- Panel: Disability Disclosure in Education and Employment (Thursday 2:00–3:30 pm, Orlando M)
- Panel: Increasing Diversity in Computing: Sharing of Good Practices (Thursday 2:00–3:30 pm, Orlando N)
- Birds of a Feather: Disability: Celebrating a Face of Diversity (Thursday 4:00–5:00 pm, Orlando M)
- Panel: Welcoming Students with Disabilities (Friday 10:30–12:00 pm, Orlando L)

View the Tapia schedule at tapiaconference.org/schedule/.



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AccessCSforAll professional development workshop participants

AccessCSforAll Professional Development Workshop for Teachers of Blind and Visually Impaired Students

By Richard Ladner, *AccessComputing* PI

AccessCSforAll held its first professional development workshop for teachers of blind and visually impaired students at the University of Texas, Austin, for one week in early July 2018. The workshop was led by *AccessCSforAll* principal investigators Richard Ladner and Andreas Stefik. Assisting were William Allee, Quorum programming language developer, and Sean Mealin, PhD student at North Carolina State University and *AccessComputing* Team member. Eleven teachers from ten different states and Puerto Rico participated in the workshop that focused on the accessible Computer Science Principles (CSP), which is based on the Code.org CSP curriculum and the Quorum Language lessons. Activities in the workshop were modeled after the activities at Code.org's TeacherCon professional development workshop held in Atlanta in June 2018 that Ladner attended. Activities at the *AccessCSforAll* workshop included an overview of CSP, lesson preparation and teaching by participants, Quorum programming language overview and lessons, and critiques of the latest accessible CSP curriculum draft developed by the *AccessCSforAll* team at the University of Nevada, Las Vegas. The critique included suggestions to make the curriculum, both plugged and unplugged activities, more accessible for blind and visually impaired students. Three of the

teachers, who came from mainstream schools, did not have experience with blind students, but were expecting them in their classes this coming year. One session included advice by the experienced teachers of blind students on proper etiquette when interacting with blind people. There will be additional professional development, done remotely, with these teachers during the academic year. In 2019, *AccessCSforAll* will hold additional professional development workshops for teachers of deaf students and teachers of learning disabled students.

AccessComputing's Added Initiative

By Sheryl Burgstahler, *AccessComputing* Co-PI

AccessComputing has received supplemental funding to undertake an additional initiative that supports our work. The supplement will allow us to increase the capacity of other computing-related projects funded through the National Science Foundation (NSF) to recruit and fully include individuals with disabilities in computing instruction, research, and other activities supported by their projects. We aim to foster synergistic and lasting relationships among NSF project leaders to promote systemic changes toward inclusiveness in computing research, education, and careers.

As part of NSF's Directorate for Computer and Information Science and Engineering (CISE) commitment to broadening participation in computing (BPC), grant proposals in a subset of programs must provide meaningful BPC plans. Among the supplement's objectives are to increase the capacity of CISE projects to

- recruit, mentor, and fully include individuals with disabilities in computing outreach, instruction, research, and other activities;
- develop and implement strategies to shift culture of departments/organizations to be more welcoming and accessible to people with disabilities; and

- create and deploy accessibly designed project websites, documents, curriculum, and videos.

The effort will result in the creation of online resources that will ensure a great impact for many years to come. *AccessComputing* initiatives aim to increase the successful participation of people with disabilities in STEM fields and enhance these fields with their perspectives and expertise. We look forward to extending our impact with additional project funding provided by NSF.

Ayanna Howard Wins Tapia Award

By Brianna Blaser, *AccessComputing* Staff



AccessComputing partner Ayanna Howard of Georgia Tech is the winner of The Richard A. Tapia Achievement Award for Scientific Scholarship, Civic Science and Diversifying Computing. Ayanna is the Linda J. and Mark C. Smith Professor

and Chair of the School of Interactive Computing at the Georgia Institute of Technology. Ayanna conducts research in the area of assistive robotics and has mentored *AccessComputing* students.

The Richard A. Tapia Award is awarded annually to an individual who demonstrates significant research leadership and strong commitment and contributions to diversifying computing. Previous winners of the Tapia Award include *AccessComputing* PI Richard Ladner (2015), *AccessComputing* partners Bryant York (2001) and Valerie Taylor (2005), and several of our allies.

To read the full award announcement, visit myemail.constantcontact.com/2018-Richard-A--Tapia-Award-Winner-Announced.html?soid=1103891233886&aid=8tHdMpetkXQ.

2018 AccessComputing Capacity Building Award Given to Howard Kramer

By Sheryl Burgstahler, *AccessComputing* Co-PI



The 2018 *AccessComputing* Capacity Building Award goes to Howard Kramer of the University of Colorado Boulder. He teaches courses on universal design and is the PI for a grant project called Promoting the Integration of Universal

Design in University Curricula (uduc.org), funded in part by the National Endowment for the Arts. For more than two decades, Howard has led the Accessing Higher Ground conference, which focuses on accessible media and technology in higher education and legal and policy issues regarding IT accessibility. In recent years, Howard has been a champion of teaching accessibility to students in computing education. Richard Ladner and I will present the award to Howard in November at Accessing Higher Ground.

AccessComputing at the 2018 CRA Conference at Snowbird

By Richard Ladner, *AccessComputing* PI

I, representing *AccessComputing*, was on a panel titled “Increasing Diversity in Computing is Easier Than You Think: Some Small Steps that Make a Big Difference” at the 2018 Computing Research Association (CRA) Conference at Snowbird, Utah, in July 2018. The attendees were leaders in research-focused computer science academic and industry units. One of the two themes of the conference was diversity. Other panelists were Mary Hall from the University of Utah, Diane Levitt from Cornell Tech, and Manuel Pérez-Quinones from the University of North Carolina, Charlotte. More than 100 leaders attended the panel that discussed the types of programs and activities that are doable for most academic units, and particularly for units that feel they are currently not doing enough to increase diversity and retain a diverse student population.

To better include students with disabilities, I stressed four basic approaches: attitudes, infrastructure, curriculum, and faculty. For attitudes, I recommend being welcoming instead of just stressing compliance with laws such as the Americans with Disabilities Act. For infrastructure, I recommend having an accessible website, captioned videos, and accessible labs and offices. For curriculum, I recommend including accessibility topics in offered courses and highlighting common technologies such as optical character recognition, speech synthesis, and speech recognitions that were inspired by the needs of people with disabilities. Finally, for faculty I recommend hiring in areas such as human-computer interaction that are attractive to students from diverse backgrounds. Slides from the workshop are available online in PDF format (cra.org/wp-content/uploads/2018/07/2018_CRA_Snowbird_Increasing_Diversity_in_Computing.pdf).

13 Curriculum Development Awardees Announced

By Teach Access, *AccessComputing* Collaborator

Teach Access is pleased to announce the 13 faculty member winners of the first-time Teach Access Curriculum Development Awards! These \$5,000 awards will be used to develop modules, presentations, exercises or curriculum enhancements or changes that introduce the fundamental concepts and skills of accessible design and development in existing, classroom-based courses.

Read the full announcement at teachaccess.org/13-teach-access-curriculum-development-awardees-announced.



teach access

Teach Access logo



Sean Mealin and Ed Summers

Interning at SAS

By Sean Mealin, *AccessComputing* Team Member

I am a completely blind Ph.D. student in the department of computer science at North Carolina State University. During both summer 2017 and summer 2018, I have been an intern at SAS, the market leader in analytics software and consistently voted among the best places to work within the US by *Fortune*. As an intern, I worked on the accessibility team as a software developer, focused on the SAS Graphics Accelerator, freely available software that allows blind and visually impaired people to work with graphs and charts. This is the story of my internship.

In 2012, as part of a software engineering class, I decided to investigate software developers who are blind and the challenges that they face every day. One of the people that I spoke to was Ed Summers, Director of accessibility at SAS. While our paths frequently crossed over the next few years, it wasn't until late 2016 that Ed and I found ourselves sitting at a lunch table during an event, where we started discussing my research in machine learning. One thing led to another, and before I knew it, I found myself interviewing for an internship with SAS. Within six months, I showed up to the SAS campus, ready for new-hire orientation and to start work on a very exciting machine learning project. Unfortunately, as all good things do, that summer sped by in a blur and eventually ended, sending me back to the halls of academia with new skills ready to be applied to my research.

During the 2017-2018 academic year, I kept in touch with Ed, expressing my interest in coming back during the summer. We discussed potential projects, and what I wanted to do to enhance my skillset and experience. After I expressed my interest to work on a real, shipping product, Ed eventually put me on the SAS Graphics Accelerator project, one of the coolest and potentially most impactful projects that I've ever done.

This summer, I've been learning about web development and how to make complicated web applications accessible to screen readers, software that blind people use to interact with computers and the internet. As a developer, I have spent my time between fixing bugs and developing features that our users have requested. One of my favorite events from this summer is when I had the opportunity to teach a group of blind and visually impaired high school students how to turn charts into sound using our software, and how they can use it in their classes. Being able to work on projects that have a real impact, while continuing to develop my technical skills, and even getting to teach is why I love working at SAS.

My REU Experience

By Andrew Boka, *AccessComputing* Team Member



I am a junior in the College of Engineering at UC Berkeley. I am majoring in computer science and engineering. This past summer, I completed an Research Experiences for Undergraduates (REU) internship with Dr. Brendan

Morris, associate professor of electrical and computer engineering and director of the Real-Time Intelligent Systems Laboratory at the University of Nevada Las Vegas. I designed, implemented, and evaluated a low-power, lightweight facility access monitoring system utilizing modern facial recognition technology.

I first met Dr. Morris while attending high school in Las Vegas and working on a computer science STEM endorsement for my diploma. He understood my interests and training and consequently offered to mentor my research.

I found the internship to be both challenging and rewarding. Because my project involved development of a complete software and hardware system, I was able to apply many of the principles I had learned in both computer science and electrical engineering classes. I also became familiar with Facenet and Open Face deep learning facial recognition technologies and computational devices such as the Raspberry Pi and the Movidius Neural Compute Stick. During my internship, I participated in weekly research team meetings, where I learned about a wide range of other computer vision projects being conducted by undergraduate and graduate students in Dr. Morris's laboratory.

I was able to live at home while completing the internship, which also allowed me to accomplish two personal goals that were important to me: (1) I competed in the Nevada State Amateur Golf Championships; and (2) I obtained my Nevada driver's license!

AccessComputing and this internship have helped me in many other ways and I am returning to my coursework at UC Berkeley with new found energy and confidence.

AccessComputing Partners Win Trailblazer Awards

By K Wheeler, *AccessComputing* Staff

Two *AccessComputing* participants-turned-partners were recently awarded as DO-IT Trailblazers. Through their work and accomplishments they have changed the way the world views people with disabilities and increased the potential of people with disabilities to succeed in college, careers, and community life.



Dr. Shiri Azenkot is an assistant professor of information science at the Jacobs Technion-Cornell Institute at Cornell Tech, Cornell University. Her research interests are in accessibility and interaction on new platforms. As a student, Shiri was an active participant in *AccessComputing*. She has hosted research interns with a variety of disabilities, presented at a capacity building institute, and spoken in one of our videos.



Dr. Shaun Kane is an assistant professor in computer science at the University of Colorado Boulder. He directs the Superhuman Computing Lab, which conducts research on accessible user interfaces, mobile and wearable

interactions, and tangible computing. He was a participant in DO-IT programs as a student and is now an *AccessComputing* partner. He has hosted an *AccessComputing* intern in his lab, led computer science workshops at the National Federation for the Blind Youth Slam, and mentored other *AccessComputing* student participants.

To read profiles of past Trailblazer awardees, visit the Trailblazer page on the DO-IT website at www.uw.edu/doit/about/awards/trailblazers.

Low Cost Eye Tracking for Computer Access and Speech Synthesis

By Anna Kirkpatrick, *AccessComputing* Team Member

In the past couple of years, low-cost eye-tracking devices have been introduced to the consumer market. These are mainly marketed as gaming devices, but they have also found applications in computer access for people with physical disabilities.

Eye-trackers (or gaze-trackers) are devices consisting of infrared LEDs and one or more infrared cameras. By capturing the reflection

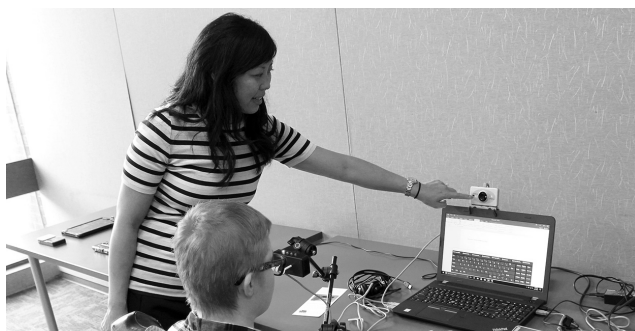
of the infrared light off of the user's eyes, an image processing algorithm can determine where on a computer monitor the user is currently looking. Historically, these devices have been very expensive, but some now sell for less than \$200.

For this article, I will focus on the Tobii Eye Tracker 4C (tobiigaming.com/eye-tracker-4c/). I have personally used this device for over a year. It retails for about \$150 and is marketed to a gaming audience. An adhesive magnet allows the device to be mounted to the lower edge of your computer monitor, and a USB 3.0 connection transmits data to the computer. In order to use all of the available utilities, Windows 8, 8.1, or 10 is required. Some functionality is possible with Windows 7. Tobii has not made similar hardware available with drivers for Mac or Linux. (Other devices on the market have similar technical specifications and will work with much of the same software.)

I have found that the Eye Tracker 4C works best with a moderately-large external monitor, but there is an upper size limit for monitors: either 27 inches or 30 inches depending on aspect ratio. In order for the device to work properly, the basic positioning requirement is that your face is oriented towards the monitor, with your two eyes at the same height. In a traditional monitor set up, this means sitting upright facing the monitor, but a variety of other positions could be achieved with creative monitor mounting.

It is possible to use the eye-tracker with a laptop, but targeting will be less accurate. The screen can also become a limiting factor when working on a laptop, as an on-screen keyboard large enough for eye tracking will likely occupy at least half of the screen. A few gaming-focused laptops are available with essentially the same eye-tracking hardware integrated into the laptop itself.

Tobii provides drivers and calibration software, along with a few other utilities. The calibration is quite simple, only requiring the



A mentor shows a student how to use an eye tracking camera.

user to stare at a few points on the screen for a few seconds apiece. By default, the software attempts to track both of your eyes, but it is configurable to track only the right or only the left eye.

Most of the auxiliary software provided by Tobii should be considered more of a demo than a useful piece of software, but one feature in particular is worth mentioning. You can configure the software to have the mouse cursor "jump" to the current gaze point when the user starts moving the mouse in that general direction. This can be quite useful if combining eye tracking technology with a physical mouse (or trackball, or joystick, etc.). This configuration allows large mouse movements across the screen to be handled by the eye tracker and small, precise movements to be controlled by a physical mouse. Other options include configuring the cursor to jump when a key is pressed and setting thresholds for the minimum jump distance.

To control the computer entirely with your eyes, additional software is required. A high-quality, free, and open-source option is OptiKey (github.com/OptiKey/OptiKey/wiki). (Full disclosure: I have contributed to OptiKey and its documentation.) At its core, OptiKey is a tool that allows users to interact with a Windows computer and generate synthesized speech output using eye gaze. It features an on-screen keyboard where you point with your eyes and click either with a switch or by dwelling on a key. Well-designed mouse emulation tools are also included. These include options that allow you to

more easily select small targets by zooming in on a screen region. OptiKey also features multiple methods of word prediction and completion from the keyboard and the ability to change common settings without exiting the keyboard environment. It is designed so that, once Optikey is running, you can interact with the computer using only the eye-tracker (and optionally a switch). OptiKey contains keyboards in many languages and even includes a set of pictorial keyboards (designed to allow children and others who struggle with written language to communicate).

It is entirely possible to use OptiKey to write source code, but some of the symbols that are frequently used in code are buried in OptiKey, requiring the user to navigate through multiple sub keyboards before reaching the desired symbol. My amazing friend Maxie (github.com/maxieds/) has been helping me create and implement some alternative keyboard layouts better suited to coding, and you can find our work (as well as instructions for making your own custom keyboards) on GitHub (github.com/OptiKey/OptiKey/wiki/Creating-and-Using-Dynamic-Keyboards).

Project Iris (iris.xcensity.at/) is another software package that works with the eye-tracker. It is tailored towards allowing you to craft your own eye-tracking-based interfaces for Windows programs. Its most powerful feature is "interactors," on-screen rectangles that respond when you look at them, triggering keystrokes or other actions. The software is particularly useful when real-time input is important, such as in video games. This software isn't free, but there is a free 14 day trial available.

Dasher (www.inference.org.uk/dasher/) is another free and open-source on-screen keyboard, and its design works extremely well for noisy input like eye trackers. To use Dasher, you must first map the eye tracker input to the mouse. This can be done with Project Iris or with a simple FreePIE script (see below). Dasher is very good for fast text entry, but it is not good for editing

or navigating user interfaces. I like to describe using Dasher with an eye tracker as "interactive reading." Dasher does have quite a steep learning curve, but at the top of that curve, it really is as easy as reading.

If you want to write your own code to interface with the eye tracker, FreePIE (github.com/AndersMalmgren/FreePIE/wiki) is a great place to start. It lets you write Python scripts that take input from any number of devices (including the eye tracker) and emulate the mouse and/or keyboard as output.

Ed-ICT International Network Update

By Sheryl Burgstahler, *AccessComputing* Co-PI

Through the Ed-ICT International Network we are exploring the ways that information and communication technologies (ICT) affect students with disabilities in postsecondary education experience.

In its first two years of operation, the Network has begun

- Synthesizing and comparing the research evidence across the five countries regarding the relationship between students with disabilities, ICTs and post-compulsory education;
- Constructing theoretical explanations for why ICTs have not yet brought about the reductions in discrimination, disadvantage, and exclusion that were predicted when equality and discrimination related laws were published; and
- Providing new perspectives about potential future solutions regarding how post-compulsory education institutions can better use ICTs to remove the ongoing problems of disadvantage and exclusion of students with disabilities.

For more information consult the project website at ed-ict.com.

About AccessComputing

Led by the Paul G. Allen School of Computer Science & Engineering, the Information School, and DO-IT (Disabilities, Opportunities, Internetworking, and Technology) at UW, *AccessComputing* is supported by the National Science Foundation (NSF) (Grant #CNS-0540615, CNS-0837508, CNS-1042260, CNS-1539179). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF. For further information, to be placed on the mailing list, request materials in an alternate format, or to make suggestions for project publications or web pages, contact us:

AccessComputing

University of Washington

Box 354842

Seattle, WA 98195-4842

accesscomp@uw.edu

www.uw.edu/accesscomputing/

206-685-DOIT (3648) (voice/TTY)

888-972-DOIT (3648) (toll free voice/TTY)

206-221-4171 (FAX)

Richard Ladner, PI

Sheryl Burgstahler, Co-PI

Amy J. Ko, Co-PI

Jacob O. Wobbrock, Co-PI

Brianna Blaser, Project Coordinator

Kayla Brown, Project Coordinator

Lyla Crawford, Internal Evaluator

